



TEST REPORT

TEST OF A NON-CATALYTIC WOOD HEATER FOR EMISSIONS AND EFFICIENCY  
PER EPA METHODS ALT-125, ASTM E2515, ASTM E3053 and CSA B415.1,

Client:

**Wolf Steel Ltd.**

24 Napoleon Road, Barrie,  
Ont. L4M 0G8  
Model Name: 2200

Attention: Rafael Sanchez

TESTED BY:

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

TEST DATES: October 24<sup>th</sup> and 25<sup>th</sup> 2018


REPORT DATE: October 31<sup>st</sup> 2018


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## List of revisions

Revision 1: April 16<sup>th</sup> 2019 updated names

Revision 2: inclusion of Operating instruction into the NCBI report

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## 1 INTRODUCTION

### 1.1 GENERAL

#### Laboratory

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

#### Test program

- Purpose: unit qualification NSPS 2020 cord wood
- Test dates: October 24<sup>th</sup> and 25<sup>th</sup> 2018
- Test methods used:
  - Particulate emissions: ASTM E3053-17 ; ASTM E2515-11 methods ALT-125 as referred into 40 CFR Part 60 Subpart AAA
  - Efficiency: CSA B415.1-10

### 1.2 TEST UNIT INFORMATION

#### General

- Manufacturer: Wolf Steel ltd
- Product type: wood heater
- Combustion system: non-catalytic
- Unit tested: 2200

#### Particularities

- Timberwolf 2200 – Stove with pedestal/legs
- Timberwolf EPI22 - Insert
- Napoleon S20 – Stove with pedestal
- Napoleon S20-i – Insert
- Napoleon 2020-S
- Napoleon 2020-Si

#### In Summary:

All six models are built from the same firebox configuration. All primary and secondary airflows are exactly the same at that point where they enter the unit. The viewing area and latching mechanism is the same for all door configurations. Optional stove pedestal/leg accessories are provided as are optional blowers.

### 1.3 RESULTS

#### Emission results obtained

- Weighted Average Emissions Rate: 2.25 g/hr

- Weighted Average Overall Efficiency: 72 %
- Conformity: NSPS Phase 2020 cord wood.

## 1.4 PRETEST INFORMATION

Unit condition: The unit was received by carrier in July 2018 in good condition. The 50hrs of aging was made by Polytests Services.

### Set up

- Venting system type: diameter 6-inch steel pipe and insulated chimney
- System height from floor: 15 feet
- Particularities: Optional convection fan can be provided with the heater

## 2 SUMMARY OF TEST RESULTS

### 2.1 MODEL IDENTIFICATION

Model name number	2200
Manufacturer	Wolf Steel ltd
address	24 Napoleon Road, Barrie, Ont. L4M 0G8
appliance category	wood stove
Usable Firebox Volume - ft3	1,91
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	24-10-2018
Test Methods / Standard	ALT-125
Dilution Tunnel Inside diameter - in	8
Filter diameter	47
Filter material	PTFE Pall

### 2.3 TEST CONDITION SUMMARY

Model Name(s) / number(s)	2200		
Usable firebox Volume-ft3	1,91		
Convection Air Fan (No, Standard, Optional)	optional		
Test runs #	1,1	1,2	2.1

Date tested	24-10-2018	24-10-2018	25-10-2018
test run category (L,M,H)	H	L	M
average barometric pressure – in Hg	30,00	30,00	29,90
Max observe Ambient temp. °F	78,03	79,36	80,55
Min observe Ambient Temp °F	73,10	76,50	75,47
Max observe Filter temp °F	89,97	84,91	85,46
Run air settings			
Primary (measured up from minimum)	full open	full closed	full closed
Secondary (measured up from minimum)	fix	fix	fix
Convection air setting	on	on	on
Test fuel load			
Cordwood fuel species	Oak	Oak	Oak
specific Gravity (from Table 1)	0,66	0,66	0,66
Higher heating value - Btu/lb (from Annex A1)	8690	8690	8690
Nom. Test fuel piece length - in	16	16	16
Number of test fuel pieces	5	5	5
Test fuel Weight			
Kindling - as fired lb.	3,80	NA	NA
Kindling Wt. - as % of test fuel load	19,3%	NA	NA
Kindling Moisture % Db	9,0	NA	NA
Kindling Kg DB	1,58	NA	NA
SU Fuel Wt- as fired lb	4,90	NA	NA
SU Fuel wt. - as % of test fuel load	24,9%	NA	NA
SU Fuel moisture - % DB	20,0	NA	NA
SU fuel- Kg DB	1,85	NA	NA
Test Fuel Load - As Fired lb	19,69	22,14	22,20
Ave. Test Fuel Load MC % DB	20,51	21,53	21,61
Test Fuel Load - kg DB	7,41	8,26	8,28
Test fuel Loading density lb./ft3	10,31	11,59	11,62
Residual SU fuel wt. - as fired lb.	3	NA	NA
Residual SU fuel wt.- as % of test fuel load	15,2%	NA	NA
Test run duration - minutes	123	501	400
Test run duration - h	2,05	8,35	6,67
Test fuel load wt at the end of the test - as fired lb	1,9	0	0
total fuel burned kg Db	8,62	8,26	8,28

% test fuel load wt at end of the test	9,7%	0,0%	0,0%
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## 2.4 TEST RUN RESULTS SUMMARY

Model name / number	2200		
Usable Firebox volume	1,91		
Convection air Fan (no, Standard, option)	optional		
Test runs nu.	1,1	1,2	2,1
Date tested	24-10-2018	24-10-2018	25-10-2018
Test run category	H	L	M
Burn rate - Kg/hr DB	4,14	0,99	1,24
Burn rate as % of low to high Midpoint	NA	23,9%	190,8%
Burn duration - h	2,05	8,35	6,67
Heat output btu/hr	54 127	12 944	17 310
Average Dilution Tunnel Flow Rate - dscfm	285,4	301,6	302,3
Average Sample Flow Rates - dscfm			
Train 1	0,1563	0,1582	0,1584
train 2	0,1535	0,1544	0,1547
Total PM Emissions - g			
Train 1 g	6,21	23,66	9,16
train 2 g	6,51	23,07	8,01
Average	6,36	23,36	8,59
PM emission train precision %	2,34%	1,26%	6,68%
PM emission g/kg	0,74	2,83	1,04
PM emission rate g/h	3,10	2,80	1,29
Total Co Emission g	156,4	1077,3	636,2
Co emission Rate g/h	97,7	129,0	95,4
1 <sup>st</sup> hour emission rate g/h	4.2	11.63	4.39
Overall Efficiency - CSA B415,1			
% HHV Basis	71,04%	71,95%	72,69%
% LHV Basis	76,44%	77,42%	78,21%



## 2.5 WEIGHTED AVERAGE SUMMARY

Model name / number	2200		
Usable Firebox volume	1,91		
Convection air Fan ( no, Standard, option)	optional		
average for each test run category	L	M	H
burn rate kg/h DB	0,99	1,24	4,14
PM Emission rate - g/h	2,80	1,29	3,10
Co emission rate - g/h	129,02	95,42	97,73
Overall Efficiency - CSA B 415,1			
% HHV Basis	72,0%	72,7%	71,0%
% LHV Basis	77,4%	78,2%	76,4%
Heat output - Btu/hr	12944	17310	54127
Category weighting	0,4	0,4	0,2

## 2.6 WEIGHTED AVERAGE FINAL RESULTS

ASTM E 3053 Weighted averages			
PM Emission Rate - g/h	2,25		
CO Emission Rate g/h	109,3		
Overall Efficiency - CSA B415,1			
% HHV Basis	72,06%		
% LHV Basis	77,54%		
Heat output range - Btu/h	12 944	to	54127
Co Arithmetic average g/min	1.79		

## 2.7 TEST FACILITY CONDITIONS

Run Number	Room Temperature		Barometric pressure		Relative humidity		Air Velocity	
	Before	After	Before	After	Before	After	Before	After
	(F)	(F)	(in.Hg)	(in.Hg)	(%)	(%)	(ft/min)	(ft/min)
1	76	82	30,03	29,97	31	28,4	0	0
2	79	82	29,97	29,83	25,1	23	0	0

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

Average dilution tunnel measurements				Sample Data			
Run Number/ test category	Burn Rate (Min)	Volumetric Flow Rate (dscf/min)	Total Temperatures (°R)	Volume sampled (DSCF)		Particulate catch (mg)	
				1	2	1	2
high Fire test	123	285,35	582,81	19,221	18,883	3,40	3,50
Low fire test	501	301,64	550,30	79,257	77,369	12,50	11,90
medium fire test	400	302,33	555,43	63,349	61,863	4,80	4,10

## 2.9 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number/ test category	Sample Ratio		Total Emission (g)		
	Train 1	Train 2	Train 1	Train 2	% Deviation
high Fire test	1826,09	1858,74	6,21	6,51	2,34%
Low fire test	1906,71	1953,24	23,66	23,07	1,26%
medium fire test	1909,00	1954,86	9,16	8,01	6,68%

## 3 PROCESS DESCRIPTION

### 3.1 DISCUSSION

The heater was received in a good shape by a carrier in July 2018. Pre-burn was done as preliminary testing with cord wood at Polytests facility. The side walls of the combustion chamber are lined with Firebricks. The secondary air inlet is fixed and the primary air damper is located at the underneath the firebox. Post combustion is ensured by the secondary 4 tubes located at the top of the firebox. Above the tubes a is a deflector made of Ceramic fiber.

### 3.2 UNIT DIMENSIONS

#### Baffle

- Location: between top of combustion chamber and hearth
- Restriction: 2 ¼ X 23 ¼ inches at the front of unit
- Dimensions: covers the hearth area minus the restriction at front
- Material: 1-inch thick Ceramic Fiber

#### Bricks

- Firebrick 1 ¼ thick lining bottom, back and side of the firebox.

#### Flue gas exhaust

- Location: top
- Dimensions: 6 in. diameter
- Material: Steel

#### Gasket

- Door-Outer: ½" Dia. Black Woven Fiberglass Rope
- Door-Inner: 1/4" Black Woven Fiberglass Rope
- Glass: ¾" x 0.062" Black Woven Fiberglass

#### Overall unit dimension

- Firebox dimensions: W=20.87", D=14.66", H Max=11.63"
- Usable volume: 1.91 cuft
- Overall dimension: 26-inch-wide x 22.5-inch-deep x 29 3/4-inch-high

#### Convection fan

- Optional Model EPT70

#### Catalyst

- none

### 3.3 AIR SUPPLY SYSTEM

#### Description

- Primary air: Bottom front of the heater
- Secondary air: sides of the heater Refer appendix 6 for drawing details

#### 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	0.11	2.773	Yes	8.565
B *	Secondary	4.12	4.12	Fix	2.348
C *	Pilot	0.113	0.113	Fix	0.028

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

#### Legend

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

Type: Characterization of air intake

Imin: Minimum air intake of a particular air channel

Imax: Maximum air intake of a particular air channel

Controlled: Determines if a provision for air control is present

Outlet: Total air outlet of a particular air channel

### 3.4 OPERATION DURING TEST

#### Run #1.1

This run was performed on October 24<sup>th</sup> 2018. It lasted 123 minutes and a maximum burn rate was obtained at 4.14 kg/hr & emission at 3.1 gr/hr. The air inlet damper was fully open.

#### Run #1.2

This run was performed on October 24<sup>th</sup> 2018 as a continuation of the maximum burn rate (run1.1). It lasted 501 minutes and a Minimum burn rate was obtained at 0.99 kg/hr & emission at 2.8 gr/hr. The air inlet damper was at the minimum setting.

#### Run #21

This run was performed on October 25<sup>th</sup> 2018. It lasted 400 minutes and a medium burn rate was obtained at 1.24 kg/hr & emission at 1.29 gr/hr. The air inlet damper was at the medium setting.

- 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, 18 to 28% dry basis moisture content
- Description: for each test, description of the fuel crib is found on the front page of each test run data sheet together with photograph in appendix.

### 3.5 START-UP OPERATION

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

### 3.6 SAMPLING LOCATIONS

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

### 3.7 DRAWINGS

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

### 3.8 EMISSIONS EFFICIENCY TESTING EQUIPMENT LIST

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

## 4 SAMPLING METHODS

### 4.1 PARTICULATE SAMPLING

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

## 5 QUALITY ASSURANCE

### 5.1 INSTRUMENT CALIBRATION

#### 5.1.1 GAS METERS

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

#### 5.1.2 SCALES

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

#### 5.1.3 GAS ANALYZERS

The continuous analyzers are zeroed and spanned before each test with NBS traceable gases. A mid-scale multi-component calibration gas is then analyzed (values are recorded). At the conclusion of a test, the instruments are checked again with zero, span and calibration gases (values are recorded only). The drift in each meter is then calculated and must not exceed 5% of the scale used for the test.

### 5.2 TEST METHOD PROCEDURES

#### 5.2.1 LEAK CHECK PROCEDURES

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

#### 5.2.2 TUNNEL VELOCITY FLOW MEASUREMENT

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

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

#### 5.2.3 PM SAMPLING PROPORTIONALITY (ASTM E2515)

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

## APPENDIX 1: Raw data, forms and results



## Paramètres

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

Code verrouillage: WOL

### Description du test

Test standard	EPA
Run #	1
Date	24-10-2018
Technicien	m.m
Project #	pi-20178

### Description de l'unité

Manufacturier	Wolf Steel ltd	
Modèle	Timberwolf 2200	
Combustion system	Non-Cat	
Appliance type	wood stove	
Firebox volume	1,91	cu ft.
Appliance weight empty	n.a	lbs
Fan (no, Standard, Option)	optional	

### Paramètres du test

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

### Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,988	Dimensionless
Equipment number (DGM #1):	em 178	
Calibration Factor (DGM #2):	0,991	Dimensionless
Equipment number (DGM #2):	em 179	
Calibration Factor (DGM #3):	0,996	Dimensionless
Equipment number (DGM #3):	em 070	

### Tunnel

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

Project nu.	pi-20178
Date	24-10-2018
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<sup>3</sup> 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 <sup>3</sup>				
Usable Firebox Volume	1,91	ft <sup>3</sup>				
Total Nom. Load Wt. Target	19,10	lb				
Total Load Wt. Allowable Range	18,10	to	20,10	lb		
Core Target Wt. Allowable Range	8,60	to	12,40	lb		
Remainder Load Wt. Allowable Range	6,70	to	10,50	lb		
					Mid-Point	
Core Load Pc. Wt. Allowable Range	2,90	to	4,80	lb	3,85	
Remainder Load Pc. Wt. Allowable Range	1,90	to	10,50	lb	6,20	
		Pc. #				
Core Load Piece Wt. Actual	1	4,09	lb	In Range		
	2	4,16	lb	In Range		
	3	4,02	lb	In Range		
Core Load Total. Wt. Actual		12,27	lb	In Range		
		Pc. #				
Remainder Load Piece Wt.	1	3,16	lb	In Range		
(1 to 3 Pcs.)	2	4,26	lb	In Range		
	3		lb	NA		
Remainder Load Tot. Wt. Act		7,42	lb	In Range		
Total Load Wt. Actual		19,69	lb	In Range		
Core % of Total Wt.		62%		In Range	45-65%	
Remainder % of Total Wt.		38%		In Range	35-55%	
Actual Load % of Nominal Target		103%		In Range	95-105%	
Actual Fuel Load Density		10,3	lb/ft <sup>3</sup>			
<u>Kindling and Start-up Fuel</u>						
Maximum Kindling Wt. (20% of Tot. Load Wt.)		3,94	lb			
Actual Kindling Wt.		3,80	lb	In Range	19,3%	
Maximum Start-up Fuel Wt. (30% of Tot. Load Wt.)		5,91	lb			
Actual Start-up Fuel Wt.		4,90	lb	In Range	24,9%	
Allowable Residual Start-up Fuel Wt. Range	2,0	to	3,9	lb	Mid-Point	
Actual Residual Start-up Fuel Wt.		3	lb	In Range	3,0	
Total Wt. All Fuel Added (wet basis)		28,39	lb			
<u>High Fire Test Run End Point Range</u>						
	Low		High		Mid-Point	
Based on Fuel Load Wt. (w/tares)	1,8	to	2,2	lb	2,0	
Actual Fuel Load Ending Wt.		1,9	lb	In Range		

Fuel Piece Moisture Reading (%-dry basis)							
	1	2	3	Ave.		Pc. Wt. Dry Basis	
	18,9	19	19,1	19,0	In Range	3,43	1,56
	19,1	19,3	19,3	19,2	In Range	3,49	1,58
	19,2	19,8	19,1	19,4	In Range	3,37	1,53
	27,8	27,6	27,8	27,7	In Range	2,47	1,12
	19,3	19,2	19,3	19,3	In Range	3,57	1,62
				NA	NA	NA	NA
Total Load Ave. MC (%-dry basis)				20,5	In Range		
Total Load Ave. MC % (wet basis)				17,0			
Total Test Load Weight (dry basis)						16,34	7,41
<u>Kindling Moisture (%-dry basis)</u>							
	9	9	9	9,0	In Range	3,49	1,58
<u>Start-up Fuel Moisture Readings (%-dry basis)</u>							
	20	20	20	20,0	In Range	4,08	1,85
Total Wt. All Fuel Added (dry basis)						23,91	10,84
Total Wt. All Fuel Burned (dry basis)						19,0	8,6

Load pieces Length in. 16 in.

For Usable Firebox Volumes up to 3.0 ft <sup>3</sup> - Low and Medium Fire				CONSHOHOCKEN, PA 19428. ALL RIGHTS RESERVED.			
Nominal Required Load Density (wet basis)	12	lb/ft <sup>3</sup>					
Usable Firebox Volume	1,91	ft <sup>3</sup>					
Total Nom. Load Wt. Target	22,92	lb					
Total Load Wt. Allowable Range	21,77	to	24,07	lb			
Core Target Wt. Allowable Range	10,314	to	14,90	lb			
Remainder Load Wt. Allowable Range	8,02	to	12,61	lb			
Core Load Fuel Pc. Wt. Allowable Range	3,44	to	5,73	lb	Mid-Point	4,58	
Remainder Load Pc. Wt. Allowable Range	2,29	to	6,88	lb		4,58	
Core Load Piece Wt. Actual	Pc. #						
	1	3,99	lb	In Range			
	2	4,20	lb	In Range			
	3	4,36	lb	In Range			
Core Load Total. Wt. Actual		12,55	lb	In Range			
Remainder Load Piece Wt.	Pc. #						
(2 or 3 Pcs.)	1	3,39	lb	In Range			
	2	6,20	lb	In Range			
	3		lb	NA			
Remainder Load Piece Weight Ratio - Small/Large		55%		In Range		≤ 67%	
Remainder Load Tot. Wt. Act		9,58	lb	In Range			
Total Load Wt. Actual		22,14	lb	In Range			
Core % of Total Wt.		57%		In Range		45-65%	
Remainder % of Total Wt.		43%		In Range		35-55%	
Actual Load % of Nominal Target		97%		In Range		95-105%	
Actual Fuel Load Density		11,6	lb/ft <sup>3</sup>				
Allowable Charcoal Bed Wt. Range (lb)	2,3	to	4,4		Mid-Point		
Actual Charcoal Bed Wt.		4,0	lb	In Range		3,3	
Actual Fuel Load Ending Wt.		0,0	lb	Valid Test		≥ 90%	
Total Wt. of Fuel Burned During Test Run lb.		22,1	lb				
Load pieces Length in.		16	in.				

Fuel Piece Moisture Reading (%-dry basis)				Pc. Wt. Dry Basis					
1	2	3	Ave.						
19,2	19,3	19,2	19,2	In Range	3,35	lb	1,52	kg	
19,2	19,9	19,1	19,4	In Range	3,52	lb	1,60	kg	
19,3	19,4	19,3	19,3	In Range	3,65	lb	1,66	kg	
19,2	19,1	19,2	19,2	In Range	2,84	lb	1,29	kg	
27,4	27,8	27,9	27,7	In Range	4,85	lb	2,20	kg	
			NA	NA	NA	lb	NA	kg	
Total Load Ave. MC % (dry basis)				21,5	In Range				
Total Load Ave. MC % (wet basis)				17,7					
Total Test Load Weight (dry basis)						18,21	lb	8,26	kg
Total Fuel Weight Burned During Test Run (dry basis)						18,2	lb	8,26	kg

	Start	End
Barometer (kPa):	101,7	101,5
Barometer (in.Hg):	30,031999	29,97293872
Dry Bulb (F):	76,28	82,09
Humidity (%):	31	28,4
Air velocity (ft/min)	0	0

High fire test				
DGM #1	Final:	28620,755 cuft	Final:	810449,500 Liter
	Initial:	28600,427 cuft	Initial:	809873,880 Liter
DGM #2	Final:	26935,259 cuft	Final:	762721,580 Liter
	Initial:	26915,364 cuft	Initial:	762158,210 Liter
DGM room			Final:	465,440 cuft
			Initial:	419,120 cuft

min or med burnrate				
DGM #1	Final:	28704,920 cuft	Final:	812832,790 Liter
	Initial:	28620,862 cuft	Initial:	810452,550 Liter
DGM #2	Final:	27017,094 cuft	Final:	765038,880 Liter
	Initial:	26935,378 cuft	Initial:	762724,960 Liter
DGM room			Final:	642,800 cuft
			Initial:	465,440 cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du test commence	102
Numéro de la ligne dans "Raw data" à partir duquel les données du highfire test commence	130
Numéro de la ligne dans "Raw data" à partir duquel les données du min ou medium fire test commence	244

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

Project nu.	pi-20178
Date	24-10-2018
Technicien	m.m

## Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,2 in. H2O  
 Barometer: 30,032 in. Hg

**Pour un tunnel de 12" et plus, prendre 6 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
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

**PITOT CONSTANT=**  
0,969

**Pour un tunnel moins de 12", prendre 4 lectures**

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,056	91,14	0,2366
B center	0,056	90,91	0,2366
A1	0,048	91,34	0,2191
A2	0,066	91,37	0,2569
A3	0,049	91,31	0,2214
A4	0,043	90,99	0,2074
B1	0,043	91,460	0,2074
B2	0,069	91,980	0,2627
B3	0,054	92,330	0,2324
B4	0,045	92,310	0,2121
AVERAGE	0,0529	91,5140	0,2293

<b>Project nu.</b>	pi-20178
<b>Date</b>	24-10-2018
<b>Technicien</b>	<span style="border: 1px solid red; padding: 2px;">m.m</span>

## Filter set weight highfire

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	1	308	309	18	20	320	321	20	35	324	332	26	333		
Before (1)		na				na				na					
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,0691		0,1767	34,1659	108,8431		0,1756	35,4898	109,2859		0,1755	34,6692	0,1266	2018-10-23	17:00
Before (6)	61,0691		0,1767	34,1660	108,8432		0,1756	35,4897	109,2860		0,1754	34,6693	0,1267	2018-10-24	09:00
After (1)	61,0696	na	0,1778	34,1692	108,8434	na	0,1749	35,4925	109,2867	na	0,1765	34,6737	0,1267	2018-10-24	13:00
After (2)	61,0695		0,1778	34,1682	108,8433		0,1749	35,4914	109,2867		0,1765	34,6720	0,1267	2018-10-31	08:00
After (3)	61,0691		0,1778	34,1672	108,8433		0,1749	35,4914	109,2867		0,1765	34,6710	0,1267	2018-11-01	08:00
After (4)	61,0691		0,1778	34,1672	108,8433		0,1749	35,4914	109,2867		0,1765	34,6710	0,1267	2018-11-01	17:00
After (5)															
After (6)	61,0691		0,1778	34,1672	108,8433		0,1749	35,4914	109,2867		0,1765	34,6710	0,1267	2018-11-01	17:00
Difference	0,0000	0,0000	0,0011	0,0012	0,0001	0,0000	-0,0007	0,0017	0,0007	0,0000	0,0011	0,0017	0,0000		
Total (mg)		2,3				3,4				3,5			0		
Total ajusté (mg)		<b>2,30</b>				<b>3,40</b>				<b>3,50</b>					

Project nu.	pi-20178
Date	24-10-2018
Technicien	mm

**Filter set weight Low/ medium fire**

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	2	301	302	13	34	304	306	29	41	307	334	32	326		
Before (1)		na				na				na					
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,0996		0,1742	34,8651	110,1030		0,1735	34,3101	110,3647		0,1763	34,3980	0,1293	2018-10-23	17:00
Before (6)	61,0997		0,1743	34,8652	110,1029		0,1736	34,3100	110,3648		0,1763	34,3981	0,1294	2018-10-24	09:00
After (1)	61,1001	na	0,1769	34,8691	110,103	na	0,1799	34,3118	110,3654	na	0,1862	34,4019	0,1296	2018-10-24	22:00
After (2)	61,1001		0,1763	34,8689	110,1030		0,1793	34,3106	110,3654		0,1852	34,4005	0,1296	2018-10-31	08:00
After (3)	61,1001		0,1763	34,8689	110,1030		0,1793	34,3106	110,3654		0,1852	34,4005	0,1296	2018-11-01	08:00
After (4)															
After (5)															
After (6)	61,1001		0,1763	34,8689	110,1030		0,1793	34,3106	110,3654		0,1852	34,4005	0,1296	2018-11-01	08:00
Difference	0,0004	0,0000	0,0020	0,0037	0,0001	0,0000	0,0057	0,0006	0,0006	0,0000	0,0089	0,0024	0,0002		
Total (mg)		6,1				12,5				11,9			0,2		
Total ajusté (mg)		<b>5,90</b>				<b>12,30</b>				<b>11,70</b>					

Project nu.	pi-20178
Date	24-10-2018
Technicien	mm

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 3,1 g/hr

Test Duration: 123 min

Burn Rate : 4,136 Dry kg/hr

PRESSURE FACTOR: DGM 1 0,97973  
 DGM 2 0,98140  
 DGM 3 1,00276

BAROMETRIC PRESSURE  
 Average: 30,00246871 in Hg  
 Start: 30,0319987 in Hg  
 End: 29,97293872 in Hg

TEMPERATURE FACTORS DGM 1 0,97635  
 DGM 2 0,97550  
 DGM 3 0,98466

DGM CONTROLLER VALUES

DGM 1 Final: 28620,755 Cuft  
 Initial: 28600,427 Cuft

VOLUMES SAMPLED DGM 1 19,221 Scft  
 DGM 2 18,883 Scft  
 DGM 3 45,541 Scft

DGM 2 Final: 26935,259 Cuft  
 Initial: 26915,364 Cuft

DGM #3 Final: 465,440 Cuft  
 Initial: 419,120 Cuft

TOTAL TUNNEL VOLUME : 35099

TEMPERATURES

SAMPLE RATIOS  
 Sample Train 1: 1826,087  
 Sample Train 2: 1858,736

DGM 1 540,789 °R  
 DGM 2 541,261 °R

Particulate concentration  
 Sample Train 1 0,000177 g/dscf  
 Sample Train 2 0,000185 g/dscf  
 Room 0,000000 g/dscf

CALIBRATION FACTORS

DGM 1 0,9885  
 DGM 2 0,9914  
 DGM #3 0,9958

TUNNEL FLOW RATE: 285,355 Dscfm

TOTAL EMISSIONS  
 Sample Train 1 6,21 g  
 Sample Train 2 6,51 g

PARTICULATE CATCH  
 Total Sample Train 1: 3,40 mg  
 Total Sample Train 2: 3,50 mg  
 Total Sample Train 1 1st hour: 2,30 mg

EMISSION RATES  
 Sample Train 1 3,03 g/hr  
 Sample Train 2 3,17 g/hr

1st hour emission rate 4,20 g/hr

DEVIATION: 2,34%

Cs Train 1 0,0001769 Train 2 0,00018535





82.0	184.0	8.6	0.1	11.4	575.5	77.1	121.8	742.6	301.0	578.5	622.7	310.9	0.16	82.65	80.97	86.43	0.15	82.73	82.10	84.63
83.0	185.0	8.5	0.1	10.8	568.9	77.3	121.2	733.4	302.6	577.8	623.0	315.3	0.16	82.60	80.97	86.35	0.15	82.67	82.11	84.72
84.0	186.0	8.3	0.1	10.5	563.2	77.4	120.1	723.6	304.4	576.4	621.3	319.7	0.16	82.46	80.97	86.25	0.15	82.57	82.09	84.81
85.0	187.0	8.2	0.1	10.3	558.3	77.4	119.6	713.2	306.1	576.0	620.9	324.2	0.16	82.43	80.94	86.15	0.15	82.52	82.08	84.89
86.0	188.0	8.1	0.1	10.1	554.3	77.2	118.5	705.6	307.1	575.4	619.2	328.8	0.16	82.40	80.95	86.06	0.15	82.54	82.07	84.98
87.0	189.0	8.0	0.1	9.9	550.5	77.8	118.6	697.5	308.3	572.4	617.7	333.3	0.16	82.39	80.94	85.99	0.15	82.52	82.09	85.06
88.0	190.0	7.8	0.1	9.8	546.8	77.7	118.1	689.3	309.4	571.4	615.9	337.8	0.16	82.38	80.95	85.92	0.15	82.51	82.12	85.12
89.0	191.0	7.7	0.1	9.7	542.2	77.2	117.5	681.9	310.2	569.9	615.0	342.3	0.16	82.35	80.95	85.81	0.15	82.51	82.13	85.13
90.0	192.0	7.6	0.1	9.6	539.2	77.0	116.7	674.1	311.0	569.2	612.0	346.5	0.16	82.33	80.94	85.70	0.15	82.49	82.14	85.18
91.0	193.0	7.5	0.1	9.6	535.5	77.5	116.6	667.2	312.0	566.3	610.1	350.9	0.16	82.29	80.93	85.61	0.15	82.45	82.15	85.23
92.0	194.0	7.4	0.1	9.6	532.5	77.0	116.1	659.7	313.1	565.4	609.2	355.3	0.16	82.28	80.95	85.56	0.15	82.46	82.14	85.28
93.0	195.0	7.2	0.1	9.5	529.0	76.9	115.6	652.3	313.8	563.5	607.8	359.5	0.16	82.20	80.96	85.44	0.15	82.38	82.15	85.29
94.0	196.0	7.1	0.1	9.2	524.5	77.3	114.9	643.4	313.7	562.9	604.8	363.5	0.16	82.14	80.95	85.36	0.15	82.29	82.12	85.32
95.0	197.0	7.0	0.1	9.0	520.3	77.4	114.6	636.3	314.7	560.2	603.8	367.7	0.16	82.07	80.97	85.25	0.15	82.26	82.12	85.35
96.0	198.0	6.9	0.1	8.9	517.1	77.4	114.5	628.1	315.7	558.5	602.5	371.7	0.16	82.00	80.97	85.17	0.15	82.22	82.12	85.37
97.0	199.0	6.8	0.1	8.9	513.9	77.1	114.0	622.0	316.7	556.6	600.2	375.7	0.16	81.97	80.98	85.07	0.15	82.19	82.12	85.32
98.0	200.0	6.7	0.1	8.8	510.3	77.1	113.3	615.2	317.7	554.5	598.0	379.4	0.16	81.88	80.96	84.93	0.15	82.11	82.10	85.33
99.0	201.0	6.6	0.1	8.7	508.0	77.0	113.4	609.4	318.7	552.5	596.3	383.2	0.16	81.83	80.96	84.88	0.15	82.07	82.09	85.34
100.0	202.0	6.5	0.1	8.7	506.2	77.0	112.8	603.9	319.8	550.3	594.9	387.0	0.16	81.77	80.96	84.77	0.15	82.01	82.06	85.32
101.0	203.0	6.4	0.1	8.7	504.9	77.0	112.8	600.0	320.6	547.8	592.7	390.3	0.16	81.70	80.95	84.67	0.15	81.94	82.03	85.31
102.0	204.0	6.4	0.1	8.6	500.7	77.1	111.8	595.4	321.6	544.6	590.6	393.7	0.16	81.62	80.94	84.56	0.15	81.88	82.03	85.29
103.0	205.0	6.3	0.1	8.3	496.2	76.9	111.3	590.1	322.8	541.8	588.7	397.1	0.16	81.51	80.92	84.45	0.15	81.81	82.00	85.29
104.0	206.0	6.2	0.1	8.1	493.1	76.7	111.2	586.0	323.6	538.5	587.0	400.5	0.16	81.44	80.93	84.35	0.15	81.76	81.99	85.25
105.0	207.0	6.1	0.1	8.0	491.1	76.9	110.3	580.8	324.2	536.2	584.6	403.7	0.16	81.29	80.89	84.24	0.15	81.65	81.97	85.22
106.0	208.0	6.0	0.1	8.0	487.7	77.0	110.3	576.5	324.8	533.0	581.9	406.7	0.16	81.24	80.85	84.13	0.15	81.59	81.93	85.19
107.0	209.0	5.9	0.1	7.9	484.4	76.8	110.3	571.7	325.8	529.7	579.5	410.0	0.16	81.17	80.87	84.05	0.15	81.55	81.94	85.17
108.0	210.0	5.9	0.2	7.8	481.6	77.1	109.4	566.8	326.4	525.8	578.0	413.3	0.16	81.13	80.84	83.92	0.15	81.50	81.92	85.11
109.0	211.0	5.8	0.2	7.7	478.5	76.9	109.7	562.8	327.2	522.8	574.6	416.2	0.16	81.09	80.84	83.83	0.15	81.44	81.92	85.06
110.0	212.0	5.7	0.2	7.6	475.0	76.9	109.2	558.5	328.3	519.6	571.7	418.9	0.16	81.04	80.81	83.74	0.15	81.36	81.86	85.02
111.0	213.0	5.6	0.2	7.5	472.9	77.0	108.6	553.0	328.6	517.4	569.0	422.0	0.16	81.00	80.79	83.65	0.15	81.30	81.86	84.97
112.0	214.0	5.6	0.2	7.3	467.6	76.8	108.2	547.9	329.2	514.4	565.8	424.7	0.16	80.95	80.77	83.53	0.15	81.27	81.83	84.95
113.0	215.0	5.5	0.3	7.1	462.8	77.1	107.6	542.2	329.6	510.7	563.2	427.7	0.16	80.99	80.75	83.43	0.15	81.26	81.82	84.92
114.0	216.0	5.4	0.3	6.8	458.1	76.7	106.7	536.3	329.9	507.0	559.7	430.3	0.16	80.94	80.73	83.31	0.15	81.22	81.78	84.85
115.0	217.0	5.4	0.3	6.6	452.2	76.9	106.5	529.9	329.9	505.4	555.8	432.8	0.16	80.91	80.71	83.17	0.15	81.15	81.76	84.79
116.0	218.0	5.3	0.3	6.6	448.3	76.5	105.9	523.4	330.4	501.9	552.4	435.3	0.16	80.86	80.70	83.10	0.15	81.12	81.74	84.74
117.0	219.0	5.3	0.3	6.5	444.5	77.0	105.6	518.4	330.7	498.4	548.8	437.8	0.16	80.90	80.70	82.95	0.15	81.14	81.73	84.67
118.0	220.0	5.2	0.3	6.4	440.8	76.8	105.9	512.3	330.4	495.6	544.4	440.2	0.16	80.96	80.71	82.86	0.15	81.19	81.73	84.63
119.0	221.0	5.2	0.4	6.4	438.4	76.7	105.1	507.0	330.2	492.9	541.4	442.3	0.16	80.98	80.71	82.77	0.15	81.16	81.72	84.57
120.0	222.0	5.1	0.4	6.4	435.4	76.5	104.9	502.3	330.2	490.1	537.2	444.7	0.16	81.01	80.69	82.65	0.15	81.17	81.71	84.51
121.0	223.0	5.0	0.4	6.3	431.9	76.9	105.1	497.3	329.6	487.3	533.6	446.8	0.16	81.04	80.70	82.68	0.15	81.17	81.70	84.47
122.0	224.0	5.0	0.4	6.3	429.1	76.6	104.3	493.0	329.5	484.9	530.6	449.0	0.16	81.06	80.72	82.92	0.15	81.18	81.71	84.41
123.0	225.0	4.9	0.4	6.1	426.2	76.4	104.1	489.0	329.1	482.5	526.8	451.0	0.16	81.14	80.74	83.16	0.15	81.26	81.73	84.34

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 2,80 g/hr

Burn Rate : 0,989 Dry kg/hr

Test Duration: 501 min

PRESSURE FACTOR: DGM 1 0,97973  
 DGM 2 0,98140  
 DGM 3 1,00276

BAROMETRIC PRESSURE  
 Average: 30,00246871 in Hg  
 Start: 30,0319987 in Hg  
 End: 29,97293872 in Hg

TEMPERATURE FACTORS DGM 1 0,97362  
 DGM 2 0,97312  
 DGM 3 0,98158

DGM CONTROLLER VALUES

DGM 1 Final: 28704,920 Cuft  
 Initial: 28620,862 Cuft

VOLUMES SAMPLED DGM 1 79,257 Scft  
 DGM 2 77,369 Scft  
 DGM 3 173,834 Scft

DGM 2 Final: 27017,094 Cuft  
 Initial: 26935,378 Cuft

DGM #3 Final: 642,800 Cuft  
 Initial: 465,440 Cuft

TOTAL TUNNEL VOLUME : 151119

TEMPERATURES

SAMPLE RATIOS  
 Sample Train 1: 1906,708  
 Sample Train 2: 1953,237

DGM 1 542,307 °R  
 DGM 2 542,586 °R

CALIBRATION FACTORS

Particulate concentration  
 Sample Train 1 0,000158 g/dscf  
 Sample Train 2 0,000154 g/dscf  
 Room 0,000001 g/dscf

DGM 1 0,9885  
 DGM 2 0,9914  
 DGM #3 0,9958

TUNNEL FLOW RATE: 301,636 Dscfm

TOTAL EMISSIONS  
 Sample Train 1 23,66 g  
 Sample Train 2 23,07 g

PARTICULATE CATCH  
 Total Sample Train 1: 12,50 mg  
 Total Sample Train 2: 11,90 mg  
 Total Sample Train 1 1st hour: 6,10 mg

EMISSION RATES  
 Sample Train 1 2,83 g/hr  
 Sample Train 2 2,76 g/hr

1st hour emission rate 11,63 g/hr

DEVIATION: 1,26%

Cs Train 1 0,0001577 Train 2 0,00015381













426.0	670.0	0.8	1.1	5.5	167.6	77.7	85.6	266.3	348.1	291.1	275.5	335.2	0.16	81.57	81.88	80.51	0.15	81.80	82.24	80.64
427.0	671.0	0.8	1.1	5.5	167.6	77.7	85.3	266.3	347.2	291.2	275.3	335.4	0.16	81.49	81.86	80.52	0.15	81.75	82.21	80.66
428.0	672.0	0.8	1.1	5.5	167.5	77.7	85.2	266.1	346.4	291.2	275.2	335.4	0.16	81.42	81.85	80.51	0.15	81.70	82.20	80.66
429.0	673.0	0.8	1.1	5.6	167.5	77.7	85.2	266.0	345.6	291.2	274.8	335.5	0.16	81.38	81.82	80.51	0.15	81.65	82.18	80.65
430.0	674.0	0.8	1.1	5.6	167.7	77.7	85.2	265.8	344.7	291.2	274.7	335.6	0.16	81.29	81.80	80.48	0.15	81.59	82.17	80.64
431.0	675.0	0.7	1.1	5.6	167.4	77.6	85.2	265.8	344.0	291.1	274.5	335.8	0.16	81.20	81.77	80.48	0.15	81.55	82.13	80.64
432.0	676.0	0.7	1.1	5.4	167.4	77.6	85.0	265.5	343.3	291.1	274.3	335.8	0.16	81.16	81.75	80.46	0.15	81.50	82.11	80.62
433.0	677.0	0.7	1.1	5.3	167.1	77.6	84.9	265.4	342.6	291.1	274.2	335.8	0.16	81.11	81.71	80.47	0.15	81.44	82.08	80.59
434.0	678.0	0.7	1.1	5.3	166.9	77.6	84.9	265.0	341.8	291.0	273.9	335.9	0.16	81.07	81.68	80.44	0.15	81.40	82.05	80.59
435.0	679.0	0.7	1.2	5.1	166.9	77.6	84.9	264.9	341.2	291.0	273.9	336.0	0.16	81.03	81.67	80.42	0.15	81.35	82.03	80.60
436.0	680.0	0.7	1.1	5.0	166.9	77.5	84.8	264.8	340.6	291.0	273.6	336.1	0.16	80.98	81.62	80.40	0.15	81.28	81.98	80.55
437.0	681.0	0.7	1.1	5.0	166.4	77.5	84.6	264.2	340.0	290.8	273.4	336.2	0.16	80.93	81.62	80.38	0.15	81.27	81.98	80.54
438.0	682.0	0.7	1.1	4.9	166.2	77.5	84.6	263.9	339.2	290.6	273.3	336.3	0.16	80.90	81.58	80.38	0.15	81.22	81.97	80.53
439.0	683.0	0.7	1.1	5.0	166.0	77.5	84.7	263.4	338.8	290.5	273.1	336.4	0.16	80.86	81.56	80.37	0.15	81.16	81.92	80.52
440.0	684.0	0.6	1.1	5.0	165.5	77.5	84.6	262.9	338.4	290.2	272.7	336.5	0.16	80.85	81.54	80.36	0.15	81.15	81.92	80.50
441.0	685.0	0.6	1.1	4.9	165.6	77.5	84.4	262.3	337.7	289.8	272.5	336.5	0.16	80.81	81.51	80.33	0.15	81.11	81.90	80.48
442.0	686.0	0.6	1.1	5.0	165.0	77.4	84.4	262.1	336.9	289.6	272.2	336.5	0.16	80.75	81.46	80.29	0.15	81.06	81.86	80.43
443.0	687.0	0.6	1.1	5.0	164.8	77.4	84.4	261.6	336.3	289.3	272.0	336.5	0.16	80.73	81.44	80.27	0.15	81.02	81.82	80.43
444.0	688.0	0.6	1.1	5.0	164.8	77.4	84.3	261.2	335.7	288.9	271.8	336.5	0.16	80.68	81.42	80.27	0.15	80.99	81.80	80.42
445.0	689.0	0.6	1.1	5.0	164.6	77.4	84.3	260.7	335.1	288.5	271.4	336.5	0.16	80.65	81.39	80.23	0.15	80.95	81.76	80.37
446.0	690.0	0.6	1.0	5.0	164.6	77.4	84.4	260.2	334.5	288.1	271.2	336.5	0.16	80.62	81.37	80.22	0.15	80.94	81.73	80.37
447.0	691.0	0.6	1.0	5.0	164.5	77.3	84.4	260.1	334.0	287.8	271.0	336.5	0.16	80.59	81.34	80.20	0.15	80.89	81.70	80.33
448.0	692.0	0.6	1.1	5.0	164.2	77.3	84.2	259.7	333.4	287.6	270.7	336.4	0.16	80.55	81.31	80.17	0.15	80.85	81.67	80.31
449.0	693.0	0.6	1.1	5.0	164.1	77.3	84.1	259.4	332.9	287.0	270.4	336.4	0.16	80.53	81.27	80.15	0.15	80.83	81.65	80.28
450.0	694.0	0.5	1.1	5.0	163.9	77.3	84.0	259.3	332.3	286.8	270.3	336.5	0.16	80.51	81.25	80.12	0.15	80.80	81.62	80.26
451.0	695.0	0.5	1.1	5.0	163.9	77.2	84.5	258.6	331.7	286.5	270.1	336.5	0.16	80.53	81.23	80.08	0.15	80.81	81.59	80.22
452.0	696.0	0.5	1.1	5.1	163.7	77.2	85.8	258.8	331.0	285.9	269.8	336.4	0.16	80.63	81.25	80.08	0.15	80.86	81.61	80.20
453.0	697.0	0.5	1.1	5.1	163.1	77.2	87.5	258.7	330.4	285.3	269.8	336.4	0.16	80.81	81.27	80.10	0.15	80.97	81.63	80.20
454.0	698.0	0.5	1.1	5.1	162.7	77.4	88.5	258.6	330.0	285.0	269.7	336.2	0.16	81.03	81.30	80.12	0.15	81.10	81.68	80.23
455.0	699.0	0.5	1.1	5.2	162.2	77.4	90.1	258.4	329.7	284.6	269.5	336.2	0.16	81.25	81.37	80.15	0.15	81.26	81.73	80.24
456.0	700.0	0.5	1.1	5.2	162.1	77.1	89.8	257.9	329.2	284.0	269.6	336.1	0.16	81.45	81.45	80.15	0.15	81.44	81.80	80.27
457.0	701.0	0.5	1.1	5.3	162.1	77.2	88.8	257.4	328.9	283.9	269.4	336.1	0.16	81.69	81.52	80.18	0.15	81.63	81.88	80.30
458.0	702.0	0.5	1.1	5.3	162.3	77.4	88.2	257.5	328.4	283.5	269.4	336.1	0.16	81.81	81.59	80.21	0.15	81.75	81.93	80.32
459.0	703.0	0.5	1.1	5.3	162.3	77.5	87.5	257.0	328.0	283.2	269.3	336.1	0.16	81.88	81.63	80.24	0.15	81.81	81.96	80.36
460.0	704.0	0.5	1.1	5.2	162.7	77.4	86.9	257.0	327.5	282.8	269.2	335.9	0.16	81.87	81.65	80.24	0.15	81.84	82.00	80.37
461.0	705.0	0.4	1.1	5.2	162.6	77.5	86.6	256.8	327.1	282.4	269.1	335.8	0.16	81.83	81.65	80.26	0.15	81.82	82.01	80.39
462.0	706.0	0.4	1.1	5.2	162.7	77.4	86.1	256.4	326.5	282.0	269.0	335.7	0.16	81.77	81.65	80.24	0.15	81.82	82.01	80.39
463.0	707.0	0.4	1.1	5.3	162.6	77.4	85.8	256.3	326.1	281.7	268.9	335.5	0.16	81.69	81.65	80.26	0.15	81.78	82.00	80.38
464.0	708.0	0.4	1.1	5.3	162.6	77.4	85.5	256.4	325.8	281.2	269.0	335.5	0.16	81.60	81.64	80.28	0.15	81.74	82.00	80.41
465.0	709.0	0.4	1.1	5.3	162.3	77.4	85.4	256.0	325.5	280.9	268.8	335.4	0.16	81.53	81.64	80.28	0.15	81.69	81.98	80.40
466.0	710.0	0.4	1.1	5.2	162.3	77.4	85.1	255.6	325.1	280.7	268.8	335.4	0.16	81.45	81.62	80.28	0.15	81.63	82.00	80.42
467.0	711.0	0.4	1.1	5.2	162.1	77.4	85.1	255.5	324.8	280.3	268.7	335.3	0.16	81.36	81.60	80.28	0.15	81.58	81.98	80.41
468.0	712.0	0.4	1.1	5.2	161.8	77.4	84.9	255.2	324.6	280.3	268.7	335.2	0.16	81.25	81.58	80.30	0.15	81.50	81.95	80.41
469.0	713.0	0.4	1.1	5.2	161.5	77.4	84.8	255.0	324.3	279.9	268.4	335.1	0.16	81.15	81.53	80.27	0.15	81.45	81.94	80.39
470.0	714.0	0.3	1.1	5.2	161.6	77.1	84.7	254.9	323.7	279.6	268.4	335.0	0.16	81.09	81.52	80.27	0.15	81.39	81.91	80.39
471.0	715.0	0.3	1.1	5.2	161.9	77.1	84.5	254.9	323.4	279.3	268.3	335.0	0.16	81.03	81.49	80.27	0.15	81.34	81.89	80.39
472.0	716.0	0.3	1.1	5.2	161.4	77.2	84.7	255.0	323.2	279.1	268.1	335.0	0.16	80.97	81.47	80.25	0.15	81.29	81.86	80.38
473.0	717.0	0.3	1.1	5.2	161.4	77.1	84.5	254.9	322.9	278.8	268.0	334.9	0.16	80.94	81.45	80.23	0.15	81.27	81.84	80.36
474.0	718.0	0.3	1.1	5.3	161.5	76.8	84.4	254.7	322.6	278.8	268.0	334.9	0.16	80.92	81.43	80.23	0.15	81.23	81.85	80.37
475.0	719.0	0.3	1.1	5.3	161.6	76.9	84.5	254.5	322.2	278.3	267.5	335.0	0.16	80.91	81.42	80.22	0.15	81.19	81.82	80.32
476.0	720.0	0.3	1.1	5.2	161.8	76.9	84.8	254.1	321.8	278.4	267.6	334.9	0.16	80.91	81.38	80.19	0.15	81.17	81.81	80.31
477.0	721.0	0.3	1.1	5.2	162.0	77.0	84.6	253.7	321.6	278.3	267.5	334.8	0.16	80.90	81.37	80.19	0.15	81.13	81.80	80.31
478.0	722.0	0.3	1.1	5.2	162.2	77.1	84.3	253.5	321.3	278.1	267.5	334.7	0.16	80.87	81.34	80.16	0.15	81.11	81.78	80.30
479.0	723.0	0.3	1.1	5.3	162.1	77.1	84.4	253.2	320.9	278.0	267.7	334.7	0.16	80.85	81.31	80.15	0.15	81.09	81.74	80.26
480.0	724.0	0.3	1.1	5.3	162.3	77.1	84.2	252.9	320.8	277.9	267.4	334.6	0.16	80.84	81.30	80.12	0.15	81.05	81.74	80.26
481.0	725.0	0.2	1.1	5.3	161.9	77.1	84.3	252.6	320.7	277.8	267.3	334.5	0.16	80.80	81.26	80.12	0.15	81.02	81.71	80.24
482.0	726.0	0.2	1.1	5.2	161.8	77.0	84.0	252.1	320.4	277.6	267.1	334.5	0.16	80.77	81.24	80.10	0.15	80.99	81.68	80.20
483.0	727.0	0.2	1.1	5.2	161.7	77.0	83.9	252.0	320.2	277.4	267.2	334.5	0.16	80.73	81.19	80.07	0.15	80.95	81.65	80.20
484.0	728.0	0.2	1.1	5.2	161.8	77.1	83.8	251.7	320.1	277.2	267.1	334.3	0.16	80.71	81.17	80.05	0.15	80.93	81.65	80.17
485.0	729.0	0.2	1.1	5.2	161.5	77.0	83.8	251.3	319.8	277.1	266.8	334.2	0.16	80.67	81.14	80.04	0.15	80.88	81.62	

Manufacturer: Wolf Steel Ltd  
 Model: Timberwolf 2200

Run: 1  
 Project #: pi-20178  
 Test Duration: 501 min

	HHV	LHV
Eff	71,04%	76,44%
Comb Eff	98,40%	98,40%
HT Eff	72,20%	77,69%
Output	57 059	kJ/h
Burn Rate	3,97	kg/h
Grams CO	156	g
Input	80 316	kJ/h
MC wet	17,02	

Note: In the "Input data", "Calc. % O<sub>2</sub>", "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 13.7.3

Ultimate CO<sub>2</sub>  
 CO<sub>2-ut</sub> 19,86  
 F<sub>o</sub>  
 1,051

Overall Heating Efficiency: 71,04%  
 Combustion Efficiency: 98,40%  
 Heat Transfer Efficiency: 72,20%

	Air Fuel Ratio (A/F)	
	Dry Molecular Weight (M <sub>d</sub> )	30,20
	Dry Moles Exhaust Gas (N <sub>p</sub> ):	322,21
	Air Fuel Ratio (A/F)	9,22

Heat Output:	54 127 Btu/h	57 059 kJ/h
Heat Input:	76 188 Btu/h	80 316 kJ/h
Burn Duration:	1,60 h	
Burn Rate:	8,76 lb/h	3,975 kg/h
Stack Temp:	585,6 Deg. F	307,5 Deg. C

Manufacturer: Wolf Steel Ltd  
 Model: Timberwolf 2200

Run: 1  
 Project #: pi-20178  
 Test Duration: 501 min

	HHV	LHV
Eff	71.95%	77.42%
Comb Eff	90.26%	90.26%
HT Eff	79.71%	85.77%
Output	13 645	kJ/h
Burn Rate	0.94	kg/h
Grams CO	1 077	g
Input	18 964	kJ/h
MC wet	17.72	

Note: In the "Input data", "Calc. % O<sub>2</sub>", "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 13.7.3

Ultimate CO<sub>2</sub>  
 CO<sub>2-ut</sub> 19,86  
 F<sub>o</sub>  
 1,050

Overall Heating Efficiency: 71,95%  
 Combustion Efficiency: 90,26%  
 Heat Transfer Efficiency: 79,71%

	Air Fuel Ratio (A/F)	
	Dry Molecular Weight (M <sub>d</sub> )	29,66
	Dry Moles Exhaust Gas (N <sub>p</sub> )	427,83
	Air Fuel Ratio (A/F)	12,18

Heat Output:	12 944 Btu/h	13 645 kJ/h
Heat Input:	17 990 Btu/h	18 964 kJ/h
Burn Duration:	8,35 h	
Burn Rate:	2,07 lb/h	0,939 kg/h
Stack Temp:	223,2 Deg. F	106,2 Deg. C

Date: 2018-10-24 Manufacturer: WolfSteel Model: 22  
 Project #: PI 20178 Run: 1 Tech: MM Reviewer: SP

- kindling 86 LBS stack Fine 1 m w torch
- No paper
- Fan ~~Low~~ off
- close DOOR immediately
- At 300 LBS insert load
- At 683 °F in stack close DOOR
- At 39 mins open Fan low
- At 49 LBS stop pump and stop Fan
- At 400 LBS insert load
- At 5 min close DOOR
- At 1300 close air gradually
- At 15 min close air net completely between light orange and Black

TEST LOAD CONFIGURATION

**PRE / POST CHECKS**

 Date: 2018-10-24 Manufacturer: Wolf Steel Model: 22  
 Project #: PI 20178 Run: 1 Tech: MM Reviewer: JP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-191	7:00	ok	ok

Pre-Test

Post-Test

**Facility Conditions:**

 Air Velocity from less than 2 feet .....  
 Smoke Capture Check.....  
 Picture.....

	Pre-Test	Post-Test
(max50 Fpm)	0	0
ok	ok	ok
4 sides	ok	ok

**Wood Heater Conditions:**

 Date Wood Heater Stack Cleaned.....  
 Date Dilution Tunnel Cleaned.....  
 Induced Draft Check (max 0.005 H2O).....  
 Traverse before ignition.....

2018-10-24
2018-10-24
ok
ok

**Temperature System:**

Ambient (65°-90°F).....

ok	°F
----	----

**Proportional Checks:**

 Thermocouple check.....  
 Pitot Clean.....  
 Pitot verification.....

ok
ok
ok

**Sampling Train ID Numbers:**

	High fire test			Medium low fire test		
	1 <sup>st</sup> hour	Train 1	Train 2	1 <sup>st</sup> hour	Train 1	Train 2
Probe.....	01	20	35	02	34	41
Filter Front.....	308	320	321	301	304	307
Filter Back.....	309	321	332	302	306	334
Filter Thermocouple.....	11	11	12	11	11	12
Filter (80°F ≥ <90°F).....	ok	ok	ok	ok	ok	ok

# SAMPLING EQUIPMENT CHECK OUT

Date: 2018-10-24 Manufacturer: Wolf Steel Model: 22

Project #: PJ 20178 Run: 1 Tech: MM Reviewer: SP

## Leakage Checks Tunnel Samplers

High fire test	System 1 <sup>st</sup> hour		System 1		System 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	809872.83	80450.56	809873.06	810450.73	762157.08	762724.68
Initial 1minute DGM (Liter)	809872.83	80450.55	809873.11	810450.70	762157.08	762724.62
Change © (Liter)	∅	0.01	<del>809873.11</del>	0.03	∅	0.06
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)			0.10			
Check OK	ok	ok	ok	ok	ok	ok

Low medium fire test	System 1 <sup>st</sup> hour		System 1		System 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	810451.79	812833.49	810451.95	812833.56	762724.12	765040.08
Initial 1minute DGM (Liter)	810451.79	812833.48	810451.93	812833.54	762724.12	765040.06
Change © (Liter)	∅	0.01	0.02	0.02	∅	0.02
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	ok	ok	ok	ok	ok	ok



# SAMPLING EQUIPMENT CHECK OUT

Date: 2018-10-24 Manufacturer: Wolf Steel Model: 22  
 Project #: pt 20178 Run: 1 Tech: Mr Reviewer: SP

## Leakage Checks Flue Gas Sampler

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

## Leakage Checks Pitot

Plugged Probe	Pre Test	Pre Test	Post Test	Post Test
	3 H2o static	0.4-0.5 H2o velocity	3 H2o Static	0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	.5	3	.4
Check OK (no change after 15 sec.)	ok	ok	ok	ok

Date: 2018-10-24 Manufacturer: Wollstedt Model: 22  
 Project #: PT 20178 Run: 1 Tech: MM Reviewer: DP

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

**LIMITS OF WEIGHT RANGES**

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



Date: 2018-10-24 Manufacturer: Wolf Steel Model: 22  
 Project #: pJ 2018 Run: 1 Tech: MM Reviewer: DP

FOR TUNNELS &lt; 12 in

 Barometric pressure ( $P_{bar}$ ) 101.7 (KPa.) Static pressure ( $P_q$ ) 0.20 (inches w.c.)  
 Inside diameter: Port A \_\_\_\_\_ Port B \_\_\_\_\_  
 Tunnel cross sectional area: .1963Ft<sup>2</sup>  
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head $\Delta_p$ (inches H <sub>2</sub> O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0.056	91.14
B - Centroid	3.00	3.50	4	<del>0.056</del> <del>0.048</del>	<del>91.34</del> 90.91
A-1	0.40	0.50	0.50	<del>0.048</del> <del>0.066</del>	<del>91.37</del> 91.34
A-2	1.50	1.75	2	0.066	91.37
A-3	4.50	5.25	6	0.049	91.31
A-4	5.60	6.5	7.5	0.043	90.99
B-1	0.40	0.50	0.50	0.043	91.46
B-2	1.50	1.75	2	0.069	91.98
B-3	4.50	5.25	6	0.054	92.33
B-4	5.60	6.5	7.5	0.045	92.31
				AVERAGE	

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

Where,

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

 $\Delta_p$  = manometer reading (inches H<sub>2</sub>O)

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

 $P_s$  = absolute dilution tunnel gas pressure or  $P_{bar} + P_{qg}$ 
 $P_q$  = static pressure in. H<sub>2</sub>O  
 { 13.6 }

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

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

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

Date: 2018-10-24 Manufacturer: Wolfsteel Model: 22  
 Project #: PI 20178 Run: 1 Tech: MM Reviewer: DP

**Pre-Test (Adjust and Record)**

	ZERO		SPAN		CAL. (Record Only)	
	Actual	Should Be	Actual	Should Be	Actual	Should Be
CO	0	0	2989	3000	1008	1000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO <sub>2</sub>	0	0	1793	1800	980	1000
Tolerance CO <sub>2</sub>		+/- 0.02		+/- 0.5		+/- 0.5
O <sub>2</sub> 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	2990	1003	0	0.02	0.006	0.15	0.005	0.05	✓	
CO <sub>2</sub>	0	1790	985	0	0.02	0.07	0.5	0.05	0.5	✓	

**TEST DATA LOG**

Date: 2018-10-24      Manufacturer: WolfSteel      Model: 22  
 Project #: PJ 20178      Run: 1      Tech: MM      Reviewer: DP

**RAW DRY GAS METER READINGS**

		System 1	System 2	Blank
High fire test	Final (Liter)	810449.50	76272.58	465.44
	Initial (Liter)	809873.88	760158.21	<del>418</del> , 419.12
Low medium fire test	Final (Liter)	812832.79	765038.88	642.80
	Initial (Liter)	810452.55	762724.96	465.44

**AMBIENT CONDITIONS**

	Before	After
Barometer (kPa):	101.7	101.5
Dry Bulb (F):	76.28	82.09
Humidity (%):	31.0	28.4

## FUEL DATA

Date: 2018-10-24 Manufacturer: Wolfsteel Model: 22  
 Project #: PI 20178 Run: 1 Tech: MM Reviewer: DP

### FUEL DESCRIPTION:

Type of wood:

### KINDLING AND START-UP LOAD

Piece Size		Weight	Meter Moisture Content (% dry)			
X	X 16 in.	4086 lbs.				
X	X in.	4162 lbs.				
X	X in.	4020 lbs.				
X	X in.					
X	X 16 in.	48 lbs.	20		20	20
X	X in.					
X	X 16 in.	38 lbs.	9		9	9
X	X in.					
X	X in.					

### HIGHFIRE TEST LOAD

Piece Size		Weight	Meter Moisture Content (% dry)			
X	X 16 in.	4086 lbs.	189		190	191
X	X 16 in.	4162 lbs.	191		193	193
X	X 16 in.	4020 lbs.	192		198	191
X	X in.					
X	X 16 in.	360 lbs.	278		276	278
X	X 16 in.	4260 lbs.	193		192	193
X	X in.					
X	X in.					
X	X in.					

## FUEL DATA

Date: 2018-10-24 Manufacturer: Wolf Steel Model: 22  
 Project #: PI 20178 Run: 1 Tech: MM Reviewer: ND

### FUEL DESCRIPTION:

Type of wood:

### LOW OR MEDIUM TEST LOAD

Piece Size		Weight	Meter Moisture Content (% dry)			
x	x 16 in.	3 992 lbs.	192		193	192
x	x 16 in.	4200 lbs.	192		199	191
x	x 16 in.	4360 lbs.	193		194	193
x	x in.					
x	x 16 in.	3852 lbs.	192		191	192
x	x 16 in.	6198 lbs.	<del>192</del>		<del>191</del>	<del>191</del>
x	x in.		274		278	279
x	x in.					
x	x in.					
x	x in.					
x	x in.					
x	x in.					
x	x in.					
x	x in.					

**DILUTION TUNNEL PARTICULATE SAMPLER DATA**

Date: 2018-10-24 Project #: PI 20178 Run: 1 Manufacturer: Wolfsteel Model: ZZ  
 Tech: MM Reviewer: \_\_\_\_\_

HIGHFIRE TEST FILTERS										
SYSTEM 1 - 1 <sup>st</sup> 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	Blanck	
Date	Time	001	308	309	18	20	320	321	20	333
2018-10-23	17:00	610691	01767	341659	1088431			01756	354898	01266
2018-10-24	9:00	610691	01767	341660	1088432			01756	354897	01267

HIGHFIRE TEST FILTERS										
SYSTEM 1 - 1 <sup>st</sup> 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	Blanck	
Date	Time	001	308	309	18	20	320	321	20	333
2018-10-24	13:00	610696	<del>01778</del>	<del>01776</del>	341692	1088434		01749	354925	01267
2018-10-31	8:00	610695	01778	341682	1088433			01749	354914	01267
2018-11-01	8:00	610691	01778	341672	1088433			01749	354914	01267
2018-11-01	17:00	610691	01778	341672	1088433			01749	354914	01267

Date: 2018-10-24 Model: 22

Manufacturer: Wolf Steel

Project #: pI 20178 Run: 1 Tech: MM Reviewer: \_\_\_\_\_

HIGH FIRE TEST FILTERS					
SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	35	324	332	26
2018-10-23	17:00	1092859		01755	346692
2018-10-24	9:00	1092860		01754	346693

HIGH FIRE TEST FILTERS					
SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	35	324	332	26
2018-10-24	13:00	1092867		01765	346737
2018-10-31	8:00	1092867		01765	346720
2018-11-01	8:00	1092867		01765	346710
2018-11-01	17:00	1092867		01765	346710



# DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2018-10-24 Manufacturer: Wolf Steel Model: 22  
 Project #: PI 20178 Run: 1 Tech: AA Reviewer: \_\_\_\_\_

LOW OR MEDIUM TEST FILTERS									
SYSTEM 1 - 1 <sup>st</sup> 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	Blanck
Date	Time	02	302	13	34	304	306	29	336
2018-10-23	17:00	610996	01742	348651	110 1030		01735	34 3101	0 1293
2018-10-24	9:00	610997	01743	348652	110 1029		01736	34 3100	0 1294

SYSTEM 1 - 1 <sup>st</sup> hour									
SYSTEM 1					SYSTEM 1				
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	02	302	13	34	304	306	29	336
2018-10-24	22:00	611001	01769	348691	110 1030		01799	34 3118	0 1296 0 1293
2018-10-31	8:00	611001	01763	348689	110 1030		01793	34 3106	0 1296 0 1294
2018-11-01	8:00	611001	01763	348689	110 1030		01793	34 3106	0 1296





# DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2018-10-24 Manufacturer: WolfSteel Model: 22

Project #: PI 20178 Run: 1 Tech: \_\_\_\_\_ Reviewer: \_\_\_\_\_

LOW OR MEDIUM FIRE TEST FILTERS			
SYSTEM 2			
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number
Date	Time	307	334
2018-10-23	17:00	110 3647	01763
2018-10-24	9:00	110 3648	01763

LOW OR MEDIUM FIRE TEST FILTERS			
SYSTEM 2			
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number
Date	Time	307	334
2018-10-24	22:00	110 3654	01862
2018-10-31	8:00	110 3654	01852
2018-11-01	8:00	110 3654	01852

## Paramètres

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

Code verrouillage: WOL

### Description du test

Test standard	EPA
Run #	2
Date	25-10-2018
Technicien	M.M
Project #	PI 20178

### Description de l'unité

Manufacturier	WOLFSTEEL	
Modèle	22	
Combustion system	Non-Cat	
Appliance type	WOODSTOVE	
Firebox volume	1,91	cu ft.
Appliance weight empty	n.a	lbs
Fan (no, Standard, Option)		

### Paramètres du test

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

### Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,988	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,991	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,996	Dimensionless
Equipment number (DGM #3):	EM 070	Dimensionless

### Tunnel

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

Project nu.	PI 20178
Date	25-10-2018
Technicien	<span style="border: 1px solid red; padding: 2px;">m.m</span>

### 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<sup>3</sup> 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 <sup>3</sup>				
Usable Firebox Volume	1,91	ft <sup>3</sup>				
Total Nom. Load Wt. Target	19,10	lb				
Total Load Wt. Allowable Range	18,10	to	20,10	lb		
Core Target Wt. Allowable Range	8,60	to	12,40	lb		
Remainder Load Wt. Allowable Range	6,70	to	10,50	lb		
					Mid-Point	
Core Load Pc. Wt. Allowable Range	2,90	to	4,80	lb	3,85	
Remainder Load Pc. Wt. Allowable Range	1,90	to	10,50	lb	6,20	
		Pc. #				
Core Load Piece Wt. Actual	1	3,58	lb	In Range		
	2	4,05	lb	In Range		
	3	4,70	lb	In Range		
Core Load Total. Wt. Actual		12,33	lb	In Range		
		Pc. #				
Remainder Load Piece Wt.	1	4,07	lb	In Range		
(1 to 3 Pcs.)	2	2,84	lb	In Range		
	3		lb	NA		
Remainder Load Tot. Wt. Act		6,91	lb	In Range		
Total Load Wt. Actual		19,24	lb	In Range		
Core % of Total Wt.		64%		In Range	45-65%	
Remainder % of Total Wt.		36%		In Range	35-55%	
Actual Load % of Nominal Target		101%		In Range	95-105%	
Actual Fuel Load Density		10,1	lb/ft <sup>3</sup>			
<u>Kindling and Start-up Fuel</u>						
Maximum Kindling Wt. (20% of Tot. Load Wt.)		3,85	lb			
Actual Kindling Wt.		3,80	lb	In Range	19,8%	
Maximum Start-up Fuel Wt. (30% of Tot. Load Wt.)		5,77	lb			
Actual Start-up Fuel Wt.		5,00	lb	In Range	26,0%	
Allowable Residual Start-up Fuel Wt. Range	1,9	to	3,8	lb	Mid-Point	
Actual Residual Start-up Fuel Wt.		3	lb	In Range	2,9	
Total Wt. All Fuel Added (wet basis)		28,04	lb			
<u>High Fire Test Run End Point Range</u>						
	Low		High		Mid-Point	
Based on Fuel Load Wt. (w/tares)	1,7	to	2,1	lb	1,9	
Actual Fuel Load Ending Wt.		1,8	lb	In Range		

Fuel Piece Moisture Reading (%-dry basis)							
	1	2	3	Ave.		Pc. Wt. Dry Basis	
	19,2	19,1	19,2	19,2	In Range	3,00	1,36
	19,9	19,2	19,2	19,4	In Range	3,39	1,54
	19,8	19,6	19,8	19,7	In Range	3,93	1,78
	27,9	27,6	27,7	27,7	In Range	3,18	1,44
	19,1	19,3	19,3	19,2	In Range	2,38	1,08
				NA	NA	NA	NA
Total Load Ave. MC (%-dry basis)				21,1	In Range		
Total Load Ave. MC % (wet basis)				17,4			
Total Test Load Weight (dry basis)						15,89	7,21
<u>Kindling Moisture (%-dry basis)</u>							
	9	9	9	9,0	In Range	3,49	1,58
<u>Start-up Fuel Moisture Readings (%-dry basis)</u>							
	20	20	20	20,0	In Range	4,17	1,89
Total Wt. All Fuel Added (dry basis)						23,54	10,68
Total Wt. All Fuel Burned (dry basis)						18,7	8,5

Load pieces Length in. 16 in.

For Usable Firebox Volumes up to 3.0 ft <sup>3</sup> - Low and Medium Fire				CONSHOHOCKEN, PA 19428. ALL RIGHTS RESERVED.			
Nominal Required Load Density (wet basis)	12	lb/ft <sup>3</sup>					
Usable Firebox Volume	1,91	ft <sup>3</sup>					
Total Nom. Load Wt. Target	22,92	lb					
Total Load Wt. Allowable Range	21,77	to	24,07	lb			
Core Target Wt. Allowable Range	10,314	to	14,90	lb			
Remainder Load Wt. Allowable Range	8,02	to	12,61	lb			
Core Load Fuel Pc. Wt. Allowable Range	3,44	to	5,73	lb	Mid-Point	4,58	
Remainder Load Pc. Wt. Allowable Range	2,29	to	6,88	lb		4,58	
Core Load Piece Wt. Actual	Pc. #						
	1	4,10	lb	In Range			
	2	4,04	lb	In Range			
	3	3,85	lb	In Range			
Core Load Total. Wt. Actual		11,99	lb	In Range			
Remainder Load Piece Wt.	Pc. #						
(2 or 3 Pcs.)	1	3,87	lb	In Range			
	2	6,34	lb	In Range			
	3		lb	NA			
Remainder Load Piece Weight Ratio - Small/Large		61%		In Range		≤ 67%	
Remainder Load Tot. Wt. Act		10,21	lb	In Range			
Total Load Wt. Actual		22,20	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		97%		In Range		95-105%	
Actual Fuel Load Density		11,6	lb/ft <sup>3</sup>				
Allowable Charcoal Bed Wt. Range (lb)	2,3	to	4,4		Mid-Point		
Actual Charcoal Bed Wt.		4,0	lb	In Range		3,3	
Actual Fuel Load Ending Wt.		0,0	lb	Valid Test		≥ 90%	
Total Wt. of Fuel Burned During Test Run lb.		22,2	lb				
Load pieces Length in.		16	in.				

Fuel Piece Moisture Reading (%-dry basis)				Pc. Wt. Dry Basis					
1	2	3	Ave.						
19,6	19,3	19,3	19,4	In Range	3,43	lb	1,56	kg	
19,2	19,3	19,2	19,2	In Range	3,39	lb	1,54	kg	
19,2	19,3	19,2	19,2	In Range	3,23	lb	1,46	kg	
19,1	19,6	19,5	19,4	In Range	3,24	lb	1,47	kg	
27,8	27,7	27,8	27,8	In Range	4,96	lb	2,25	kg	
			NA	NA	NA	lb	NA	kg	
Total Load Ave. MC % (dry basis)				21,6	In Range				
Total Load Ave. MC % (wet basis)				17,8					
Total Test Load Weight (dry basis)						18,25	lb	8,28	kg
Total Fuel Weight Burned During Test Run (dry basis)						18,3	lb	8,28	kg

	Start	End
Barometer (kPa):	101,5	101
Barometer (in.Hg):	29,972939	29,82528877
Dry Bulb (F):	78,98	82
Humidity (%):	25,1	23
Air velocity (ft/min)	0	0

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

min or med burnrate						
DGM #1	Final:	28772,270	cuft	Final:	814739,950	Liter
	Initial:	28705,043	cuft	Initial:	812836,270	Liter
DGM #2	Final:	27082,542	cuft	Final:	766892,180	Liter
	Initial:	27017,225	cuft	Initial:	765042,600	Liter
DGM room				Final:	704,650	cuft
				Initial:	642,800	cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du test commence 246

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

Numéro de la ligne dans "Raw data" à partir duquel les données du min ou medium fire test commence 246

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

Project nu.	PI 20178
Date	25-10-2018
Technicien	M.M

## Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,21 in. H2O  
 Barometer: 29,973 in. Hg

**Pour un tunnel de 12" et plus, prendre 6 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
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

**PITOT CONSTANT=**  
0,972

**Pour un tunnel moins de 12", prendre 4 lectures**

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,058	90,08	0,2408
B center	0,059	87,68	0,2429
A1	0,053	89,9	0,2302
A2	0,068	89,06	0,2608
A3	0,052	88,61	0,2280
A4	0,046	88,01	0,2145
B1	0,047	87,430	0,2168
B2	0,069	86,980	0,2627
B3	0,056	86,500	0,2366
B4	0,047	86,030	0,2168
AVERAGE	0,0555	88,0280	0,2350

<b>Project nu.</b>	PI 20178
<b>Date</b>	25-10-2018
<b>Technicien</b>	<span style="border: 1px solid red; padding: 2px;">M.M</span>

**Filter set weight Low/ medium fire**

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	4	701	703	35	18	705	706	40	30	707	708	42	709		
Before (1)		na				na				na					
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,3821		0,1736	33,9699	108,9481		0,1799	34,3251	110,2298		0,1800	35,3654	0,1217	2018-10-24	18:00
Before (6)	61,3820		0,1737	33,9698	108,9480		0,1800	34,3250	110,2299		0,1800	35,3653	0,1217	2018-10-25	08:00
After (1)	61,3824	na	0,1729	33,9731	108,948	na	0,1825	34,3264	110,2299	na	0,1829	35,3685	0,1217	2018-10-25	19:00
After (2)	61,3824		0,1729	33,9725	108,9480		0,1817	34,3258	110,2299		0,1824	35,3671	0,1217	2018-10-31	08:00
After (3)	61,3824		0,1729	33,9725	108,9480		0,1817	34,3258	110,2299		0,1823	35,3671	0,1217	2018-11-01	08:00
After (4)															
After (5)															
After (6)	61,3824		0,1729	33,9725	108,9480		0,1817	34,3258	110,2299		0,1823	35,3671	0,1217	2018-11-01	08:00
Difference	0,0004	0,0000	-0,0008	0,0027	0,0000	0,0000	0,0017	0,0008	0,0000	0,0000	0,0023	0,0018	0,0000		
Total (mg)		2,3				4,8				4,1			0		
Total ajusté (mg)		<b>2,30</b>				<b>4,80</b>				<b>4,10</b>					

Project nu.	PI 20178
Date	25-10-2018
Technicien	mm

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 1,29 g/hr

Test Duration: 400 min

Burn Rate : 1,242 Dry kg/hr

PRESSURE FACTOR: DGM 1 0,98077  
 DGM 2 0,98373  
 DGM 3 0,99930

BAROMETRIC PRESSURE  
 Average: 29,89911375 in Hg  
 Start: 29,97293872 in Hg  
 End: 29,82528877 in Hg

TEMPERATURE FACTORS DGM 1 0,97199  
 DGM 2 0,97113  
 DGM 3 0,98027

DGM CONTROLLER VALUES

DGM 1 Final: 28772,270 Cuft  
 Initial: 28705,043 Cuft

VOLUMES SAMPLED DGM 1 63,349 Scft  
 DGM 2 61,863 Scft  
 DGM 3 60,331 Scft

DGM 2 Final: 27082,542 Cuft  
 Initial: 27017,225 Cuft

DGM #3 Final: 704,650 Cuft  
 Initial: 642,800 Cuft

TOTAL TUNNEL VOLUME : 120934

TEMPERATURES

SAMPLE RATIOS  
 Sample Train 1: 1908,997  
 Sample Train 2: 1954,864

DGM 1 543,215 °R  
 DGM 2 543,694 °R

CALIBRATION FACTORS

Particulate concentration  
 Sample Train 1 0,000076 g/dscf  
 Sample Train 2 0,000066 g/dscf  
 Room 0,000000 g/dscf

DGM 1 0,9885  
 DGM 2 0,9914  
 DGM #3 0,9958

TUNNEL FLOW RATE: 302,335 Dscfm

TOTAL EMISSIONS  
 Sample Train 1 9,16 g  
 Sample Train 2 8,01 g

PARTICULATE CATCH  
 Total Sample Train 1: 4,80 mg  
 Total Sample Train 2: 4,10 mg  
 Total Sample Train 1 1st hour: 2,30 mg

EMISSION RATES  
 Sample Train 1 1,37 g/hr  
 Sample Train 2 1,20 g/hr

1st hour emission rate 4,39 g/hr

DEVIATION: 6,68%

Cs Train 1 7,577E-05 Train 2 6,6275E-05



*		*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2
Elapsed		Weight			Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp
Time	Raw data row	Remaining	CO	CO <sub>2</sub>	Gas	Temp	Dry Bulb	Top	Back	R. Side	L. Side	Bottom	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF
min	lbs	%	%	%	%F	%F	%F	%F	%F	%F	%F	%F								
0.00	246.00	22.2	0.3	5.7	386.8	76.9	148.2	452.0	436.1	436.9	419.4	510.3	0.16	80.75	80.96	80.83	0.15	81.15	82.05	80.76
1.0	247.0	21.7	0.2	2.1	456.2	76.9	145.4	436.2	436.7	436.0	419.3	513.8	0.16	80.96	81.01	80.93	0.15	81.21	82.12	80.87
2.0	248.0	21.5	0.3	3.6	505.0	76.9	154.1	436.8	436.8	433.8	419.9	516.5	0.16	81.05	81.05	81.07	0.15	81.20	82.14	81.03
3.0	249.0	21.1	0.3	4.1	652.0	76.8	177.0	448.3	435.9	433.4	424.0	518.0	0.16	81.07	81.05	81.35	0.15	81.17	82.17	81.36
4.0	250.0	20.7	0.4	8.7	654.3	76.5	146.9	435.1	433.0	432.6	428.6	518.8	0.16	81.13	81.07	81.36	0.15	81.19	82.19	81.45
5.0	251.0	20.4	0.3	13.7	621.6	76.8	133.8	553.9	434.2	432.1	432.0	519.1	0.16	81.32	81.14	81.54	0.15	81.35	82.25	81.68
6.0	252.0	20.2	0.2	12.9	623.2	76.7	130.5	432.8	433.2	432.2	432.0	519.2	0.16	81.44	81.19	81.69	0.15	81.45	82.28	81.86
7.0	253.0	19.9	0.2	13.5	637.7	76.9	129.8	628.0	431.7	435.5	443.4	518.8	0.16	81.56	81.22	81.91	0.15	81.52	82.34	82.10
8.0	254.0	19.6	0.2	14.3	654.0	77.1	130.3	430.8	439.5	451.2	518.2	518.2	0.16	81.60	81.24	82.14	0.15	81.53	82.36	82.33
9.0	255.0	19.3	0.3	15.1	663.0	77.0	130.9	698.5	429.1	443.7	459.0	516.9	0.16	81.70	81.27	82.31	0.15	81.62	82.40	82.59
10.0	256.0	19.0	0.3	15.2	663.6	78.5	131.7	727.2	428.0	448.7	466.6	515.8	0.16	81.76	81.30	82.56	0.15	81.67	82.45	82.84
11.0	257.0	18.8	0.2	14.9	665.1	78.4	131.5	750.9	427.1	455.5	474.4	514.2	0.16	81.84	81.33	82.78	0.15	81.71	82.47	83.13
12.0	258.0	18.5	0.2	14.7	662.5	78.0	132.1	771.6	426.1	461.4	481.3	512.6	0.16	81.99	81.39	83.00	0.15	81.84	82.54	83.40
13.0	259.0	18.3	0.1	14.5	626.9	77.3	128.6	785.6	425.0	467.6	487.2	510.7	0.16	82.06	81.41	83.23	0.15	81.87	82.58	83.67
14.0	260.0	18.1	0.2	14.5	570.1	77.4	120.8	778.7	423.8	474.5	491.4	508.5	0.16	82.21	81.46	83.45	0.15	81.98	82.64	83.91
15.0	261.0	17.9	0.3	14.4	516.4	77.0	114.2	762.7	423.0	479.9	494.8	506.4	0.16	82.38	81.50	83.66	0.15	82.09	82.67	84.16
16.0	262.0	17.8	0.4	13.5	484.9	78.2	110.3	744.6	421.7	482.7	495.8	503.9	0.16	82.50	81.55	83.82	0.15	82.20	82.72	84.36
17.0	263.0	17.6	0.4	12.1	464.2	77.3	107.2	726.5	420.3	484.4	496.6	501.4	0.16	82.60	81.57	83.98	0.15	82.29	82.76	84.57
18.0	264.0	17.5	0.4	11.5	448.2	77.7	105.2	709.6	418.6	484.6	495.8	498.9	0.16	82.69	81.57	84.10	0.15	82.34	82.75	84.73
19.0	265.0	17.4	0.3	11.2	435.8	78.3	104.9	694.5	416.7	484.4	493.6	496.2	0.16	82.81	81.59	84.21	0.15	82.48	82.79	84.89
20.0	266.0	17.2	0.4	11.0	426.0	77.5	103.4	681.8	414.6	482.7	491.9	493.6	0.16	82.85	81.62	84.34	0.15	82.53	82.81	85.04
21.0	267.0	17.1	0.5	10.8	418.5	77.4	102.5	669.9	412.2	480.4	488.7	491.0	0.16	82.90	81.66	84.43	0.15	82.60	82.82	85.16
22.0	268.0	17.0	0.6	10.8	413.7	78.2	102.5	660.7	409.7	477.1	485.4	488.4	0.16	82.85	81.65	84.50	0.15	82.61	82.83	85.23
23.0	269.0	16.8	0.6	11.0	409.5	76.8	102.5	652.7	407.1	473.4	482.0	485.7	0.16	82.77	81.66	84.55	0.15	82.62	82.83	85.34
24.0	270.0	16.7	0.5	11.1	406.1	77.4	101.8	646.2	404.4	470.7	478.8	483.1	0.16	82.63	81.64	84.60	0.15	82.55	82.81	85.41
25.0	271.0	16.6	0.5	11.2	403.2	77.2	101.2	644.1	402.1	466.5	475.8	480.5	0.16	82.56	81.63	84.63	0.15	82.51	82.80	85.44
26.0	272.0	16.4	0.4	11.7	402.4	76.8	101.2	642.3	399.1	463.6	473.0	477.7	0.16	82.51	81.63	84.70	0.15	82.50	82.82	85.44
27.0	273.0	16.3	0.5	11.7	401.4	77.8	101.4	641.4	396.3	459.5	470.1	475.0	0.16	82.43	81.62	84.70	0.15	82.39	82.78	85.46
28.0	274.0	16.2	0.5	11.8	400.1	77.2	100.7	640.8	393.6	455.7	467.5	472.5	0.16	82.43	81.63	84.68	0.15	82.40	82.78	85.45
29.0	275.0	16.0	0.5	11.8	398.9	77.0	100.5	640.3	391.2	452.5	465.4	469.8	0.16	82.38	81.62	84.71	0.15	82.38	82.78	85.40
30.0	276.0	15.9	0.6	11.7	397.5	77.4	100.1	641.8	388.6	448.9	463.9	467.1	0.16	82.39	81.63	84.71	0.15	82.38	82.78	85.41
31.0	277.0	15.8	0.5	11.9	395.1	77.2	100.7	642.9	386.1	446.1	462.0	464.6	0.16	82.32	81.61	84.70	0.15	82.34	82.74	85.35
32.0	278.0	15.6	0.6	12.0	395.2	77.8	99.9	644.8	383.7	442.9	460.4	461.9	0.16	82.31	81.61	84.67	0.15	82.33	82.75	85.32
33.0	279.0	15.5	0.6	12.2	394.0	77.5	100.6	646.6	381.6	439.9	459.5	459.5	0.16	82.28	81.59	84.68	0.15	82.30	82.73	85.28
34.0	280.0	15.4	0.6	12.3	393.5	76.9	100.2	648.5	379.7	436.7	459.0	457.0	0.16	82.25	81.56	84.65	0.15	82.26	82.71	85.26
35.0	281.0	15.2	0.6	12.4	393.7	77.5	100.5	650.4	377.5	433.7	458.3	454.5	0.16	82.30	81.56	84.62	0.15	82.24	82.69	85.22
36.0	282.0	15.1	0.6	12.5	394.5	77.4	101.1	652.7	375.4	431.0	457.9	452.0	0.16	82.35	81.57	84.60	0.15	82.26	82.68	85.19
37.0	283.0	15.0	0.6	12.7	395.0	77.2	99.9	655.0	374.0	428.5	457.9	449.7	0.16	82.36	81.57	84.53	0.15	82.26	82.67	85.11
38.0	284.0	14.8	0.5	12.8	394.8	77.2	100.9	656.5	372.3	426.2	458.0	447.4	0.16	82.35	81.53	84.53	0.15	82.28	82.66	85.09
39.0	285.0	14.7	0.5	12.9	395.3	76.8	100.9	657.9	370.8	424.0	458.2	445.1	0.16	82.31	81.52	84.47	0.15	82.24	82.64	85.02
40.0	286.0	14.5	0.5	13.0	395.4	78.0	99.3	658.6	369.2	421.8	458.0	443.1	0.16	82.29	81.52	84.42	0.15	82.22	82.64	84.98
41.0	287.0	14.4	0.5	12.9	395.0	76.9	99.5	658.4	367.8	420.3	459.1	441.0	0.16	82.19	81.50	84.36	0.15	82.17	82.63	84.93
42.0	288.0	14.3	0.6	12.8	395.5	77.5	99.6	657.7	366.9	418.5	459.9	439.0	0.16	82.15	81.49	84.34	0.15	82.15	82.61	84.87
43.0	289.0	14.1	0.5	12.9	395.4	78.0	99.8	657.1	365.3	417.2	460.6	436.8	0.16	82.17	81.49	84.31	0.15	82.18	82.61	84.82
44.0	290.0	14.0	0.5	13.0	394.8	76.9	99.6	656.5	364.4	416.2	461.7	435.1	0.16	82.16	81.49	84.27	0.15	82.17	82.62	84.75
45.0	291.0	13.9	0.7	13.0	395.2	77.8	99.4	658.4	363.9	414.4	462.8	433.0	0.16	82.16	81.48	84.23	0.15	82.16	82.63	84.70
46.0	292.0	13.7	0.6	13.2	396.1	77.0	99.0	657.5	363.2	413.7	463.6	431.1	0.16	82.09	81.47	84.18	0.15	82.10	82.59	84.63
47.0	293.0	13.6	0.5	13.4	395.8	77.0	98.4	655.7	362.6	412.9	464.9	429.5	0.16	82.07	81.48	84.16	0.15	82.05	82.59	84.58
48.0	294.0	13.4	0.6	13.4	397.0	77.8	98.5	655.0	362.3	411.6	465.9	427.7	0.16	82.09	81.47	84.15	0.15	82.06	82.58	84.55
49.0	295.0	13.3	0.6	13.5	399.1	77.8	99.4	654.9	362.2	411.2	467.1	426.1	0.16	82.13	81.46	84.10	0.15	82.10	82.58	84.51
50.0	296.0	13.1	0.6	13.6	401.3	78.6	100.1	657.2	362.0	411.0	468.4	424.4	0.16	82.16	81.44	84.05	0.15	82.11	82.58	84.45
51.0	297.0	13.0	0.7	13.9	402.3	78.2	98.8	659.7	362.0	410.5	469.7	422.9	0.16	82.19	81.44	84.02	0.15	82.13	82.56	84.43
52.0	298.0	12.9	0.7	13.9	399.8	78.5	99.3	658.9	361.8	410.9	471.0	421.3	0.16	82.09	81.43	83.99	0.15	82.08	82.55	84.39
53.0	299.0	12.7	0.5	13.6	397.6	77.6	98.2	655.7	361.9	410.6	472.7	419.7	0.16	82.06	81.42	83.97	0.15	82.07	82.56	84.36
54.0	300.0	12.6	0.4	13.2	393.1	77.1	98.9	652.3	362.1	410.9	474.1	418.3	0.16	81.98	81.40	83.91	0.15	82.01	82.52	84.31
55.0	301.0	12.5	0.3	12.8	390.0	77.1	98.3	650.5	362.5	410.8	474.9	417.0	0.16	82.00	81.40	83.88	0.15	82.01	82.54	84.27
56.0	302.0	12.4	0.5	12.8	389.1	78.4	98.5	649.6												

82.0	328.0	9.3	0.3	12.9	376.5	77.7	96.1	632.5	374.7	439.5	473.4	389.9	0.16	81.64	81.16	82.89	0.15	81.58	82.22	81.77
83.0	329.0	9.2	0.3	12.5	374.4	77.2	96.7	628.5	376.2	439.9	473.7	389.3	0.16	81.54	81.14	82.85	0.15	81.52	82.19	81.84
84.0	330.0	9.1	0.3	12.4	372.9	76.8	96.3	623.7	376.9	440.2	474.0	388.7	0.16	81.51	81.10	82.83	0.15	81.50	82.18	81.89
85.0	331.0	9.0	0.4	12.1	371.0	78.3	95.7	618.6	378.1	441.1	473.7	388.2	0.16	81.51	81.07	82.78	0.15	81.47	82.16	81.90
86.0	332.0	8.9	0.4	12.2	370.1	78.5	95.8	614.9	378.9	441.9	473.3	387.4	0.16	81.54	81.07	82.76	0.15	81.45	82.16	81.95
87.0	333.0	8.8	0.4	12.1	368.7	78.4	95.4	611.6	380.0	442.7	473.7	386.9	0.16	81.54	81.03	82.72	0.15	81.41	82.13	82.00
88.0	334.0	8.7	0.4	12.0	366.6	77.4	96.1	609.6	380.9	443.3	472.4	386.2	0.16	81.51	81.01	82.67	0.15	81.38	82.11	82.01
89.0	335.0	8.6	0.3	12.1	364.0	78.3	95.8	603.7	381.8	443.8	472.2	385.9	0.16	81.54	81.02	82.68	0.15	81.42	82.11	82.06
90.0	336.0	8.5	0.3	11.9	361.1	78.7	94.8	598.4	382.5	444.5	471.5	385.3	0.16	81.52	81.00	82.67	0.15	81.40	82.08	82.06
91.0	337.0	8.4	0.2	11.5	358.2	77.5	94.8	592.6	383.0	445.0	470.5	384.3	0.16	81.55	81.00	82.66	0.15	81.43	82.07	82.09
92.0	338.0	8.3	0.2	11.2	355.5	77.7	95.4	587.8	383.4	444.5	471.1	384.0	0.16	81.48	80.99	82.62	0.15	81.41	82.06	82.10
93.0	339.0	8.2	0.2	11.2	354.0	77.5	94.3	582.6	384.0	444.4	470.1	383.3	0.16	81.45	80.96	82.62	0.15	81.34	82.03	82.14
94.0	340.0	8.2	0.2	11.1	351.1	78.1	94.2	577.8	384.6	444.1	469.5	382.9	0.16	81.41	80.94	82.57	0.15	81.30	82.00	82.17
95.0	341.0	8.1	0.2	10.9	347.3	78.7	93.9	572.2	385.1	443.6	468.8	382.3	0.16	81.42	80.92	82.56	0.15	81.29	81.99	82.20
96.0	342.0	8.0	0.3	10.6	344.6	78.1	93.9	565.9	385.0	443.0	468.3	381.8	0.16	81.42	80.89	82.52	0.15	81.29	81.97	82.20
97.0	343.0	8.0	0.4	10.2	341.3	77.6	93.7	559.5	385.5	441.8	467.2	381.4	0.16	81.41	80.87	82.49	0.15	81.26	81.97	82.18
98.0	344.0	7.9	0.4	10.0	337.6	78.2	93.5	552.3	385.8	441.5	465.9	380.9	0.16	81.33	80.86	82.47	0.15	81.21	81.93	82.17
99.0	345.0	7.8	0.4	9.9	335.6	78.1	93.1	545.6	386.0	439.1	464.9	380.5	0.16	81.33	80.85	82.45	0.15	81.19	81.92	82.17
100.0	346.0	7.7	0.4	9.7	332.9	78.5	92.4	539.7	386.0	437.6	463.7	379.9	0.16	81.33	80.84	82.41	0.15	81.16	81.90	82.15
101.0	347.0	7.7	0.5	9.7	330.2	77.5	92.9	534.1	385.8	435.9	462.5	379.8	0.16	81.23	80.80	82.38	0.15	81.10	81.88	82.13
102.0	348.0	7.6	0.5	9.6	327.8	77.3	92.4	528.6	386.1	434.1	460.9	379.1	0.16	81.18	80.76	82.33	0.15	81.05	81.82	82.11
103.0	349.0	7.5	0.5	9.5	325.1	77.6	91.9	523.9	386.2	433.0	459.9	379.0	0.16	81.10	80.75	82.30	0.15	80.99	81.83	82.13
104.0	350.0	7.5	0.5	9.3	322.4	77.9	91.9	519.1	386.2	430.3	458.7	378.8	0.16	81.11	80.75	82.30	0.15	81.05	81.82	82.14
105.0	351.0	7.4	0.5	9.3	320.1	77.4	92.0	514.6	385.7	428.4	457.6	378.6	0.16	81.10	80.72	82.25	0.15	81.05	81.81	82.10
106.0	352.0	7.3	0.5	9.3	318.8	77.6	91.3	510.6	386.0	426.7	456.4	378.3	0.16	81.14	80.73	82.20	0.15	81.12	81.80	82.08
107.0	353.0	7.3	0.5	9.3	317.0	77.0	91.8	506.7	385.8	424.5	455.3	378.1	0.16	81.15	80.75	82.17	0.15	81.14	81.81	82.05
108.0	354.0	7.2	0.5	9.3	314.8	77.4	91.3	502.7	386.1	423.6	454.6	378.0	0.16	81.09	80.72	82.13	0.15	81.07	81.79	82.01
109.0	355.0	7.2	0.5	9.3	314.0	77.3	92.2	499.9	386.0	422.0	453.1	377.9	0.16	81.04	80.71	82.10	0.15	81.02	81.77	82.02
110.0	356.0	7.1	0.5	9.3	312.2	77.2	91.7	498.3	386.4	419.5	453.0	377.9	0.16	80.96	80.72	82.04	0.15	80.99	81.75	81.98
111.0	357.0	7.0	0.5	9.4	311.4	77.8	91.0	495.7	386.4	417.7	452.2	377.9	0.16	80.90	80.71	82.01	0.15	80.96	81.74	81.95
112.0	358.0	7.0	0.4	9.4	310.6	77.4	91.3	493.4	386.2	416.0	451.5	377.7	0.16	80.82	80.69	81.95	0.15	80.90	81.72	81.92
113.0	359.0	6.9	0.4	9.4	309.3	77.7	91.0	491.2	386.2	414.7	451.3	377.8	0.16	80.80	80.67	81.90	0.15	80.89	81.71	81.93
114.0	360.0	6.9	0.4	9.5	309.2	77.6	91.1	488.6	386.1	413.3	450.6	377.9	0.16	80.79	80.66	81.87	0.15	80.89	81.68	81.93
115.0	361.0	6.8	0.4	9.4	308.5	78.0	90.7	486.0	386.2	412.5	450.2	377.8	0.16	80.80	80.64	81.81	0.15	80.90	81.66	81.88
116.0	362.0	6.8	0.4	9.4	308.0	78.1	90.4	484.5	386.2	410.8	449.2	378.1	0.16	80.78	80.62	81.79	0.15	80.88	81.65	81.84
117.0	363.0	6.7	0.4	9.4	306.5	77.0	90.6	482.7	386.5	409.8	448.7	378.4	0.16	80.73	80.60	81.77	0.15	80.82	81.62	81.83
118.0	364.0	6.6	0.4	9.5	305.6	76.7	90.7	480.7	386.3	408.3	447.9	378.5	0.16	80.71	80.56	81.73	0.15	80.83	81.61	81.80
119.0	365.0	6.6	0.4	9.4	304.5	77.7	90.2	479.2	386.7	407.4	447.5	378.2	0.16	80.63	80.54	81.68	0.15	80.75	81.59	81.79
120.0	366.0	6.5	0.4	9.4	304.0	77.2	90.7	476.9	386.7	406.5	447.0	378.8	0.16	80.58	80.53	81.66	0.15	80.70	81.55	81.77
121.0	367.0	6.5	0.4	9.3	302.9	77.1	90.4	474.4	386.6	405.0	446.3	379.1	0.16	80.59	80.51	81.59	0.15	80.71	81.54	81.75
122.0	368.0	6.4	0.4	9.3	301.2	77.3	90.5	472.1	386.9	404.8	446.0	379.4	0.16	80.64	80.51	81.56	0.15	80.73	81.51	81.70
123.0	369.0	6.4	0.4	9.2	300.3	77.5	90.0	470.5	386.9	403.3	445.4	379.5	0.16	80.60	80.48	81.56	0.15	80.68	81.53	81.69
124.0	370.0	6.3	0.4	9.1	298.2	76.6	90.3	468.0	387.0	403.2	445.0	380.1	0.16	80.54	80.46	81.49	0.15	80.63	81.47	81.61
125.0	371.0	6.3	0.4	8.8	296.8	76.8	90.1	467.1	387.4	401.3	444.3	379.9	0.16	80.57	80.48	81.45	0.15	80.68	81.49	81.61
126.0	372.0	6.2	0.5	8.6	294.6	76.9	90.3	463.5	387.2	400.3	443.5	380.8	0.16	80.54	80.47	81.40	0.15	80.68	81.47	81.59
127.0	373.0	6.2	0.5	8.5	292.7	77.4	89.5	461.0	387.0	398.6	442.7	381.1	0.16	80.54	80.45	81.38	0.15	80.67	81.47	81.58
128.0	374.0	6.1	0.5	8.4	290.9	76.3	89.2	459.1	386.9	397.5	441.8	381.5	0.16	80.50	80.44	81.33	0.15	80.65	81.46	81.56
129.0	375.0	6.1	0.5	8.3	289.0	76.2	89.1	456.0	386.5	396.0	440.8	382.0	0.16	80.44	80.39	81.32	0.15	80.63	81.45	81.53
130.0	376.0	6.0	0.5	8.3	287.5	76.8	89.3	453.7	386.3	395.1	439.6	382.2	0.16	80.44	80.38	81.27	0.15	80.62	81.43	81.47
131.0	377.0	6.0	0.5	8.2	286.2	77.1	89.3	451.2	385.8	394.5	438.4	382.2	0.16	80.39	80.36	81.21	0.15	80.57	81.40	81.43
132.0	378.0	5.9	0.6	8.2	284.9	76.9	89.1	448.8	385.2	393.4	437.1	382.9	0.16	80.35	80.34	81.18	0.15	80.54	81.40	81.44
133.0	379.0	5.9	0.6	8.1	278.7	76.9	89.1	443.4	384.2	391.9	435.3	383.3	0.16	80.35	80.32	81.11	0.15	80.53	81.35	81.40
134.0	380.0	5.8	1.4	6.8	274.7	76.7	89.0	438.3	383.7	390.6	432.8	383.5	0.16	80.40	80.34	81.09	0.15	80.58	81.38	81.35
135.0	381.0	5.8	1.5	6.6	271.5	76.5	88.3	434.0	383.1	389.6	430.4	383.9	0.16	80.35	80.31	81.06	0.15	80.53	81.35	81.34
136.0	382.0	5.8	1.5	6.6	268.4	76.6	88.0	429.2	382.0	387.7	428.2	384.1	0.16	80.27	80.27	81.04	0.15	80.42	81.31	81.29
137.0	383.0	5.7	1.5	6.6	265.3	77.1	88.2	424.4	380.9	386.2	425.4	384.4	0.16	80.19	80.26	81.01	0.15	80.40	81.29	81.25
138.0	384.0	5.7	1.5	6.6	263.6	76.2	87.5	419.9	379.6	384.9	423.2	384.6	0.16	80.21	80.24	80.97	0.15	80.39	81.25	81.18
139.0	385.0	5.6	1.5	6.6	261.7	76.8	88.1	415.7	378.0	383.0	420.2	384.9	0.16	80.22	80.23	80.94	0.15	80.38	81.25	81.15
140.0	386.0	5.6	1.5	6.7	259.6	77.1	87.5	410.9	376.6	382.5	417.6	385.1	0.16	80.25	80.22	80.88	0.15	80.40	81.23	81.10
141.0	387.0	5.6	1.5	6.7	257.9	76.6	87.4	407.8	375.4	380.2	415.2	385.4	0.16	80.19	80.21	80.85	0.15	80.36	8	

168.0	414.0	4.5	1.7	6.7	233.5	76.1	86.3	357.5	359.0	351.4	373.7	388.5	0.16	79.55	79.73	80.23	0.15	79.63	80.56	80.07
169.0	415.0	4.4	1.7	6.8	232.8	76.9	88.0	356.5	359.2	350.9	372.9	388.4	0.16	79.77	79.79	80.50	0.15	79.78	80.57	80.07
170.0	416.0	4.4	1.7	6.7	232.0	77.6	89.5	355.4	359.5	350.5	372.1	388.6	0.16	79.97	79.85	80.60	0.15	79.94	80.63	80.10
171.0	417.0	4.4	1.7	6.7	231.7	76.9	90.1	354.9	359.9	350.1	371.3	388.7	0.16	80.16	79.92	80.80	0.15	80.08	80.68	80.11
172.0	418.0	4.3	1.7	6.7	231.0	77.6	89.5	353.9	360.2	349.8	371.4	388.9	0.16	80.34	79.99	80.84	0.15	80.23	80.74	80.12
173.0	419.0	4.3	1.7	6.7	231.4	77.3	89.0	353.1	360.4	349.6	370.2	389.0	0.16	80.42	80.03	80.84	0.15	80.31	80.78	80.13
174.0	420.0	4.2	1.7	6.8	231.5	77.9	88.4	352.3	360.6	348.9	369.9	389.0	0.16	80.41	80.08	81.18	0.15	80.35	80.83	81.19
175.0	421.0	4.2	1.6	6.7	231.6	78.0	88.6	351.6	360.8	348.8	369.2	389.0	0.16	80.41	80.10	82.28	0.15	80.41	80.84	82.26
176.0	422.0	4.2	1.6	6.5	230.7	77.3	90.1	350.7	361.5	348.2	368.6	389.1	0.16	80.54	80.16	82.49	0.15	80.52	80.90	82.33
177.0	423.0	4.1	1.7	6.4	230.4	78.4	91.1	350.3	362.1	347.8	367.8	389.2	0.16	80.73	80.24	82.47	0.15	80.67	80.95	82.34
178.0	424.0	4.1	1.7	6.5	230.2	77.4	91.4	349.6	362.5	347.5	367.0	389.2	0.16	80.93	80.34	82.39	0.15	80.84	81.02	82.37
179.0	425.0	4.1	1.6	6.6	229.5	78.1	92.2	348.9	362.8	347.4	366.7	389.2	0.16	81.12	80.42	82.31	0.15	81.01	81.10	82.36
180.0	426.0	4.0	1.6	6.6	229.5	78.0	92.6	348.6	363.2	347.1	365.8	389.4	0.16	81.33	80.53	82.22	0.15	81.19	81.19	82.36
181.0	427.0	4.0	1.6	6.7	229.4	78.2	93.0	348.3	363.3	347.0	365.7	389.3	0.16	81.52	80.65	82.21	0.15	81.41	81.29	82.37
182.0	428.0	4.0	1.6	6.8	229.5	78.0	94.1	348.2	364.2	346.7	364.9	389.5	0.16	81.76	80.77	82.14	0.15	81.60	81.41	82.39
183.0	429.0	3.9	1.5	6.8	229.6	78.7	94.4	347.9	364.5	346.6	364.2	389.6	0.16	82.02	80.91	82.12	0.15	81.85	81.54	82.42
184.0	430.0	3.9	1.5	6.8	229.2	78.2	95.4	347.8	365.0	346.3	364.2	389.7	0.16	82.24	81.05	82.07	0.15	82.06	81.67	82.44
185.0	431.0	3.8	1.5	6.8	229.3	78.3	95.2	347.2	365.5	346.4	363.6	389.8	0.16	82.48	81.19	82.05	0.15	82.27	81.78	82.46
186.0	432.0	3.8	1.5	6.8	229.1	78.7	95.8	346.6	366.1	346.5	363.3	389.9	0.16	82.68	81.34	82.06	0.15	82.52	81.91	82.51
187.0	433.0	3.8	1.5	6.9	228.9	78.4	96.3	346.8	366.9	346.5	363.1	390.2	0.16	82.91	81.47	82.06	0.15	82.76	82.07	82.55
188.0	434.0	3.7	1.4	6.8	229.1	79.1	96.6	346.8	367.5	346.6	362.8	390.2	0.16	83.14	81.63	82.09	0.15	83.01	82.24	82.61
189.0	435.0	3.7	1.4	6.9	229.4	79.1	96.9	347.2	368.4	346.8	362.3	390.3	0.16	83.34	81.78	82.11	0.15	83.22	82.39	82.64
190.0	436.0	3.7	1.3	6.9	229.7	78.9	96.9	346.6	369.5	347.2	362.1	390.4	0.16	83.51	81.93	82.14	0.15	83.46	82.54	82.70
191.0	437.0	3.6	1.3	6.9	229.4	78.8	97.5	346.9	370.4	347.0	362.0	390.5	0.16	83.73	82.09	82.18	0.15	83.69	82.72	82.76
192.0	438.0	3.6	1.3	6.9	229.5	78.8	97.9	346.9	371.4	347.2	361.7	390.7	0.16	83.91	82.23	82.25	0.15	83.86	82.84	82.84
193.0	439.0	3.6	1.3	6.9	229.7	78.2	98.2	347.0	372.4	347.1	361.9	390.6	0.16	84.11	82.37	82.27	0.15	84.08	82.99	82.90
194.0	440.0	3.5	1.3	7.0	230.1	78.8	98.2	347.2	373.6	347.6	362.0	390.8	0.16	84.31	82.51	82.31	0.15	84.30	83.15	82.98
195.0	441.0	3.5	1.2	7.1	230.7	79.4	98.8	347.4	374.4	348.0	361.6	390.7	0.16	84.52	82.69	82.40	0.15	84.54	83.30	83.05
196.0	442.0	3.5	1.2	7.1	231.8	79.6	98.7	347.9	375.3	348.3	361.4	390.8	0.16	84.71	82.84	82.45	0.15	84.77	83.43	83.11
197.0	443.0	3.4	1.1	7.2	232.3	78.9	99.6	348.6	376.3	348.5	361.7	390.8	0.16	84.89	82.99	82.52	0.15	84.95	83.59	83.20
198.0	444.0	3.4	1.1	7.3	233.6	79.7	99.7	350.0	377.7	348.8	361.7	390.9	0.16	85.05	83.13	82.58	0.15	85.13	83.72	83.28
199.0	445.0	3.4	1.1	7.5	235.2	79.9	100.2	351.4	378.6	349.2	361.7	390.8	0.16	85.21	83.27	82.64	0.15	85.31	83.89	83.38
200.0	446.0	3.3	1.0	7.6	236.3	79.0	98.7	352.7	379.5	349.7	361.4	390.6	0.16	85.35	83.41	82.69	0.15	85.50	84.01	83.43
201.0	447.0	3.3	1.0	7.6	237.9	80.0	97.4	354.7	380.8	350.3	362.4	390.6	0.16	85.42	83.51	82.77	0.15	85.61	84.12	83.53
202.0	448.0	3.3	0.9	7.7	239.3	79.4	95.9	356.6	382.0	351.1	361.9	390.6	0.16	85.41	83.57	82.85	0.15	85.62	84.18	83.58
203.0	449.0	3.2	0.9	7.7	240.8	79.4	95.3	358.1	383.0	351.4	362.0	390.4	0.16	85.30	83.62	82.90	0.15	85.55	84.21	83.63
204.0	450.0	3.2	0.9	7.7	242.7	79.1	94.4	359.9	384.3	351.8	362.3	390.5	0.16	85.13	83.61	82.94	0.15	85.48	84.20	83.69
205.0	451.0	3.2	0.8	7.8	244.3	78.7	93.6	361.8	385.6	352.6	362.7	390.3	0.16	84.95	83.58	82.97	0.15	85.35	84.18	83.73
206.0	452.0	3.1	0.7	7.9	245.9	79.7	93.3	363.1	386.9	353.6	363.2	390.2	0.16	84.73	83.56	83.03	0.15	85.20	84.18	83.77
207.0	453.0	3.1	0.7	8.0	247.2	79.0	93.0	365.6	388.1	353.7	363.4	390.1	0.16	84.52	83.51	83.04	0.15	85.04	84.13	83.78
208.0	454.0	3.0	0.7	8.1	248.8	79.3	92.4	368.0	389.5	354.7	364.2	389.8	0.16	84.35	83.48	83.06	0.15	84.91	84.10	83.80
209.0	455.0	3.0	0.7	8.1	249.7	79.9	93.2	370.3	391.1	355.7	365.0	389.9	0.16	84.27	83.46	83.08	0.15	84.83	84.07	83.81
210.0	456.0	3.0	0.6	8.2	250.6	79.6	94.1	372.4	392.4	356.6	365.2	389.8	0.16	84.26	83.46	83.09	0.15	84.82	84.07	83.82
211.0	457.0	2.9	0.6	8.2	251.5	80.1	95.5	374.1	393.6	357.9	366.0	389.7	0.16	84.38	83.49	83.14	0.15	84.86	84.12	83.89
212.0	458.0	2.9	0.6	8.3	252.1	79.8	96.7	376.4	395.2	358.2	367.0	389.6	0.16	84.52	83.53	83.19	0.15	84.97	84.15	83.93
213.0	459.0	2.9	0.6	8.3	253.4	79.0	97.6	378.4	396.4	359.3	367.6	389.4	0.16	84.69	83.61	83.23	0.15	85.08	84.22	83.99
214.0	460.0	2.8	0.7	8.3	254.3	79.9	98.1	380.5	397.3	360.3	368.5	389.5	0.16	84.89	83.71	83.26	0.15	85.24	84.31	84.05
215.0	461.0	2.8	0.6	8.4	254.1	80.1	98.5	382.0	398.5	361.5	369.2	389.5	0.16	85.13	83.82	83.33	0.15	85.41	84.41	84.08
216.0	462.0	2.8	0.6	8.1	251.8	80.4	99.0	384.5	399.4	362.5	369.7	389.4	0.16	85.35	83.93	83.36	0.15	85.57	84.50	84.12
217.0	463.0	2.7	0.7	7.5	248.4	80.5	100.0	380.8	400.1	363.3	369.6	389.4	0.16	85.59	84.03	83.43	0.15	85.78	84.63	84.22
218.0	464.0	2.7	0.8	6.9	245.6	80.3	100.5	378.6	401.1	364.0	369.8	389.3	0.16	85.83	84.18	83.49	0.15	85.97	84.75	84.27
219.0	465.0	2.7	0.9	6.5	243.1	79.5	101.5	376.2	401.7	364.3	369.4	389.3	0.16	86.03	84.30	83.55	0.15	86.17	84.88	84.34
220.0	466.0	2.7	0.9	6.4	241.3	80.0	101.0	373.9	401.9	364.7	369.3	389.0	0.16	86.22	84.44	83.62	0.15	86.35	85.00	84.39
221.0	467.0	2.7	0.9	6.4	239.5	79.2	99.5	371.2	402.1	365.0	368.4	389.2	0.16	86.42	84.57	83.67	0.15	86.54	85.11	84.47
222.0	468.0	2.7	0.9	6.3	238.8	79.6	97.9	369.6	402.0	364.9	368.3	389.0	0.16	86.51	84.68	83.72	0.15	86.63	85.22	84.51
223.0	469.0	2.6	0.9	6.3	237.9	78.5	96.7	366.8	402.0	364.7	367.5	389.0	0.16	86.49	84.73	83.77	0.15	86.66	85.26	84.56
224.0	470.0	2.6	1.0	6.3	237.2	79.8	95.9	365.2	401.7	364.5	366.9	389.0	0.16	86.34	84.75	83.81	0.15	86.60	85.28	84.60
225.0	471.0	2.6	1.0	6.3	236.3	79.8	94.8	362.9	401.3	364.0	365.9	389.1	0.16	86.14	84.74	83.86	0.15	86.49	85.30	84.62
226.0	472.0	2.6	1.0	6.2	235.7	79.8	94.4	361.1	400.6	363.5	364.9	389.2	0.16	85.94	84.73	83.85	0.15	86.36	85.29	84.64
227.0	473.0	2.6	1.0	6.2	234.7	79.8	94.1	359.0	399.7	363.1	364.2	389.2	0.16	85.75	84.70	83.87	0.15	86.22	85.	

254.0	500.0	2.1	1.0	6.1	219.7	79.3	91.9	328.0	384.8	349.7	346.2	391.6	0.16	84.95	85.12	84.05	0.15	85.57	85.72	84.78
255.0	501.0	2.1	1.0	6.1	219.4	79.5	91.4	328.1	384.8	349.3	345.9	391.6	0.16	84.83	85.08	84.03	0.15	85.46	85.68	84.72
256.0	502.0	2.1	1.0	6.1	219.1	79.8	91.4	327.5	384.4	349.1	345.6	391.7	0.16	84.73	85.04	84.00	0.15	85.34	85.65	84.71
257.0	503.0	2.0	1.0	6.2	219.1	79.3	91.3	326.8	384.7	349.0	344.8	391.9	0.16	84.60	85.00	83.99	0.15	85.23	85.62	84.67
258.0	504.0	2.0	1.0	6.1	218.7	79.7	91.8	326.3	384.5	349.0	344.8	392.0	0.16	84.59	84.96	83.97	0.15	85.21	85.60	84.63
259.0	505.0	2.0	1.0	6.1	218.1	79.1	93.5	326.3	384.7	348.4	344.0	392.0	0.16	84.66	84.99	83.94	0.15	85.24	85.59	84.61
260.0	506.0	2.0	1.0	6.1	217.4	80.0	94.3	325.8	384.7	348.3	343.5	392.1	0.16	84.81	85.04	83.96	0.15	85.31	85.61	84.63
261.0	507.0	2.0	1.0	6.2	217.1	79.9	95.8	325.5	385.0	348.2	343.4	392.4	0.16	85.00	85.09	83.98	0.15	85.43	85.65	84.63
262.0	508.0	2.0	1.0	6.2	216.8	79.3	97.3	324.6	384.5	348.0	342.8	392.4	0.16	85.21	85.14	83.98	0.15	85.58	85.71	84.64
263.0	509.0	1.9	1.0	6.2	216.2	80.0	97.7	324.0	384.5	348.0	342.6	392.4	0.16	85.46	85.24	84.00	0.15	85.77	85.78	84.68
264.0	510.0	1.9	1.0	6.2	215.9	80.1	99.4	323.7	384.7	347.9	342.7	392.6	0.16	85.67	85.33	84.03	0.15	85.94	85.86	84.70
265.0	511.0	1.9	1.0	6.2	215.8	80.2	100.4	323.1	384.9	347.6	342.2	392.9	0.16	85.95	85.48	84.07	0.15	86.19	85.98	84.72
266.0	512.0	1.9	1.0	6.2	215.5	79.8	98.9	322.8	384.8	347.5	341.6	393.0	0.16	86.20	85.61	84.09	0.15	86.40	86.10	84.76
267.0	513.0	1.9	1.0	6.2	215.4	80.5	97.4	321.7	385.1	347.3	341.6	393.1	0.16	86.36	85.71	84.14	0.15	86.55	86.20	84.78
268.0	514.0	1.9	0.9	6.2	215.9	79.9	96.0	321.7	385.1	347.0	341.4	393.4	0.16	86.35	85.76	84.17	0.15	86.56	86.24	84.79
269.0	515.0	1.8	0.9	6.2	216.0	80.0	95.1	321.7	385.4	347.0	340.9	393.6	0.16	86.26	85.78	84.19	0.15	86.53	86.27	84.82
270.0	516.0	1.8	0.9	6.2	216.1	80.1	94.2	321.4	385.5	347.0	340.6	393.7	0.16	86.15	85.79	84.18	0.15	86.48	86.27	84.84
271.0	517.0	1.8	0.9	6.2	216.4	80.0	93.5	321.1	385.9	347.1	340.3	393.8	0.16	86.03	85.78	84.17	0.15	86.41	86.28	84.84
272.0	518.0	1.8	0.9	6.2	215.9	79.3	92.9	321.0	386.3	346.7	340.1	394.0	0.16	85.86	85.77	84.16	0.15	86.29	86.25	84.82
273.0	519.0	1.8	0.9	6.1	215.7	80.0	93.1	320.8	386.9	346.5	339.7	394.1	0.16	85.70	85.73	84.14	0.15	86.20	86.25	84.80
274.0	520.0	1.7	0.9	6.1	215.9	80.1	92.3	320.2	387.4	346.5	339.3	394.2	0.16	85.54	85.69	84.14	0.15	86.08	86.20	84.80
275.0	521.0	1.7	0.9	6.1	215.9	79.9	92.2	319.6	388.0	346.3	338.8	394.5	0.16	85.38	85.66	84.12	0.15	85.96	86.19	84.82
276.0	522.0	1.7	0.9	6.1	215.9	80.1	91.8	318.4	388.9	346.6	338.9	394.7	0.16	85.20	85.61	84.10	0.15	85.83	86.15	84.77
277.0	523.0	1.7	1.0	6.1	216.3	79.7	91.6	318.2	389.9	346.0	338.6	394.8	0.16	85.00	85.57	84.09	0.15	85.67	86.11	84.75
278.0	524.0	1.7	1.0	6.1	215.7	79.7	91.4	317.7	390.6	346.0	338.3	395.0	0.16	84.85	85.53	84.05	0.15	85.54	86.07	84.71
279.0	525.0	1.7	1.0	6.1	216.1	79.6	90.9	317.4	391.4	345.6	338.2	395.2	0.16	84.73	85.47	84.01	0.15	85.44	86.03	84.69
280.0	526.0	1.6	1.0	6.0	215.9	78.8	91.2	316.9	392.1	345.6	337.7	395.4	0.16	84.64	85.44	84.00	0.15	85.34	85.98	84.67
281.0	527.0	1.6	1.0	6.0	215.8	79.4	91.3	316.7	392.7	345.3	337.8	395.5	0.16	84.57	85.41	83.98	0.15	85.26	85.95	84.63
282.0	528.0	1.6	1.0	6.0	215.7	79.8	90.9	316.1	393.4	344.9	337.5	395.7	0.16	84.51	85.37	83.95	0.15	85.20	85.91	84.60
283.0	529.0	1.6	1.0	6.0	215.4	80.5	91.5	315.8	394.1	345.1	337.0	395.8	0.16	84.51	85.36	83.93	0.15	85.19	85.87	84.56
284.0	530.0	1.6	1.0	6.0	214.7	79.3	93.3	315.4	394.6	344.4	336.8	395.9	0.16	84.56	85.36	83.90	0.15	85.17	85.86	84.52
285.0	531.0	1.6	1.0	6.0	214.0	80.1	94.2	315.0	394.8	343.9	337.0	396.2	0.16	84.72	85.39	83.91	0.15	85.26	85.87	84.53
286.0	532.0	1.5	1.0	6.0	213.9	79.9	95.4	314.5	395.6	343.6	336.6	396.4	0.16	84.93	85.43	83.89	0.15	85.40	85.91	84.53
287.0	533.0	1.5	1.0	6.0	213.2	79.3	97.5	314.2	395.8	343.6	336.6	396.4	0.16	85.19	85.52	83.93	0.15	85.57	85.99	84.57
288.0	534.0	1.5	1.0	6.1	212.8	79.8	98.4	313.6	396.3	343.1	336.1	396.4	0.16	85.45	85.60	83.95	0.15	85.77	86.06	84.58
289.0	535.0	1.5	1.0	6.1	212.4	79.9	98.5	313.2	396.6	342.9	336.1	396.6	0.16	85.75	85.72	84.00	0.15	85.98	86.17	84.63
290.0	536.0	1.5	0.9	6.1	212.3	79.8	99.3	312.4	397.2	342.5	335.7	396.8	0.16	85.99	85.82	84.04	0.15	86.21	86.28	84.65
291.0	537.0	1.5	0.9	6.1	212.6	79.9	97.8	312.4	397.3	342.1	335.6	396.9	0.16	86.21	85.94	84.07	0.15	86.40	86.38	84.67
292.0	538.0	1.4	0.9	6.1	212.6	79.9	96.6	311.9	397.8	341.9	335.3	396.8	0.16	86.28	86.01	84.08	0.15	86.48	86.46	84.67
293.0	539.0	1.4	0.9	6.1	212.6	80.0	95.5	311.8	398.5	341.8	335.4	396.8	0.16	86.24	86.02	84.09	0.15	86.49	86.48	84.68
294.0	540.0	1.4	0.9	6.1	212.5	79.8	94.5	311.3	399.1	341.4	334.9	397.1	0.16	86.13	86.05	84.09	0.15	86.45	86.49	84.69
295.0	541.0	1.4	0.9	6.1	212.6	79.3	93.8	311.1	399.5	340.9	334.6	397.1	0.16	86.03	86.06	84.12	0.15	86.41	86.49	84.69
296.0	542.0	1.4	0.9	6.1	212.7	80.0	93.3	310.7	399.9	340.6	334.4	397.1	0.16	85.90	86.03	84.09	0.15	86.32	86.49	84.70
297.0	543.0	1.4	0.9	6.1	212.5	79.6	92.9	310.4	400.5	340.2	333.7	397.1	0.16	85.79	86.03	84.11	0.15	86.26	86.48	84.72
298.0	544.0	1.3	0.9	6.1	212.4	79.8	92.5	310.1	401.2	339.8	333.7	397.2	0.16	85.68	85.99	84.09	0.15	86.17	86.46	84.70
299.0	545.0	1.3	0.9	6.1	212.5	79.7	92.1	309.9	402.0	339.3	333.5	397.3	0.16	85.54	85.98	84.08	0.15	86.06	86.43	84.70
300.0	546.0	1.3	0.8	6.2	212.5	79.9	92.0	309.7	402.7	338.8	333.2	397.3	0.16	85.40	85.93	84.09	0.15	85.96	86.39	84.71
301.0	547.0	1.3	0.8	6.3	212.4	80.1	91.7	309.6	403.3	338.6	333.0	397.3	0.16	85.28	85.90	84.09	0.15	85.85	86.36	84.71
302.0	548.0	1.3	0.7	6.3	213.2	80.1	91.7	310.0	403.9	338.2	333.1	397.3	0.16	85.18	85.85	84.06	0.15	85.74	86.33	84.67
303.0	549.0	1.3	0.7	6.3	213.4	79.8	91.3	309.9	405.3	337.9	333.0	397.4	0.16	85.10	85.82	84.04	0.15	85.64	86.31	84.67
304.0	550.0	1.2	0.7	6.4	213.8	79.7	91.1	309.9	405.1	337.7	333.0	397.4	0.16	85.02	85.87	84.05	0.15	85.55	86.27	84.65
305.0	551.0	1.2	0.7	6.4	213.8	79.5	91.1	310.0	406.3	337.5	333.1	397.6	0.16	84.94	85.73	84.02	0.15	85.48	86.23	84.64
306.0	552.0	1.2	0.6	6.4	214.2	79.7	91.1	310.6	407.4	337.3	333.2	397.8	0.16	84.89	85.70	84.01	0.15	85.40	86.20	84.60
307.0	553.0	1.2	0.6	6.4	214.4	79.4	90.8	310.6	408.1	337.1	333.1	397.9	0.16	84.79	85.65	83.98	0.15	85.31	86.17	84.59
308.0	554.0	1.2	0.6	6.4	214.4	79.9	90.9	310.9	409.1	337.1	333.4	398.1	0.16	84.74	85.62	83.98	0.15	85.25	86.15	84.57
309.0	555.0	1.1	0.6	6.4	214.6	80.0	90.8	310.9	409.9	336.9	333.5	398.2	0.16	84.67	85.58	83.94	0.15	85.18	86.10	84.55
310.0	556.0	1.1	0.7	6.4	214.8	79.8	90.6	311.0	411.0	336.9	333.8	398.6	0.16	84.60	85.54	83.92	0.15	85.11	86.07	84.50
311.0	557.0	1.1	0.7	6.3	214.9	80.0	90.7	310.9	412.2	336.8	334.1	398.8	0.16	84.53	85.51	83.88	0.15	85.04	86.04	84.48
312.0	558.0	1.1	0.7	6.4	214.7	80.2	91.0	311.4	413.1	337.1	334.1	399.1	0.16	84.46	85.48	83.84	0.15	84.96	86.01	84.42
313.0	559.0	1.1	0.7	6.4	215.0	80.3	92.0	311.5	414.2	336.8	334.2	399.4	0.16	84.51	85.50	83.83	0.15	85.01	86.02</	

340.0	586.0	0.7	0.9	5.2	208.3	79.8	90.5	303.4	418.1	328.7	326.5	401.9	0.16	84.58	85.57	83.84	0.15	85.03	86.09	84.40
341.0	587.0	0.7	0.9	5.2	207.8	79.7	90.4	302.7	417.5	328.1	325.9	401.6	0.16	84.50	85.53	83.82	0.15	84.98	86.08	84.33
342.0	588.0	0.7	0.9	5.2	207.4	78.9	90.3	301.9	416.7	327.4	325.2	400.8	0.16	84.43	85.50	83.80	0.15	84.91	86.04	84.31
343.0	589.0	0.6	0.9	5.2	207.2	79.3	90.4	301.2	415.4	326.8	324.4	400.3	0.16	84.37	85.45	83.75	0.15	84.86	86.01	84.27
344.0	590.0	0.6	0.9	5.1	206.3	80.2	90.7	300.8	415.0	326.2	323.8	399.7	0.16	84.34	85.43	83.74	0.15	84.84	85.99	84.24
345.0	591.0	0.6	0.9	5.1	206.0	79.7	91.6	299.6	414.0	325.3	323.2	399.3	0.16	84.42	85.45	83.72	0.15	84.90	85.99	84.25
346.0	592.0	0.6	0.9	5.1	205.0	79.9	92.8	299.5	413.3	324.9	323.0	398.8	0.16	84.56	85.48	83.72	0.15	84.97	85.99	84.24
347.0	593.0	0.6	0.9	5.1	204.3	80.0	94.5	298.5	412.4	324.2	322.4	398.2	0.16	84.75	85.53	83.75	0.15	85.11	86.03	84.26
348.0	594.0	0.6	0.9	5.1	203.8	79.4	95.5	298.0	411.6	323.4	321.9	397.5	0.16	84.97	85.58	83.79	0.15	85.26	86.07	84.25
349.0	595.0	0.6	0.9	5.1	203.2	79.9	96.7	297.4	410.4	322.8	321.2	397.0	0.16	85.24	85.68	83.81	0.15	85.49	86.15	84.31
350.0	596.0	0.6	0.9	5.1	202.3	79.5	95.9	296.5	409.5	322.1	320.5	396.4	0.16	85.50	85.77	83.84	0.15	85.68	86.23	84.34
351.0	597.0	0.6	0.9	5.1	202.1	80.4	94.9	295.8	408.3	321.4	319.9	395.8	0.16	85.71	85.85	83.87	0.15	85.85	86.31	84.35
352.0	598.0	0.5	0.9	5.1	202.3	79.9	94.1	295.4	407.8	320.7	319.5	395.3	0.16	85.78	85.90	83.91	0.15	85.95	86.36	84.36
353.0	599.0	0.5	0.9	5.1	202.0	79.8	93.4	294.6	406.6	320.1	318.8	394.6	0.16	85.78	85.93	83.91	0.15	85.96	86.37	84.41
354.0	600.0	0.5	0.9	5.1	202.1	79.6	92.9	294.0	405.7	319.4	318.3	394.0	0.16	85.71	85.93	83.92	0.15	85.94	86.37	84.39
355.0	601.0	0.5	0.9	5.0	202.0	79.6	92.4	293.2	404.8	318.6	317.3	393.4	0.16	85.61	85.93	83.91	0.15	85.87	86.36	84.39
356.0	602.0	0.5	0.9	5.0	201.4	80.0	92.0	292.5	403.9	317.9	316.7	392.7	0.16	85.49	85.90	83.93	0.15	85.80	86.35	84.40
357.0	603.0	0.5	0.9	5.0	201.4	79.8	91.6	292.0	402.9	317.3	316.0	392.1	0.16	85.36	85.89	83.92	0.15	85.71	86.34	84.39
358.0	604.0	0.5	0.9	5.0	201.0	80.0	91.3	291.3	402.4	316.5	315.5	391.5	0.16	85.22	85.85	83.93	0.15	85.64	86.31	84.38
359.0	605.0	0.4	0.9	5.0	200.8	79.9	91.1	290.8	401.7	315.9	315.1	391.0	0.16	85.11	85.83	83.91	0.15	85.53	86.30	84.38
360.0	606.0	0.4	0.9	5.0	200.5	80.0	90.8	290.2	400.9	315.2	314.4	390.4	0.16	85.02	85.79	83.89	0.15	85.43	86.25	84.36
361.0	607.0	0.4	0.9	5.0	200.0	80.1	90.5	289.7	400.0	314.5	313.8	389.8	0.16	84.92	85.76	83.89	0.15	85.36	86.23	84.36
362.0	608.0	0.4	0.9	4.9	200.0	79.9	90.6	289.5	399.2	313.9	313.3	389.2	0.16	84.85	85.73	83.89	0.15	85.28	86.21	84.36
363.0	609.0	0.4	0.9	4.9	199.4	79.9	90.3	288.9	398.6	313.1	312.8	388.6	0.16	84.79	85.70	83.88	0.15	85.21	86.17	84.33
364.0	610.0	0.4	0.9	4.9	199.5	79.8	90.1	288.1	398.0	312.5	312.4	388.1	0.16	84.72	85.67	83.84	0.15	85.14	86.13	84.28
365.0	611.0	0.4	0.9	4.9	199.3	79.7	90.0	287.6	397.4	312.0	311.6	387.6	0.16	84.64	85.64	83.82	0.15	85.07	86.13	84.27
366.0	612.0	0.3	0.9	4.9	198.8	79.9	89.9	287.3	396.1	311.0	310.9	386.9	0.16	84.54	85.58	83.76	0.15	85.00	86.08	84.23
367.0	613.0	0.3	0.9	4.9	198.7	79.9	89.8	286.6	395.7	310.5	310.4	386.4	0.16	84.46	85.55	83.74	0.15	84.92	86.05	84.21
368.0	614.0	0.3	0.9	4.9	198.1	79.8	89.6	285.6	395.1	309.8	309.8	385.8	0.16	84.39	85.53	83.71	0.15	84.87	86.03	84.18
369.0	615.0	0.3	0.9	4.7	197.8	79.7	89.5	284.9	394.1	309.2	309.5	385.1	0.16	84.33	85.47	83.66	0.15	84.77	85.99	84.16
370.0	616.0	0.3	0.9	4.7	197.4	80.1	89.3	284.1	393.8	308.7	309.0	384.6	0.16	84.27	85.45	83.63	0.15	84.73	85.94	84.11
371.0	617.0	0.3	0.9	4.7	197.2	79.9	89.4	283.4	393.1	308.1	308.4	384.1	0.16	84.20	85.40	83.62	0.15	84.66	85.91	84.07
372.0	618.0	0.3	0.9	4.7	196.9	79.7	89.3	282.6	392.3	307.4	307.8	383.6	0.16	84.16	85.36	83.59	0.15	84.61	85.88	84.04
373.0	619.0	0.3	0.9	4.6	196.4	79.8	89.2	281.9	391.9	306.6	307.2	383.1	0.16	84.09	85.32	83.55	0.15	84.56	85.82	83.99
374.0	620.0	0.3	0.9	4.6	195.9	79.6	89.1	281.3	390.8	306.0	306.9	382.5	0.16	84.04	85.30	83.51	0.15	84.50	85.80	83.93
375.0	621.0	0.2	0.9	4.6	195.5	80.0	89.4	280.7	390.4	305.7	306.0	381.9	0.16	83.97	85.27	83.46	0.15	84.46	85.77	83.89
376.0	622.0	0.2	0.8	4.6	194.7	80.3	89.9	280.2	389.9	304.9	305.2	381.5	0.16	84.03	85.26	83.43	0.15	84.50	85.72	83.87
377.0	623.0	0.2	0.8	4.6	194.0	79.7	91.4	279.2	389.4	304.3	304.7	380.9	0.16	84.12	85.28	83.44	0.15	84.57	85.74	83.86
378.0	624.0	0.2	0.8	4.6	193.3	80.3	92.7	278.5	388.7	303.7	304.1	380.3	0.16	84.29	85.31	83.45	0.15	84.68	85.77	83.85
379.0	625.0	0.2	0.8	4.6	192.5	80.1	94.3	278.0	388.1	302.9	303.5	379.8	0.16	84.52	85.36	83.45	0.15	84.83	85.82	83.88
380.0	626.0	0.2	0.8	4.6	192.1	80.2	95.9	277.4	387.6	302.5	302.9	379.2	0.16	84.74	85.42	83.48	0.15	84.99	85.85	83.89
381.0	627.0	0.2	0.8	4.6	191.4	80.0	96.5	276.7	387.1	301.9	302.2	378.5	0.16	85.00	85.51	83.50	0.15	85.20	85.92	83.92
382.0	628.0	0.2	0.8	4.6	190.9	79.2	95.4	276.0	386.5	301.6	301.7	378.1	0.16	85.22	85.58	83.52	0.15	85.38	86.00	83.87
383.0	629.0	0.2	0.8	4.6	190.7	79.6	94.1	275.7	386.1	300.4	300.8	377.7	0.16	85.34	85.66	83.74	0.15	85.47	86.07	83.74
384.0	630.0	0.1	0.8	4.6	190.8	79.7	93.3	275.2	385.4	300.1	300.1	377.0	0.16	85.36	85.68	83.71	0.15	85.53	86.11	83.71
385.0	631.0	0.1	0.8	4.6	190.7	80.0	92.2	274.5	384.7	299.5	299.3	376.5	0.16	85.31	85.69	83.74	0.15	85.51	86.11	83.66
386.0	632.0	0.1	0.8	4.5	190.6	79.6	91.8	274.2	384.0	299.0	298.5	375.9	0.16	85.21	85.67	83.74	0.15	85.47	86.11	83.63
387.0	633.0	0.1	0.8	4.5	190.2	79.4	91.3	273.5	383.7	298.4	297.8	375.3	0.16	85.10	85.66	83.71	0.15	85.41	86.09	83.62
388.0	634.0	0.1	0.8	4.5	190.1	79.6	90.7	272.8	383.2	297.7	297.1	374.7	0.16	84.99	85.63	83.66	0.15	85.34	86.07	83.59
389.0	635.0	0.1	0.8	4.5	190.1	79.5	90.6	272.4	382.8	297.0	296.4	374.2	0.16	84.85	85.60	83.63	0.15	85.24	86.04	83.74
390.0	636.0	0.1	0.8	4.5	189.8	79.4	90.3	271.7	382.3	296.4	295.7	373.7	0.16	84.74	85.57	83.62	0.15	85.16	86.01	83.71
391.0	637.0	0.1	0.8	4.5	189.6	79.7	90.0	271.0	381.8	295.7	294.9	373.1	0.16	84.66	85.53	83.59	0.15	85.07	85.98	83.66
392.0	638.0	0.1	0.8	4.5	189.2	79.0	89.7	270.6	381.7	295.2	294.4	372.6	0.16	84.56	85.48	83.55	0.15	85.00	85.95	83.63
393.0	639.0	0.1	0.8	4.5	189.3	79.5	89.5	270.2	381.2	294.7	294.0	372.0	0.16	84.49	85.47	83.51	0.15	84.95	85.93	83.62
394.0	640.0	0.1	0.8	4.5	188.6	79.4	89.4	269.6	381.2	294.0	293.1	371.5	0.16	84.39	85.40	83.46	0.15	84.85	85.88	83.59
395.0	641.0	0.1	0.8	4.5	188.4	79.4	89.2	268.8	380.7	293.5	292.5	371.0	0.16	84.30	85.38	83.43	0.15	84.78	85.85	83.55
396.0	642.0	0.1	0.8	4.5	188.1	79.5	89.0	268.2	380.1	292.9	292.0	370.4	0.16	84.22	85.35	83.44	0.15	84.73	85.81	83.51
397.0	643.0	0.1	0.8	4.5	188.3	79.5	89.1	267.8	380.0	292.2	291.8	369.9	0.16	84.14	85.27	83.45	0.15	84.65	85.78	83.46
398.0	644.0	0.1	0.8	4.5	188.0	79.5	88.6	267.3	379.7	291.7	291.2	369.4	0.16	84.08	85.26	83.45	0.15	84.58	85.75	83.43
399.0	645.0	0.1	0.8	4.5	187.8	79.6	88.6	266.7	379.2	291.1	290.3	368.8	0.16	83.99	85.20	83.48	0.15	84.51	85.70	

Manufacturer: WOLFSTEEL  
 Model: 22

Run: 2  
 Project #: PI 20178  
 Test Duration: 400 min

	HHV	LHV
Eff	72,69%	78,21%
Comb Eff	94,79%	94,79%
HT Eff	76,69%	82,52%
Output	18 248	kJ/h
Burn Rate	1,24	kg/h
Grams CO	636	g
Input	25 104	kJ/h
MC wet	17,77	

Note: In the "Input data", "Calc. % O<sub>2</sub>", "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 13.7.3

Ultimate CO<sub>2</sub>  
 CO<sub>2-ut</sub> 19,86  
 F<sub>o</sub>  
 1,050

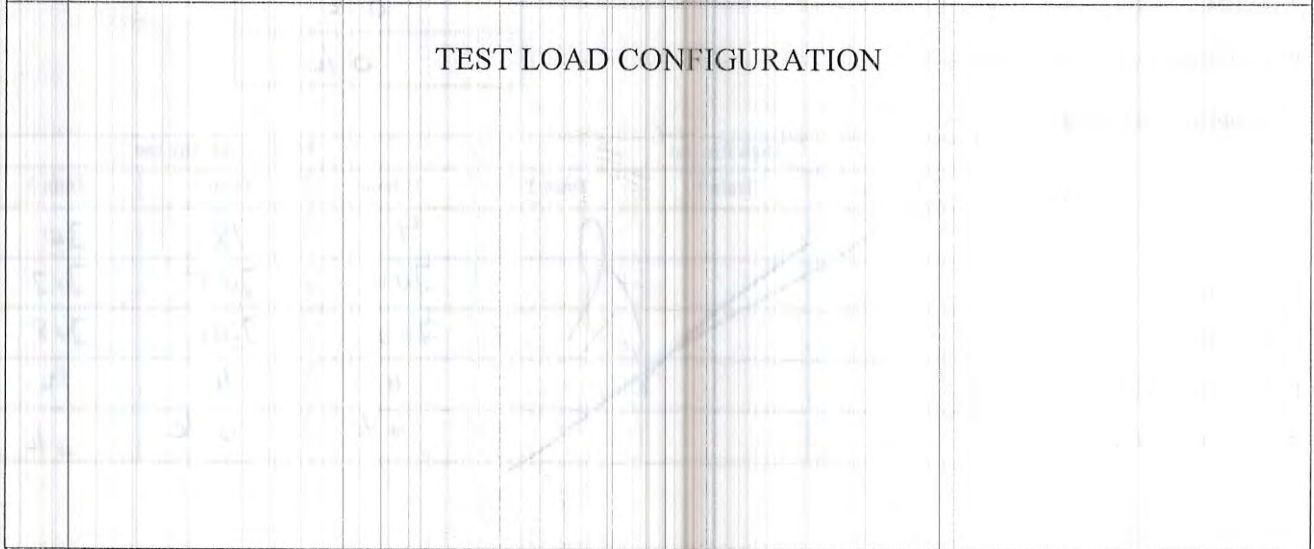
	Air Fuel Ratio (A/F)	
Overall Heating Efficiency:	72,69%	Dry Molecular Weight (M <sub>d</sub> ) 29,75
Combustion Efficiency:	94,79%	Dry Moles Exhaust Gas (N <sub>p</sub> ): 423,82
Heat Transfer Efficiency:	76,69%	Air Fuel Ratio (A/F) 12,10

Heat Output:	17 310 Btu/h	18 248 kJ/h
Heat Input:	23 814 Btu/h	25 104 kJ/h
Burn Duration:	6,67 h	
Burn Rate:	2,74 lb/h	1,242 kg/h
Stack Temp:	277,8 Deg. F	136,6 Deg. C

Date: 2018-10-25 Manufacturer: WOLF Steel Model: 22  
 Project #: PI 20178 Run: 2 Tech: M m Reviewer: DP

- landing 88 LBS SIBAL 1<sup>st</sup> flt  
 - 1 min torch  
 - close Door immediately  
 No Fan  
 At 300 LBS instnl load  
 After 2 min close Door  
 At 400 LBS instnl load  
 After 4,00 mins close Door  
 At 13 min close an into gradually  
 At 15 min close an into complement ligne Green

TEST LOAD CONFIGURATION



**PRE / POST CHECKS**

Date: 2018-10-25 Manufacturer: Wall Steel Model: 22  
 Project #: PI 20178 Run: 2 Tech: MM Reviewer: HS

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
Em-191	7:00	ok	ok

Pre-Test

Post-Test

**Facility Conditions:**

Air Velocity from less than 2 feet .....  
 Smoke Capture Check.....  
 Picture.....

	(max50 Fpm)	(max50 Fpm)
	0	
	ok	ok
4 sides	ok	ok

**Wood Heater Conditions:**

Date Wood Heater Stack Cleaned.....  
 Date Dilution Tunnel Cleaned.....  
 Induced Draft Check (max 0.005 H2O).....  
 Traverse before ignition.....

2018-10-24
2018-10-24
ok
ok

**Temperature System:**

Ambient (65°-90°F).....

ok	°F
----	----

**Proportional Checks:**

Thermocouple check.....  
 Pitot Clean.....  
 Pitot verification.....

ok
ok
ok

**Sampling Train ID Numbers:**

	High fire test		Medium low fire test			
	1 <sup>st</sup> hour	Train 1	Train 2	1 <sup>st</sup> hour	Train 1	Train 2
Probe.....				4	18	30
Filter Front.....				701	705	707
Filter Back.....				703	706	708
Filter Thermocouple.....				n	11	12
Filter (80°F ≥ <90°F).....				ok	ok	ok



## SAMPLING EQUIPMENT CHECK OUT

Date: 2018-10-25 Manufacturer: Wolf Steel Model: 2L  
 Project #: PT 20178 Run: 2 Tech: mm Reviewer: JP

### Leakage Checks Tunnel Samplers

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

Low medium fire test	System 1 <sup>st</sup> hour		System 1		System 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Unplugged Flow Rate = .25cfm						
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	812835.45	81474.28	812835.90	81474.37	76504.58	766893.24
Initial 1minute DGM (Liter)	812835.46	81474.26	812835.85	81474.38	76504.58	766893.21
Change © (Liter)	0.02	0.02	0.05	0.01	0	0.03
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 ( 0.56)						
Check OK	OK	OK	OK	OK	OK	OK

## SAMPLING EQUIPMENT CHECK OUT

Date: 2/18/10 25      Manufacturer: Wolf Steel      Model: 22  
 Project #: PT 2078      Run: 2      Tech: MM      Reviewer: SP

### Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	- 5	- 5
Rotameter Reading (mm/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	.5	3	.5
Check OK (no change after 15 sec.)	OK	OK	OK	OK

Date: 2018-10-25 Manufacturer: Wolff Steel Model: 22  
 Project #: PT 20178 Run: 2 Tech: MM Reviewer: JP

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

**LIMITS OF WEIGHT RANGES**

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

Date: 2018-10-25 Manufacturer: Wolf Steel Model: 22  
 Project #: PI 20178 Run: 2 Tech: MM Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure ( $P_{bar}$ ) 101.5 (KPa.) Static pressure ( $P_q$ ) 0.21 (inches w.c.)  
 Inside diameter: Port A \_\_\_\_\_ Port B \_\_\_\_\_  
 Tunnel cross sectional area: .1963Ft<sup>2</sup>  
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head $\Delta_p$ (inches H <sub>2</sub> O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0058	9008
B - Centroid	3.00	3.50	4	0059	8768
A-1	0.40	0.50	0.50	0053	8990
A-2	1.50	1.75	2	0068	8906
A-3	4.50	5.25	6	0052	8861
A-4	5.60	6.5	7.5	0046	8801
B-1	0.40	0.50	0.50	0047	8743
B-2	1.50	1.75	2	0069	8698
B-3	4.50	5.25	6	0056	8650
B-4	5.60	6.5	7.5	0047	8603
				AVERAGE	

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

Where,

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

$\Delta_p$  = manometer reading (inches H<sub>2</sub>O)

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

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

$P_q$  = static pressure in. H<sub>2</sub>O  
 { 13.6 }

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

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

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

## CONTINUOUS ANALYZERS

Date: 2018-10-25      Manufacturer: Wolf Steel      Model: 22  
 Project #: PI 2178      Run: 2      Tech: MR      Reviewer: DP

### Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
	Actual	Should Be	Actual	Should Be	Actual	Should Be
CO	<del>1.009</del> 0	0	2.993	3.000	1.009	1.00
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO <sub>2</sub>	<del>9.73</del> 0	0	17.96	18.00	9.73	10.00
Tolerance CO <sub>2</sub>		+/- 0.02		+/- 0.5		+/- 0.5
O <sub>2</sub> 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	2.993	1.002	0	0.02	0.003	0.15	0.007	0.05	✓	
CO <sub>2</sub>	0	17.92	9.77	0	0.02	0.04	0.5	0.04	0.5	✓	

**TEST DATA LOG**

Date: 2018-10-25 Manufacturer: Wolfe Steel Model: 22  
 Project #: PT 6178 Run: 2 Tech: mm Reviewer: BP

**RAW DRY GAS METER READINGS**

		System 1	System 2	Blank
High fire test	Final (Liter)			
	Initial (Liter)			
Low medium fire test	Final (Liter)	814738,96	766892,18	794,65
	Initial (Liter)	812836,27	765042,60	642,80

**AMBIENT CONDITIONS**

	Before	After
Barometer (kPa):	101,5	101,1
Dry Bulb (F):	78,98	80,61
Humidity (%):	25,1	23,4

### FUEL DATA

Date: 2018-10-25 Manufacturer: Wolff Steel Model: 22  
 Project #: PI 20178 Run: 2 Tech: MR Reviewer: DO

#### FUEL DESCRIPTION:

Type of wood:

#### KINDLING AND START-UP LOAD

Piece Size		Weight		Meter Moisture Content (% dry)			
X	X 1/2 in.	380	lbs.	9		9	9
X	X 1/6 in.	500	lbs.	20		20	20
X	X in.		lbs.				
X	X in.		lbs.				
X	X in.		lbs.				
X	X in.		lbs.				
X	X in.		lbs.				
X	X in.		lbs.				
X	X in.		lbs.				

#### HIGHFIRE TEST LOAD

Piece Size		Weight		Meter Moisture Content (% dry)			
X	X 1/6 in.	3578	lbs.	192		191	192
X	X 1/6 in.	4054	lbs.	199		192	192
X	X 1/6 in.	470	lbs.	198		196	198
X	X in.		lbs.				
X	X 1/6 in.	284	lbs.	279		276	273
X	X 1/6 in.	4066	lbs.	191		193	193
X	X in.		lbs.				
X	X in.		lbs.				
X	X in.		lbs.				

## FUEL DATA

Date: 2018-10-25 Manufacturer: Wolf Steel Model: 22  
 Project #: PT 20178 Run: 2 Tech: Mr Reviewer: [Signature]

### FUEL DESCRIPTION:

Type of wood:

### LOW OR MEDIUM TEST LOAD

Piece Size		Weight	Meter Moisture Content (% dry)			
x	x 16 in.	410 lbs.	196		193	191
x	x 16 in.	4048 lbs.	192		193	192
x	x 16 in.	3850 lbs.	192		193	192
x	x in.					
x	x 16 in.	387 lbs.	191		196	195
x	x 16 in.	634 lbs.	278		277	278
x	x in.					
x	x in.					
x	x in.					
x	x in.					
x	x in.					
x	x in.					
x	x in.					
x	x in.					





# DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: \_\_\_\_\_ Manufacturer: \_\_\_\_\_ Model: \_\_\_\_\_

Project #: \_\_\_\_\_ Run: \_\_\_\_\_ Tech: \_\_\_\_\_ Reviewer: \_\_\_\_\_

HIGHFIRE TEST FILTERS									
SYSTEM 1 - 1 <sup>st</sup> 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	Blanck
Date	Time								

HIGHFIRE TEST FILTERS									
SYSTEM 1 - 1 <sup>st</sup> 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	Blanck
Date	Time								

No High

Date: \_\_\_\_\_ Manufacturer: \_\_\_\_\_ Model: \_\_\_\_\_

Project #: \_\_\_\_\_ Run: \_\_\_\_\_ Tech: \_\_\_\_\_ Reviewer: \_\_\_\_\_

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

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

No High



# DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2018-10-25 Project #: PJ 20178 Run: 2 Manufacturer: WJ/Steel Model: 22  
 Tech: MM Reviewer: \_\_\_\_\_

LOW OR MEDIUM TEST FILTERS									
SYSTEM 1 - 1 <sup>st</sup> 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	Blanc
Date	Time	409 <sup>h</sup> 701	703	35	18	705	706	40	709
2018-10-24	18:00	613821	01736	33 9699	108 9481		01799	34 3251	01217
2018-10-25	8:00	613820	01737	33 9698	108 9480		01800	34 3250	01217

SYSTEM 1 - 1 <sup>st</sup> hour									
SYSTEM 1					SYSTEM 1				
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanc
Date	Time	04 701	703	35	18	705	706	40	01217
2018-10-25	19:00	613824	01729	33 9731	108 9480		01825	34 3264	01217
2018-10-31	8:00	613824	01729	33 9725	108 9480		01817	34 3258	01217
2018-11-01	8:00	613824	01729	33 9725	108 9480		01817	34 3258	01217

Date: 2018-10-25 Manufacturer: Wolf Steel Model: 22

Project #: PI 20178 Run: 2 Tech: MM Reviewer: \_\_\_\_\_

LOW OR MEDIUM FIRE TEST FILTERS				
SYSTEM 2				
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
	30	707	708	42
2018-10-24 18:00	110 2299 <del>613824</del>		01800	35 3654
2018-10-25 8:00	110 2299		01800	35 3653

LOW OR MEDIUM FIRE TEST FILTERS				
SYSTEM 2				
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
	30	707	708	42
2018-10-25 19:00	110 2299 <del>110 2299</del>		01829	35 3685
2018-10-31 8:00	110 2299		01824	35 3671
2018-11-01 8:00	110 2299		01823	35 3671

## APPENDIX 2: Proportionality results

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	99,27	99,02	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
			PR1	PR2			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
15,278	538,6	538,8			0,149	0,147	0	0,2337469
15,155	538,5	538,7	93,67	93,48	0,149	0,147	1	0,2320037
15,063	538,3	538,6	94,56	94,31	0,149	0,147	2	0,230028
15,218	538,2	538,5	94,61	94,20	0,149	0,146	3	0,231565
15,294	538,1	538,4	94,86	94,62	0,149	0,147	4	0,2315656
15,370	538,0	538,3	95,14	94,82	0,149	0,147	5	0,2320038
15,344	538,0	538,3	95,64	95,32	0,149	0,147	6	0,2311272
15,350	538,0	538,3	96,21	96,00	0,149	0,147	7	0,2304673
15,327	538,0	538,3	97,08	96,80	0,149	0,147	8	0,2293644
15,250	538,0	538,3	97,77	97,73	0,149	0,147	9	0,2278107
15,252	538,0	538,3	98,30	98,34	0,149	0,147	10	0,2273654
15,336	538,1	538,3	97,78	97,62	0,149	0,147	11	0,2284781
15,300	538,2	538,4	98,16	97,98	0,149	0,147	12	0,2278106
15,434	538,3	538,5	97,47	97,64	0,149	0,147	13	0,2293648
15,274	538,5	538,7	98,96	98,79	0,149	0,147	14	0,2266947
15,283	538,7	538,9	98,90	98,65	0,149	0,147	15	0,2266946
15,254	539,0	539,1	99,00	98,89	0,149	0,147	16	0,2262467
15,266	539,3	539,4	99,12	99,07	0,149	0,147	17	0,2262471
15,334	539,6	539,6	98,72	98,30	0,149	0,147	18	0,227366
15,138	539,9	539,9	99,70	99,44	0,149	0,146	19	0,2246729
15,310	540,0	540,0	98,60	98,51	0,149	0,147	20	0,2273669
15,254	540,1	540,1	98,70	98,51	0,149	0,147	21	0,2266957
15,290	540,1	540,2	98,52	98,20	0,149	0,147	22	0,2273667
15,171	540,1	540,3	98,89	98,92	0,149	0,147	23	0,2257996
15,407	540,1	540,3	97,34	96,95	0,149	0,147	24	0,2293657
15,187	540,1	540,3	98,65	98,43	0,149	0,146	25	0,2262474
15,332	540,0	540,3	97,68	97,46	0,149	0,147	26	0,2284792
15,575	540,0	540,3	99,23	98,91	0,149	0,147	27	0,2284789
16,321	540,0	540,3	104,77	104,61	0,149	0,146	28	0,2274732
15,616	540,1	540,4	105,38	105,17	0,149	0,147	29	0,2219477
15,184	540,1	540,5	104,72	104,31	0,149	0,146	30	0,21965
15,330	540,2	540,6	102,38	102,17	0,149	0,146	31	0,2230875
15,291	540,3	540,6	102,26	101,94	0,149	0,147	32	0,2230874
15,274	540,3	540,7	102,22	102,13	0,149	0,147	33	0,2230876
15,356	540,4	540,8	101,33	100,94	0,149	0,147	34	0,2246736
15,267	540,5	540,9	101,80	101,49	0,149	0,147	35	0,2235417
15,299	540,6	541,0	101,50	101,17	0,149	0,147	36	0,2239957
15,199	540,7	541,1	102,23	102,02	0,149	0,147	37	0,2225802
15,238	540,8	541,2	101,98	101,96	0,149	0,147	38	0,2230878
15,257	540,9	541,3	101,79	101,46	0,150	0,147	39	0,2235418
15,293	540,9	541,3	101,70	101,35	0,150	0,147	40	0,2239957
15,230	541,0	541,4	102,00	101,79	0,150	0,147	41	0,2230879
15,367	541,0	541,4	100,94	100,81	0,149	0,147	42	0,225125
15,326	541,1	541,5	101,19	101,03	0,149	0,147	43	0,2246743
15,250	541,1	541,6	101,85	101,64	0,150	0,147	44	0,2235421
15,271	541,1	541,6	101,61	101,36	0,150	0,147	45	0,2239959
15,321	541,2	541,7	101,41	101,39	0,150	0,147	46	0,2246747
15,425	541,3	541,7	100,92	100,61	0,150	0,148	47	0,2262491
15,290	541,4	541,8	101,41	101,34	0,150	0,147	48	0,2242958
15,331	541,5	541,9	101,08	100,95	0,150	0,147	49	0,2251245
15,471	541,5	542,0	100,13	99,95	0,150	0,147	50	0,2273679
15,212	541,6	542,0	101,65	101,24	0,150	0,147	51	0,2236291
15,362	541,6	542,0	100,76	100,52	0,150	0,147	52	0,2258005
15,202	541,6	542,1	102,08	101,89	0,150	0,148	53	0,2235427
15,357	541,7	542,1	100,91	100,67	0,150	0,148	54	0,2258003
15,307	541,7	542,2	101,18	100,97	0,150	0,148	55	0,225125
15,277	541,8	542,2	101,39	100,94	0,150	0,147	56	0,2246748
15,451	541,8	542,3	100,15	99,60	0,150	0,147	57	0,2273683
15,188	541,8	542,3	101,76	101,43	0,150	0,147	58	0,2235397
15,400	541,8	542,3	100,31	99,99	0,150	0,147	59	0,2266975
15,397	541,9	542,4	100,35	100,04	0,150	0,147	60	0,226698
15,341	541,9	542,4	100,85	100,56	0,150	0,148	61	0,2258018
15,339	541,9	542,4	100,70	100,42	0,150	0,148	62	0,2258013

15,328	542,0	542,5	100,62	100,20	0,150	0,147	63	0,2258012
15,325	542,0	542,5	100,53	100,44	0,150	0,147	64	0,2258013
15,273	541,9	542,5	100,76	100,52	0,150	0,147	65	0,225126
15,243	541,9	542,5	101,03	100,75	0,150	0,147	66	0,2246749
15,258	541,9	542,5	100,73	100,60	0,150	0,147	67	0,2251251
15,336	542,0	542,5	100,22	99,99	0,150	0,148	68	0,2262493
15,330	542,0	542,5	99,94	99,96	0,150	0,147	69	0,2262494
15,354	542,0	542,6	100,00	99,53	0,150	0,147	70	0,226698
15,243	542,0	542,6	100,65	100,39	0,150	0,147	71	0,2251261
15,389	542,0	542,5	99,51	99,39	0,150	0,147	72	0,2273683
15,447	541,9	542,5	99,09	98,90	0,150	0,148	73	0,2284811
15,326	541,9	542,5	99,80	99,57	0,150	0,148	74	0,2266979
15,321	541,8	542,4	99,81	99,67	0,150	0,148	75	0,2266979
15,288	541,8	542,4	99,96	99,74	0,150	0,148	76	0,2262499
15,204	541,8	542,4	100,47	100,10	0,150	0,147	77	0,2251256
15,244	541,8	542,4	100,06	99,88	0,150	0,147	78	0,2258018
15,153	541,8	542,4	100,71	99,94	0,150	0,147	79	0,2246752
15,284	541,8	542,4	99,68	99,16	0,150	0,147	80	0,2266975
15,277	541,9	542,4	99,62	99,42	0,150	0,147	81	0,2266981
15,201	541,8	542,4	99,93	99,72	0,150	0,148	82	0,2258011
15,253	541,8	542,4	99,64	99,25	0,151	0,148	83	0,226698
15,284	541,7	542,3	99,13	98,94	0,151	0,148	84	0,2273677
15,307	541,7	542,3	98,87	98,57	0,150	0,148	85	0,2278132
15,338	541,7	542,3	98,60	98,10	0,150	0,148	86	0,2284808
15,295	541,7	542,3	98,73	98,44	0,150	0,148	87	0,2278139
15,332	541,7	542,3	98,43	98,34	0,150	0,148	88	0,228481
15,384	541,7	542,3	98,01	97,81	0,150	0,148	89	0,2293679
15,269	541,6	542,3	98,54	98,33	0,150	0,148	90	0,2278135
15,164	541,6	542,3	99,35	99,03	0,150	0,148	91	0,2262491
15,306	541,6	542,3	98,43	98,11	0,151	0,148	92	0,2284813
15,299	541,6	542,3	98,32	98,01	0,151	0,148	93	0,2284821
15,349	541,5	542,2	97,92	97,35	0,151	0,148	94	0,2293679
15,286	541,5	542,2	98,17	98,03	0,151	0,148	95	0,2284813
15,239	541,5	542,2	98,49	98,29	0,150	0,148	96	0,2278139
15,203	541,5	542,2	98,76	98,66	0,151	0,148	97	0,2273682
15,268	541,4	542,1	98,12	97,85	0,151	0,148	98	0,2284818
15,329	541,4	542,1	97,86	97,51	0,151	0,148	99	0,2293678
15,218	541,4	542,0	98,33	98,09	0,151	0,148	100	0,2278135
15,084	541,3	542,0	99,25	98,81	0,151	0,148	101	0,2258007
15,308	541,3	542,0	97,71	97,33	0,151	0,148	102	0,2293675
15,242	541,2	541,9	97,98	97,75	0,151	0,148	103	0,2284809
15,091	541,2	541,9	98,90	98,50	0,151	0,148	104	0,2262497
15,288	541,1	541,8	97,51	97,19	0,151	0,148	105	0,2293675
15,154	541,0	541,8	98,29	98,32	0,151	0,148	106	0,2273676
15,109	541,0	541,7	98,70	98,34	0,151	0,148	107	0,2266975
15,349	541,0	541,7	97,06	96,78	0,151	0,148	108	0,230471
15,324	541,0	541,7	97,25	97,09	0,151	0,148	109	0,2300302
15,390	540,9	541,6	96,81	96,61	0,151	0,148	110	0,2311304
15,162	540,9	541,6	98,03	97,64	0,151	0,148	111	0,2278135
15,200	540,9	541,5	97,82	97,63	0,151	0,148	112	0,2284815
15,295	540,9	541,5	96,97	96,95	0,151	0,148	113	0,2300298
15,107	540,8	541,5	98,07	97,49	0,151	0,148	114	0,2273679
15,133	540,8	541,5	97,85	97,56	0,151	0,148	115	0,2278132
15,273	540,8	541,4	96,83	96,47	0,151	0,148	116	0,2300295
15,342	540,8	541,4	96,57	95,96	0,151	0,148	117	0,23113
15,301	540,8	541,5	96,55	96,58	0,151	0,148	118	0,2304695
15,262	540,8	541,4	96,95	96,50	0,151	0,148	119	0,2300302
15,391	540,8	541,4	96,03	95,69	0,151	0,148	120	0,2320064
15,335	540,9	541,4	96,35	96,12	0,151	0,148	121	0,2311298
15,281	540,9	541,4	96,62	96,49	0,151	0,148	122	0,2304703
15,146	540,9	541,5	97,42	96,92	0,151	0,148	123	0,2284808

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,57	98,94	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	Proportional Rates		Vol. Std.	Vol. Std.		Delta-P
			PR1	PR2			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
15,713	541,0	541,6			0,151	0,148	0	0,2315681
15,519	541,1	541,6	103,54	103,84	0,151	0,148	1	0,2293681
15,622	541,2	541,6	104,23	104,58	0,150	0,148	2	0,2293679
15,539	541,3	541,7	105,50	105,87	0,150	0,148	3	0,2273687
15,605	541,4	541,7	107,56	107,59	0,150	0,148	4	0,2258016
15,421	541,5	541,8	106,23	106,42	0,151	0,147	5	0,2258019
15,422	541,5	541,9	105,18	105,62	0,150	0,148	6	0,2266983
15,415	541,6	542,0	105,24	105,87	0,150	0,148	7	0,2265174
15,479	541,7	542,1	104,89	105,46	0,150	0,148	8	0,2273689
15,414	541,9	542,2	105,67	106,18	0,150	0,148	9	0,2262499
15,526	542,1	542,3	104,76	105,29	0,150	0,148	10	0,2278143
15,683	542,2	542,5	103,92	104,33	0,150	0,148	11	0,2300314
15,426	542,3	542,6	105,75	106,17	0,150	0,148	12	0,2262517
15,455	542,4	542,7	104,49	104,81	0,150	0,148	13	0,2278152
15,275	542,6	542,8	104,20	104,44	0,150	0,147	14	0,2266994
15,284	542,7	542,9	102,59	103,05	0,150	0,147	15	0,2284827
15,362	542,7	543,0	101,37	101,86	0,150	0,148	16	0,2304722
15,326	542,8	543,1	101,00	101,52	0,150	0,148	17	0,2304718
15,405	542,9	543,1	100,26	100,59	0,150	0,147	18	0,2320081
15,351	542,9	543,2	100,12	100,37	0,150	0,147	19	0,2315697
15,328	542,9	543,2	100,09	100,37	0,150	0,147	20	0,2315703
15,339	543,0	543,3	99,89	100,12	0,150	0,147	21	0,2320088
15,243	543,0	543,3	100,58	100,73	0,150	0,147	22	0,2304721
15,322	542,9	543,3	99,59	100,27	0,150	0,147	23	0,2320087
15,396	542,9	543,3	99,08	99,68	0,150	0,148	24	0,2330987
15,292	542,8	543,3	99,90	100,41	0,150	0,148	25	0,2315703
15,424	542,8	543,2	98,94	99,30	0,150	0,148	26	0,233753
15,194	542,8	543,2	100,33	100,58	0,150	0,147	27	0,2304725
15,340	542,8	543,2	99,47	99,64	0,150	0,147	28	0,2326641
15,292	542,8	543,2	99,49	100,17	0,150	0,148	29	0,2320089
15,330	542,8	543,2	99,33	99,45	0,150	0,148	30	0,232664
15,274	542,8	543,3	99,59	100,00	0,150	0,147	31	0,2318726
15,287	542,9	543,3	99,56	99,55	0,150	0,147	32	0,2320094
15,300	542,9	543,3	99,57	99,89	0,150	0,147	33	0,2322716
15,278	543,0	543,3	99,54	99,82	0,150	0,148	34	0,232009
15,248	543,0	543,3	99,68	100,02	0,150	0,147	35	0,2315707
15,267	542,9	543,3	99,44	99,69	0,150	0,147	36	0,2320095
15,264	542,9	543,3	99,35	99,77	0,150	0,147	37	0,2320094
15,270	542,9	543,3	99,61	99,96	0,150	0,148	38	0,2320097
15,232	542,9	543,3	99,50	100,00	0,150	0,148	39	0,2315722
15,268	542,9	543,3	99,41	99,76	0,150	0,148	40	0,2320093
15,238	542,9	543,3	99,72	100,06	0,150	0,148	41	0,2315712
15,233	542,9	543,2	99,59	99,96	0,150	0,148	42	0,2315707
15,230	542,9	543,3	99,54	100,02	0,150	0,148	43	0,231571
15,341	543,0	543,3	99,09	99,52	0,150	0,148	44	0,2330993
15,256	542,9	543,2	99,37	99,86	0,150	0,148	45	0,2320096
15,282	542,9	543,2	99,23	99,91	0,150	0,148	46	0,232398
15,265	542,9	543,2	99,55	99,82	0,150	0,148	47	0,2320095
15,263	542,9	543,2	99,43	99,80	0,150	0,148	48	0,2320094
15,263	542,8	543,1	99,30	99,74	0,150	0,148	49	0,2320095
15,265	542,8	543,1	99,25	99,81	0,150	0,148	50	0,2320097
15,236	542,8	543,1	99,43	100,03	0,150	0,148	51	0,231571
15,260	542,8	543,1	99,30	99,45	0,150	0,147	52	0,2320094
15,221	542,8	543,1	99,47	99,88	0,150	0,147	53	0,2315733
15,298	542,8	543,1	98,96	99,25	0,150	0,147	54	0,2326649
15,304	542,8	543,1	99,04	99,40	0,150	0,147	55	0,2326645
15,333	542,8	543,1	99,00	99,38	0,150	0,148	56	0,2330998
15,234	542,8	543,1	99,51	99,87	0,150	0,148	57	0,2315717
15,302	542,8	543,1	99,16	99,53	0,150	0,147	58	0,2325753
15,196	542,8	543,1	99,62	100,11	0,150	0,148	59	0,2311333
15,309	542,8	543,1	99,08	99,45	0,150	0,148	60	0,2326646
15,305	542,8	543,1	99,15	99,53	0,150	0,148	61	0,2326418
15,244	542,8	543,1	99,63	99,79	0,150	0,147	62	0,2315713
15,239	542,8	543,1	99,77	99,78	0,150	0,147	63	0,2315715



15,230	542,8	543,1	99,62	99,87	0,150	0,147	64	0,2315714
15,267	542,8	543,0	99,60	99,76	0,150	0,147	65	0,2320065
15,230	542,8	543,0	99,54	99,85	0,150	0,147	66	0,2315716
15,327	542,7	543,0	98,85	99,25	0,150	0,147	67	0,2331002
15,189	542,7	543,0	99,74	100,15	0,150	0,148	68	0,231133
15,246	542,7	543,0	99,30	99,51	0,150	0,148	69	0,2320093
15,256	542,7	543,0	99,36	99,72	0,150	0,147	70	0,2320094
15,329	542,7	542,9	98,99	99,21	0,150	0,148	71	0,2330996
15,226	542,6	542,9	99,62	99,99	0,150	0,148	72	0,2315714
15,153	542,6	542,9	100,06	100,62	0,150	0,148	73	0,230473
15,250	542,6	542,9	99,40	99,69	0,150	0,148	74	0,2320097
15,122	542,6	542,9	100,35	100,59	0,150	0,148	75	0,2300329
15,254	542,6	542,8	99,38	99,63	0,150	0,148	76	0,2320094
15,371	542,6	542,9	98,53	98,89	0,150	0,147	77	0,2337528
15,257	542,6	542,9	99,33	99,84	0,150	0,148	78	0,2320094
15,234	542,6	542,9	99,67	100,12	0,150	0,148	79	0,2315712
15,233	542,6	542,9	99,60	100,09	0,150	0,148	80	0,2315733
15,236	542,6	542,9	99,62	99,93	0,150	0,148	81	0,2315714
15,229	542,6	542,9	99,66	99,91	0,150	0,148	82	0,2315712
15,261	542,7	542,9	99,39	99,70	0,150	0,147	83	0,2320093
15,251	542,7	542,9	99,33	99,99	0,150	0,148	84	0,232009
15,198	542,7	542,9	99,75	100,10	0,150	0,148	85	0,2311331
15,262	542,7	542,9	99,47	99,92	0,150	0,148	86	0,2320087
15,296	542,7	543,0	99,05	99,56	0,150	0,148	87	0,2326645
15,223	542,8	543,0	99,42	99,93	0,150	0,148	88	0,2315709
15,111	542,8	543,0	100,11	100,51	0,150	0,148	89	0,230033
15,247	542,8	543,0	99,22	99,76	0,150	0,148	90	0,2320093
15,225	542,8	543,0	99,52	99,92	0,150	0,148	91	0,2315712
15,249	542,9	543,1	99,35	99,70	0,150	0,148	92	0,2320098
15,254	542,9	543,1	99,21	99,72	0,150	0,148	93	0,2320096
15,247	542,9	543,1	99,27	99,79	0,150	0,148	94	0,2320094
15,317	542,9	543,1	98,97	99,23	0,150	0,148	95	0,2330998
15,183	542,9	543,1	99,59	99,79	0,150	0,147	96	0,2311329
15,235	542,8	543,1	99,23	99,72	0,150	0,147	97	0,2320096
15,168	542,8	543,1	99,63	100,03	0,150	0,148	98	0,2311335
15,234	542,8	543,1	99,14	99,61	0,150	0,148	99	0,2320098
15,210	542,8	543,1	99,54	99,69	0,150	0,147	100	0,231571
15,198	542,7	543,0	99,60	99,68	0,150	0,147	101	0,2315707
15,294	542,7	543,0	98,71	99,01	0,150	0,147	102	0,2330996
15,220	542,6	542,9	99,09	99,46	0,150	0,148	103	0,2320093
15,119	542,6	542,9	99,92	100,24	0,150	0,148	104	0,2304732
15,190	542,6	542,9	99,48	99,63	0,150	0,148	105	0,2315717
15,261	542,6	542,9	98,85	99,20	0,150	0,148	106	0,2326641
15,190	542,6	542,9	99,31	99,79	0,150	0,148	107	0,2315712
15,184	542,5	542,9	99,38	99,54	0,150	0,148	108	0,2315707
15,174	542,5	542,8	99,32	99,56	0,150	0,147	109	0,2315748
15,247	542,5	542,8	98,74	99,22	0,150	0,148	110	0,2326641
15,198	542,5	542,8	99,15	99,41	0,150	0,148	111	0,2320093
15,195	542,5	542,8	99,17	99,52	0,151	0,148	112	0,2320095
15,188	542,5	542,8	99,02	99,39	0,150	0,148	113	0,232009
15,188	542,4	542,7	99,03	99,26	0,150	0,148	114	0,2320091
15,139	542,4	542,7	99,44	99,78	0,150	0,148	115	0,231133
15,192	542,4	542,7	99,04	99,47	0,150	0,148	116	0,2320094
15,156	542,3	542,6	99,30	99,85	0,150	0,148	117	0,2315711
15,190	542,3	542,6	99,21	99,39	0,151	0,148	118	0,2320111
15,158	542,2	542,5	99,23	99,78	0,151	0,148	119	0,2315707
15,173	542,2	542,5	99,03	99,44	0,150	0,148	120	0,2320086
15,175	542,2	542,5	99,17	99,23	0,151	0,148	121	0,2320087
15,215	542,1	542,4	98,73	99,12	0,151	0,148	122	0,2326638
15,208	542,1	542,4	98,71	98,98	0,151	0,148	123	0,2326638
15,283	542,0	542,4	98,17	98,38	0,150	0,148	124	0,2337514
15,232	542,1	542,4	98,44	98,70	0,150	0,148	125	0,233099
15,205	542,1	542,4	98,74	99,10	0,151	0,148	126	0,2326634
15,202	542,0	542,3	98,51	98,92	0,150	0,148	127	0,2326637
15,159	542,0	542,3	98,82	99,38	0,150	0,148	128	0,2320085
15,127	541,9	542,3	99,09	99,57	0,150	0,148	129	0,2315701
15,367	541,8	542,2	97,58	98,09	0,151	0,148	130	0,2352783
15,144	541,8	542,2	98,82	99,22	0,151	0,148	131	0,2320083
15,184	541,7	542,1	98,54	99,04	0,151	0,148	132	0,2326638

15,212	541,7	542,1	98,48	98,80	0,151	0,148	133	0,2330985
15,212	541,6	542,1	98,51	98,69	0,151	0,148	134	0,2330999
15,263	541,6	542,0	98,23	98,47	0,151	0,148	135	0,2337515
15,378	541,5	541,9	97,37	97,70	0,151	0,148	136	0,2356963
15,209	541,4	541,9	98,46	98,93	0,151	0,148	137	0,2330986
15,321	541,4	541,8	97,68	97,88	0,151	0,148	138	0,2348335
15,175	541,3	541,8	98,40	99,08	0,151	0,148	139	0,2326639
15,129	541,3	541,7	98,77	99,15	0,151	0,148	140	0,232008
15,210	541,3	541,7	98,32	98,84	0,151	0,148	141	0,2330984
15,350	541,3	541,6	97,57	97,79	0,151	0,148	142	0,2352653
15,374	541,3	541,6	97,32	97,63	0,151	0,148	143	0,2356961
15,318	541,3	541,6	97,43	98,07	0,150	0,148	144	0,2348336
15,202	541,2	541,6	98,50	98,88	0,151	0,148	145	0,2330989
15,362	541,2	541,6	97,36	97,60	0,151	0,148	146	0,235696
15,238	541,2	541,6	98,06	98,53	0,151	0,148	147	0,2337512
15,233	541,1	541,5	97,99	98,49	0,151	0,148	148	0,2337507
15,332	541,2	541,5	97,46	97,83	0,151	0,148	149	0,235265
15,245	541,2	541,6	98,20	98,41	0,151	0,148	150	0,2337427
15,149	541,3	541,6	99,05	99,58	0,151	0,148	151	0,2320068
15,214	541,4	541,7	98,90	99,05	0,151	0,148	152	0,2326628
15,226	541,5	541,7	98,94	99,17	0,151	0,148	153	0,2326636
15,410	541,7	541,9	97,86	98,22	0,151	0,148	154	0,2352655
15,216	541,8	542,0	99,43	99,52	0,151	0,148	155	0,2320079
15,228	542,0	542,1	99,28	99,76	0,151	0,148	156	0,2320088
15,351	542,2	542,3	98,72	99,20	0,150	0,148	157	0,2337514
15,289	542,3	542,4	99,22	99,56	0,151	0,148	158	0,2326634
15,323	542,5	542,6	98,98	99,36	0,150	0,148	159	0,2330986
15,265	542,7	542,8	99,62	99,84	0,150	0,148	160	0,2320086
15,274	542,9	543,0	99,51	99,85	0,150	0,148	161	0,2320089
15,341	543,1	543,1	99,19	99,47	0,150	0,148	162	0,2330992
15,428	543,2	543,3	98,16	98,52	0,150	0,148	163	0,2348344
15,468	543,3	543,4	97,54	97,86	0,150	0,148	164	0,235697
15,282	543,4	543,5	98,70	98,93	0,150	0,147	165	0,2330995
15,412	543,3	543,5	97,69	98,09	0,150	0,148	166	0,2352672
15,471	543,3	543,5	97,23	97,55	0,150	0,148	167	0,2363433
15,180	543,2	543,4	98,97	99,23	0,150	0,148	168	0,23201
15,358	543,1	543,4	97,88	98,11	0,151	0,148	169	0,2348347
15,409	543,1	543,4	97,39	97,80	0,151	0,148	170	0,2356899
15,237	543,0	543,3	98,50	98,74	0,150	0,148	171	0,2331
15,275	543,0	543,3	98,31	98,45	0,151	0,148	172	0,2337526
15,230	542,9	543,2	98,27	98,85	0,150	0,148	173	0,2331013
15,247	542,9	543,2	98,26	98,67	0,150	0,148	174	0,233409
15,340	542,8	543,1	97,80	98,12	0,151	0,148	175	0,2348348
15,360	542,8	543,1	97,46	97,75	0,151	0,148	176	0,2352672
15,224	542,8	543,1	98,36	98,34	0,150	0,147	177	0,2331002
15,226	542,7	543,1	98,46	98,85	0,151	0,148	178	0,2331001
15,198	542,7	543,1	98,40	98,98	0,150	0,148	179	0,2325958
15,251	542,8	543,1	98,59	98,79	0,150	0,148	180	0,2330997
15,314	542,9	543,2	98,50	98,68	0,151	0,148	181	0,2337526
15,404	543,0	543,3	98,14	98,66	0,151	0,148	182	0,2348347
15,209	543,1	543,4	99,54	99,95	0,150	0,148	183	0,2315722
15,304	543,3	543,5	99,13	99,73	0,150	0,148	184	0,232674
15,231	543,5	543,7	99,65	100,10	0,150	0,148	185	0,2315721
15,447	543,7	543,8	97,92	98,22	0,150	0,148	186	0,2352676
15,404	543,8	543,9	97,94	98,65	0,150	0,148	187	0,2348355
15,418	543,8	544,0	97,78	98,15	0,150	0,148	188	0,2352684
15,309	543,8	544,0	98,38	98,57	0,150	0,148	189	0,2337534
15,186	543,7	544,0	99,01	99,31	0,150	0,148	190	0,2320182
15,294	543,7	543,9	98,17	98,70	0,150	0,148	191	0,2337539
15,291	543,6	543,9	98,20	98,49	0,150	0,148	192	0,2337533
15,412	543,6	543,8	97,38	97,75	0,150	0,148	193	0,2356987
15,353	543,5	543,8	97,57	97,96	0,150	0,148	194	0,2348357
15,236	543,5	543,8	98,26	98,77	0,150	0,148	195	0,2331011
15,402	543,5	543,7	97,34	97,67	0,150	0,148	196	0,235551
15,237	543,4	543,7	98,31	98,69	0,150	0,148	197	0,2331019
15,272	543,4	543,7	97,93	98,39	0,150	0,148	198	0,2337538
15,137	543,4	543,7	98,90	99,09	0,150	0,148	199	0,2317057
15,199	543,3	543,6	98,33	98,56	0,150	0,147	200	0,2326662
15,256	543,3	543,6	98,07	98,58	0,150	0,147	201	0,2335446

15,227	543,3	543,6	98,07	98,32	0,150	0,147	202	0,2331087
15,395	543,2	543,6	97,11	97,46	0,150	0,147	203	0,2356985
15,333	543,2	543,5	97,33	97,73	0,150	0,147	204	0,2348362
15,219	543,2	543,5	98,19	98,49	0,150	0,147	205	0,2331005
15,206	543,2	543,5	98,25	98,49	0,150	0,147	206	0,2328966
15,218	543,1	543,4	98,20	98,43	0,150	0,147	207	0,233101
15,191	543,1	543,4	98,29	98,67	0,150	0,147	208	0,2326656
15,194	543,1	543,4	98,32	98,75	0,150	0,148	209	0,2326977
15,262	543,0	543,4	97,81	98,28	0,150	0,148	210	0,2337531
15,257	543,0	543,3	97,91	98,27	0,150	0,148	211	0,2337535
15,256	543,0	543,3	97,97	98,35	0,150	0,148	212	0,2337534
15,212	543,0	543,3	98,26	98,54	0,150	0,148	213	0,2331006
15,384	543,0	543,3	97,21	97,33	0,150	0,147	214	0,2356983
15,349	543,0	543,3	97,23	97,69	0,150	0,147	215	0,2351779
15,235	542,9	543,2	97,91	98,33	0,150	0,148	216	0,2334601
15,352	542,9	543,2	97,11	97,45	0,150	0,147	217	0,2352676
15,256	542,9	543,2	97,97	98,33	0,150	0,148	218	0,2337528
15,325	542,9	543,2	97,34	97,80	0,150	0,148	219	0,2348355
15,253	542,9	543,1	97,82	98,18	0,150	0,148	220	0,2337531
15,379	542,8	543,1	97,10	97,49	0,150	0,148	221	0,2356983
15,424	542,8	543,1	96,87	97,07	0,150	0,148	222	0,2363441
15,135	542,8	543,1	98,75	99,10	0,150	0,148	223	0,231949
15,332	542,8	543,1	97,45	98,07	0,150	0,148	224	0,2348355
15,372	542,9	543,2	97,43	97,68	0,150	0,148	225	0,2352672
15,227	542,9	543,2	98,60	99,00	0,150	0,148	226	0,2326651
15,176	543,1	543,3	99,28	99,56	0,150	0,148	227	0,2315711
15,296	543,2	543,4	98,60	99,13	0,150	0,148	228	0,2331004
15,435	543,4	543,5	97,64	98,12	0,150	0,148	229	0,2352677
15,324	543,6	543,7	98,32	98,57	0,150	0,147	230	0,233753
15,415	543,7	543,8	97,43	97,67	0,150	0,147	231	0,235268
15,263	543,7	543,8	98,29	98,67	0,150	0,147	232	0,2331009
15,364	543,8	543,9	97,65	98,08	0,150	0,147	233	0,2348358
15,415	543,8	543,9	97,33	97,55	0,150	0,148	234	0,2356988
15,241	543,7	543,9	98,25	98,68	0,150	0,147	235	0,2331011
15,382	543,7	543,8	97,32	97,43	0,150	0,147	236	0,235268
15,349	543,6	543,8	97,47	97,84	0,150	0,147	237	0,2348355
15,273	543,6	543,8	97,81	98,36	0,150	0,147	238	0,2337534
15,368	543,6	543,8	97,31	97,35	0,150	0,147	239	0,2352684
15,367	543,6	543,8	97,30	97,45	0,150	0,147	240	0,235268
15,154	543,5	543,7	98,69	99,31	0,150	0,148	241	0,2320103
15,396	543,5	543,7	97,18	97,51	0,150	0,148	242	0,2356981
15,193	543,5	543,7	98,29	98,88	0,150	0,148	243	0,2326633
15,149	543,4	543,7	98,75	99,14	0,150	0,148	244	0,2320103
15,119	543,4	543,6	98,78	99,29	0,150	0,148	245	0,231572
15,212	543,3	543,6	98,15	98,46	0,150	0,148	246	0,2331006
15,186	543,3	543,6	98,40	98,38	0,150	0,147	247	0,2326655
15,328	543,2	543,5	97,49	97,81	0,150	0,147	248	0,2348353
15,213	543,2	543,5	98,27	98,47	0,150	0,148	249	0,2331008
15,140	543,2	543,4	98,56	98,96	0,150	0,148	250	0,2320101
15,324	543,1	543,4	97,69	97,88	0,150	0,148	251	0,2348354
15,254	543,1	543,4	97,81	98,05	0,150	0,147	252	0,2337528
15,381	543,1	543,4	97,09	97,35	0,150	0,147	253	0,235698
15,349	543,1	543,4	97,42	97,76	0,150	0,148	254	0,2352094
15,351	543,1	543,3	97,18	97,71	0,150	0,148	255	0,2352673
15,208	543,0	543,3	98,16	98,29	0,150	0,147	256	0,2330714
15,349	543,0	543,3	97,23	97,50	0,150	0,147	257	0,2352667
15,251	543,0	543,3	97,75	98,38	0,150	0,148	258	0,2337529
15,318	542,9	543,2	97,49	97,70	0,150	0,148	259	0,2348352
15,317	542,9	543,2	97,38	97,80	0,150	0,148	260	0,2348347
15,247	542,9	543,2	97,85	98,20	0,150	0,148	261	0,2337529
15,175	542,9	543,2	98,24	98,68	0,150	0,148	262	0,2326648
15,178	542,9	543,2	98,28	98,61	0,150	0,148	263	0,232665
15,318	542,9	543,2	97,38	97,63	0,150	0,147	264	0,234835
15,139	542,9	543,2	98,49	98,93	0,150	0,147	265	0,2320101
15,352	542,8	543,1	97,26	97,44	0,150	0,147	266	0,2352674
15,327	542,8	543,1	97,47	97,72	0,150	0,147	267	0,2348348
15,142	542,8	543,1	98,81	98,93	0,150	0,147	268	0,2320195
15,322	542,8	543,1	97,57	97,88	0,151	0,148	269	0,234835
15,349	542,8	543,1	97,24	97,74	0,150	0,148	270	0,2352676

15,136	542,8	543,1	98,65	98,87	0,150	0,148	271	0,2320097
15,376	542,8	543,1	97,13	97,40	0,150	0,148	272	0,2356978
15,180	542,8	543,1	98,35	98,60	0,150	0,148	273	0,2326665
15,346	542,8	543,1	97,25	97,64	0,150	0,148	274	0,2352664
15,250	542,8	543,0	97,91	98,40	0,150	0,148	275	0,2337527
15,132	542,7	543,0	98,61	99,24	0,150	0,148	276	0,2320098
15,205	542,7	543,0	98,20	98,31	0,150	0,148	277	0,2331004
15,374	542,7	542,9	97,04	97,68	0,150	0,148	278	0,2356977
15,107	542,7	542,9	98,71	98,99	0,150	0,148	279	0,2315715
15,320	542,6	542,9	97,46	98,00	0,150	0,148	280	0,2348348
15,345	542,6	542,9	97,42	97,87	0,150	0,148	281	0,2352674
15,136	542,6	542,9	98,52	98,95	0,150	0,148	282	0,2320096
15,318	542,6	542,9	97,44	97,98	0,150	0,148	283	0,2348349
15,418	542,6	542,8	96,84	97,16	0,150	0,148	284	0,236343
15,133	542,6	542,8	98,63	98,82	0,150	0,147	285	0,2320096
15,349	542,6	542,8	97,21	97,88	0,150	0,148	286	0,2352667
15,373	542,6	542,8	97,11	97,58	0,150	0,148	287	0,2356965
15,349	542,6	542,8	97,19	97,80	0,150	0,148	288	0,2352669
15,487	542,5	542,8	96,45	96,79	0,150	0,148	289	0,2374133
15,104	542,5	542,8	99,09	99,34	0,151	0,148	290	0,2315714
15,320	542,5	542,8	97,53	97,83	0,151	0,148	291	0,2348347
15,247	542,5	542,7	97,84	98,10	0,150	0,148	292	0,2337523
15,206	542,5	542,7	98,15	98,56	0,150	0,148	293	0,2330996
15,375	542,5	542,7	97,05	97,47	0,150	0,148	294	0,2356975
15,202	542,5	542,7	98,17	98,58	0,150	0,148	295	0,2330998
15,314	542,4	542,7	97,32	97,66	0,150	0,148	296	0,2348346
15,129	542,4	542,7	98,68	98,93	0,150	0,148	297	0,2320094
15,416	542,4	542,7	97,02	97,14	0,151	0,148	298	0,2363426
15,179	542,4	542,7	98,33	98,72	0,150	0,148	299	0,2326647
15,318	542,4	542,6	97,51	98,20	0,150	0,148	300	0,2348346
15,197	542,3	542,6	98,27	98,83	0,150	0,148	301	0,2330974
15,200	542,3	542,6	98,12	98,51	0,150	0,148	302	0,2330995
15,344	542,2	542,5	97,19	97,91	0,150	0,148	303	0,2352658
15,320	542,3	542,5	97,45	97,91	0,150	0,148	304	0,234835
15,390	542,3	542,6	97,15	97,55	0,150	0,148	305	0,2356971
15,239	542,4	542,7	98,46	98,73	0,150	0,148	306	0,2330991
15,435	542,6	542,7	97,49	97,88	0,150	0,148	307	0,235697
15,252	542,7	542,8	98,84	99,39	0,150	0,148	308	0,2326645
15,481	542,8	543,0	97,21	97,44	0,150	0,148	309	0,2363432
15,473	543,0	543,1	97,14	97,53	0,150	0,148	310	0,2363429
15,354	543,0	543,1	97,77	98,08	0,150	0,148	311	0,2346538
15,358	543,1	543,2	97,43	98,02	0,150	0,148	312	0,2348347
15,238	543,1	543,2	98,39	98,60	0,150	0,148	313	0,2330831
15,377	543,1	543,2	97,40	97,82	0,150	0,148	314	0,2352669
15,468	543,1	543,2	96,89	96,99	0,150	0,148	315	0,2367714
15,369	543,0	543,2	97,40	97,57	0,150	0,147	316	0,2352681
15,366	543,0	543,1	97,40	97,64	0,150	0,147	317	0,2352675
15,362	542,9	543,1	97,21	97,90	0,150	0,148	318	0,2352668
15,148	542,9	543,1	98,64	98,91	0,150	0,148	319	0,232009
15,261	542,8	543,0	98,08	98,61	0,150	0,148	320	0,2337526
15,357	542,7	543,0	97,25	98,05	0,150	0,148	321	0,2352672
15,386	542,7	543,0	97,19	97,31	0,150	0,148	322	0,2357072
15,115	542,7	542,9	99,06	99,32	0,151	0,148	323	0,2315706
15,353	542,6	542,9	97,44	97,80	0,151	0,148	324	0,2352668
15,381	542,6	542,9	97,17	97,20	0,150	0,148	325	0,2356972
15,254	542,5	542,8	97,97	98,43	0,150	0,148	326	0,2337517
15,355	542,5	542,8	97,33	97,71	0,150	0,148	327	0,2352667
15,182	542,4	542,7	98,29	98,56	0,150	0,148	328	0,2326642
15,380	542,4	542,7	97,07	97,41	0,150	0,147	329	0,2356969
15,139	542,3	542,7	98,71	99,16	0,150	0,148	330	0,2320089
15,208	542,3	542,6	98,29	98,64	0,150	0,148	331	0,2330995
15,323	542,3	542,6	97,51	98,15	0,150	0,148	332	0,2348339
15,350	542,2	542,6	97,43	97,80	0,150	0,148	333	0,235259
15,349	542,2	542,5	97,13	97,75	0,150	0,148	334	0,2352661
15,350	542,2	542,5	97,40	97,87	0,150	0,148	335	0,2352659
15,348	542,2	542,5	97,33	97,79	0,150	0,148	336	0,2352662
15,207	542,1	542,4	98,24	98,81	0,150	0,148	337	0,2330743
15,180	542,1	542,4	98,37	98,93	0,150	0,148	338	0,2326635
15,005	542,1	542,4	99,57	99,89	0,150	0,148	339	0,2300321

15,374	542,0	542,3	97,18	97,68	0,150	0,148	340	0,2356962
15,243	542,0	542,3	97,88	98,45	0,150	0,148	341	0,2337511
15,134	542,0	542,3	98,82	99,10	0,150	0,148	342	0,2320082
15,343	542,0	542,3	97,35	97,67	0,151	0,148	343	0,2352655
15,245	541,9	542,2	98,09	98,28	0,151	0,148	344	0,2337506
15,203	541,9	542,2	98,37	98,72	0,151	0,148	345	0,2330983
15,131	541,9	542,2	98,72	99,08	0,151	0,148	346	0,2320075
15,341	541,8	542,2	97,46	97,72	0,151	0,148	347	0,2352654
15,342	541,8	542,1	97,22	97,92	0,150	0,148	348	0,2352651
15,311	541,8	542,1	97,63	97,88	0,150	0,148	349	0,2348327
15,310	541,8	542,1	97,56	97,83	0,151	0,148	350	0,2348327
15,125	541,8	542,1	98,59	99,15	0,150	0,148	351	0,2320071
15,312	541,7	542,0	97,57	97,98	0,150	0,148	352	0,2348376
15,311	541,7	542,0	97,72	98,06	0,151	0,148	353	0,2348329
15,337	541,7	542,0	97,21	97,76	0,151	0,148	354	0,2352654
15,307	541,7	541,9	97,57	97,98	0,150	0,148	355	0,2348329
15,336	541,6	541,9	97,28	97,85	0,151	0,148	356	0,2352654
15,408	541,6	541,9	96,74	97,21	0,150	0,148	357	0,236341
15,338	541,6	541,9	97,29	97,76	0,150	0,148	358	0,2352652
15,338	541,6	541,9	97,49	97,73	0,151	0,148	359	0,2352647
15,167	541,5	541,8	98,55	99,03	0,151	0,148	360	0,2326625
15,121	541,5	541,8	98,94	99,09	0,151	0,148	361	0,2320079
15,335	541,5	541,8	97,35	97,90	0,151	0,148	362	0,2352647
15,336	541,5	541,7	97,49	97,67	0,151	0,148	363	0,2352654
15,179	541,5	541,8	98,53	99,23	0,151	0,148	364	0,2327077
15,223	541,6	541,9	98,59	98,87	0,151	0,148	365	0,2330987
15,451	541,7	541,9	97,05	97,55	0,151	0,148	366	0,2363406
15,377	541,9	542,0	97,84	98,37	0,150	0,148	367	0,234843
15,257	542,0	542,2	98,49	98,96	0,150	0,148	368	0,2330982
15,359	542,2	542,3	97,80	98,24	0,150	0,148	369	0,2348331
15,381	542,3	542,4	97,55	97,93	0,150	0,148	370	0,2352657
15,401	542,3	542,4	97,33	97,79	0,150	0,148	371	0,2356958
15,225	542,3	542,4	98,32	98,53	0,150	0,148	372	0,2330982
15,264	542,3	542,5	98,16	98,44	0,150	0,148	373	0,2337505
15,327	542,3	542,5	97,57	98,25	0,151	0,148	374	0,2348332
15,383	542,2	542,4	97,18	97,77	0,150	0,148	375	0,2356962
15,353	542,2	542,4	97,46	97,87	0,150	0,148	376	0,2352651
15,320	542,2	542,4	97,71	97,91	0,151	0,148	377	0,2348331
15,318	542,1	542,4	97,66	98,03	0,151	0,148	378	0,2348333
15,373	542,0	542,3	97,33	97,62	0,151	0,148	379	0,2356961
15,173	542,0	542,3	98,56	99,04	0,151	0,148	380	0,232663
15,314	542,0	542,3	97,50	98,09	0,151	0,148	381	0,2348333
15,368	541,9	542,2	97,21	97,65	0,151	0,148	382	0,2356959
15,368	541,9	542,2	97,34	97,52	0,151	0,148	383	0,2356961
15,310	541,8	542,1	97,55	97,95	0,151	0,148	384	0,2348333
15,338	541,8	542,1	97,52	97,85	0,151	0,148	385	0,2352656
15,309	541,8	542,1	97,51	97,94	0,151	0,148	386	0,2348331
15,336	541,8	542,1	97,44	97,78	0,151	0,148	387	0,2352652
15,119	541,7	542,0	98,88	99,17	0,151	0,148	388	0,2319436
15,362	541,7	542,0	97,27	97,61	0,151	0,148	389	0,2356959
15,192	541,7	542,0	98,26	98,71	0,151	0,148	390	0,2330978
15,306	541,6	541,9	97,65	97,86	0,151	0,148	391	0,2348327
15,361	541,6	541,9	97,32	97,45	0,151	0,148	392	0,2356954
15,426	541,5	541,9	96,82	97,01	0,151	0,148	393	0,2367697
15,330	541,5	541,8	97,27	97,69	0,151	0,148	394	0,2352651
15,331	541,5	541,8	97,33	97,53	0,151	0,148	395	0,2352686
15,191	541,5	541,8	98,21	98,73	0,151	0,148	396	0,2330982
15,297	541,4	541,8	97,64	97,80	0,151	0,148	397	0,2348328
15,227	541,4	541,7	97,91	98,11	0,151	0,148	398	0,2337497
15,297	541,4	541,7	97,48	97,84	0,151	0,148	399	0,2348324
15,324	541,4	541,7	97,32	97,73	0,151	0,148	400	0,235264
15,355	541,3	541,7	97,19	97,47	0,151	0,148	401	0,2356955
15,186	541,3	541,6	98,32	98,59	0,151	0,148	402	0,233098
15,297	541,3	541,6	97,58	97,93	0,151	0,148	403	0,2348323
15,297	541,2	541,6	97,64	97,72	0,151	0,148	404	0,2348321
15,226	541,2	541,5	98,07	98,29	0,151	0,148	405	0,2337498
15,322	541,2	541,5	97,37	97,63	0,151	0,148	406	0,2352648
15,352	541,2	541,5	97,24	97,46	0,151	0,148	407	0,2356951
15,297	541,1	541,4	97,47	97,92	0,151	0,148	408	0,2348322

15,300	541,2	541,5	97,45	97,83	0,151	0,148	409	0,2348321
15,245	541,2	541,5	98,41	98,63	0,151	0,148	410	0,2337492
15,267	541,3	541,6	98,25	98,60	0,151	0,148	411	0,2337496
15,286	541,4	541,7	98,39	98,73	0,151	0,148	412	0,2337496
15,185	541,6	541,8	99,30	99,58	0,151	0,148	413	0,2320073
15,369	541,7	541,9	97,81	98,49	0,151	0,148	414	0,2348328
15,387	541,9	542,0	97,72	98,26	0,150	0,148	415	0,2352651
15,407	542,0	542,1	97,51	97,78	0,151	0,148	416	0,2356951
15,344	542,0	542,2	97,67	98,18	0,151	0,148	417	0,2348327
15,461	542,0	542,2	96,83	97,06	0,150	0,148	418	0,2367689
15,428	542,0	542,2	97,09	97,51	0,151	0,148	419	0,2363406
15,328	542,0	542,2	97,67	98,02	0,151	0,148	420	0,2348326
15,379	542,0	542,2	97,10	97,70	0,150	0,148	421	0,235696
15,373	541,9	542,2	97,32	97,50	0,151	0,148	422	0,2356959
15,341	541,9	542,1	97,27	97,65	0,151	0,148	423	0,235265
15,440	541,8	542,1	96,82	97,23	0,151	0,148	424	0,2367697
15,423	541,8	542,0	96,87	97,28	0,151	0,148	425	0,2365733
15,337	541,7	542,0	97,28	97,83	0,151	0,148	426	0,235265
15,362	541,7	542,0	97,16	97,63	0,151	0,148	427	0,2356956
15,360	541,6	542,0	97,25	97,62	0,151	0,148	428	0,2356953
15,232	541,6	541,9	98,15	98,45	0,151	0,148	429	0,23375
15,401	541,5	541,9	96,96	97,37	0,151	0,148	430	0,2363407
15,360	541,5	541,8	97,29	97,51	0,151	0,148	431	0,2356952
15,357	541,5	541,8	97,32	97,70	0,151	0,148	432	0,2356954
15,230	541,4	541,8	97,94	98,18	0,151	0,148	433	0,23375
15,397	541,4	541,7	96,84	97,46	0,151	0,148	434	0,2363409
15,299	541,3	541,7	97,52	97,88	0,151	0,148	435	0,2348326
15,349	541,3	541,6	97,25	97,64	0,151	0,148	436	0,2356927
15,296	541,3	541,6	97,59	98,00	0,151	0,148	437	0,2348324
15,224	541,2	541,6	98,03	98,37	0,151	0,148	438	0,2337414
15,226	541,2	541,5	97,94	98,50	0,151	0,148	439	0,2337496
15,323	541,2	541,5	97,43	97,81	0,151	0,148	440	0,2352643
15,321	541,2	541,5	97,28	97,69	0,151	0,148	441	0,2352639
15,292	541,1	541,5	97,59	97,80	0,151	0,148	442	0,2348326
15,222	541,1	541,4	98,00	98,26	0,151	0,148	443	0,2337416
15,319	541,1	541,4	97,37	97,93	0,151	0,148	444	0,2352646
15,107	541,0	541,4	98,77	99,17	0,151	0,148	445	0,2320066
15,150	541,0	541,3	98,47	98,95	0,151	0,148	446	0,2326522
15,390	541,0	541,3	96,97	97,40	0,151	0,148	447	0,2363399
15,149	540,9	541,3	98,59	99,07	0,151	0,148	448	0,2326613
15,147	540,9	541,2	98,47	98,80	0,151	0,148	449	0,2326622
15,335	540,9	541,2	97,32	97,52	0,151	0,148	450	0,2355715
15,461	540,9	541,2	96,70	96,82	0,151	0,148	451	0,2374106
15,241	540,9	541,2	98,17	98,74	0,151	0,148	452	0,2337493
15,335	541,0	541,3	97,92	98,22	0,151	0,148	453	0,2348316
15,350	541,2	541,4	97,90	98,39	0,151	0,148	454	0,2348326
15,400	541,3	541,5	97,85	98,23	0,151	0,148	455	0,2352642
15,424	541,5	541,6	97,55	97,93	0,151	0,148	456	0,2356951
15,382	541,6	541,8	97,70	98,06	0,151	0,148	457	0,2352641
15,345	541,7	541,8	97,78	98,12	0,151	0,148	458	0,2348324
15,364	541,8	541,9	97,69	97,75	0,151	0,148	459	0,2352648
15,256	541,8	541,9	98,12	98,21	0,151	0,148	460	0,2337501
15,252	541,7	541,9	98,09	98,40	0,151	0,148	461	0,2337504
15,344	541,7	541,9	97,36	98,06	0,151	0,148	462	0,235265
15,341	541,7	541,9	97,42	97,67	0,151	0,148	463	0,2352646
15,195	541,6	541,9	98,41	98,80	0,151	0,148	464	0,233097
15,350	541,6	541,8	97,30	97,54	0,151	0,148	465	0,2354921
15,401	541,5	541,8	97,14	97,32	0,151	0,148	466	0,2363396
15,161	541,5	541,8	98,41	98,85	0,151	0,148	467	0,2326623
15,328	541,4	541,7	97,23	97,74	0,151	0,148	468	0,2352645
15,326	541,3	541,7	97,34	97,76	0,151	0,148	469	0,2352645
15,185	541,3	541,6	98,25	98,73	0,151	0,148	470	0,2331188
15,181	541,3	541,6	98,20	98,56	0,151	0,148	471	0,2330968
15,353	541,2	541,6	97,36	97,71	0,151	0,148	472	0,2356952
15,322	541,2	541,6	97,27	97,85	0,151	0,148	473	0,2352642
14,806	541,2	541,5	100,78	101,23	0,151	0,148	474	0,227368
14,837	541,2	541,5	100,47	100,85	0,151	0,148	475	0,2278135
14,812	541,1	541,5	100,82	101,02	0,151	0,148	476	0,2273682
14,838	541,1	541,5	100,77	100,97	0,151	0,148	477	0,2278133

14,733	541,1	541,4	101,17	101,83	0,151	0,148	478	0,2262495
14,806	541,1	541,4	100,80	101,09	0,151	0,148	479	0,2273679
14,934	541,1	541,4	99,92	100,10	0,151	0,148	480	0,2293676
14,834	541,0	541,4	100,47	101,13	0,151	0,148	481	0,2278134
14,974	541,0	541,3	99,49	99,89	0,151	0,148	482	0,23003
14,973	541,0	541,3	99,67	99,94	0,151	0,148	483	0,2300302
14,827	540,9	541,3	100,60	101,10	0,151	0,148	484	0,2278133
14,871	540,9	541,2	100,16	100,73	0,151	0,148	485	0,2284813
14,826	540,9	541,2	100,65	100,96	0,151	0,148	486	0,2278133
14,999	540,9	541,2	99,51	99,84	0,151	0,148	487	0,2304705
14,998	540,8	541,2	99,41	99,67	0,151	0,148	488	0,2304705
14,721	540,9	541,2	101,32	101,77	0,151	0,148	489	0,2261029
14,823	540,9	541,2	100,84	101,40	0,151	0,148	490	0,2273682
14,921	541,0	541,3	100,68	100,84	0,151	0,148	491	0,2284807
14,893	541,1	541,3	101,01	101,37	0,151	0,148	492	0,2278132
14,907	541,2	541,4	101,09	101,18	0,151	0,148	493	0,2278137
14,805	541,3	541,6	101,70	102,17	0,151	0,148	494	0,2262497
14,894	541,5	541,7	100,95	100,96	0,151	0,148	495	0,2278137
14,782	541,5	541,8	101,30	101,80	0,151	0,148	496	0,226265
14,917	541,6	541,8	100,40	100,77	0,150	0,148	497	0,2284812
14,821	541,6	541,8	100,83	101,34	0,150	0,148	498	0,2271113
14,832	541,6	541,8	100,92	101,21	0,151	0,148	499	0,2273691
15,030	541,6	541,8	99,63	99,73	0,151	0,148	500	0,2304705
15,027	541,5	541,8	99,45	99,95	0,151	0,148	501	0,2304706

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,76	99,09	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
			PR1	PR2			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
16,165	540,9	541,6			0,151	0,148	0	0,2337495
15,826	541,0	541,7	105,69	105,71	0,151	0,147	1	0,2293668
16,016	541,1	541,7	105,95	106,43	0,151	0,148	2	0,2304696
15,981	541,1	541,7	109,94	110,31	0,150	0,148	3	0,2258001
15,707	541,1	541,7	106,64	107,17	0,150	0,148	4	0,2273672
15,613	541,2	541,8	104,87	105,51	0,150	0,148	5	0,2284802
15,705	541,3	541,9	103,71	104,05	0,150	0,148	6	0,2304697
15,800	541,4	541,9	102,94	103,34	0,150	0,148	7	0,232006
15,807	541,4	541,9	103,14	103,41	0,150	0,148	8	0,232006
15,860	541,5	542,0	103,03	103,05	0,151	0,148	9	0,2326612
15,871	541,5	542,1	102,93	103,19	0,151	0,147	10	0,2326609
15,643	541,6	542,1	104,27	104,69	0,150	0,148	11	0,229367
15,831	541,7	542,2	103,26	103,43	0,150	0,147	12	0,2320065
15,785	541,7	542,2	102,88	103,03	0,150	0,147	13	0,2320069
15,899	541,8	542,3	100,78	101,05	0,150	0,147	14	0,2352639
15,780	541,9	542,4	100,40	100,74	0,150	0,148	15	0,234831
15,580	542,0	542,5	100,92	101,56	0,150	0,148	16	0,2326615
15,813	542,1	542,5	98,99	99,46	0,150	0,148	17	0,2367678
15,656	542,1	542,5	99,48	100,20	0,150	0,148	18	0,2348313
15,579	542,2	542,6	100,08	100,44	0,150	0,148	19	0,2337492
15,731	542,2	542,7	98,73	99,06	0,150	0,148	20	0,2363391
15,676	542,3	542,7	98,92	99,38	0,150	0,148	21	0,2356937
15,547	542,3	542,7	99,80	100,08	0,150	0,148	22	0,2337487
15,546	542,2	542,7	99,77	100,46	0,150	0,148	23	0,2337487
15,562	542,1	542,7	99,48	99,77	0,150	0,148	24	0,2341389
15,629	542,1	542,7	98,96	99,19	0,150	0,147	25	0,2352631
15,629	542,1	542,7	98,98	99,50	0,150	0,147	26	0,2352638
15,603	542,0	542,6	99,44	99,42	0,150	0,148	27	0,2348308
15,621	542,0	542,6	99,13	99,48	0,151	0,148	28	0,2352639
15,619	542,0	542,6	98,93	99,32	0,150	0,148	29	0,2352635
15,614	542,0	542,6	98,93	99,23	0,150	0,147	30	0,2352632
15,405	542,0	542,5	100,44	100,61	0,150	0,147	31	0,2320063
15,466	542,0	542,5	99,77	100,44	0,150	0,148	32	0,2330959
15,374	541,9	542,5	100,56	101,10	0,150	0,148	33	0,2315672
15,398	541,9	542,5	100,28	100,53	0,150	0,148	34	0,2320053
15,590	541,9	542,5	99,12	99,52	0,150	0,147	35	0,2348312
15,526	542,0	542,5	99,72	100,17	0,150	0,148	36	0,2337486
15,610	542,0	542,5	98,89	99,07	0,150	0,148	37	0,2352627
15,384	541,9	542,5	100,60	101,00	0,150	0,147	38	0,2316403
15,524	541,9	542,4	99,68	99,89	0,150	0,148	39	0,2337487
15,603	541,9	542,4	99,08	99,39	0,150	0,148	40	0,2352632
15,576	541,8	542,4	99,18	99,44	0,150	0,148	41	0,2348301
15,332	541,8	542,4	100,76	101,12	0,150	0,148	42	0,2311292
15,609	541,8	542,4	98,90	99,11	0,150	0,148	43	0,2352631
15,462	541,8	542,4	99,80	100,02	0,150	0,147	44	0,233096
15,388	541,8	542,4	100,22	100,67	0,150	0,147	45	0,2320056
15,569	541,8	542,3	98,94	99,41	0,150	0,148	46	0,2348306
15,374	541,8	542,3	100,17	100,37	0,150	0,147	47	0,2320052
15,376	541,8	542,3	100,08	100,43	0,150	0,147	48	0,2320052
15,430	541,8	542,3	99,97	100,39	0,150	0,148	49	0,2326608
15,470	541,8	542,3	100,04	100,12	0,150	0,148	50	0,2330955
15,566	541,8	542,3	99,12	99,37	0,150	0,147	51	0,2348304
15,459	541,8	542,3	99,86	100,06	0,150	0,148	52	0,2330958
15,487	541,7	542,3	99,43	99,92	0,150	0,148	53	0,2337482
15,381	541,7	542,3	100,23	100,40	0,150	0,148	54	0,2320057
15,372	541,7	542,3	100,15	100,69	0,150	0,148	55	0,2320055
15,447	541,7	542,3	99,96	100,03	0,150	0,148	56	0,233096
15,438	541,7	542,3	99,69	100,11	0,150	0,148	57	0,2330959
15,366	541,7	542,2	100,02	100,53	0,150	0,148	58	0,2320481
15,639	541,7	542,2	98,15	98,49	0,150	0,148	59	0,2363387
15,542	541,7	542,2	98,89	98,85	0,150	0,147	60	0,2348304
15,311	541,7	542,2	100,25	100,41	0,150	0,147	61	0,2315668
15,565	541,7	542,2	98,65	99,03	0,150	0,148	62	0,2352626
15,476	541,7	542,2	99,48	99,83	0,150	0,148	63	0,233749



15,360	541,7	542,2	100,15	100,46	0,150	0,148	64	0,232052
15,400	541,7	542,2	99,82	100,17	0,150	0,148	65	0,2326606
15,573	541,7	542,1	98,79	99,16	0,150	0,148	66	0,2352625
15,538	541,7	542,1	98,91	99,31	0,150	0,148	67	0,2348298
15,330	541,6	542,1	100,46	100,65	0,150	0,148	68	0,2315675
15,423	541,6	542,1	99,62	99,95	0,150	0,148	69	0,233095
15,466	541,6	542,1	99,22	99,66	0,150	0,148	70	0,2337476
15,581	541,6	542,1	98,68	98,76	0,150	0,148	71	0,2355946
15,564	541,6	542,0	98,85	99,12	0,151	0,148	72	0,2352622
15,414	541,6	542,0	99,50	99,76	0,150	0,148	73	0,233095
15,288	541,5	542,0	100,44	100,69	0,150	0,147	74	0,2311279
15,456	541,5	542,0	99,26	99,67	0,150	0,148	75	0,2337472
15,530	541,5	542,0	98,73	99,34	0,150	0,148	76	0,2349054
15,529	541,5	542,0	99,10	99,12	0,151	0,148	77	0,2348297
15,453	541,5	541,9	99,23	99,79	0,151	0,148	78	0,2337472
15,536	541,5	541,9	98,97	99,17	0,150	0,148	79	0,2348292
15,439	541,5	541,9	99,62	99,94	0,151	0,148	80	0,2333624
15,528	541,5	541,9	98,70	99,19	0,150	0,148	81	0,2348295
15,558	541,4	541,9	98,71	98,87	0,150	0,148	82	0,2352618
15,396	541,3	541,9	99,81	100,18	0,150	0,148	83	0,2327027
15,416	541,3	541,8	99,84	100,13	0,151	0,148	84	0,2330954
15,383	541,3	541,8	99,78	100,32	0,151	0,148	85	0,2327092
15,433	541,3	541,8	99,56	99,72	0,151	0,148	86	0,2334467
15,518	541,3	541,8	98,74	99,11	0,150	0,148	87	0,2348298
15,316	541,3	541,7	100,23	100,79	0,150	0,148	88	0,2315962
15,553	541,3	541,8	98,80	99,11	0,150	0,148	89	0,2352619
15,539	541,3	541,7	98,57	99,25	0,151	0,148	90	0,2352622
15,539	541,3	541,8	98,58	98,81	0,150	0,148	91	0,2352621
15,405	541,2	541,7	99,62	99,84	0,150	0,148	92	0,2330951
15,388	541,2	541,7	99,46	99,70	0,150	0,148	93	0,2330943
15,559	541,2	541,7	98,35	99,00	0,150	0,148	94	0,2356919
15,426	541,2	541,6	99,18	99,52	0,150	0,148	95	0,2337466
15,598	541,2	541,6	98,14	98,53	0,151	0,148	96	0,2363372
15,381	541,1	541,6	99,54	99,69	0,151	0,148	97	0,2330937
15,421	541,1	541,6	99,21	99,34	0,151	0,148	98	0,2337467
15,415	541,1	541,6	99,25	99,70	0,151	0,148	99	0,2337469
15,506	541,1	541,5	98,55	98,72	0,151	0,148	100	0,2352612
15,341	541,0	541,5	99,61	99,84	0,151	0,148	101	0,2326587
15,505	541,0	541,4	98,49	98,70	0,151	0,148	102	0,2352621
15,355	540,9	541,4	99,27	99,65	0,151	0,148	103	0,233095
15,569	540,9	541,4	98,02	98,22	0,151	0,148	104	0,2363377
15,500	540,9	541,4	98,37	98,75	0,151	0,148	105	0,2352621
15,462	540,9	541,5	98,51	98,98	0,150	0,148	106	0,2348294
15,497	540,9	541,5	98,13	98,78	0,150	0,148	107	0,2352618
15,348	540,9	541,4	99,27	99,52	0,150	0,148	108	0,2330949
15,531	540,9	541,4	98,24	98,40	0,151	0,148	109	0,2356927
15,566	540,8	541,4	97,95	98,49	0,151	0,148	110	0,2363378
15,585	540,8	541,3	97,81	97,96	0,151	0,148	111	0,2367663
15,461	540,8	541,3	98,62	98,84	0,151	0,148	112	0,2348297
15,344	540,7	541,3	99,11	99,82	0,151	0,148	113	0,233098
15,558	540,7	541,3	97,77	98,15	0,150	0,148	114	0,2363371
15,552	540,7	541,3	97,89	98,19	0,150	0,148	115	0,2363371
15,506	540,7	541,3	98,23	98,46	0,151	0,148	116	0,2356918
15,481	540,7	541,2	98,22	98,56	0,151	0,148	117	0,2352616
15,454	540,6	541,2	98,44	98,85	0,150	0,148	118	0,2348291
15,545	540,6	541,2	97,89	98,13	0,151	0,148	119	0,2363373
15,268	540,6	541,1	99,74	100,08	0,151	0,148	120	0,2320042
15,378	540,6	541,1	99,02	99,21	0,151	0,148	121	0,2337466
15,508	540,6	541,1	98,04	98,50	0,151	0,148	122	0,235692
15,329	540,5	541,1	99,15	99,37	0,150	0,148	123	0,2330947
15,504	540,5	541,1	98,05	98,52	0,151	0,148	124	0,2356919
15,445	540,5	541,1	98,42	99,06	0,151	0,148	125	0,2348293
15,547	540,5	541,1	97,92	98,10	0,151	0,148	126	0,2363365
15,493	540,5	541,1	98,13	98,46	0,151	0,148	127	0,2356917
15,531	540,5	541,1	97,78	98,09	0,151	0,148	128	0,2363378
15,246	540,4	541,0	99,52	99,84	0,151	0,148	129	0,2320034
15,319	540,4	541,0	98,99	99,54	0,150	0,148	130	0,2330942
15,532	540,4	541,0	97,87	98,21	0,151	0,148	131	0,236337
15,487	540,3	541,0	98,19	98,36	0,151	0,148	132	0,2356918

15,459	540,3	540,9	98,25	98,50	0,151	0,148	133	0,235261
15,358	540,4	541,0	98,83	99,24	0,151	0,148	134	0,2337464
15,519	540,3	540,9	97,65	97,98	0,151	0,148	135	0,2363374
15,584	540,3	540,9	97,28	97,45	0,151	0,148	136	0,2374013
15,417	540,2	540,8	98,22	98,75	0,151	0,148	137	0,2348292
15,408	540,2	540,8	98,29	98,68	0,151	0,148	138	0,2348287
15,474	540,2	540,8	97,95	98,21	0,151	0,148	139	0,2356918
15,599	540,2	540,8	96,95	97,38	0,151	0,148	140	0,2377318
15,265	540,2	540,8	99,17	99,38	0,151	0,148	141	0,2326591
15,576	540,1	540,7	97,13	97,48	0,151	0,148	142	0,2374077
15,505	540,1	540,7	97,75	97,92	0,151	0,148	143	0,2363369
15,572	540,1	540,7	97,23	97,54	0,151	0,148	144	0,2374078
15,578	540,1	540,7	97,33	97,54	0,151	0,148	145	0,2374078
15,530	540,0	540,6	97,65	97,97	0,151	0,148	146	0,2367674
15,424	540,0	540,6	98,10	98,43	0,151	0,148	147	0,2352616
15,620	539,9	540,5	97,00	97,26	0,151	0,148	148	0,2382611
15,521	539,9	540,5	97,49	97,66	0,151	0,148	149	0,2367653
15,565	539,9	540,4	97,19	97,48	0,151	0,148	150	0,2374073
15,491	539,9	540,4	97,57	98,08	0,151	0,148	151	0,2363368
15,521	539,8	540,4	97,55	97,74	0,151	0,148	152	0,2367651
15,330	539,8	540,4	98,53	99,14	0,151	0,148	153	0,2340002
15,495	539,8	540,3	97,36	97,85	0,151	0,148	154	0,2363367
15,587	539,8	540,3	97,05	97,30	0,151	0,148	155	0,2378348
15,313	539,7	540,2	98,69	99,25	0,151	0,148	156	0,2337467
15,443	539,7	540,2	97,79	97,97	0,151	0,148	157	0,2357596
15,586	539,7	540,2	97,00	97,32	0,151	0,148	158	0,2378346
15,555	539,7	540,2	97,06	97,53	0,151	0,148	159	0,2374076
15,415	539,6	540,2	98,17	98,37	0,151	0,148	160	0,235261
15,486	539,6	540,2	97,58	97,85	0,151	0,148	161	0,2363374
15,479	539,6	540,1	97,50	97,92	0,151	0,148	162	0,2363375
15,480	539,6	540,1	97,55	97,69	0,151	0,148	163	0,2363372
15,437	539,6	540,1	97,76	98,11	0,151	0,148	164	0,2356909
15,394	539,6	540,1	98,22	98,67	0,151	0,148	165	0,234932
15,510	539,5	540,0	97,29	97,70	0,151	0,148	166	0,2367649
15,510	539,6	540,1	97,38	97,68	0,151	0,148	167	0,2367651
15,392	539,6	540,1	98,04	98,50	0,151	0,148	168	0,2348283
15,444	539,8	540,2	98,26	98,28	0,151	0,148	169	0,2352612
15,493	539,9	540,3	98,10	98,41	0,151	0,148	170	0,2356912
15,501	540,0	540,4	98,07	98,38	0,151	0,148	171	0,2356912
15,634	540,2	540,5	97,30	97,50	0,151	0,148	172	0,2378351
15,458	540,2	540,5	98,24	98,68	0,151	0,148	173	0,2352614
15,590	540,2	540,6	97,26	97,59	0,151	0,148	174	0,2374077
15,523	540,3	540,6	97,73	98,13	0,151	0,148	175	0,2363367
15,572	540,3	540,7	97,59	98,04	0,151	0,148	176	0,2367653
15,515	540,5	540,8	98,32	98,34	0,151	0,148	177	0,2356917
15,562	540,6	540,9	97,95	98,10	0,151	0,148	178	0,2363368
15,503	540,8	541,1	98,54	98,85	0,151	0,148	179	0,2352616
15,537	540,9	541,2	98,10	98,76	0,150	0,148	180	0,2356921
15,613	541,1	541,4	97,77	97,98	0,150	0,148	181	0,2367661
15,558	541,3	541,5	98,42	98,70	0,150	0,148	182	0,235692
15,606	541,5	541,7	97,99	98,50	0,150	0,148	183	0,2363375
15,647	541,6	541,9	97,93	98,51	0,150	0,148	184	0,2367668
15,572	541,8	542,0	98,41	98,79	0,150	0,148	185	0,2356874
15,652	542,0	542,2	97,72	98,19	0,150	0,148	186	0,2367672
15,759	542,2	542,4	97,40	97,48	0,150	0,147	187	0,2382629
15,706	542,4	542,6	97,70	98,02	0,150	0,147	188	0,2374038
15,809	542,6	542,8	96,99	97,45	0,150	0,147	189	0,2389016
15,640	542,7	543,0	98,06	98,45	0,150	0,147	190	0,2363396
15,747	542,9	543,2	97,64	98,02	0,150	0,147	191	0,237838
15,781	543,1	543,4	97,47	97,70	0,150	0,147	192	0,2382639
15,758	543,2	543,5	97,57	98,20	0,150	0,148	193	0,2378385
15,827	543,4	543,7	97,18	97,52	0,150	0,148	194	0,238903
15,695	543,6	543,9	98,02	98,41	0,150	0,147	195	0,2367694
15,736	543,8	544,1	97,67	98,02	0,150	0,147	196	0,237411
15,748	543,9	544,3	97,93	98,21	0,150	0,147	197	0,2374113
15,848	544,1	544,4	97,35	97,60	0,150	0,147	198	0,2388949
15,884	544,2	544,6	97,33	97,49	0,150	0,147	199	0,239328
15,694	544,4	544,8	97,91	98,16	0,150	0,147	200	0,2367701
15,676	544,5	544,9	97,66	97,80	0,150	0,147	201	0,2367707

15,654	544,5	544,9	97,62	97,84	0,150	0,147	202	0,2367712
15,618	544,5	544,9	97,73	98,09	0,150	0,147	203	0,2363425
15,634	544,4	544,8	97,66	97,94	0,150	0,147	204	0,2367711
15,550	544,3	544,8	97,92	98,25	0,150	0,147	205	0,2356793
15,716	544,1	544,7	96,93	97,29	0,150	0,147	206	0,2382665
15,585	544,0	544,6	97,64	98,00	0,150	0,147	207	0,2363431
15,534	543,9	544,5	97,89	97,94	0,150	0,147	208	0,2356975
15,617	543,9	544,5	97,51	97,73	0,150	0,147	209	0,2367707
15,530	543,9	544,4	98,14	98,69	0,150	0,147	210	0,2352667
15,549	543,9	544,5	98,52	98,75	0,150	0,147	211	0,2352665
15,665	544,0	544,6	97,84	98,09	0,150	0,147	212	0,2367711
15,579	544,1	544,7	98,52	98,80	0,150	0,147	213	0,2352672
15,414	544,3	544,8	99,58	99,78	0,150	0,147	214	0,2326648
15,620	544,5	544,9	98,22	98,47	0,150	0,147	215	0,2356984
15,670	544,6	545,0	98,17	98,36	0,150	0,147	216	0,2363432
15,684	544,8	545,2	98,11	98,49	0,150	0,147	217	0,2363433
15,402	545,0	545,4	100,09	100,60	0,150	0,147	218	0,2320098
15,632	545,2	545,5	98,90	99,15	0,150	0,147	219	0,2352676
15,697	545,3	545,7	98,27	98,84	0,150	0,147	220	0,236344
15,605	545,5	545,8	98,62	99,04	0,150	0,147	221	0,2352676
15,555	545,6	545,9	98,65	98,97	0,150	0,147	222	0,2348356
15,566	545,6	546,0	98,47	98,98	0,150	0,147	223	0,2352679
15,555	545,5	545,9	98,46	98,77	0,150	0,147	224	0,2352688
15,738	545,4	545,9	97,06	97,35	0,150	0,147	225	0,2382685
15,434	545,3	545,8	99,02	99,29	0,150	0,147	226	0,2337541
15,501	545,2	545,7	98,45	98,84	0,150	0,147	227	0,2348362
15,424	545,1	545,7	98,77	98,92	0,150	0,147	228	0,2337535
15,550	545,0	545,6	97,98	98,44	0,150	0,147	229	0,2356992
15,542	544,9	545,5	98,12	98,22	0,150	0,147	230	0,2356987
15,542	544,8	545,4	98,16	98,22	0,150	0,147	231	0,2356988
15,502	544,7	545,3	98,09	98,68	0,150	0,147	232	0,2352681
15,254	544,6	545,2	99,88	99,75	0,150	0,147	233	0,2315733
15,482	544,6	545,2	98,42	98,76	0,150	0,147	234	0,2348362
15,431	544,6	545,2	99,05	99,28	0,150	0,147	235	0,233754
15,517	544,7	545,2	98,71	99,04	0,150	0,147	236	0,2348361
15,341	544,8	545,3	99,97	100,19	0,150	0,147	237	0,2320103
15,405	545,0	545,4	99,79	99,84	0,150	0,147	238	0,232666
15,554	545,2	545,6	98,86	98,97	0,150	0,147	239	0,2348364
15,601	545,3	545,7	98,67	99,06	0,150	0,147	240	0,2352687
15,395	545,5	545,9	100,00	100,48	0,150	0,147	241	0,2320106
15,638	545,7	546,0	98,65	99,03	0,150	0,147	242	0,2356989
15,593	545,8	546,2	98,53	98,78	0,150	0,147	243	0,2352687
15,568	545,9	546,2	98,43	98,86	0,150	0,147	244	0,2352691
15,621	545,9	546,3	97,86	98,22	0,150	0,147	245	0,2363451
15,537	545,8	546,2	98,24	98,51	0,150	0,147	246	0,2352692
15,315	545,7	546,2	99,32	99,76	0,150	0,147	247	0,2320118
15,421	545,6	546,1	98,50	98,87	0,150	0,147	248	0,2337577
15,548	545,5	546,1	97,53	98,07	0,149	0,147	249	0,2356999
15,482	545,4	546,0	98,14	98,28	0,150	0,147	250	0,2348366
15,506	545,3	545,9	97,80	98,07	0,150	0,147	251	0,2352687
15,399	545,2	545,8	98,45	98,82	0,150	0,147	252	0,2337548
15,400	545,1	545,7	98,33	98,99	0,150	0,147	253	0,233754
15,528	545,0	545,6	97,57	97,84	0,150	0,147	254	0,2356994
15,393	545,0	545,6	98,32	98,93	0,150	0,147	255	0,2337546
15,349	544,9	545,5	98,58	99,09	0,150	0,147	256	0,2331018
15,277	544,8	545,4	99,08	99,33	0,150	0,147	257	0,232011
15,326	544,8	545,4	98,93	99,29	0,150	0,147	258	0,2326661
15,534	544,8	545,4	97,81	98,40	0,150	0,147	259	0,235452
15,561	544,9	545,5	98,02	98,07	0,150	0,147	260	0,2356988
15,653	545,0	545,5	97,56	97,89	0,150	0,147	261	0,2367733
15,402	545,2	545,6	99,26	99,52	0,150	0,147	262	0,2326664
15,581	545,3	545,8	98,16	98,37	0,149	0,147	263	0,2352688
15,358	545,5	545,9	99,91	100,37	0,149	0,147	264	0,231573
15,517	545,7	546,1	99,01	99,44	0,149	0,147	265	0,2337548
15,568	545,9	546,3	98,39	98,87	0,149	0,147	266	0,2348374
15,404	546,0	546,4	99,33	99,45	0,149	0,147	267	0,2326689
15,585	546,1	546,4	97,88	98,06	0,149	0,147	268	0,2357
15,443	546,0	546,4	98,58	99,04	0,149	0,147	269	0,2337586
15,531	546,0	546,4	97,87	98,02	0,149	0,147	270	0,2352693

15,378	545,9	546,3	98,68	99,11	0,149	0,147	271	0,2331018
15,413	545,8	546,3	98,38	98,75	0,149	0,147	272	0,2337542
15,544	545,7	546,2	97,57	98,02	0,149	0,147	273	0,2356996
15,504	545,6	546,1	97,77	98,35	0,149	0,147	274	0,2352693
15,332	545,5	546,1	98,90	99,29	0,150	0,147	275	0,2326667
15,469	545,4	546,0	98,02	98,30	0,150	0,147	276	0,234837
15,352	545,3	545,9	98,68	99,00	0,150	0,147	277	0,2331019
15,393	545,2	545,8	98,35	98,52	0,150	0,147	278	0,2337546
15,342	545,1	545,7	98,62	98,98	0,150	0,147	279	0,2331016
15,217	545,0	545,7	99,49	99,92	0,150	0,147	280	0,2311351
15,319	545,0	545,6	98,88	99,19	0,150	0,147	281	0,2326664
15,485	544,9	545,6	98,03	97,98	0,150	0,147	282	0,235269
15,565	544,9	545,5	97,51	97,78	0,150	0,147	283	0,2363445
15,275	545,0	545,5	99,60	100,01	0,150	0,147	284	0,2315733
15,322	545,1	545,6	99,36	99,78	0,150	0,147	285	0,232093
15,404	545,2	545,7	99,10	99,42	0,150	0,147	286	0,2331016
15,333	545,4	545,8	99,81	100,35	0,150	0,147	287	0,2315725
15,489	545,5	545,9	98,93	99,19	0,149	0,147	288	0,2337544
15,577	545,7	546,1	98,80	99,05	0,150	0,147	289	0,2348367
15,631	545,9	546,2	98,27	98,57	0,150	0,147	290	0,2356831
15,553	546,1	546,4	98,50	99,05	0,150	0,147	291	0,2348365
15,565	546,1	546,5	98,23	98,72	0,150	0,147	292	0,2352695
15,305	546,1	546,5	99,67	99,86	0,150	0,147	293	0,2315735
15,535	546,1	546,5	98,02	98,31	0,150	0,147	294	0,2352693
15,525	546,0	546,5	97,94	98,15	0,150	0,147	295	0,2352694
15,547	546,0	546,4	97,75	97,99	0,150	0,147	296	0,2356996
15,289	545,9	546,4	99,31	99,52	0,150	0,147	297	0,2318803
15,407	545,8	546,3	98,74	98,82	0,150	0,147	298	0,2337552
15,402	545,8	546,2	98,47	98,61	0,150	0,147	299	0,233754
15,473	545,7	546,2	97,94	98,26	0,150	0,147	300	0,2348374
15,497	545,6	546,1	97,73	98,11	0,150	0,147	301	0,2352693
15,525	545,5	546,0	97,68	97,92	0,150	0,147	302	0,2356992
15,491	545,5	546,0	97,84	98,19	0,150	0,147	303	0,2352684
15,516	545,4	545,9	97,63	98,01	0,150	0,147	304	0,235699
15,388	545,3	545,9	98,48	98,94	0,150	0,147	305	0,2337543
15,516	545,3	545,8	97,64	97,76	0,150	0,147	306	0,2356994
15,512	545,2	545,7	97,65	98,09	0,150	0,147	307	0,2356992
15,386	545,2	545,7	98,33	98,78	0,150	0,147	308	0,2337539
15,513	545,1	545,6	97,77	97,88	0,150	0,147	309	0,2356995
15,452	545,1	545,6	97,83	98,46	0,150	0,147	310	0,2348333
15,339	545,0	545,5	98,85	99,15	0,150	0,147	311	0,2331014
15,315	545,0	545,5	99,00	99,18	0,150	0,147	312	0,2326662
15,328	545,0	545,5	98,86	99,33	0,150	0,147	313	0,232666
15,277	545,1	545,6	99,73	100,13	0,150	0,147	314	0,2315756
15,287	545,2	545,6	99,75	100,01	0,150	0,147	315	0,2315727
15,331	545,3	545,7	99,36	100,09	0,150	0,147	316	0,232011
15,468	545,5	545,9	98,92	99,17	0,150	0,147	317	0,2337538
15,612	545,7	546,0	98,23	98,38	0,150	0,147	318	0,2356994
15,547	545,8	546,1	98,28	98,92	0,150	0,147	319	0,2348359
15,342	546,0	546,3	99,60	99,95	0,149	0,147	320	0,2320116
15,616	546,1	546,3	97,65	98,13	0,150	0,147	321	0,236345
15,535	546,0	546,4	98,13	98,30	0,150	0,147	322	0,2352691
15,497	546,0	546,4	98,09	98,34	0,150	0,147	323	0,2348367
15,491	546,0	546,3	98,14	98,51	0,150	0,147	324	0,2348365
15,542	545,9	546,3	97,84	97,91	0,150	0,147	325	0,2356996
15,338	545,8	546,2	99,05	99,25	0,150	0,147	326	0,2326668
15,403	545,8	546,2	98,59	98,92	0,150	0,147	327	0,2337545
15,568	545,7	546,1	97,66	97,68	0,150	0,147	328	0,2363447
15,354	545,6	546,1	98,76	99,12	0,150	0,147	329	0,2330974
15,494	545,5	546,0	97,85	98,19	0,150	0,147	330	0,2352694
15,523	545,5	546,0	97,74	97,94	0,150	0,147	331	0,2356941
15,462	545,4	545,9	98,12	98,34	0,150	0,147	332	0,2348366
15,516	545,4	545,9	97,72	97,96	0,150	0,147	333	0,2356989
15,517	545,3	545,8	97,67	97,88	0,150	0,147	334	0,2356974
15,387	545,3	545,8	98,40	98,86	0,150	0,147	335	0,233754
15,387	545,2	545,7	98,51	98,69	0,150	0,147	336	0,2337808
15,346	545,2	545,7	99,01	98,97	0,150	0,147	337	0,2331011
15,244	545,1	545,7	99,70	99,81	0,150	0,147	338	0,2315724
15,509	545,1	545,6	97,70	98,18	0,150	0,147	339	0,2356986

15,549	545,1	545,6	97,46	97,57	0,150	0,147	340	0,2363351
15,335	545,0	545,5	98,80	99,20	0,150	0,147	341	0,2331013
15,463	545,0	545,5	98,06	98,23	0,150	0,147	342	0,2350544
15,449	544,9	545,4	98,04	98,25	0,150	0,147	343	0,2348363
15,511	544,9	545,4	97,77	97,97	0,150	0,147	344	0,2356987
15,466	544,9	545,4	98,15	98,48	0,150	0,147	345	0,2348393
15,483	545,0	545,5	98,28	98,42	0,150	0,147	346	0,2348365
15,320	545,1	545,6	99,47	100,11	0,150	0,147	347	0,2320106
15,377	545,3	545,7	99,36	99,87	0,150	0,147	348	0,2326736
15,351	545,5	545,8	99,72	100,11	0,150	0,147	349	0,2320109
15,527	545,6	546,0	98,43	98,66	0,150	0,147	350	0,2348356
15,512	545,8	546,1	98,39	98,72	0,150	0,147	351	0,2348358
15,386	545,8	546,2	98,99	99,34	0,150	0,147	352	0,2331012
15,349	545,9	546,2	99,11	99,35	0,150	0,147	353	0,2326659
15,414	545,8	546,2	98,57	99,02	0,150	0,147	354	0,2337541
15,263	545,8	546,1	99,63	100,05	0,150	0,147	355	0,2315729
15,572	545,7	546,1	97,50	97,74	0,150	0,147	356	0,2363445
15,466	545,6	546,0	98,25	98,47	0,150	0,147	357	0,2348362
15,391	545,5	546,0	98,52	98,85	0,150	0,147	358	0,2337538
15,515	545,5	545,9	97,74	98,09	0,150	0,147	359	0,2356988
15,455	545,4	545,8	98,04	98,50	0,150	0,147	360	0,2348362
15,508	545,3	545,8	97,61	98,04	0,150	0,147	361	0,2356984
15,481	545,3	545,7	97,70	98,10	0,150	0,147	362	0,2352686
15,477	545,2	545,7	97,84	98,28	0,150	0,147	363	0,2352682
15,303	545,2	545,6	98,93	99,36	0,150	0,147	364	0,2326657
15,329	545,1	545,6	98,78	99,00	0,150	0,147	365	0,2331007
15,370	545,1	545,5	98,37	98,73	0,150	0,147	366	0,233737
15,440	545,0	545,5	98,07	98,24	0,150	0,147	367	0,2348313
15,438	545,0	545,4	98,02	98,21	0,150	0,147	368	0,2348358
15,437	544,9	545,4	98,09	98,24	0,150	0,147	369	0,2348355
15,292	544,9	545,3	98,95	99,20	0,150	0,147	370	0,2326654
15,534	544,8	545,3	97,45	97,50	0,150	0,147	371	0,2363439
15,219	544,8	545,2	99,19	99,72	0,150	0,147	372	0,2315721
15,217	544,7	545,2	99,20	99,76	0,150	0,147	373	0,2315717
15,246	544,7	545,2	99,27	99,58	0,150	0,147	374	0,2320102
15,220	544,6	545,1	99,41	99,73	0,150	0,147	375	0,2315719
15,329	544,6	545,1	98,84	99,33	0,150	0,147	376	0,2331003
15,392	544,7	545,2	98,68	98,89	0,150	0,147	377	0,2337525
15,410	544,8	545,2	98,85	99,15	0,150	0,147	378	0,2337528
15,503	544,9	545,3	98,51	98,39	0,150	0,147	379	0,2348346
15,412	545,1	545,4	99,26	99,61	0,150	0,147	380	0,2331004
15,535	545,3	545,6	98,53	98,77	0,150	0,147	381	0,2348347
15,232	545,4	545,7	100,28	100,75	0,150	0,147	382	0,2304739
15,285	545,5	545,8	99,74	99,88	0,150	0,147	383	0,2315721
15,347	545,5	545,8	99,19	99,46	0,150	0,147	384	0,2326708
15,403	545,5	545,8	98,53	98,86	0,150	0,147	385	0,2337533
15,354	545,4	545,8	98,95	99,20	0,150	0,147	386	0,2331002
15,519	545,4	545,8	97,74	98,23	0,150	0,147	387	0,2356983
15,454	545,3	545,7	98,01	98,55	0,150	0,147	388	0,2348355
15,509	545,2	545,6	97,67	97,99	0,150	0,147	389	0,2356983
15,476	545,2	545,6	97,91	98,28	0,150	0,147	390	0,2352682
15,443	545,1	545,5	97,91	98,40	0,150	0,147	391	0,2348357
15,535	545,0	545,5	97,52	97,85	0,150	0,147	392	0,2362953
15,252	545,0	545,4	99,17	99,59	0,150	0,147	393	0,2320101
15,464	544,9	545,4	97,82	98,12	0,150	0,147	394	0,2352676
15,290	544,8	545,3	98,87	99,44	0,150	0,147	395	0,2326655
15,244	544,8	545,3	99,12	99,60	0,150	0,148	396	0,2320101
15,245	544,7	545,2	99,16	99,38	0,150	0,147	397	0,2320099
15,239	544,7	545,2	99,19	99,24	0,150	0,147	398	0,2320099
15,300	544,6	545,1	98,73	98,97	0,150	0,147	399	0,2329496
15,525	544,6	545,1	97,39	97,60	0,150	0,147	400	0,2363439

## APPENDIX 3: Calibration data

## APPENDIX 4: Unit pre burn

Time minute	Flue	Room	weight	right	back	bottom	top	left
0	71	72	8,80	71	71	71	72	71
1	511	72	8,70	71	71	71	77	72
2	276	71	8,50	75	71	71	94	84
3	338	71	8,30	81	72	71	125	96
4	405	71	8,10	88	74	71	162	105
5	474	72	7,80	97	78	71	221	122
6	493	72	7,60	107	84	71	280	135
7	512	72	7,30	117	91	71	345	150
8	515	72	7,10	128	99	71	398	164
9	552	72	6,90	139	109	71	452	179
10	579	72	6,60	151	119	71	501	193
11	570	72	6,40	165	130	72	534	206
12	597	73	6,20	179	142	73	548	220
13	548	73	6,00	194	152	74	560	233
14	541	73	5,80	209	161	75	564	245
15	547	71	5,60	224	169	77	568	255
16	561	72	5,40	238	177	79	577	266
17	563	72	5,20	252	184	81	586	275
18	552	72	5,00	266	192	84	594	286
19	568	73	4,80	279	199	87	601	296
20	575	73	4,60	293	206	90	612	305
21	580	74	4,40	305	214	94	621	315
22	587	74	4,20	318	221	97	629	324
23	581	74	4,10	331	228	101	633	332
24	571	74	3,90	342	235	105	634	340
25	562	75	3,70	353	242	109	631	348
26	557	73	3,60	363	249	113	626	354
27	551	74	3,50	371	256	117	622	360
28	552	75	3,30	379	263	121	619	365
29	548	74	3,20	386	269	126	616	372
30	543	74	3,10	391	275	130	611	377
31	539	74	2,90	396	281	135	609	383
32	541	75	2,109	403	288	139	596	388
33	536	75	2,159	407	295	144	583	389
34	461	75	2,139	408	302	149	559	380
35	497	75	2,129	408	307	154	553	391
36	517	75	2,109	408	311	159	555	391
37	531	75	2,089	406	314	163	563	390
38	540	75	2,069	403	317	167	570	391
39	559	75	2,049	402	318	170	584	392
40	569	75	2,029	401	320	173	599	393
41	565	75	2,009	400	321	175	609	394
42	566	75	1,989	400	323	178	615	395
43	531	75	1,969	401	324	180	609	396
44	521	75	1,959	400	326	183	600	397
45	507	75	1,939	400	327	185	589	396
46	500	75	1,929	399	328	187	578	395
47	496	75	1,919	398	329	189	569	395
48	494	75	1,899	397	330	191	561	394
49	493	75	1,889	395	331	193	555	394
50	504	75	1,869	393	331	195	566	395
51	517	75	1,849	391	331	196	561	396
52	520	75	1,839	389	330	198	565	398
53	515	75	1,819	388	329	200	567	401
54	508	76	1,799	386	328	202	566	403
55	506	75	1,789	385	327	203	563	407
56	512	75	1,769	384	326	205	563	411
57	525	75	1,749	383	325	207	570	414
58	551	75	1,729	383	325	208	586	418
59	573	76	1,709	384	325	210	605	422
60	588	76	1,679	385	325	212	626	427
61	596	76	1,659	389	326	214	644	432
62	603	76	1,639	391	328	216	661	437
63	609	76	1,609	395	330	218	674	443
64	613	76	1,589	399	332	220	686	448
65	617	76	1,569	405	335	222	697	453
66	619	76	1,539	410	337	223	705	459
67	619	76	1,519	416	340	225	711	464
68	618	76	1,499	421	344	227	716	470
69	618	76	1,489	427	347	229	723	475
70	617	77	1,449	432	350	231	728	480
71	618	77	1,429	437	354	233	733	485
72	617	77	1,409	443	358	235	735	489
73	616	76	1,389	447	362	237	737	494
74	614	77	1,369	451	365	240	739	499
75	613	77	1,340	455	369	242	739	503
76	611	77	1,320	458	372	244	739	507
77	608	77	1,300	462	376	247	736	510
78	606	77	1,280	466	380	249	734	513
79	604	77	1,260	468	383	252	731	517
80	601	77	1,240	471	386	254	729	521
81	601	76	1,220	473	390	257	727	524
82	602	77	1,200	476	393	260	726	528
83	600	76	1,180	478	396	263	725	531
84	598	77	1,160	480	399	266	724	535
85	598	77	1,150	483	402	268	723	538
86	596	77	1,130	485	405	271	721	541
87	595	77	1,110	487	408	274	720	544
88	592	77	1,090	490	411	278	719	546
89	592	77	1,070	491	413	281	718	550
90	591	77	1,050	493	416	284	718	552
91	589	77	1,040	494	418	288	717	554
92	587	77	1,020	496	420	291	715	556
93	587	77	1,000	498	423	294	714	558
94	586	77	9,80	499	425	298	712	559
95	584	77	9,70	500	427	302	710	560
96	583	77	9,50	501	429	306	711	562
97	585	78	9,30	503	431	309	712	564
98	586	77	9,20	503	433	313	713	565
99	584	78	9,00	505	435	317	714	567
100	583	77	8,80	505	437	321	713	568
101	579	77	8,70	507	439	325	711	570
102	570	77	8,50	508	441	329	704	570
103	566	78	8,40	509	443	334	698	571
104	563	78	8,30	509	445	338	691	570
105	558	77	8,10	510	446	342	684	570
106	555	78	8,00	511	448	347	679	570
107	553	78	7,90	511	449	351	673	570
108	552	78	7,80	512	451	356	669	569
109	552	78	7,60	513	452	360	665	569
110	550	78	7,50	514	453	365	661	568
111	548	78	7,40	514	455	369	658	568
112	543	78	7,30	515	456	374	654	567
113	534	78	7,20	515	457	378	645	567
114	522	78	7,10	515	458	383	636	565
115	513	78	7,00	515	460	388	625	562
116	505	77	6,90	514	461	392	614	560
117	496	77	6,80	513	462	397	603	557
118	489	77	6,70	511	463	402	592	553
119	482	78	6,70	510	465	406	582	550
120	476	78	6,60	508	465	411	573	545
121	471	78	6,60	506	466	416	563	541
122	466	78	6,50	503	466	420	554	536
123	462	78	6,50	501	467	425	547	532
124	458	78	6,40	498	467	429	540	528
125	454	78	6,30	495	467	434	533	523
126	450	78	6,30	493	467	439	526	519
127	447	78	6,20	490	467	443	520	515
128	444	78	6,20	487	466	448	514	511
129	441	78	6,10	485	466	452	508	507
130	438	78	6,10	482	466	456	503	503
131	436	77	6,00	480	465	461	498	500
132	433	77	6,00	478	465	465	493	497
133	432	77	5,90	475	465	469	489	493
134	430	77	5,80	472	464	473	484	490
135	428	77	5,80	470	464	477	481	487
136	427	77	5,70	469	464	481	478	485
137	426	77	5,70	467	463	485	475	483



138	425	77	5,60	465	463	489	471	479
139	423	77	5,50	463	463	493	469	478
140	423	77	5,50	461	463	496	467	476
141	422	77	5,40	460	463	500	465	474
142	422	77	5,40	458	463	503	462	472
143	421	77	5,30	457	464	506	461	470
144	418	76	5,30	455	465	509	459	468
145	414	77	5,20	454	464	512	457	466
146	409	76	5,20	452	464	515	454	462
147	404	77	5,10	450	462	517	451	460
148	399	77	5,10	448	462	519	448	458
149	397	77	5,00	446	460	521	445	456
150	394	77	5,00	444	459	523	441	453
151	391	77	4,90	442	457	525	437	450
152	390	77	4,90	440	456	526	435	448
153	387	77	4,80	438	455	528	431	446
154	385	77	4,80	435	453	529	428	443
155	383	77	4,80	434	451	530	425	441
156	379	77	4,70	431	449	531	422	439
157	377	77	4,70	429	447	532	419	437
158	375	77	4,70	427	446	533	415	434
159	373	76	4,60	425	444	533	412	432
160	371	76	4,60	422	441	534	409	430
161	370	77	4,50	420	441	535	407	428
162	368	77	4,50	418	438	535	405	426
163	366	77	4,40	416	435	536	403	424
164	365	77	4,40	414	434	537	400	422
165	364	76	4,40	412	432	538	398	420
166	362	77	4,30	410	430	539	396	418
167	362	77	4,30	409	428	540	394	416
168	360	77	4,20	406	426	541	392	414
169	359	77	4,20	405	425	541	390	412
170	358	77	4,20	403	423	542	388	411
171	357	76	4,10	401	422	543	386	409
172	356	77	4,10	400	421	544	385	408
173	355	77	4,00	398	419	545	384	406
174	356	76	4,00	396	417	546	383	405
175	356	76	4,00	395	415	546	382	403
176	356	77	3,90	394	414	547	382	402
177	356	77	3,90	394	413	548	381	400
178	357	77	3,80	393	412	549	381	399
179	357	77	3,80	393	412	550	381	399
180	361	77	3,70	392	412	551	381	397
181	365	77	3,70	391	411	552	382	396
182	368	76	3,60	391	410	553	382	395
183	370	76	3,60	392	411	553	384	395
184	372	77	3,50	392	411	554	386	395
185	377	77	3,50	392	411	556	388	395
186	381	77	3,40	392	412	557	391	395
187	385	77	3,40	392	413	558	393	395
188	379	77	3,30	393	415	559	394	396
189	410	77	3,30	393	416	562	404	399
190	420	77	3,20	394	417	562	414	400
191	418	77	3,20	395	417	562	421	401
192	408	77	3,10	396	417	561	425	402
193	402	77	3,10	397	418	560	426	402
194	401	77	3,10	398	419	558	428	402
195	400	77	3,00	398	419	557	429	402
196	398	77	3,00	399	420	555	428	402
197	389	77	3,00	400	420	552	425	402
198	382	77	3,00	400	421	550	421	401
199	377	77	2,90	400	421	547	417	400
200	306	77	18,09	400	422	545	403	399
201	358	77	21,99	400	426	543	390	397
202	421	77	21,89	398	427	541	389	395
203	443	78	21,59	396	427	538	393	392
204	561	78	21,29	396	426	536	412	390
205	568	78	20,89	396	425	533	455	388
206	572	78	20,69	396	423	530	498	387
207	601	78	20,39	398	422	527	546	387
208	630	78	19,99	402	420	524	591	391
209	642	79	19,69	408	420	522	631	394
210	642	79	19,39	413	419	518	662	399
211	654	79	19,09	420	418	515	691	406
212	665	79	18,89	427	418	512	715	415
213	665	79	18,59	434	417	508	734	423
214	665	80	18,29	441	417	505	748	432
215	552	80	17,99	448	418	501	750	440
216	464	79	17,89	453	419	498	733	446
217	414	79	17,79	455	418	495	703	450
218	379	79	17,69	456	419	492	669	452
219	475	79	17,59	455	419	487	642	452
220	480	80	17,39	454	418	484	636	452
221	441	79	17,29	451	417	481	633	450
222	424	80	17,19	448	415	478	625	450
223	413	79	16,99	444	414	474	615	448
224	404	80	16,89	440	412	471	604	448
225	398	80	16,79	436	411	467	593	446
226	393	79	16,59	433	408	464	584	445
227	388	80	16,49	429	407	461	576	444
228	384	80	16,39	425	405	457	567	444
229	382	80	16,29	421	404	454	559	443
230	381	79	16,09	418	402	451	552	443
231	380	80	15,99	414	401	447	549	443
232	381	80	15,89	411	400	445	547	443
233	382	80	15,69	408	398	442	547	442
234	383	80	15,59	406	397	439	548	442
235	383	80	15,39	402	396	437	551	442
236	383	80	15,29	400	395	434	551	442
237	385	80	15,19	398	393	429	553	441
238	386	80	14,99	396	393	429	555	441
239	385	80	14,89	395	391	427	555	440
240	386	80	14,69	394	390	424	557	440
241	386	80	14,59	393	389	421	558	440
242	387	80	14,49	391	388	420	559	439
243	388	80	14,29	391	388	418	562	439
244	390	80	14,19	390	387	416	566	439
245	390	80	14,09	390	387	414	568	439
246	388	80	13,90	390	386	411	567	440
247	388	80	13,79	390	386	409	566	440
248	388	80	13,60	390	385	408	566	441
249	388	81	13,50	390	385	406	566	441
250	388	80	13,40	390	384	404	566	441
251	389	80	13,20	390	383	402	567	442
252	391	81	13,10	391	383	400	567	443
253	391	80	13,00	391	382	399	568	443
254	391	80	12,80	392	382	398	568	444
255	392	80	12,70	392	382	397	571	444
256	393	80	12,54	393	381	396	573	445
257	394	81	12,40	394	381	394	575	446
258	395	80	12,30	396	381	394	577	447
259	396	80	12,10	397	381	393	579	449
260	398	80	12,00	398	381	391	581	450
261	399	81	11,90	400	381	391	585	452
262	400	79	11,70	402	380	390	586	453
263	402	79	11,60	403	380	389	588	454
264	403	80	11,40	405	380	388	590	456
265	405	80	11,30	407	380	388	594	457
266	405	80	11,20	409	380	387	597	459
267	406	80	11,00	412	380	386	599	460
268	408	80	10,90	414	380	386	602	462
269	409	80	10,80	417	380	385	604	463
270	409	81	10,60	420	381	384	609	464
271	411	81	10,50	422	381	384	614	465
272	411	80	10,38	425	381	384	618	466
273	412	81	10,20	429	381	383	623	467
274	413	81	10,10	432	382	383	627	468
275	413	81	9,90	435	382	383	630	468
276	414	81	9,80	439	382	383	632	469

277	416	81	9,70	442	382	382	636	470
278	415	81	9,50	446	383	381	640	471
279	414	81	9,40	449	383	382	641	473
280	411	81	9,30	451	383	381	639	474
281	410	81	9,20	454	384	381	637	475
282	410	81	9,00	455	384	381	636	477
283	409	81	8,90	457	385	381	636	479
284	411	81	8,80	459	385	380	637	481
285	412	81	8,70	461	386	380	638	484
286	411	81	8,50	462	386	380	640	486
287	410	81	8,40	464	387	380	640	488
288	412	81	8,30	466	387	379	641	489
289	413	82	8,20	467	388	379	642	491
290	416	82	8,10	470	389	379	645	492
291	417	82	7,90	472	389	378	647	494
292	418	82	7,80	474	390	379	650	496
293	419	82	7,70	476	391	379	653	497
294	419	82	7,60	478	391	379	656	498
295	418	82	7,50	480	392	379	658	500
296	419	82	7,30	481	393	379	660	501
297	417	82	7,20	483	394	379	660	502
298	413	82	7,10	484	396	379	658	504
299	409	82	7,00	484	397	379	651	505
300	404	82	6,90	485	398	379	644	506
301	400	82	6,80	485	399	379	636	508
302	398	82	6,80	485	400	380	627	508
303	392	82	6,70	484	401	380	618	509
304	387	82	6,60	484	402	380	609	509
305	383	82	6,50	483	403	380	601	510
306	379	82	6,50	482	403	381	593	510
307	376	82	6,40	481	404	381	586	510
308	374	82	6,30	480	405	381	580	510
309	371	82	6,30	479	406	382	574	510
310	368	82	6,20	478	406	382	569	509
311	366	82	6,10	477	407	382	564	508
312	365	82	6,00	476	408	383	559	508
313	363	82	6,00	474	409	383	554	507
314	360	82	5,90	473	409	384	550	507
315	358	82	5,80	472	410	385	546	506
316	356	82	5,80	471	411	385	542	505
317	356	82	5,70	470	411	386	538	505
318	354	81	5,60	469	412	386	535	505
319	352	82	5,60	468	413	387	533	505
320	351	82	5,50	467	414	387	532	504
321	350	82	5,40	466	414	388	530	504
322	349	82	5,40	465	415	389	528	503
323	347	82	5,30	464	416	389	527	502
324	347	82	5,30	463	416	390	525	502
325	346	82	5,20	462	416	391	523	501
326	346	82	5,10	461	417	392	523	499
327	346	82	5,10	460	418	392	522	498
328	345	82	5,00	459	418	392	521	496
329	345	82	5,00	459	418	394	521	494
330	345	82	4,90	458	419	394	521	493
331	344	82	4,80	458	419	395	522	491
332	344	82	4,80	457	420	396	521	490
333	342	82	4,70	456	420	397	520	488
334	341	82	4,60	456	420	397	519	486
335	340	82	4,60	455	421	398	516	485
336	338	82	4,50	455	421	399	514	483
337	337	82	4,50	455	421	399	511	481
338	336	82	4,40	454	421	400	508	479
339	334	82	4,40	454	422	401	505	477
340	332	82	4,30	454	422	401	502	475
341	330	82	4,30	454	422	402	498	473
342	328	82	4,20	454	422	403	495	471
343	326	82	4,20	454	422	403	491	469
344	323	82	4,20	454	422	404	486	467
345	319	82	4,10	453	422	404	482	465
346	315	82	4,10	453	422	405	477	462
347	311	82	4,10	452	421	405	471	460
348	307	82	4,00	450	421	406	466	457
349	304	82	4,00	449	421	406	459	454
350	301	82	4,00	447	421	407	454	451
351	298	82	4,00	444	420	407	448	448
352	295	82	3,90	442	419	408	443	445
353	293	82	3,90	439	418	408	438	442
354	290	82	3,90	437	417	408	434	439
355	289	82	3,90	434	416	409	429	436
356	287	82	3,80	432	415	409	425	433
357	286	82	3,80	429	413	410	421	430
358	284	81	3,80	426	411	411	418	428
359	283	81	3,80	424	410	411	413	426
360	281	82	3,70	422	409	412	410	423
361	280	81	3,70	419	408	412	407	421
362	279	82	3,70	417	406	413	404	419
363	277	82	3,70	415	406	414	402	417
364	276	82	3,60	413	405	414	400	415
365	275	82	3,60	412	404	415	397	413
366	275	82	3,60	410	402	416	396	412
367	274	81	3,60	408	402	417	394	410
368	273	81	3,50	407	401	418	392	409
369	273	82	3,50	405	400	418	391	407
370	272	81	3,50	404	399	419	389	406
371	271	81	3,50	403	398	420	388	404
372	270	82	3,40	401	397	421	387	403
373	270	81	3,40	400	397	422	386	401
374	269	82	3,40	399	396	423	384	400
375	268	81	3,40	398	396	423	383	399
376	267	82	3,30	397	395	424	382	397
377	267	82	3,30	396	395	425	381	396
378	265	82	3,30	395	394	426	380	395
379	264	81	3,30	394	393	426	378	394
380	264	81	3,30	393	392	427	377	393
381	263	81	3,20	392	392	428	376	391
382	263	82	3,20	390	392	428	374	391
383	261	81	3,20	389	392	429	373	389
384	261	81	3,20	389	391	429	371	388
385	260	81	3,20	387	391	430	370	387
386	259	81	3,10	386	390	429	368	386
387	258	81	3,10	385	390	430	368	385
388	258	81	3,10	384	390	430	367	384
389	257	81	3,10	383	389	431	366	383
390	257	81	3,00	382	388	431	365	383
391	256	81	3,00	381	388	432	364	382
392	256	81	3,00	380	388	432	363	381
393	256	81	3,00	379	388	432	361	380
394	256	81	3,00	378	387	432	360	379
395	255	81	2,90	377	387	432	359	379
396	255	81	2,90	377	387	433	358	378
397	255	81	2,90	375	386	433	357	377
398	254	81	2,90	374	385	433	357	377
399	254	81	2,90	373	385	433	356	376
400	254	81	2,80	373	384	433	356	375
401	253	81	2,80	372	384	433	355	374
402	253	81	2,80	371	384	433	353	373
403	252	81	2,80	370	383	434	353	373
404	252	80	2,80	369	382	434	352	372
405	251	80	2,70	368	382	434	351	371
406	252	81	2,70	368	382	434	351	370
407	251	81	2,70	366	381	434	350	369
408	250	81	2,70	366	381	434	350	369
409	249	81	2,70	365	380	434	349	368
410	249	81	2,60	364	380	434	348	367
411	248	81	2,60	363	379	434	346	366
412	247	81	2,60	362	379	434	344	365
413	246	81	2,60	362	379	434	343	364
414	245	81	2,60	361	378	434	342	364
415	244	81	2,60	360	378	434	340	363

416	244	81	2.50	359	377	434	339	362
417	243	81	2.50	359	376	434	338	361
418	243	81	2.50	358	376	433	336	361
419	242	81	2.50	357	375	433	335	360
420	242	81	2.50	356	375	433	334	359
421	241	81	2.50	355	374	432	333	358
422	240	81	2.40	354	373	432	333	357
423	240	81	2.40	353	373	432	332	357
424	239	80	2.40	353	372	431	331	356
425	239	81	2.40	352	372	431	330	355
426	239	80	2.40	351	371	430	330	354
427	238	80	2.40	350	370	430	329	353
428	238	80	2.30	349	369	430	328	353
429	237	80	2.30	348	369	429	326	352
430	236	80	2.30	347	368	429	325	351
431	236	80	2.30	346	367	429	324	350
432	235	80	2.30	345	367	428	323	350
433	234	80	2.30	344	366	428	322	349
434	234	80	2.30	344	365	427	321	348
435	233	80	2.20	343	365	426	320	347
436	233	80	2.20	341	364	426	318	346
437	232	80	2.20	341	364	425	317	345
438	231	80	2.20	339	363	424	316	345
439	231	80	2.20	339	362	423	315	344
440	231	80	2.20	338	362	422	314	343
441	230	80	2.20	337	361	421	313	342
442	230	80	2.10	336	360	420	312	341
443	230	80	2.10	335	360	419	312	340
444	229	80	2.10	334	359	418	311	340
445	229	80	2.10	333	359	417	310	339
446	228	80	2.10	332	358	416	309	338
447	228	80	2.10	331	358	415	309	337
448	227	80	2.00	330	357	414	308	337
449	226	80	2.00	329	356	414	308	336
450	226	80	2.00	328	356	413	307	335
451	226	80	2.00	328	355	412	306	335
452	225	80	2.00	327	354	411	306	334
453	225	80	2.00	326	354	410	305	334
454	225	80	2.00	325	353	409	304	333
455	224	80	1.90	324	353	409	303	332
456	223	80	1.90	324	353	408	303	332
457	223	80	1.90	323	352	407	302	331
458	223	80	1.90	322	352	407	302	330
459	223	80	1.90	321	351	406	301	330
460	222	80	1.90	321	351	405	300	329
461	222	80	1.80	320	350	405	299	329
462	222	80	1.80	319	350	404	299	328
463	221	80	1.80	319	349	403	298	328
464	221	80	1.80	318	349	403	298	327
465	221	80	1.80	317	348	402	297	327
466	221	80	1.80	317	348	402	297	327
467	220	80	1.80	316	348	401	296	326
468	220	80	1.80	316	347	401	296	326
469	219	80	1.70	315	347	400	295	325
470	219	80	1.70	314	346	400	295	324
471	218	80	1.70	314	346	399	294	324
472	217	80	1.70	313	345	399	294	323
473	217	80	1.70	312	345	398	293	323
474	217	80	1.70	312	344	398	293	322
475	217	80	1.70	311	344	397	292	322
476	216	80	1.60	310	343	397	292	321
477	216	80	1.60	310	343	396	291	321
478	215	80	1.60	309	342	396	291	320
479	215	80	1.60	309	341	396	290	320
480	215	80	1.60	308	341	395	290	319
481	214	80	1.60	308	341	395	289	319
482	215	79	1.60	307	340	395	289	318
483	214	80	1.60	306	340	394	288	318
484	214	79	1.50	306	339	394	288	317
485	213	79	1.50	305	339	393	288	317
486	213	79	1.50	305	339	393	287	316
487	212	79	1.50	304	338	393	286	316
488	212	79	1.50	304	338	393	286	315
489	212	79	1.50	304	337	392	285	315
490	212	79	1.50	303	337	392	285	314
491	211	79	1.40	303	337	392	285	314
492	211	79	1.40	302	336	391	284	313
493	211	79	1.40	302	336	391	284	313
494	211	79	1.40	301	336	391	283	312
495	210	79	1.40	301	335	390	283	312
496	210	79	1.40	300	335	390	283	311
497	210	79	1.40	300	335	390	282	311
498	210	79	1.30	299	334	389	282	311
499	210	79	1.30	299	334	389	281	310
500	209	79	1.30	299	334	389	281	310
501	209	79	1.30	298	333	388	280	309
502	209	79	1.30	298	333	388	280	309
503	208	79	1.30	298	333	388	280	309
504	208	79	1.30	297	333	388	280	308
505	208	79	1.20	297	332	387	279	308
506	208	79	1.20	296	332	387	279	307
507	208	79	1.20	296	332	387	278	307
508	207	79	1.20	295	332	387	278	307
509	207	79	1.20	295	331	386	278	307
510	207	79	1.20	295	331	386	277	306
511	206	79	1.20	294	331	386	277	305
512	206	79	1.20	294	331	386	276	305
513	206	79	1.10	293	331	385	276	305
514	206	79	1.10	293	331	385	275	304
515	206	79	1.10	293	331	385	275	304
516	205	79	1.10	292	330	385	275	304
517	205	79	1.10	292	330	385	274	303
518	205	79	1.10	291	330	384	274	303
519	205	79	1.10	291	330	384	273	303
520	204	79	1.10	290	330	384	273	302
521	205	79	1.00	290	330	384	273	302
522	204	79	1.00	289	330	384	272	301
523	203	79	1.00	289	329	383	271	301
524	203	79	1.00	288	330	383	271	301
525	203	79	1.00	288	329	383	270	300
526	202	79	1.00	287	329	383	270	300
527	202	79	1.00	287	329	382	269	299
528	201	79	1.00	286	329	382	269	299
529	201	79	0.90	286	329	382	269	298
530	201	79	0.90	285	329	381	268	298
531	201	79	0.90	285	328	381	268	298
532	201	79	0.90	284	328	381	267	297
533	200	79	0.90	284	328	381	267	297
534	200	79	0.90	284	328	381	267	296
535	200	79	0.90	283	328	381	267	296
536	200	79	0.90	283	328	381	266	295
537	199	79	0.80	282	327	381	266	295
538	199	79	0.80	282	327	380	266	295
539	199	79	0.80	282	327	380	266	294
540	199	79	0.80	281	327	380	266	294
541	199	79	0.80	281	327	380	266	293
542	199	79	0.80	281	327	380	265	293
543	199	79	0.80	281	327	380	265	293
544	199	79	0.80	280	327	380	265	292
545	199	79	0.70	280	326	380	265	292
546	199	79	0.70	280	327	380	265	291
547	199	79	0.70	280	327	380	265	291
548	199	79	0.70	279	327	380	265	291
549	199	79	0.70	279	327	381	265	290
550	199	78	0.70	279	327	380	264	290
551	199	78	0.60	279	327	380	264	290
552	199	78	0.60	279	327	381	264	289
553	199	78	0.60	279	327	381	264	289
554	199	78	0.60	278	328	381	264	289

555	199	78	0,60	278	328	381	263	288
556	199	78	0,60	278	328	381	263	288
557	199	78	0,60	278	328	381	263	288
558	198	78	0,60	278	329	382	262	287
559	198	78	0,50	278	329	382	262	287
560	199	78	0,50	277	329	382	262	287
561	199	78	0,50	277	330	382	262	287
562	199	78	0,50	277	330	382	262	286
563	199	78	0,50	277	330	383	262	286
564	199	78	0,50	277	331	384	262	286
565	199	78	0,50	277	331	383	263	285
566	199	78	0,50	277	332	384	262	285
567	199	78	0,40	277	332	384	263	285
568	199	78	0,40	277	332	384	263	284
569	199	78	0,40	276	333	384	263	284
570	199	78	0,40	276	333	385	263	284
571	200	78	0,40	276	334	386	264	284
572	199	78	0,40	276	334	386	264	284
573	200	78	0,40	276	334	387	264	283
574	200	78	0,30	276	335	388	264	283
575	200	78	0,30	276	335	388	264	283
576	200	78	0,30	276	336	388	264	283
577	200	78	0,30	276	336	389	264	283
578	200	78	0,30	276	336	389	264	283
579	200	78	0,30	275	337	390	264	283
580	200	78	0,30	275	337	390	264	283
581	201	78	0,30	275	338	391	264	283
582	201	78	0,20	275	338	391	264	282
583	201	78	0,20	275	339	392	264	282
584	201	78	0,20	275	339	393	264	282
585	202	78	0,20	275	340	393	264	282
586	202	78	0,20	275	341	394	265	282
587	202	78	0,20	275	341	395	265	282
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589	201	78	0,20	275	342	396	265	282
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591	201	78	0,10	274	342	397	265	282
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595	200	78	0,10	274	342	399	265	282
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597	200	78	0,10	274	342	399	264	282
598	200	78	0,10	273	342	400	264	281
599	200	78	0,00	273	342	400	264	281
600	73	72	8,70	72	71	71	73	72
601	147	72	8,50	73	71	71	84	74
602	164	72	8,30	77	72	71	102	88
603	333	72	8,20	83	73	71	137	102
604	387	73	7,90	92	76	71	180	112
605	445	73	7,70	101	79	71	241	126
606	484	73	7,40	110	83	71	311	143
607	518	74	7,20	121	89	71	379	158
608	555	74	6,90	132	96	71	443	176
609	565	74	6,60	144	103	72	497	194
610	565	74	6,40	158	112	72	529	210
611	563	74	6,10	171	121	73	554	225
612	573	74	5,90	184	130	74	578	241
613	573	75	5,70	199	140	76	599	256
614	588	75	5,40	213	149	78	619	270
615	597	75	5,20	228	158	80	636	285
616	598	75	4,90	241	167	82	652	300
617	598	75	4,70	254	175	85	663	315
618	601	75	4,50	266	185	89	671	330
619	605	76	4,30	278	194	92	679	346
620	593	76	4,10	288	203	96	682	360
621	584	76	3,90	298	212	100	680	374
622	571	76	3,70	307	222	104	673	387
623	564	75	3,60	315	231	108	667	399
624	562	76	3,40	322	240	112	660	410
625	559	75	3,30	330	248	117	656	419
626	559	75	3,10	336	257	121	653	429
627	557	75	3,00	342	265	126	652	437
628	549	75	2,80	347	273	131	647	444
629	502	75	2,2,19	352	281	136	626	448
630	543	75	2,1,89	357	288	141	611	452
631	539	75	2,1,59	360	296	146	598	453
632	510	75	2,1,39	362	303	151	588	451
633	494	75	2,1,29	363	308	156	579	447
634	459	75	2,1,09	363	312	160	564	441
635	435	74	20,99	361	315	165	545	433
636	404	74	20,99	358	317	169	524	425
637	346	75	20,99	355	317	173	497	417
638	325	75	20,89	352	317	176	464	411
639	399	74	20,59	350	315	179	447	408
640	440	75	20,49	345	314	182	445	405
641	459	75	20,29	341	313	185	447	403
642	466	75	20,19	338	312	188	454	402
643	498	76	19,99	335	312	190	470	403
644	524	76	19,89	335	312	192	500	404
645	533	76	19,49	336	313	195	525	406
646	535	77	19,29	338	315	197	543	406
647	542	77	19,09	342	317	199	559	407
648	545	77	18,89	345	319	201	574	408
649	546	77	18,69	350	322	203	586	409
650	553	77	18,49	355	324	206	596	411
651	559	77	18,19	360	326	208	609	412
652	548	77	17,99	365	329	210	613	412
653	551	77	17,79	370	331	213	617	412
654	558	77	17,59	376	333	215	625	412
655	567	78	17,39	382	336	218	636	412
656	570	78	17,19	388	338	220	645	413
657	574	77	16,99	394	340	223	652	413
658	578	77	16,69	401	343	225	660	413
659	580	78	16,49	407	345	228	666	414
660	585	78	16,29	413	348	230	675	416
661	593	78	16,09	419	351	233	685	420
662	598	79	15,79	425	354	235	697	423
663	621	78	15,59	431	357	237	712	428
664	637	78	15,29	437	360	240	729	433
665	645	78	15,09	442	363	242	744	438
666	649	78	14,79	448	366	245	756	445
667	649	78	14,49	454	370	247	766	452
668	648	79	14,29	459	374	250	772	459
669	646	79	14,09	464	378	252	778	467
670	643	79	13,79	469	382	254	781	474
671	640	79	13,60	474	386	257	783	481
672	640	78	13,30	479	390	259	783	488
673	636	77	13,10	483	394	262	782	494
674	633	78	12,90	488	398	264	781	500
675	630	78	12,70	492	402	267	780	506
676	627	78	12,50	496	405	269	778	510
677	625	79	12,20	499	409	272	776	515
678	623	78	12,00	503	413	274	775	518
679	621	79	11,80	506	416	277	772	522
680	617	78	11,60	510	419	280	770	525
681	614	79	11,40	512	423	283	767	528
682	611	79	11,20	515	426	285	763	531
683	609	77	11,00	519	429	288	760	533
684	606	78	10,90	521	432	291	755	535
685	604	79	10,70	523	435	294	752	537
686	600	79	10,50	526	438	297	748	540
687	598	78	10,30	528	440	300	745	542
688	595	78	10,10	531	443	303	741	544
689	591	78	10,00	532	446	307	738	546
690	590	79	9,80	534	448	310	737	548
691	589	78	9,60	536	451	313	734	551
692	588	79	9,40	538	453	317	732	553
693	589	80	9,30	539	456	320	732	555

694	590	79	9,10	540	458	324	732	559
695	586	80	8,90	542	461	327	732	560
696	586	78	8,90	542	463	331	727	562
697	586	80	8,70	544	465	335	717	564
698	559	78	8,50	543	467	339	704	565
699	550	79	8,40	543	468	342	691	566
700	542	77	8,30	542	469	346	678	565
701	533	77	8,20	541	470	350	663	564
702	525	78	8,10	540	470	354	650	563
703	519	77	8,00	539	471	358	638	560
704	514	78	8,00	536	471	362	626	558
705	507	78	7,90	535	471	366	615	555
706	501	77	7,80	532	471	370	604	552
707	494	78	7,70	530	470	373	594	549
708	490	78	7,60	528	470	377	584	546
709	485	78	7,60	525	469	381	577	543
710	482	79	7,50	523	468	385	569	540
711	478	78	7,40	520	468	389	561	537
712	475	78	7,40	518	467	393	554	534
713	472	79	7,30	515	466	397	548	530
714	468	77	7,20	512	465	400	542	528
715	466	78	7,10	510	464	404	537	525
716	463	78	7,10	506	463	407	533	522
717	460	79	7,00	504	461	411	529	519
718	459	79	6,90	502	461	414	525	517
719	457	79	6,90	499	460	417	522	515
720	457	79	6,80	496	458	420	518	513
721	457	79	6,70	493	457	423	517	512
722	456	78	6,70	492	456	426	514	510
723	452	78	6,60	489	455	429	511	508
724	447	78	6,50	486	454	431	507	507
725	440	77	6,50	485	453	434	502	503
726	433	78	6,40	482	453	436	496	500
727	427	78	6,40	479	452	438	490	497
728	422	78	6,30	477	451	440	484	492
729	417	78	6,30	474	450	442	478	488
730	414	78	6,20	471	449	444	472	484
731	411	78	6,20	469	448	446	467	480
732	407	78	6,10	466	447	448	462	476
733	404	77	6,10	463	445	450	456	472
734	400	78	6,00	461	443	451	451	468
735	397	78	6,00	458	442	453	446	464
736	393	79	5,90	455	441	455	442	461
737	391	78	5,90	452	439	456	437	458
738	388	78	5,80	450	438	458	433	454
739	385	78	5,80	447	437	459	430	451
740	384	78	5,80	445	435	461	426	448
741	382	78	5,70	442	433	462	422	445
742	380	79	5,70	440	432	463	419	442
743	379	78	5,60	438	430	464	416	439
744	377	79	5,60	436	429	466	414	437
745	376	79	5,50	434	428	467	411	435
746	375	78	5,50	432	427	468	409	433
747	373	78	5,50	430	425	469	406	431
748	371	78	5,40	428	423	470	404	429
749	370	78	5,40	426	422	472	401	427
750	367	78	5,30	424	420	472	399	425
751	365	78	5,30	422	420	473	396	423
752	364	78	5,30	420	418	475	394	421
753	362	78	5,20	418	417	476	392	419
754	360	78	5,20	417	416	476	390	417
755	360	79	5,10	415	416	477	388	416
756	359	77	5,10	413	414	478	387	415
757	358	78	5,10	411	413	479	386	414
758	358	78	5,00	410	412	479	385	412
759	356	78	5,00	408	412	480	384	410
760	355	78	5,00	406	411	481	382	410
761	355	77	4,90	405	410	481	381	408
762	355	78	4,90	403	409	482	380	407
763	353	78	4,90	401	409	483	379	405
764	352	78	4,80	400	408	483	378	404
765	351	78	4,70	398	407	484	377	403
766	350	78	4,70	397	406	484	376	402
767	349	78	4,70	395	405	485	375	400
768	348	78	4,60	394	405	486	374	399
769	347	78	4,60	393	404	486	373	398
770	346	78	4,60	391	403	487	371	397
771	346	78	4,50	390	402	488	370	396
772	345	78	4,50	389	401	489	369	394
773	345	78	4,50	387	400	489	368	393
774	344	78	4,40	386	400	490	368	392
775	345	77	4,40	385	399	491	367	392
776	344	77	4,40	384	398	491	366	390
777	344	78	4,30	383	398	492	366	389
778	343	78	4,30	382	397	493	366	388
779	342	78	4,30	381	396	495	365	387
780	341	78	4,20	380	396	496	364	386
781	341	78	4,20	379	395	496	364	385
782	339	78	4,20	378	394	497	362	384
783	338	78	4,10	376	394	499	361	384
784	339	78	4,10	375	393	499	360	383
785	339	78	4,00	374	392	500	360	383
786	336	77	4,00	372	391	501	359	382
787	334	78	4,00	371	391	502	357	381
788	332	77	3,90	370	390	503	356	380
789	331	77	3,90	368	389	503	354	379
790	329	77	3,90	367	388	504	353	378
791	328	77	3,90	366	387	505	351	376
792	327	77	3,80	365	388	505	349	375
793	329	78	3,80	364	388	506	349	374
794	329	78	3,80	362	386	506	348	372
795	328	77	3,70	361	386	507	347	371
796	329	76	3,70	360	385	507	346	370
797	327	77	3,70	358	384	507	345	369
798	326	76	3,60	357	384	507	344	368
799	326	77	3,60	356	384	508	343	367
800	326	77	3,60	355	383	508	343	366
801	326	77	3,50	354	383	508	342	365
802	289	77	22,69	354	383	509	332	364
803	283	77	22,09	354	383	510	321	365
804	383	77	21,79	354	383	510	327	364
805	405	77	21,59	352	383	509	332	361
806	427	77	21,39	350	382	508	339	360
807	459	77	21,09	349	380	508	360	360
808	442	77	20,89	348	379	506	388	360
809	423	77	20,79	347	377	504	401	359
810	410	77	20,59	347	375	502	406	358
811	429	77	20,49	346	373	500	421	358
812	463	77	20,29	347	371	497	449	356
813	516	77	20,09	347	368	495	490	355
814	532	77	19,89	348	366	492	518	354
815	558	77	19,59	350	364	489	552	355
816	578	77	19,39	353	361	486	585	358
817	593	77	19,09	357	360	484	613	362
818	493	78	18,89	362	359	481	624	367
819	529	77	18,79	367	359	478	615	370
820	385	78	18,69	371	359	475	594	374
821	358	77	18,59	374	359	472	573	376
822	338	77	18,49	376	359	469	552	377
823	323	77	18,39	377	360	465	532	376
824	308	77	18,29	376	360	462	513	375
825	334	77	18,19	375	361	459	493	372
826	369	77	18,09	373	360	456	480	369
827	410	77	17,99	372	361	453	481	366
828	454	77	17,79	372	360	450	497	363
829	506	76	17,59	372	358	446	526	363
830	557	77	17,39	374	357	443	565	364
831	591	77	17,09	377	355	440	604	368
832	485	78	16,89	381	355	437	618	372

833	439	77	16,89	384	355	434	622	376
834	411	77	16,59	388	355	432	621	379
835	368	77	16,46	392	356	429	613	383
836	370	76	16,29	395	357	426	601	384
837	351	77	16,29	397	358	424	583	386
838	335	76	16,19	398	360	421	565	386
839	323	76	16,09	398	362	419	546	386
840	312	76	15,99	398	363	417	529	385
841	302	76	15,89	394	364	414	513	385
842	333	76	15,89	391	365	412	495	382
843	494	75	17,09	389	366	409	486	379
844	509	76	15,49	387	365	407	524	379
845	523	76	14,39	386	365	405	545	379
846	535	76	15,89	388	365	402	556	382
847	587	76	14,69	391	365	400	599	388
848	603	75	14,49	396	365	398	639	395
849	608	76	14,19	401	365	396	672	404
850	502	77	13,99	407	366	394	678	411
851	454	77	13,89	412	368	393	675	416
852	427	77	13,69	416	370	391	669	420
853	408	77	13,59	420	371	389	660	424
854	394	76	13,49	423	374	387	648	426
855	381	77	13,39	425	376	386	637	428
856	372	76	13,19	426	378	384	626	428
857	363	76	13,09	426	379	383	615	428
858	355	77	12,99	426	381	381	605	428
859	349	77	12,90	425	382	379	593	426
860	343	78	12,89	424	384	378	583	424
861	339	78	12,79	423	385	376	573	422
862	336	78	12,70	421	386	375	565	420
863	335	78	12,60	420	387	373	560	418
864	335	78	12,50	419	387	372	558	415
865	334	78	12,40	419	388	370	554	412
866	332	79	12,30	419	387	369	552	410
867	330	78	12,20	419	387	368	549	407
868	329	78	12,10	419	387	366	547	404
869	326	78	12,00	419	386	365	544	402
870	321	79	11,90	419	386	363	536	399
871	317	79	11,80	419	385	362	528	396
872	312	79	11,70	418	385	360	520	394
873	305	79	11,70	417	384	359	511	391
874	300	79	11,59	416	383	358	504	389
875	296	79	11,50	413	382	356	497	386
876	293	79	11,40	411	381	355	491	384
877	293	79	11,40	408	380	354	485	381
878	296	79	11,30	405	379	353	483	379
879	296	79	11,20	401	377	351	481	377
880	292	79	11,10	397	375	350	477	374
881	285	79	11,00	393	373	349	472	372
882	280	79	11,00	389	372	348	468	370
883	269	79	10,90	385	370	347	459	368
884	260	78	10,90	382	368	346	447	366
885	256	78	10,80	378	366	345	436	363
886	249	78	10,80	375	365	344	426	361
887	245	79	10,70	372	362	343	417	358
888	241	78	10,60	368	360	342	407	355
889	237	79	10,60	365	358	341	399	352
890	234	79	10,50	362	356	340	392	349
891	231	79	10,50	359	354	339	384	346
892	228	78	10,40	357	352	339	377	343
893	225	78	10,30	354	350	338	371	340
894	222	78	10,30	351	348	337	365	337
895	220	78	10,20	349	346	336	360	335
896	218	79	10,20	347	344	335	355	332
897	216	79	10,10	344	342	335	350	329
898	214	79	10,10	342	340	334	346	327
899	213	78	10,00	340	338	333	342	325
900	211	78	9,90	338	337	333	339	322
901	209	78	9,90	336	335	332	335	320
902	208	78	9,80	334	333	332	332	318
903	207	78	9,70	333	332	331	329	315
904	207	78	9,70	331	330	330	327	313
905	206	78	9,60	330	329	330	324	312
906	205	78	9,50	328	328	329	322	310
907	205	78	9,50	327	326	329	319	308
908	204	78	9,40	326	325	328	318	307
909	204	78	9,30	324	324	328	316	305
910	203	78	9,20	323	322	328	315	304
911	203	78	9,20	322	321	327	313	302
912	203	78	9,10	321	320	327	312	301
913	203	78	9,00	320	319	327	311	300
914	202	78	8,90	319	318	326	310	299
915	202	78	8,80	318	317	326	309	298
916	202	77	8,80	317	316	326	308	297
917	201	78	8,70	317	315	326	307	296
918	201	77	8,60	316	313	325	307	295
919	201	77	8,50	315	312	325	306	294
920	200	77	8,40	315	312	325	305	293
921	201	77	8,30	314	311	325	305	293
922	200	77	8,20	313	310	325	304	292
923	200	77	8,20	313	309	325	304	291
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925	200	77	8,00	312	308	325	303	290
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937	201	77	6,90	309	304	325	304	286
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951	194	76	5,80	306	303	324	300	285
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965	186	76	5,00	301	306	324	288	287
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968	186	76	4,90	300	307	324	285	287
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971	184	76	4,70	298	308	324	284	288

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1265	153	73	0,40	242	294	333	226	254
1266	153	73	0,30	242	293	333	226	253
1267	153	73	0,30	241	293	333	225	253
1268	153	73	0,30	241	293	333	225	253
1269	153	73	0,30	241	293	333	225	252
1270	153	73	0,30	241	292	333	225	251
1271	153	73	0,30	241	292	333	225	251
1272	152	73	0,30	240	292	333	225	251
1273	152	73	0,30	240	292	332	224	250
1274	152	73	0,30	240	292	332	224	250
1275	152	73	0,30	240	292	332	224	249
1276	152	73	0,30	239	292	332	224	249
1277	152	73	0,30	240	292	332	223	249
1278	152	73	0,20	239	291	332	223	248
1279	152	73	0,20	239	291	332	223	248
1280	152	73	0,20	239	291	332	223	248
1281	152	73	0,20	238	291	332	222	247
1282	152	73	0,20	238	291	332	222	247
1283	152	73	0,20	238	290	332	222	247
1284	151	72	0,20	238	290	332	222	246
1285	152	73	0,20	238	290	332	222	246
1286	151	72	0,20	237	290	331	222	245
1287	151	72	0,20	237	290	331	221	245
1288	151	72	0,20	237	289	331	221	245
1289	151	72	0,10	237	289	331	221	244
1290	151	73	0,10	237	289	331	221	244
1291	151	73	0,10	237	289	331	221	244
1292	151	72	0,10	236	289	331	221	244
1293	151	73	0,10	236	289	331	220	243
1294	151	73	0,10	236	289	331	220	243
1295	151	73	0,10	236	289	331	220	243
1296	151	72	0,10	236	288	331	220	242
1297	150	73	0,10	235	288	331	220	242
1298	150	72	0,10	235	288	331	220	242
1299	150	73	0,10	235	288	331	219	242
1300	150	72	0,10	235	288	332	219	241
1301	150	73	0,10	235	288	332	219	241
1302	150	73	0,10	235	287	332	219	241
1303	150	72	0,10	234	287	332	218	241
1304	150	72	0,00	234	287	332	218	241
1305	150	73	0,00	234	287	332	218	240
1306	72	69	8,90	80	85	89	74	81
1307	103	69	8,80	80	84	88	76	81
1308	288	70	8,60	83	84	88	87	87
1309	479	70	8,20	92	85	88	135	101
1310	489	70	7,90	102	86	88	221	114
1311	517	70	7,60	112	90	87	303	127
1312	546	70	7,40	124	95	87	379	141
1313	568	71	7,10	136	101	87	447	155
1314	580	71	6,80	152	108	87	506	171
1315	577	71	6,51	167	116	87	555	187
1316	584	71	6,30	183	126	87	596	203
1317	573	71	6,10	198	135	88	622	219
1318	562	71	5,90	213	145	89	634	233
1319	558	71	5,70	228	155	90	640	246
1320	553	71	5,50	242	166	91	646	257
1321	557	71	5,30	256	177	93	650	269
1322	558	71	5,10	270	189	95	650	280
1323	554	71	4,90	283	200	97	649	291
1324	547	71	4,80	296	212	100	645	300
1325	546	71	4,60	308	223	103	643	308
1326	543	72	4,40	319	234	106	641	317
1327	542	72	4,30	330	245	109	636	325
1328	542	72	4,10	339	255	113	630	335
1329	539	72	4,00	347	264	116	625	345
1330	533	73	3,80	354	273	120	618	353
1331	523	72	3,70	360	281	124	610	362
1332	518	72	3,60	366	290	128	602	370
1333	516	72	3,40	371	297	132	596	378
1334	514	72	3,30	376	305	137	591	386
1335	511	72	3,20	380	311	141	586	393
1336	510	72	3,00	384	318	145	583	400
1337	510	72	12,30	389	325	150	576	405
1338	453	73	22,29	394	332	154	548	410
1339	555	73	21,99	397	339	159	537	413
1340	611	73	21,89	400	345	163	548	415
1341	580	73	21,39	402	350	168	573	416
1342	579	73	21,19	404	354	172	594	417
1343	584	73	20,89	406	358	175	613	418
1344	595	73	20,69	407	360	179	627	419
1345	622	73	20,39	408	363	182	646	422
1346	630	73	20,09	411	365	185	665	425
1347	625	73	19,79	413	367	188	682	429
1348	641	73	19,59	416	369	191	698	434
1349	643	74	19,29	420	371	193	712	439
1350	642	74	19,09	424	372	195	724	444
1351	640	74	18,79	428	374	198	732	450
1352	638	74	18,59	432	376	200	739	455
1353	641	74	18,29	436	378	202	745	460
1354	645	74	17,99	441	380	204	750	463
1355	647	74	17,79	443	383	206	757	468
1356	649	74	17,49	447	385	208	762	473
1357	652	74	17,29	449	388	211	766	477
1358	656	74	16,99	453	391	213	772	481
1359	662	74	16,79	456	394	216	777	485
1360	666	75	16,49	459	397	218	783	489
1361	671	75	16,29	462	400	221	789	494
1362	676	75	15,99	466	403	223	795	498
1363	680	75	15,69	469	406	226	800	502
1364	683	75	15,39	474	410	229	806	506
1365	682	75	15,19	478	414	231	810	510
1366	682	74	14,89	482	418	234	814	515
1367	683	75	14,59	486	421	237	816	520
1368	682	75	14,39	490	425	239	818	524
1369	682	76	14,09	494	428	242	821	528
1370	687	76	13,89	498	432	245	826	533
1371	687	76	13,59	502	435	248	833	537
1372	685	75	13,40	507	439	251	837	542
1373	679	76	13,10	510	443	254	838	546
1374	676	76	12,90	514	446	257	838	549
1375	672	76	12,60	518	449	260	838	553
1376	667	76	12,40	522	452	263	836	556
1377	666	76	12,20	525	455	266	834	559
1378	661	75	12,00	529	458	269	832	561
1379	661	76	11,70	531	461	272	831	563
1380	660	75	11,50	533	464	276	830	566
1381	659	76	11,30	537	467	279	830	568
1382	657	76	11,10	539	469	282	829	570
1383	656	76	10,90	541	472	286	828	572
1384	654	76	10,60	544	475	289	828	574
1385	654	76	10,40	545	476	292	827	577
1386	653	77	10,20	547	479	296	828	579
1387	652	76	10,00	549	481	299	826	581
1388	649	76	9,80	552	482	303	825	583

1389	645	75	9,60	554	484	306	823	584
1390	638	76	9,40	556	486	310	818	585
1391	631	76	9,30	558	488	313	812	586
1392	623	76	9,10	559	490	317	806	587
1393	615	75	8,90	560	492	321	796	587
1394	609	77	8,80	561	493	324	787	587
1395	604	76	8,60	561	494	328	779	586
1396	601	76	8,40	561	496	331	771	585
1397	598	76	8,30	562	498	335	764	585
1398	594	77	8,10	562	499	339	757	584
1399	591	76	8,00	562	500	342	751	583
1400	588	77	7,90	562	502	346	746	581
1401	585	76	7,70	562	503	350	740	580
1402	584	77	7,50	562	505	353	737	578
1403	581	76	7,40	561	506	357	732	577
1404	578	76	7,30	561	508	360	729	576
1405	575	76	7,20	562	510	364	727	575
1406	572	76	7,00	562	511	368	723	575
1407	570	76	6,90	562	512	371	720	574
1408	569	76	6,80	563	514	375	717	571
1409	567	76	6,70	563	515	379	715	570
1410	565	76	6,50	563	516	383	711	568
1411	565	77	6,40	564	517	386	708	567
1412	564	76	6,30	564	518	390	707	565
1413	563	75	6,20	564	519	394	704	564
1414	561	76	6,10	564	519	398	702	563
1415	561	77	5,90	565	520	402	702	562
1416	558	77	5,80	566	521	406	700	560
1417	556	77	5,70	566	522	409	697	558
1418	553	76	5,70	566	523	413	693	558
1419	548	76	5,60	566	524	417	685	556
1420	543	76	5,50	566	525	421	679	554
1421	538	77	5,40	565	525	424	668	553
1422	534	77	5,30	565	526	428	659	551
1423	531	77	5,30	564	526	432	651	548
1424	528	76	5,20	563	526	436	643	547
1425	521	77	5,10	562	526	439	636	544
1426	512	77	5,10	561	526	443	626	542
1427	505	77	5,00	559	525	447	617	539
1428	499	76	5,00	556	525	450	607	535
1429	492	77	5,00	553	523	454	597	533
1430	487	76	4,90	550	522	457	589	530
1431	482	76	4,90	547	521	461	580	527
1432	478	77	4,80	542	519	464	571	523
1433	474	76	4,80	539	518	467	564	521
1434	471	76	4,80	535	516	471	557	518
1435	469	76	4,70	531	514	474	551	515
1436	467	77	4,70	527	513	477	546	512
1437	466	77	4,60	523	512	480	542	510
1438	464	77	4,60	519	510	483	537	508
1439	462	77	4,60	516	509	486	533	506
1440	460	76	4,50	513	507	488	528	504
1441	457	76	4,50	509	506	491	524	503
1442	455	76	4,40	506	505	493	520	500
1443	440	76	4,40	503	504	496	515	498
1444	442	76	4,30	500	503	498	510	498
1445	440	76	4,30	497	502	500	504	497
1446	436	76	4,30	495	500	502	499	495
1447	433	76	4,30	492	499	504	495	494
1448	430	75	4,20	489	498	505	490	491
1449	427	76	4,20	486	496	507	485	489
1450	424	76	4,20	483	494	507	481	487
1451	421	76	4,10	481	493	509	477	485
1452	416	76	4,10	478	491	510	472	482
1453	414	75	4,10	475	489	511	468	480
1454	411	76	4,00	472	486	512	463	478
1455	362	76	22,35	470	485	513	453	476
1456	384	76	22,09	466	484	514	438	471
1457	469	76	21,89	462	483	515	444	467
1458	466	76	21,59	457	480	516	468	461
1459	669	75	21,19	453	477	517	519	460
1460	690	76	20,69	452	474	517	573	461
1461	673	76	20,39	451	471	518	626	460
1462	676	76	20,09	452	469	518	667	463
1463	689	76	19,69	454	467	517	705	468
1464	699	76	19,39	458	465	516	738	475
1465	705	77	18,99	463	463	516	766	483
1466	713	77	18,69	468	461	515	790	492
1467	714	77	18,29	474	461	514	810	500
1468	679	77	17,99	480	460	512	823	509
1469	626	77	17,79	487	460	511	822	517
1470	567	78	17,49	492	459	509	813	523
1471	516	77	17,39	495	458	507	795	528
1472	489	78	17,19	498	458	504	775	529
1473	469	77	17,09	499	458	503	754	530
1474	465	77	16,89	500	456	500	736	529
1475	442	77	16,79	509	454	498	720	526
1476	432	77	16,69	499	454	495	705	523
1477	423	77	16,49	497	453	493	692	519
1478	417	78	16,39	495	451	490	681	514
1479	413	77	16,19	494	449	487	671	510
1480	407	77	16,09	491	448	485	663	505
1481	402	77	15,99	490	447	482	655	501
1482	399	77	15,79	487	445	479	650	497
1483	397	77	15,69	485	443	476	645	492
1484	394	77	15,49	483	442	472	641	488
1485	393	77	15,39	481	440	469	638	484
1486	392	77	15,19	479	438	467	636	481
1487	392	77	15,09	477	437	464	635	478
1488	394	76	14,99	475	435	461	635	475
1489	396	76	14,79	474	434	458	636	471
1490	396	77	14,69	472	432	456	637	469
1491	398	77	14,49	471	430	453	640	466
1492	400	77	14,39	470	429	450	642	463
1493	400	77	14,19	469	427	447	645	462
1494	401	77	14,09	468	426	445	650	460
1495	402	77	13,89	468	425	442	653	457
1496	402	77	13,79	467	425	439	655	456
1497	402	77	13,59	467	424	437	656	455
1498	403	77	13,39	467	422	434	660	454
1499	402	77	13,29	466	422	432	660	452
1500	401	77	13,09	466	422	429	660	451
1501	401	77	12,99	467	421	426	659	450
1502	401	77	12,79	466	420	424	659	450
1503	400	77	12,70	467	420	422	658	449
1504	401	77	12,50	467	419	420	660	449
1505	400	77	12,40	467	419	417	661	448
1506	398	77	12,20	467	418	415	662	448
1507	395	77	12,10	467	418	413	661	448
1508	393	77	12,00	466	418	411	661	447
1509	391	77	11,80	466	418	409	659	448
1510	389	77	11,70	466	418	406	659	447
1511	387	77	11,59	465	418	405	659	448
1512	386	77	11,40	464	419	403	657	447
1513	384	77	11,30	463	419	401	655	447
1514	382	77	11,20	463	419	399	652	448
1515	379	77	11,10	461	418	398	649	448
1516	378	77	11,00	461	418	396	647	448
1517	375	77	10,80	460	417	395	644	448
1518	374	77	10,70	459	418	393	641	448
1519	374	77	10,60	458	417	391	638	448
1520	372	77	10,50	458	417	390	636	448
1521	371	76	10,40	457	417	388	634	448
1522	369	76	10,30	455	417	387	630	448
1523	367	76	10,20	455	416	385	628	448
1524	369	77	10,00	454	416	384	626	449
1525	368	76	9,90	452	416	383	621	450
1526	364	76	9,80	451	415	381	616	451
1527	362	77	9,70	450	415	380	611	452

1528	360	76	9,60	449	415	379	611	453
1529	359	77	9,50	448	415	377	613	454
1530	360	77	9,47	447	415	376	613	455
1531	360	77	9,30	447	415	375	613	455
1532	361	77	9,20	447	415	373	613	456
1533	362	77	9,10	447	415	372	613	456
1534	362	78	8,90	448	414	371	614	456
1535	362	77	8,80	448	414	370	616	457
1536	360	77	8,70	449	414	369	619	457
1537	360	78	8,60	450	414	367	620	457
1538	358	77	8,50	450	414	366	619	458
1539	357	77	8,40	450	414	365	620	458
1540	356	77	8,30	450	413	364	618	458
1541	359	77	8,20	450	413	363	622	458
1542	360	76	8,10	449	414	362	615	458
1543	361	77	8,00	448	414	361	614	459
1544	361	77	7,90	446	414	360	613	460
1545	361	77	7,80	444	414	359	612	462
1546	359	77	7,70	442	414	358	610	464
1547	358	77	7,70	441	415	357	610	465
1548	356	78	7,60	438	415	356	610	468
1549	355	78	7,50	436	415	355	607	470
1550	353	77	7,40	434	416	354	605	473
1551	351	77	7,20	431	416	353	603	475
1552	350	77	7,20	429	416	353	599	477
1553	350	77	7,10	427	416	352	595	478
1554	347	77	7,00	425	417	351	589	478
1555	342	78	7,00	424	417	350	582	479
1556	338	78	6,90	421	418	350	574	480
1557	334	77	6,80	420	417	349	567	479
1558	330	77	6,80	419	418	349	560	478
1559	327	78	6,70	417	418	348	553	476
1560	324	78	6,70	415	418	348	546	475
1561	322	78	6,60	414	418	347	540	473
1562	318	78	6,50	413	417	346	534	471
1563	316	78	6,50	411	417	346	527	469
1564	313	77	6,40	409	416	345	522	467
1565	310	78	6,40	408	416	345	517	465
1566	308	78	6,30	406	415	344	512	462
1567	304	77	6,30	405	414	344	507	461
1568	302	77	6,20	404	414	344	502	459
1569	300	77	6,20	402	413	343	498	457
1570	298	77	6,10	401	412	343	493	455
1571	296	78	6,10	400	412	343	488	453
1572	293	78	6,00	399	412	343	484	450
1573	292	78	6,00	398	411	342	479	449
1574	290	78	5,90	396	410	342	476	447
1575	289	77	5,90	395	410	342	472	444
1576	287	78	5,80	394	409	341	468	442
1577	286	77	5,80	393	408	341	465	440
1578	284	77	5,80	392	407	341	462	439
1579	282	77	5,70	391	406	341	459	437
1580	281	78	5,70	390	406	340	456	435
1581	281	78	5,60	389	405	340	453	434
1582	279	78	5,60	388	404	340	450	433
1583	278	77	5,50	387	404	340	448	432
1584	277	77	5,50	386	403	340	446	431
1585	277	77	5,40	385	402	340	444	429
1586	276	77	5,40	384	401	339	443	427
1587	276	77	5,40	384	399	339	442	426
1588	275	78	5,30	383	399	339	441	424
1589	275	78	5,30	382	398	339	440	422
1590	275	78	5,20	382	397	339	439	421
1591	275	78	5,20	381	397	339	438	419
1592	274	78	5,10	381	396	339	437	417
1593	274	77	5,10	380	396	338	436	416
1594	274	78	5,00	380	395	338	436	414
1595	274	78	5,00	379	395	338	435	413
1596	274	78	4,90	379	394	338	435	411
1597	273	78	4,90	378	393	338	434	410
1598	274	78	4,80	378	393	338	434	409
1599	275	78	4,80	378	393	338	435	408
1600	276	77	4,70	377	392	338	435	408
1601	277	77	4,70	377	391	337	436	408
1602	278	77	4,60	376	391	337	436	407
1603	278	78	4,60	376	391	337	437	407
1604	278	77	4,50	375	390	337	437	407
1605	279	77	4,50	375	390	337	438	407
1606	279	76	4,40	374	390	337	439	408
1607	280	77	4,40	374	389	337	441	408
1608	280	77	4,40	374	389	337	442	409
1609	278	77	4,30	373	389	336	442	409
1610	274	77	4,30	373	389	336	439	408
1611	271	78	4,30	372	389	336	437	408
1612	266	77	4,20	372	389	336	432	408
1613	261	78	4,20	371	389	336	428	407
1614	256	77	4,20	370	388	336	422	405
1615	252	77	4,20	369	388	335	416	403
1616	249	78	4,20	368	387	335	409	401
1617	246	77	4,10	367	386	335	403	398
1618	243	77	4,10	366	385	335	397	395
1619	240	77	4,10	364	383	334	391	392
1620	238	77	4,10	363	381	334	386	389
1621	235	77	4,10	361	379	334	381	386
1622	234	78	4,00	360	377	334	376	383
1623	231	78	4,00	359	375	334	371	380
1624	230	77	4,00	357	373	333	367	377
1625	228	77	4,00	356	371	333	363	374
1626	226	77	4,00	354	369	333	359	372
1627	224	77	3,90	353	367	333	356	369
1628	223	77	3,90	352	365	333	353	367
1629	222	77	3,90	351	363	333	350	365
1630	220	77	3,90	349	361	333	347	362
1631	220	77	3,90	347	359	333	344	360
1632	218	77	3,90	346	358	333	341	358
1633	217	77	3,80	345	356	333	338	355
1634	216	77	3,80	344	354	333	337	354
1635	215	77	3,80	343	353	332	334	352
1636	214	77	3,80	342	351	333	332	350
1637	213	77	3,80	340	350	332	330	348
1638	212	77	3,70	339	349	333	328	347
1639	211	77	3,70	338	347	333	326	346
1640	210	77	3,70	337	346	333	325	344
1641	209	77	3,70	336	345	333	323	343
1642	209	77	3,60	335	343	333	321	341
1643	208	77	3,60	334	343	333	320	340
1644	207	77	3,60	332	341	333	318	339
1645	206	77	3,60	332	340	333	317	337
1646	205	77	3,60	331	339	333	315	336
1647	204	77	3,60	329	337	333	313	335
1648	204	77	3,60	328	336	333	312	334
1649	203	77	3,50	327	336	333	310	333
1650	203	77	3,50	327	335	333	309	332
1651	203	77	3,50	325	334	333	308	331
1652	202	76	3,50	325	333	333	307	330
1653	202	76	3,50	323	332	333	306	330
1654	201	76	3,50	322	331	333	305	328
1655	200	76	3,40	322	330	333	304	328
1656	200	76	3,40	321	329	333	303	327
1657	200	76	3,40	320	328	333	303	326
1658	200	76	3,40	319	328	334	302	325
1659	199	77	3,40	319	327	334	301	324
1660	198	76	3,40	318	326	334	300	323
1661	198	76	3,30	317	326	334	300	323
1662	198	76	3,30	316	325	334	299	322
1663	198	76	3,30	316	324	334	298	322
1664	197	76	3,30	315	324	334	297	321
1665	197	76	3,30	314	324	334	297	320
1666	197	76	3,30	313	323	334	297	320

1667	197	76	3,30	313	322	334	296	319
1668	196	76	3,20	312	322	334	296	319
1669	196	76	3,12	321	321	334	295	318
1670	195	76	3,20	312	321	334	294	318
1671	195	76	3,20	310	320	334	293	318
1672	195	76	3,20	310	320	334	293	317
1673	194	76	3,20	309	320	334	292	317
1674	194	76	3,10	309	319	334	291	316
1675	194	76	3,10	308	319	335	290	316
1676	194	76	3,10	308	318	335	290	316
1677	194	75	3,10	307	318	335	289	315
1678	193	76	3,10	307	318	335	289	314
1679	193	76	3,10	306	317	335	288	315
1680	193	76	3,00	306	317	335	288	314
1681	192	75	3,00	305	316	335	288	314
1682	192	75	3,00	305	316	335	287	314
1683	192	76	3,00	305	316	335	287	314
1684	192	76	3,00	304	316	335	287	314
1685	192	76	3,00	304	315	335	286	314
1686	192	75	2,90	303	315	335	286	313
1687	192	76	2,90	303	315	335	286	313
1688	192	75	2,90	303	315	336	286	313
1689	192	75	2,90	303	314	336	286	313
1690	192	75	2,90	302	314	336	286	313
1691	192	75	2,90	302	315	336	286	313
1692	192	76	2,90	302	315	336	286	313
1693	193	76	2,80	302	315	336	286	312
1694	193	76	2,80	302	315	337	286	313
1695	193	76	2,80	302	315	337	287	312
1696	193	76	2,80	302	315	337	287	313
1697	194	75	2,80	302	315	337	287	313
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1699	194	75	2,70	302	315	338	288	313
1700	195	76	2,70	303	316	338	288	313
1701	195	76	2,70	303	316	338	289	313
1702	195	75	2,70	303	316	338	289	313
1703	195	76	2,70	303	316	339	290	313
1704	195	75	2,70	303	316	339	290	313
1705	195	76	2,70	304	316	339	290	313
1706	195	76	2,60	304	316	339	290	313
1707	195	75	2,60	304	316	340	291	313
1708	196	76	2,60	304	316	340	291	313
1709	196	75	2,60	304	316	340	291	312
1710	196	75	2,60	304	315	340	291	312
1711	196	75	2,60	304	315	340	291	312
1712	196	75	2,50	304	315	340	291	312
1713	197	75	2,50	304	315	340	292	312
1714	196	75	2,50	305	315	340	292	312
1715	197	76	2,50	305	316	340	292	312
1716	197	75	2,50	305	316	340	293	312
1717	197	76	2,50	305	316	340	292	312
1718	198	76	2,50	305	316	340	293	312
1719	198	76	2,40	306	316	340	293	312
1720	198	76	2,40	306	316	340	293	312
1721	198	76	2,40	306	317	340	294	312
1722	198	75	2,40	306	316	340	294	313
1723	198	75	2,40	306	316	340	294	313
1724	198	75	2,40	306	316	340	294	313
1725	197	76	2,30	306	316	340	294	313
1726	197	76	2,30	306	316	340	294	313
1727	197	76	2,30	306	316	340	294	313
1728	197	75	2,30	306	316	340	294	313
1729	197	76	2,30	306	316	340	294	313
1730	196	76	2,30	306	316	340	294	313
1731	196	76	2,30	306	316	340	293	313
1732	196	75	2,20	306	316	340	293	313
1733	196	76	2,20	306	316	340	292	313
1734	196	76	2,20	306	316	340	292	313
1735	195	75	2,20	305	316	340	291	313
1736	195	75	2,20	305	316	340	291	312
1737	195	75	2,20	305	316	340	291	312
1738	195	75	2,20	305	316	340	290	312
1739	194	75	2,10	305	316	340	290	312
1740	194	76	2,10	304	316	340	289	311
1741	194	75	2,10	304	316	340	289	311
1742	194	76	2,10	304	316	340	288	311
1743	194	75	2,10	304	315	340	288	311
1744	193	75	2,10	303	315	340	288	311
1745	193	75	2,10	303	315	340	287	310
1746	193	75	2,10	303	315	340	287	310
1747	193	75	2,00	302	315	339	287	310
1748	193	75	2,00	302	315	339	286	309
1749	193	75	2,00	302	315	339	286	309
1750	192	75	2,00	302	315	339	286	309
1751	191	76	2,00	302	315	339	286	309
1752	192	76	2,00	302	315	339	285	309
1753	191	76	2,00	301	315	339	285	308
1754	191	76	2,00	301	315	339	284	308
1755	191	75	1,90	301	315	339	284	308
1756	190	75	1,90	300	315	339	284	307
1757	190	75	1,90	300	314	338	283	307
1758	190	76	1,90	300	314	338	283	306
1759	189	76	1,90	300	315	338	282	306
1760	189	76	1,90	299	314	338	282	306
1761	189	75	1,90	299	314	338	281	305
1762	188	75	1,90	298	314	338	280	305
1763	188	75	1,80	298	314	338	280	304
1764	187	76	1,80	297	314	338	279	304
1765	187	76	1,80	297	315	338	279	304
1766	187	75	1,80	296	315	338	278	303
1767	186	76	1,80	296	315	338	278	302
1768	186	76	1,80	295	315	337	277	302
1769	186	76	1,80	294	315	337	276	302
1770	185	76	1,70	294	315	337	276	301
1771	186	76	1,70	293	315	337	275	301
1772	185	76	1,70	293	315	336	275	300
1773	185	75	1,70	292	316	336	274	300
1774	185	76	1,70	292	316	336	274	299
1775	184	76	1,70	292	316	336	273	299
1776	184	75	1,70	291	317	335	273	299
1777	184	76	1,70	291	317	335	272	299
1778	184	76	1,60	291	317	335	272	298
1779	184	76	1,60	290	317	334	272	298
1780	184	76	1,60	290	317	334	271	297
1781	183	76	1,60	289	317	334	271	297
1782	183	76	1,60	289	318	333	270	297
1783	183	76	1,60	289	318	333	270	296
1784	184	76	1,60	288	318	333	270	295
1785	183	75	1,60	288	318	332	270	296
1786	183	76	1,50	287	318	332	269	295
1787	183	76	1,50	287	319	332	269	295
1788	183	75	1,50	287	319	331	269	295
1789	183	75	1,50	287	319	331	269	295
1790	182	76	1,50	286	319	331	268	294
1791	182	75	1,50	286	319	330	268	294
1792	182	75	1,50	286	320	330	268	294
1793	182	75	1,50	285	320	330	268	294
1794	182	75	1,40	285	320	329	267	294
1795	182	75	1,40	285	320	329	267	294
1796	182	75	1,40	284	320	329	267	293
1797	182	75	1,40	284	320	328	267	293
1798	182	75	1,40	284	321	328	267	293
1799	182	75	1,40	284	321	328	266	293
1800	182	75	1,40	283	321	328	266	293
1801	182	75	1,40	283	321	327	266	293
1802	182	75	1,30	283	321	327	266	293
1803	181	75	1,30	283	322	327	266	293
1804	181	75	1,30	283	321	326	266	293
1805	181	75	1,30	282	321	326	265	293

1806	181	75	1,30	282	322	326	265	292
1807	181	75	1,30	282	322	326	265	292
1808	181	75	1,30	282	322	326	265	292
1809	181	75	1,30	281	322	325	265	292
1810	181	75	1,20	281	323	325	265	292
1811	180	75	1,20	281	323	325	265	292
1812	181	75	1,20	281	323	325	265	292
1813	180	75	1,20	281	323	324	265	292
1814	181	75	1,20	281	324	324	265	292
1815	181	75	1,20	281	324	324	264	292
1816	181	75	1,20	281	324	324	264	292
1817	180	75	1,10	281	324	324	264	292
1818	180	75	1,10	280	324	323	264	292
1819	180	74	0,90	280	324	323	264	292
1820	180	75	1,10	280	324	323	264	292
1821	180	75	1,10	279	324	323	263	292
1822	180	75	1,10	279	324	323	263	292
1823	180	75	1,10	279	324	323	263	292
1824	180	75	1,10	279	324	322	263	292
1825	180	75	1,00	278	325	322	263	291
1826	180	75	1,00	278	325	322	263	291
1827	180	75	1,00	278	325	322	263	292
1828	180	75	1,00	278	325	322	262	291
1829	180	75	1,00	278	325	322	262	291
1830	179	75	1,00	277	325	322	262	291
1831	180	75	1,00	277	325	322	262	291
1832	180	75	1,00	277	325	322	262	291
1833	179	75	0,90	277	325	322	262	291
1834	179	75	0,90	276	325	322	262	291
1835	179	75	0,90	276	325	322	262	291
1836	178	75	0,90	276	325	322	262	291
1837	179	75	0,90	275	325	322	261	290
1838	178	75	0,90	275	325	322	261	290
1839	178	75	0,90	275	324	321	261	290
1840	178	75	0,90	274	324	321	261	290
1841	178	75	0,80	274	324	321	261	290
1842	178	75	0,80	274	324	321	260	290
1843	177	75	0,80	273	323	321	260	289
1844	177	74	0,80	273	323	321	260	289
1845	177	75	0,80	273	322	321	260	289
1846	177	75	0,80	272	322	321	260	289
1847	177	75	0,80	272	322	321	259	288
1848	177	75	0,80	271	322	321	259	288
1849	177	74	0,80	271	321	321	258	288
1850	177	75	0,70	271	321	321	258	287
1851	176	75	0,70	270	321	321	257	287
1852	176	75	0,70	270	321	321	257	287
1853	176	75	0,70	270	321	321	256	286
1854	175	75	0,70	269	321	321	256	286
1855	175	75	0,70	269	320	321	255	286
1856	175	75	0,70	269	320	321	255	286
1857	175	75	0,70	269	320	321	255	286
1858	174	75	0,70	268	319	321	254	285
1859	174	75	0,60	268	319	321	254	284
1860	173	75	0,60	267	318	320	254	284
1861	173	75	0,60	267	317	320	253	283
1862	172	75	0,60	267	317	320	253	282
1863	172	74	0,60	266	316	320	252	282
1864	172	75	0,60	266	316	320	252	281
1865	172	75	0,60	265	315	320	251	280
1866	172	75	0,60	265	315	320	251	279
1867	171	75	0,60	265	315	320	250	279
1868	171	75	0,60	264	314	320	249	278
1869	170	75	0,50	264	314	319	249	277
1870	170	75	0,50	264	313	319	248	276
1871	169	75	0,50	263	312	319	247	276
1872	169	75	0,50	263	311	319	247	275
1873	169	75	0,50	262	311	319	246	274
1874	169	75	0,50	262	311	319	245	273
1875	168	74	0,50	261	310	319	245	272
1876	168	75	0,50	261	310	319	244	271
1877	168	75	0,50	260	310	318	243	271
1878	167	75	0,50	260	309	318	243	270
1879	167	75	0,40	260	308	318	242	270
1880	167	75	0,40	259	308	318	241	269
1881	167	75	0,40	259	308	318	241	268
1882	166	75	0,40	258	307	318	240	267
1883	166	75	0,40	258	307	318	240	267
1884	166	75	0,40	258	306	317	239	266
1885	165	75	0,40	257	305	317	238	265
1886	165	75	0,40	257	305	317	238	264
1887	165	75	0,40	256	304	317	238	263
1888	165	74	0,40	256	304	317	237	263
1889	164	75	0,40	255	304	317	236	262
1890	164	75	0,30	255	303	317	236	262
1891	164	75	0,30	255	303	317	235	261
1892	164	75	0,30	254	303	316	235	260
1893	163	74	0,30	254	303	316	234	260
1894	163	74	0,30	254	302	316	234	259
1895	163	74	0,30	253	302	316	233	258
1896	163	74	0,30	253	302	316	233	257
1897	162	74	0,30	253	302	316	233	257
1898	162	75	0,30	252	302	316	232	257
1899	162	75	0,30	252	301	316	232	256
1900	162	74	0,30	252	300	316	231	256
1901	161	75	0,20	251	300	315	231	255
1902	161	75	0,20	251	300	315	230	254
1903	161	75	0,20	250	299	315	230	254
1904	161	75	0,20	250	299	315	229	253
1905	160	74	0,20	250	298	315	229	253
1906	160	75	0,20	249	298	315	228	252
1907	160	75	0,20	249	297	315	228	252
1908	160	75	0,20	249	297	315	228	251
1909	159	75	0,20	248	297	315	227	251
1910	159	75	0,20	248	297	315	227	250
1911	159	75	0,10	248	296	314	227	250
1912	159	75	0,10	248	296	314	226	249
1913	159	75	0,10	247	296	314	226	249
1914	159	75	0,10	247	295	314	225	248
1915	158	75	0,10	247	295	314	225	248
1916	158	75	0,10	247	295	314	225	247
1917	158	75	0,10	246	295	314	224	247
1918	158	75	0,10	246	295	314	224	246
1919	158	68	6,2088	166	104	68	638	193
1920	157	75	0,10	245	294	314	223	245
1921	157	75	0,10	245	294	314	223	245
1922	157	75	0,10	245	294	314	222	245
1923	157	75	0,10	244	294	314	222	244
1924	156	74	0,00	244	294	314	222	244
1925	86	67	8,8976	67	67	67	67	67
1926	112	67	8,7976	67	67	67	74	67
1927	208	67	8,6976	69	67	67	97	69
1928	290	67	8,4977	73	67	67	127	75
1929	407	67	8,2978	80	68	67	182	83
1930	470	67	7,9980	80	69	67	261	85
1931	552	67	7,6981	100	72	67	354	111
1932	578	67	7,3982	110	75	67	435	128
1933	588	68	7,1982	121	81	67	501	143
1934	602	68	6,8983	135	87	67	555	159
1935	620	68	6,5987	150	95	68	601	175
1936	621	68	6,2988	166	104	68	638	193
1937	614	68	6,0989	183	114	69	659	211
1938	618	68	5,7981	201	124	70	676	227
1939	625	69	5,5991	219	135	72	690	243
1940	629	69	5,3991	237	146	74	701	258
1941	631	70	5,0992	253	157	76	710	272
1942	628	70	4,8994	268	168	79	717	287
1943	627	70	4,6994	283	179	82	721	300
1944	623	70	4,4994	298	190	85	722	313

1945	619	70	4,2996	312	201	89	722	326
1946	617	71	4,0996	324	212	92	722	337
1947	613	71	3,8997	337	223	97	722	348
1948	608	71	3,6999	350	233	101	721	359
1949	597	70	3,4999	362	244	106	718	369
1950	590	70	3,2999	372	254	110	708	379
1951	580	71	3,2001	381	263	115	697	387
1952	571	71	3,1003	389	272	120	686	395
1953	547	71	19,9014	388	282	126	666	404
1954	590	71	21,9903	404	291	131	636	411
1955	647	70	21,5907	410	301	137	636	416
1956	624	70	21,3908	413	310	142	658	420
1957	630	71	21,0910	415	317	148	683	422
1958	651	71	20,7912	416	324	153	715	424
1959	665	71	20,4905	419	330	157	742	426
1960	683	71	20,1914	421	335	162	765	429
1961	700	71	19,8914	425	339	165	790	433
1962	702	72	19,5917	429	342	169	807	439
1963	704	71	19,2918	433	346	172	821	445
1964	706	72	18,9920	436	349	175	831	451
1965	708	73	18,6923	444	351	178	840	459
1966	705	73	18,3924	450	354	181	847	466
1967	703	73	18,0927	456	357	183	851	474
1968	697	74	17,7927	462	359	185	853	480
1969	692	74	17,4930	468	362	188	854	486
1970	688	74	17,2930	474	364	190	855	492
1971	684	74	16,9933	479	367	192	853	498
1972	680	74	16,6934	485	369	194	853	503
1973	676	74	16,4935	489	372	196	850	508
1974	673	75	16,1938	494	374	198	849	512
1975	674	75	15,9937	499	377	200	849	517
1976	671	74	15,6939	504	379	202	849	521
1977	669	74	15,4940	509	381	204	848	526
1978	667	75	15,1941	512	384	205	848	530
1979	666	75	14,9943	516	386	207	847	534
1980	664	74	14,6944	520	388	209	847	537
1981	663	75	14,4945	524	390	212	846	540
1982	661	76	14,1947	527	392	214	846	544
1983	661	76	13,9948	531	394	216	845	546
1984	660	75	13,6949	535	396	219	843	549
1985	658	75	13,4953	538	398	222	842	552
1986	655	75	13,2952	541	401	224	839	554
1987	653	75	12,9953	544	402	227	836	557
1988	650	74	12,7954	548	404	230	832	559
1989	647	74	12,5957	550	406	233	828	562
1990	644	75	12,3957	553	409	237	825	564
1991	641	75	12,0958	556	411	240	819	566
1992	638	75	11,8959	559	413	244	814	568
1993	637	76	11,6960	560	415	247	810	570
1994	634	76	11,4961	562	417	251	805	571
1995	632	76	11,2962	564	420	255	801	573
1996	630	76	11,0962	567	422	259	798	574
1997	629	76	10,8963	568	424	262	795	576
1998	627	76	10,5965	570	426	266	791	578
1999	626	76	10,3966	572	428	270	788	579
2000	626	75	10,1968	575	431	274	785	581
2001	628	76	9,9970	576	433	278	783	583
2002	628	75	9,7971	578	435	282	782	584
2003	631	76	9,5970	579	438	286	783	586
2004	630	76	9,3973	582	440	290	785	587
2005	631	77	9,1972	584	444	294	786	589
2006	632	75	8,9973	586	446	298	788	592
2007	631	76	8,7975	588	448	302	788	595
2008	629	76	8,5976	589	451	307	784	596
2009	624	75	8,3976	591	454	311	779	599
2010	620	76	8,2977	593	456	315	774	601
2011	617	75	8,0977	595	459	319	770	604
2012	611	76	7,8979	597	462	323	765	606
2013	609	75	7,7979	598	464	327	759	609
2014	605	74	7,5980	599	468	331	755	612
2015	600	75	7,4979	600	470	335	749	613
2016	596	75	7,2982	602	473	340	745	614
2017	591	75	7,1981	602	475	344	741	617
2018	589	76	6,9983	603	478	348	734	617
2019	584	76	6,8982	604	481	353	728	617
2020	581	75	6,7984	605	484	357	722	617
2021	578	76	6,5985	606	486	362	718	618
2022	574	76	6,4985	606	489	367	714	618
2023	569	75	6,3987	607	492	372	709	618
2024	566	74	6,2987	606	494	377	703	618
2025	562	75	6,1988	605	496	382	698	616
2026	553	75	6,0988	603	499	387	691	613
2027	543	73	6,0987	600	501	391	681	610
2028	534	74	5,9987	597	503	396	670	606
2029	527	75	5,8988	593	505	401	658	602
2030	521	75	5,8988	589	508	406	646	597
2031	515	75	5,7990	585	509	411	635	591
2032	510	74	5,6987	580	510	416	625	587
2033	506	73	5,6987	577	511	420	616	582
2034	503	73	5,5988	572	511	425	608	578
2035	499	74	5,4990	567	512	429	599	572
2036	496	73	5,4990	563	513	434	591	568
2037	493	75	5,3989	559	514	438	584	564
2038	490	74	5,2990	555	514	442	578	560
2039	488	74	5,2990	552	514	446	572	555
2040	486	75	5,1990	548	514	450	566	552
2041	484	73	5,1990	543	514	454	562	549
2042	483	73	5,0990	540	514	458	557	545
2043	482	74	5,0990	537	513	461	554	542
2044	479	74	4,9991	534	514	465	551	540
2045	477	74	4,8991	530	514	468	548	537
2046	478	74	4,8991	529	514	471	545	534
2047	477	74	4,7991	525	514	474	543	532
2048	471	73	4,7991	523	513	478	539	530
2049	464	74	4,6991	520	514	481	534	527
2050	459	73	4,6991	518	514	483	528	523
2051	455	74	4,5992	515	514	486	523	521
2052	449	73	4,5992	512	512	489	517	518
2053	445	73	4,5992	509	512	491	512	514
2054	442	73	4,4991	506	511	493	507	511
2055	439	73	4,4991	503	509	496	502	507
2056	436	73	4,4991	500	508	498	497	504
2057	433	74	4,3992	497	507	500	492	501
2058	431	73	4,3992	494	506	502	488	498
2059	428	74	4,2993	492	504	504	484	494
2060	426	74	4,2993	488	503	506	480	491
2061	424	74	4,2992	485	501	507	477	489
2062	423	74	4,1993	483	500	509	474	486
2063	421	73	4,1992	481	498	510	471	483
2064	419	73	4,1992	478	498	512	468	480
2065	419	74	4,0992	475	496	513	466	477
2066	418	73	4,0992	473	495	515	464	476
2067	418	74	4,0992	471	495	516	462	472
2068	339	74	21,0907	470	495	518	447	471
2069	461	73	21,6903	468	495	521	437	467
2070	535	73	21,3904	466	495	523	444	465
2071	616	73	20,9906	463	495	525	476	464
2072	635	73	20,6902	462	493	527	539	464
2073	644	73	20,2911	462	491	528	595	463
2074	663	73	19,9911	463	488	529	652	467
2075	688	73	19,6914	465	484	530	695	472
2076	677	73	19,3915	469	484	529	731	480
2077	687	74	18,9916	474	482	529	763	487
2078	693	74	18,6919	479	478	528	788	495
2079	699	74	18,3920	485	476	528	810	503
2080	705	74	18,0923	491	475	526	830	512
2081	688	74	17,7923	497	474	525	842	520
2082	613	73	17,5923	501	472	524	842	525
2083	537	74	17,3927	505	471	522	824	530

2084	494	75	17,1927	507	469	520	804	532
2085	466	74	16,9929	509	469	518	783	532
2086	444	74	16,9830	509	468	515	762	530
2087	426	74	16,7931	508	466	512	743	527
2088	411	74	16,5931	506	465	510	723	524
2089	398	74	16,4931	503	464	507	705	518
2090	385	74	16,3931	500	462	505	688	514
2091	374	74	16,2932	496	461	501	671	508
2092	364	74	16,1934	490	458	499	655	504
2093	357	74	16,0934	486	457	496	640	499
2094	350	74	15,9934	479	455	493	627	493
2095	345	73	15,8934	474	453	490	616	488
2096	340	73	15,6935	468	450	487	607	483
2097	336	73	15,5936	462	447	483	597	479
2098	333	73	15,4936	457	445	480	589	475
2099	330	74	15,3937	452	442	477	581	472
2100	329	73	15,2937	447	440	474	575	467
2101	328	73	15,1937	443	437	471	570	464
2102	328	73	15,0938	438	436	468	565	461
2103	328	73	14,8940	434	433	465	562	458
2104	328	73	14,7939	431	431	462	560	455
2105	329	73	14,6940	427	429	459	558	453
2106	330	73	14,5940	424	427	456	558	451
2107	331	73	14,3942	421	425	453	559	449
2108	332	73	14,2942	419	424	450	559	448
2109	334	72	14,1943	416	422	447	560	446
2110	336	73	13,9944	414	421	444	561	445
2111	337	73	13,8946	412	420	441	563	444
2112	339	73	13,7946	410	418	438	566	444
2113	341	73	13,6945	409	418	435	569	444
2114	341	73	13,4949	407	417	433	571	444
2115	342	73	13,3949	407	416	430	572	443
2116	344	74	13,1948	406	415	427	575	443
2117	345	74	13,0949	405	416	425	577	444
2118	347	73	12,9948	405	415	422	579	444
2119	347	73	12,7949	404	414	419	581	444
2120	349	73	12,6950	403	413	417	584	444
2121	350	73	12,5953	403	412	415	586	445
2122	353	73	12,3951	403	411	412	589	445
2123	353	73	12,2952	403	411	410	592	446
2124	354	73	12,0953	403	412	408	595	447
2125	355	73	11,9954	403	412	405	597	448
2126	356	73	11,8954	403	411	403	600	448
2127	357	73	11,6955	404	411	401	602	449
2128	358	73	11,5947	403	411	398	607	450
2129	359	73	11,4956	403	411	396	612	450
2130	360	74	11,2957	404	410	394	617	450
2131	361	73	11,1957	404	410	393	623	451
2132	365	73	10,9957	405	409	391	630	452
2133	370	73	10,8958	406	409	389	637	452
2134	370	73	10,6959	407	409	387	640	453
2135	369	73	10,5960	409	409	385	645	454
2136	369	74	10,3960	411	409	383	646	455
2137	364	73	10,2963	413	408	381	646	455
2138	359	73	10,1962	415	408	380	644	455
2139	355	73	10,0962	417	408	378	641	456
2140	353	73	9,9964	418	409	376	638	456
2141	351	74	9,8964	419	409	375	634	456
2142	349	73	9,7965	420	409	373	630	456
2143	348	73	9,5965	421	409	371	627	457
2144	347	74	9,4966	421	409	370	624	456
2145	346	73	9,3967	422	409	368	622	457
2146	346	74	9,2967	422	409	366	620	457
2147	345	74	9,1967	422	410	365	618	457
2148	345	74	9,0968	421	410	364	617	458
2149	346	74	8,9968	421	410	362	617	459
2150	345	74	8,8969	420	410	361	616	459
2151	346	74	8,6969	420	410	359	616	459
2152	346	74	8,5970	420	411	358	616	459
2153	346	74	8,4972	420	411	357	617	460
2154	347	74	8,3971	420	411	356	617	460
2155	347	74	8,2972	421	411	354	618	460
2156	347	74	8,1973	422	412	353	618	460
2157	348	74	8,0972	422	412	352	621	460
2158	349	74	7,8974	424	413	351	623	459
2159	350	74	7,7974	425	412	350	628	459
2160	351	74	7,6974	426	413	349	631	458
2161	353	74	7,5975	428	413	348	634	457
2162	353	74	7,4974	429	413	347	639	455
2163	354	74	7,2977	432	413	346	642	453
2164	355	74	7,1977	434	413	345	646	452
2165	355	74	7,098	435	413	344	651	451
2166	354	74	6,998	438	413	343	653	450
2167	355	74	6,898	440	413	343	654	449
2168	356	74	6,798	442	414	342	656	449
2169	356	74	6,598	443	414	341	657	449
2170	355	74	6,498	445	414	340	659	448
2171	353	75	6,398	446	414	339	660	449
2172	351	74	6,298	446	415	339	660	449
2173	346	74	6,198	447	416	338	658	450
2174	341	74	6,198	448	416	337	655	450
2175	339	75	6,098	448	417	336	651	449
2176	337	74	5,998	448	417	336	646	450
2177	335	74	5,898	448	417	336	644	449
2178	334	74	5,798	448	418	335	640	448
2179	333	74	5,798	447	418	335	637	448
2180	330	74	5,698	447	418	334	634	448
2181	328	74	5,598	446	419	334	632	447
2182	326	74	5,499	446	419	333	630	445
2183	325	74	5,499	446	420	333	627	444
2184	322	75	5,398	446	420	332	622	443
2185	319	74	5,299	445	420	332	619	442
2186	315	74	5,299	444	421	331	614	441
2187	311	74	5,199	444	422	331	605	439
2188	307	74	5,199	443	422	331	597	438
2189	304	75	5,099	443	423	331	587	436
2190	300	75	5,099	442	423	331	576	434
2191	294	74	4,999	441	423	330	563	434
2192	288	74	4,999	440	423	330	550	431
2193	283	75	4,999	440	423	330	536	429
2194	278	74	4,999	439	423	330	525	427
2195	274	75	4,899	437	422	329	515	425
2196	271	75	4,899	435	422	329	505	423
2197	267	74	4,899	433	421	329	496	421
2198	263	74	4,799	431	421	329	486	418
2199	258	74	4,799	428	420	329	475	416
2200	254	74	4,799	425	419	329	464	413
2201	249	74	4,799	422	419	328	454	410
2202	246	74	4,699	419	418	328	445	408
2203	242	74	4,699	416	416	328	436	405
2204	239	73	4,699	413	414	328	427	403
2205	236	74	4,699	410	413	328	419	400
2206	234	74	4,599	407	411	328	412	397
2207	231	74	4,599	404	410	328	405	394
2208	228	74	4,599	400	408	328	399	392
2209	226	74	4,599	398	406	329	393	390
2210	224	74	4,499	395	405	328	388	388
2211	222	74	4,499	392	403	329	382	386
2212	220	74	4,499	389	401	329	378	383
2213	218	74	4,499	387	400	329	373	381
2214	217	74	4,499	385	399	329	369	380
2215	215	74	4,399	382	398	329	366	378
2216	213	74	4,399	380	396	329	362	376
2217	212	74	4,399	378	396	329	359	374
2218	211	74	4,399	375	394	330	356	372
2219	209	74	4,399	373	393	330	353	371
2220	208	74	4,299	370	392	330	350	369
2221	207	74	4,299	370	391	330	347	368
2222	206	74	4,299	369	390	330	345	367

2223	205	74	4,299	367	389	330	342	365
2224	205	73	4,199	365	388	330	340	364
2225	203	74	4,199	364	387	331	338	363
2226	203	74	4,199	363	386	331	337	362
2227	202	74	4,199	361	385	331	334	361
2228	201	74	4,199	359	383	331	333	359
2229	200	73	4,199	357	384	331	331	358
2230	199	74	4,099	359	383	332	329	357
2231	199	74	4,099	356	382	332	328	356
2232	198	74	4,099	355	382	332	327	355
2233	198	74	4,099	354	381	332	325	354
2234	198	74	4,099	353	381	332	324	353
2235	197	74	4,099	352	380	332	322	352
2236	196	74	3,999	351	380	332	321	351
2237	196	74	3,999	350	379	333	320	351
2238	196	74	3,999	349	379	333	319	350
2239	195	74	3,999	348	379	333	318	349
2240	194	73	3,999	347	378	333	317	349
2241	194	74	3,899	347	378	333	316	348
2242	193	73	3,899	346	378	333	315	347
2243	193	74	3,899	345	377	333	314	347
2244	193	74	3,899	344	376	333	313	347
2245	192	74	3,899	344	376	334	312	346
2246	192	74	3,899	343	376	334	312	345
2247	192	74	3,799	342	375	334	311	344
2248	192	74	3,799	341	375	334	310	344
2249	191	74	3,799	341	375	334	309	344
2250	191	73	3,799	340	375	334	309	343
2251	190	74	3,799	340	374	334	309	342
2252	190	74	3,799	339	375	335	308	342
2253	190	74	3,699	338	373	335	308	341
2254	190	73	3,699	338	373	335	307	340
2255	189	73	3,699	337	373	335	306	340
2256	190	73	3,699	337	373	335	305	340
2257	190	73	3,699	336	372	335	305	339
2258	189	73	3,699	336	372	335	304	339
2259	189	73	3,599	335	372	335	303	338
2260	189	73	3,599	335	372	335	303	338
2261	188	73	3,599	334	371	335	303	337
2262	189	73	3,599	334	371	336	302	337
2263	188	73	3,599	334	371	336	302	337
2264	188	73	3,499	333	371	336	301	336
2265	188	73	3,499	333	371	336	301	336
2266	188	73	3,499	332	370	336	301	336
2267	188	73	3,499	332	370	336	300	335
2268	188	73	3,499	332	370	336	300	335
2269	187	73	3,499	331	370	336	300	334
2270	187	73	3,499	331	370	336	299	334
2271	187	73	3,399	331	370	336	299	334
2272	187	73	3,399	330	369	337	299	334
2273	187	73	3,399	330	369	336	299	333
2274	186	73	3,399	329	369	337	298	333
2275	186	74	3,399	329	369	337	298	333
2276	186	74	3,399	329	369	337	298	333
2277	186	74	3,299	328	368	337	298	332
2278	186	74	3,299	328	368	337	298	332
2279	186	74	3,299	327	368	337	298	332
2280	186	73	3,299	327	368	337	298	332
2281	186	73	3,299	327	368	337	298	332
2282	186	74	3,299	327	368	337	297	331
2283	186	73	3,299	326	368	337	297	331
2284	186	73	3,199	326	368	338	298	331
2285	186	73	3,199	326	368	337	297	331
2286	186	74	3,199	326	368	338	297	331
2287	186	74	3,199	325	368	337	297	330
2288	186	73	3,199	325	367	338	297	330
2289	186	73	3,199	325	367	338	297	330
2290	186	73	3,099	325	367	338	297	330
2291	185	73	3,099	324	367	338	296	330
2292	185	73	3,099	324	367	338	296	329
2293	185	73	3,099	324	367	338	296	329
2294	185	73	3,099	324	366	338	296	330
2295	185	73	3,099	323	367	338	296	329
2296	186	73	3,099	323	367	338	296	329
2297	185	73	2,999	323	366	338	296	328
2298	185	73	2,999	323	366	338	296	328
2299	185	73	2,999	323	366	338	296	328
2300	185	73	2,999	322	366	338	296	328
2301	185	73	2,999	322	365	338	296	328
2302	185	73	2,999	322	365	338	296	327
2303	185	73	2,899	322	365	338	296	327
2304	185	73	2,898	321	365	338	296	326
2305	185	73	2,898	321	365	338	296	326
2306	184	74	2,898	321	365	339	297	326
2307	184	73	2,898	320	365	339	296	326
2308	184	73	2,898	320	365	339	296	325
2309	184	73	2,899	320	364	339	296	325
2310	184	73	2,898	319	363	338	296	325
2311	184	73	2,899	319	362	338	295	324
2312	184	73	2,800	319	362	338	295	324
2313	184	73	2,800	318	362	338	295	324
2314	184	73	2,800	318	362	338	295	324
2315	184	73	2,800	318	362	338	294	323
2316	183	73	2,800	318	361	338	294	323
2317	183	73	2,800	317	361	338	294	323
2318	183	73	2,700	317	361	338	294	323
2319	183	73	2,700	317	360	338	294	323
2320	183	73	2,700	317	360	338	294	323
2321	183	73	2,700	317	360	338	294	322
2322	183	73	2,700	316	360	338	293	322
2323	183	73	2,700	316	360	338	293	322
2324	183	73	2,700	316	360	337	293	321
2325	183	73	2,600	316	360	337	293	321
2326	183	73	2,600	316	359	337	293	321
2327	183	73	2,600	316	360	337	293	321
2328	183	73	2,600	315	360	337	293	320
2329	183	73	2,600	316	360	337	293	320
2330	183	73	2,600	315	360	337	293	321
2331	183	73	2,600	315	360	337	293	320
2332	182	73	2,600	315	360	337	293	320
2333	182	73	2,500	315	360	337	293	320
2334	182	73	2,500	315	360	337	293	320
2335	182	73	2,500	315	360	337	294	320
2336	183	73	2,500	315	360	337	294	320
2337	182	73	2,500	314	360	337	294	320
2338	183	74	2,500	314	360	337	294	319
2339	182	74	2,400	314	360	337	294	319
2340	183	73	2,400	315	359	337	294	319
2341	182	73	2,400	314	360	337	294	319
2342	182	74	2,400	314	360	338	294	319
2343	182	74	2,400	314	360	337	294	320
2344	182	74	2,400	314	360	338	295	319
2345	183	73	2,400	314	360	337	295	319
2346	183	73	2,300	314	360	338	295	319
2347	183	73	2,300	314	360	337	295	319
2348	183	73	2,300	314	359	338	295	319
2349	183	73	2,300	314	359	338	295	319
2350	183	73	2,300	314	359	338	295	320
2351	183	73	2,300	314	358	338	295	319
2352	183	73	2,200	314	358	338	296	319
2353	183	73	2,200	314	359	338	296	319
2354	183	73	2,200	314	358	338	296	319
2355	183	73	2,200	314	358	338	296	319
2356	183	74	2,200	313	357	338	296	318
2357	183	73	2,200	313	357	338	296	319
2358	183	73	2,200	313	357	338	296	318
2359	183	74	2,100	313	357	338	297	318
2360	183	74	2,100	313	356	338	297	318
2361	183	73	2,100	313	356	338	297	318



2362	183	73	2,100	313	356	338	297	318
2363	183	74	2,100	313	356	338	297	318
2364	183	73	2,100	312	355	338	297	318
2365	183	74	2,100	312	354	338	297	317
2366	183	74	2,000	312	354	338	297	317
2367	183	73	2,000	312	354	338	297	317
2368	183	73	2,000	312	354	338	297	317
2369	183	73	2,000	312	353	338	297	317
2370	182	73	2,000	311	353	338	297	317
2371	182	74	2,000	311	353	338	296	317
2372	182	73	2,000	311	353	338	297	317
2373	182	73	2,000	311	353	338	296	317
2374	182	74	1,900	310	352	338	296	317
2375	182	73	1,900	309	351	338	296	317
2376	182	74	1,900	310	352	338	296	317
2377	182	73	1,900	310	351	338	296	317
2378	182	73	1,900	309	351	338	296	317
2379	182	73	1,900	309	351	337	295	317
2380	182	73	1,900	309	351	337	295	317
2381	182	73	1,800	309	351	337	295	317
2382	181	73	1,800	309	350	337	295	317
2383	181	73	1,800	308	350	337	295	317
2384	182	73	1,800	308	349	337	294	317
2385	181	73	1,800	308	349	337	294	317
2386	181	73	1,800	308	348	337	294	317
2387	181	73	1,800	308	348	337	293	317
2388	181	73	1,700	307	348	337	293	317
2389	181	73	1,700	307	347	337	293	317
2390	181	73	1,700	307	347	337	293	316
2391	181	73	1,700	307	347	337	292	316
2392	182	73	1,700	306	347	337	292	316
2393	181	73	1,700	306	346	337	292	316
2394	181	73	1,700	306	346	337	291	316
2395	182	73	1,600	305	346	336	291	316
2396	182	73	1,600	305	345	336	291	316
2397	181	73	1,600	304	345	336	290	316
2398	181	73	1,600	304	345	336	290	315
2399	181	73	1,600	304	345	336	290	315
2400	181	73	1,600	303	344	336	289	315
2401	181	73	1,600	303	344	336	290	315
2402	181	73	1,500	303	344	336	289	315
2403	180	73	1,500	302	344	336	289	314
2404	180	73	1,500	302	343	336	288	314
2405	180	73	1,500	301	343	336	289	314
2406	179	73	1,500	301	343	336	288	313
2407	179	73	1,500	301	342	336	288	313
2408	179	73	1,500	300	342	335	287	313
2409	179	73	1,500	300	342	335	286	313
2410	179	73	1,400	299	341	335	286	313
2411	179	73	1,400	299	341	335	286	312
2412	178	73	1,400	299	341	335	285	312
2413	178	73	1,400	298	341	335	285	312
2414	178	73	1,400	298	340	335	284	312
2415	177	73	1,400	297	340	335	283	311
2416	177	73	1,400	297	340	335	283	311
2417	177	73	1,300	297	340	335	282	310
2418	177	73	1,300	296	340	335	282	310
2419	177	73	1,300	296	339	335	281	310
2420	177	73	1,300	296	339	335	280	310
2421	176	73	1,300	295	338	335	280	309
2422	176	73	1,300	295	338	334	280	309
2423	176	73	1,300	295	338	334	279	308
2424	176	73	1,300	294	338	334	279	308
2425	176	73	1,200	294	338	334	278	307
2426	175	73	1,200	294	337	334	278	307
2427	175	73	1,200	293	337	334	277	307
2428	175	73	1,200	293	337	334	276	306
2429	175	73	1,200	293	337	334	276	306
2430	174	73	1,200	292	337	334	276	306
2431	174	73	1,200	292	336	334	275	305
2432	174	73	1,200	292	336	334	275	305
2433	174	73	1,137	291	336	334	274	304
2434	174	73	1,100	291	336	334	274	304
2435	174	73	1,100	291	335	334	273	303
2436	173	73	1,100	290	335	333	273	303
2437	173	73	1,100	290	334	333	272	303
2438	173	73	1,100	290	334	333	272	302
2439	173	73	1,100	289	334	333	271	302
2440	173	73	1,100	289	334	333	271	302
2441	172	73	1,100	288	334	333	270	301
2442	172	73	1,000	288	333	333	270	301
2443	172	73	1,000	288	333	333	269	300
2444	171	73	1,000	287	332	333	269	300
2445	172	73	1,000	287	332	332	269	300
2446	171	73	1,000	287	332	332	268	299
2447	171	73	1,000	286	332	332	268	299
2448	171	73	1,000	286	332	332	268	298
2449	171	73	1,000	286	331	332	267	298
2450	171	73	0,900	285	331	332	267	297
2451	170	73	0,900	285	331	332	267	297
2452	170	73	0,900	285	331	332	266	296
2453	170	73	0,900	284	331	332	266	296
2454	170	73	0,900	284	330	332	266	296
2455	170	73	0,900	284	330	332	265	295
2456	170	73	0,900	283	330	331	265	295
2457	170	73	0,900	283	330	331	265	295
2458	169	73	0,900	283	329	331	264	294
2459	169	73	0,800	282	329	331	263	294
2460	169	73	0,800	282	329	331	263	294
2461	169	73	0,800	282	329	331	262	294
2462	169	73	0,800	281	329	331	262	293
2463	169	73	0,800	281	329	331	262	293
2464	169	73	0,800	281	329	331	262	293
2465	169	73	0,800	281	328	331	261	293
2466	169	73	0,800	280	328	331	261	292
2467	169	73	0,700	280	328	331	261	292
2468	169	73	0,700	280	328	330	260	292
2469	168	73	0,700	279	327	330	260	292
2470	168	73	0,700	279	327	330	260	291
2471	168	73	0,700	279	327	330	259	291
2472	168	73	0,700	278	326	330	259	291
2473	168	72	0,700	278	327	330	259	291
2474	168	72	0,700	278	326	330	259	290
2475	168	72	0,700	277	326	330	259	290
2476	168	73	0,600	277	325	330	258	290
2477	167	73	0,600	277	325	330	259	290
2478	168	73	0,600	277	325	330	258	289
2479	168	73	0,600	276	324	330	258	289
2480	167	73	0,600	276	325	330	258	289
2481	167	73	0,600	276	325	330	258	289
2482	167	73	0,600	275	324	330	258	288
2483	167	73	0,600	275	324	330	258	288
2484	167	72	0,600	275	324	330	257	288
2485	167	72	0,600	275	323	330	257	287
2486	167	72	0,500	274	323	330	257	287
2487	166	72	0,500	274	323	330	256	287
2488	166	72	0,500	274	322	329	256	286
2489	166	72	0,500	273	322	330	256	286
2490	166	72	0,500	273	322	329	255	285
2491	166	72	0,500	273	321	329	255	285
2492	166	72	0,500	272	321	329	255	284
2493	165	72	0,500	272	320	329	254	284
2494	165	72	0,500	272	320	329	254	284
2495	165	72	0,500	271	319	329	254	283
2496	165	72	0,400	271	319	329	253	283
2497	164	72	0,400	271	319	329	253	282
2498	164	72	0,400	270	319	329	253	282
2499	164	72	0,400	270	318	329	252	281
2500	164	72	0,400	270	318	329	252	281

2501	164	72	0,400	269	317	329	252	281
2502	163	72	0,400	269	317	329	251	280
2503	163	72	0,400	269	317	329	251	280
2504	163	72	0,400	268	316	329	251	279
2505	163	72	0,400	268	316	329	251	279
2506	163	72	0,300	268	316	329	250	278
2507	163	72	0,300	268	315	329	250	278
2508	162	72	0,300	267	315	329	250	277
2509	162	72	0,300	267	315	329	250	277
2510	162	72	0,300	267	314	329	250	277
2511	162	72	0,300	266	314	329	249	276
2512	162	72	0,300	266	314	329	249	276
2513	162	72	0,300	266	313	329	249	275
2514	161	72	0,300	266	313	329	249	275
2515	162	72	0,201	266	312	328	248	274
2516	161	72	0,200	265	312	328	248	274
2517	161	72	0,200	265	312	328	248	274
2518	161	72	0,200	265	312	328	248	273
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2521	161	72	0,200	265	312	328	247	272
2522	161	72	0,200	264	311	328	247	272
2523	161	72	0,200	264	311	328	247	272
2524	161	72	0,200	264	311	328	246	271
2525	161	72	0,100	264	310	328	246	271
2526	160	72	0,100	264	310	328	246	270
2527	160	72	0,100	264	310	328	246	270
2528	160	72	0,100	263	310	328	246	269
2529	159	72	0,100	263	309	328	245	269
2530	159	72	0,100	263	310	328	245	269
2531	158	72	0,100	262	309	328	245	268
2532	158	72	0,100	262	309	328	244	267
2533	157	72	0,100	262	309	327	243	267
2534	157	72	0,100	261	309	327	243	266
2535	157	72	0,100	261	309	327	242	266
2536	156	72	0,000	260	308	327	242	265
2537	72	71	9,8966	73	73	74	74	73
2538	79	72	9,8966	73	73	74	74	73
2539	160	71	9,7967	74	73	74	92	75
2540	286	71	9,5966	76	73	74	149	78
2541	407	71	9,3968	80	74	74	239	86
2542	49970	72	9,0970	87	75	74	329	88
2543	565	72	8,7971	97	77	74	414	114
2544	605	72	8,4973	108	82	74	491	131
2545	574	72	8,1974	120	87	74	543	145
2546	571	72	7,8976	132	94	74	578	162
2547	594	72	7,6977	146	102	74	608	178
2548	610	72	7,3977	162	111	62	632	195
2549	621	72	7,0980	179	121	75	656	211
2550	611	72	6,8979	195	131	76	671	226
2551	606	72	6,5982	213	142	77	680	241
2552	609	73	6,3985	230	152	79	687	254
2553	615	73	6,1985	246	162	695	695	267
2554	620	73	5,8986	263	172	82	703	279
2555	628	72	5,6986	279	182	85	713	292
2556	637	73	5,3988	295	192	87	721	304
2557	637	73	5,1989	311	203	90	733	317
2558	636	73	4,9990	326	214	94	745	330
2559	638	73	4,6991	342	224	97	756	343
2560	640	74	4,4991	357	234	101	761	356
2561	637	74	4,2993	371	245	105	765	368
2562	628	74	3,9994	386	255	110	762	379
2563	619	74	3,8994	399	265	114	758	390
2564	606	74	3,6996	411	274	119	749	400
2565	598	74	3,4997	422	285	125	741	410
2566	589	73	3,2998	433	294	130	730	419
2567	576	74	3,1999	442	304	136	715	426
2568	565	74	3,1001	447	314	142	700	432
2569	535	75	14,1945	453	323	147	676	436
2570	616	74	22,9899	457	333	153	646	440
2571	847	74	20,1653	460	342	159	656	442
2572	682	75	21,1907	462	350	165	691	445
2573	662	74	20,8910	461	356	170	716	446
2574	669	75	20,5914	462	361	175	740	448
2575	664	75	20,3914	464	363	180	757	450
2576	660	75	20,0913	465	364	184	770	453
2577	661	75	19,7916	467	320	188	779	458
2578	661	75	19,4917	470	310	191	788	462
2579	661	75	19,2918	473	301	194	794	467
2580	663	75	18,9920	477	295	196	800	472
2581	664	75	18,6922	480	289	199	806	478
2582	663	75	18,4922	484	284	201	809	483
2583	667	75	18,1924	487	281	202	814	488
2584	665	75	17,8926	491	278	204	816	493
2585	667	75	17,6927	494	275	206	819	498
2586	664	75	17,3930	498	274	208	820	503
2587	663	75	17,0934	502	273	210	820	508
2588	661	75	16,8933	506	273	213	820	513
2589	659	75	16,5935	510	272	215	819	518
2590	655	75	16,3935	514	271	218	820	522
2591	652	76	16,0937	517	271	220	819	527
2592	650	75	15,8937	520	271	222	816	531
2593	646	75	15,6938	523	271	225	816	535
2594	644	75	15,3940	526	271	227	814	539
2595	643	75	15,1941	529	271	230	813	542
2596	642	75	14,8942	531	272	233	813	546
2597	640	75	14,6943	534	273	236	812	550
2598	638	75	14,4944	536	273	239	812	552
2599	636	76	14,1946	539	274	242	810	556
2600	633	76	13,9948	541	274	244	808	559
2601	632	75	13,7949	543	275	247	807	562
2602	629	76	13,5951	544	276	250	805	564
2603	627	75	13,2952	546	278	253	802	566
2604	625	76	13,0953	548	279	255	800	569
2605	623	76	12,8953	549	280	258	797	571
2606	627	75	12,6954	550	281	261	798	574
2607	626	75	12,4955	552	282	264	801	577
2608	621	76	12,1956	553	283	267	799	579
2609	616	76	11,9956	553	285	270	794	582
2610	609	75	11,7959	554	286	273	785	584
2611	603	75	11,5951	555	287	277	776	586
2612	597	75	11,4961	555	289	280	768	587
2613	593	75	11,2961	555	289	283	759	589
2614	587	75	11,0961	554	290	286	751	589
2615	583	75	10,8963	554	291	290	743	589
2616	581	75	10,6964	553	293	293	736	590
2617	580	75	10,5964	553	293	297	731	590
2618	580	74	10,3964	552	294	300	727	590
2619	580	74	10,1967	552	295	303	726	588
2620	580	75	9,9969	552	295	307	726	589
2621	582	76	9,8968	551	296	310	728	589
2622	585	75	9,6969	551	298	314	732	590
2623	587	76	9,4970	552	299	317	735	591
2624	589	75	9,2971	552	301	321	741	592
2625	594	76	9,0972	553	302	324	746	593
2626	597	75	8,8973	554	303	327	752	594
2627	599	76	8,6973	555	303	331	759	597
2628	604	75	8,4975	556	304	334	767	598
2629	603	75	8,2975	557	306	337	773	600
2630	599	76	8,1976	559	307	341	773	603
2631	595	76	7,9977	561	308	344	771	605
2632	592	76	7,7977	562	309	347	766	606
2633	587	75	7,6978	564	310	351	760	608
2634	584	75	7,4978	565	312	354	756	608
2635	584	76	7,2980	568	313	357	752	610
2636	585	76	7,1980	568	314	360	751	611
2637	584	76	6,9981	569	316	363	753	612
2638	578	76	6,8981	570	317	367	750	613
2639	562	76	6,7982	572	319	369	734	614

2640	548	76	6,6984	571	320	373	715	613
2641	535	76	6,5983	571	320	376	695	614
2642	526	75	6,5983	570	321	379	677	613
2643	516	75	6,4983	567	322	382	662	610
2644	507	75	6,3986	565	322	385	645	606
2645	500	76	6,3986	562	322	388	631	601
2646	493	76	6,2985	559	322	390	618	597
2647	487	75	6,2985	555	322	393	604	591
2648	481	75	6,1986	552	321	396	593	586
2649	476	76	6,0986	548	321	399	582	580
2650	472	75	6,0986	543	320	402	573	576
2651	468	75	5,9985	539	319	405	564	570
2652	463	75	5,9985	536	319	407	556	564
2653	460	75	5,8986	531	318	410	548	560
2654	456	75	5,7979	528	317	413	540	555
2655	454	75	5,7978	524	317	415	534	550
2656	451	75	5,6986	521	316	418	529	546
2657	448	75	5,6986	517	316	421	523	542
2658	445	75	5,5987	514	315	423	518	537
2659	442	75	5,5987	511	315	426	513	533
2660	440	75	5,4988	507	314	428	509	530
2661	438	76	5,3987	504	314	430	504	526
2662	436	75	5,3987	501	314	433	500	522
2663	435	75	5,2988	498	314	435	496	520
2664	433	75	5,2988	496	313	437	492	517
2665	432	75	5,1988	493	313	439	489	513
2666	430	75	5,1988	491	313	441	486	511
2667	427	75	5,099	488	312	443	482	508
2668	422	75	5,099	485	312	445	477	505
2669	416	75	5,099	482	312	447	473	502
2670	411	75	4,999	479	311	449	468	498
2671	406	74	4,999	476	310	451	463	495
2672	401	75	4,999	472	309	453	458	491
2673	398	75	4,899	469	308	454	453	487
2674	394	75	4,899	465	307	456	449	484
2675	392	75	4,899	462	306	457	444	480
2676	389	75	4,799	458	305	459	438	477
2677	385	75	4,799	455	304	460	434	474
2678	383	75	4,799	452	303	462	430	471
2679	379	75	4,699	448	302	463	425	467
2680	376	75	4,699	445	301	464	421	464
2681	375	74	4,599	442	300	465	416	462
2682	372	75	4,599	439	299	466	412	459
2683	370	74	4,599	437	298	467	408	456
2684	368	74	4,599	434	297	467	404	453
2685	366	75	4,499	431	296	468	401	450
2686	364	75	4,499	428	295	469	398	447
2687	363	74	4,499	426	295	470	394	444
2688	361	74	4,399	423	294	470	391	442
2689	359	74	4,399	421	294	471	388	440
2690	358	74	4,399	419	293	471	386	437
2691	356	74	4,399	417	293	471	383	435
2692	355	74	4,299	415	295	472	381	432
2693	354	74	4,299	412	296	472	379	430
2694	352	74	4,299	410	294	472	377	428
2695	350	74	4,299	409	294	473	376	426
2696	349	74	4,199	407	294	473	374	424
2697	348	74	4,199	405	294	473	373	422
2698	347	75	4,199	403	293	474	372	421
2699	347	73	4,099	402	293	474	370	418
2700	345	73	4,099	400	292	475	368	416
2701	344	74	4,099	399	292	476	367	415
2702	343	74	4,099	397	291	476	365	413
2703	342	74	4,099	396	291	477	363	412
2704	341	74	3,999	395	302	478	363	410
2705	280	75	18,292	394	325	479	353	409
2706	305	74	22,789	395	341	481	340	407
2707	494	75	22,490	392	353	482	345	403
2708	644	75	21,990	391	361	483	371	402
2709	625	74	21,490	393	368	484	445	402
2710	623	75	20,890	392	373	484	525	401
2711	637	75	20,591	393	378	485	590	402
2712	657	75	20,291	394	382	484	647	406
2713	653	75	19,991	396	384	484	669	411
2714	642	75	19,691	399	386	484	676	417
2715	637	75	19,391	404	387	483	684	425
2716	638	73	19,191	409	388	482	692	432
2717	643	73	18,892	415	388	481	700	439
2718	623	74	18,692	421	389	480	719	446
2719	583	74	18,392	426	390	479	735	452
2720	510	73	18,192	431	390	478	734	456
2721	470	73	17,992	435	391	476	720	459
2722	445	72	17,892	437	391	474	704	460
2723	420	71	17,792	438	390	473	683	460
2724	402	72	17,692	439	390	471	664	459
2725	388	73	17,492	438	390	469	646	456
2726	375	73	17,392	437	390	467	628	455
2727	366	73	17,292	435	390	465	613	451
2728	359	73	17,093	434	390	463	601	448
2729	353	74	16,993	432	389	461	590	444
2730	351	74	16,893	429	389	459	583	441
2731	350	75	16,793	427	388	456	577	437
2732	349	74	16,593	425	387	454	573	434
2733	347	74	16,493	423	387	452	568	431
2734	346	74	16,293	421	386	449	565	428
2735	345	74	16,193	419	385	447	561	426
2736	344	74	15,993	418	384	445	560	425
2737	344	75	15,893	415	383	442	560	422
2738	345	75	15,793	415	382	440	561	421
2739	346	75	15,693	413	381	437	562	419
2740	348	74	15,493	412	381	435	564	418
2741	348	74	15,393	412	380	432	567	418
2742	350	75	15,193	411	379	430	572	416
2743	353	74	15,094	411	379	428	579	415
2744	355	74	14,994	411	378	425	585	415
2745	357	74	14,794	411	378	423	592	414
2746	359	74	14,694	412	377	421	597	414
2747	361	74	14,494	412	377	418	601	413
2748	362	74	14,394	413	376	416	606	413
2749	362	74	14,194	414	376	413	610	413
2750	364	75	14,094	415	375	411	612	413
2751	364	74	13,994	415	375	409	616	413
2752	365	75	13,794	416	376	407	619	412
2753	364	75	13,594	418	375	404	620	413
2754	365	75	13,495	418	375	402	623	413
2755	364	75	13,395	419	375	400	624	413
2756	365	75	13,295	420	375	398	624	414
2757	365	75	13,095	421	375	396	625	414
2758	365	75	12,995	422	376	393	626	415
2759	364	75	12,895	422	376	391	626	415
2760	365	75	12,695	423	376	389	628	416
2761	366	75	12,595	424	376	387	630	417
2762	368	75	12,395	425	375	385	632	417
2763	368	75	12,295	427	375	383	633	418
2764	368	75	12,195	427	375	381	635	419
2765	367	75	11,995	429	365	380	636	421
2766	367	75	11,895	429	336	378	637	421
2767	365	75	11,695	430	319	376	636	423
2768	363	75	11,595	431	308	374	635	423
2769	361	75	11,495	432	299	373	634	424
2770	359	75	11,395	433	292	371	632	426
2771	356	75	11,196	434	286	369	630	426
2772	356	75	11,096	434	282	367	629	427
2773	356	75	10,996	434	278	366	628	429
2774	355	75	10,796	434	275	364	628	428
2775	357	75	10,696	435	272	363	631	430
2776	358	75	10,596	437	270	361	633	431
2777	361	75	10,396	437	268	359	635	432
2778	362	75	10,196	438	267	358	636	434

2779	362	75	10,096	438	265	356	639	436
2780	360	75	9,996	440	263	355	640	438
2781	359	75	9,796	439	262	354	641	440
2782	360	75	9,696	441	261	352	641	442
2783	359	75	9,497	442	261	350	641	444
2784	355	76	9,397	443	260	349	640	447
2785	351	76	9,297	443	260	347	637	447
2786	347	75	9,197	445	259	346	632	448
2787	342	74	9,097	445	259	344	628	448
2788	335	75	8,997	445	259	343	622	448
2789	327	75	8,997	445	258	342	612	447
2790	319	75	8,897	445	258	341	599	446
2791	310	75	8,797	444	258	339	585	444
2792	303	74	8,797	442	257	338	570	443
2793	296	76	8,697	440	257	337	556	441
2794	290	75	8,697	436	256	335	542	440
2795	284	75	8,597	433	256	334	529	438
2796	278	75	8,597	430	255	333	516	436
2797	272	75	8,497	427	254	332	504	433
2798	266	75	8,497	423	254	330	494	430
2799	263	74	8,397	420	253	329	483	428
2800	259	75	8,397	416	252	328	473	425
2801	255	75	8,297	413	251	327	464	422
2802	251	75	8,297	409	250	326	455	419
2803	247	75	8,197	405	249	325	446	416
2804	244	75	8,197	401	249	324	439	413
2805	241	75	8,097	397	248	323	431	410
2806	237	75	8,097	394	248	322	424	407
2807	235	75	7,997	390	247	322	417	404
2808	232	75	7,997	387	246	321	411	401
2809	230	75	7,897	384	245	320	405	398
2810	228	74	7,897	381	244	319	400	397
2811	227	75	7,797	378	242	319	395	394
2812	225	75	7,797	375	241	318	390	391
2813	224	75	7,697	372	240	318	386	390
2814	222	74	7,697	370	239	317	382	388
2815	221	74	7,597	367	238	317	378	386
2816	220	74	7,597	365	237	316	375	384
2817	218	75	7,497	363	236	316	372	382
2818	218	74	7,497	360	235	315	370	381
2819	217	74	7,397	359	235	315	367	380
2820	216	74	7,397	357	235	315	364	378
2821	215	75	7,397	355	234	314	362	377
2822	213	75	7,298	353	233	314	359	376
2823	213	75	7,298	352	233	313	358	375
2824	212	75	7,198	350	232	313	356	375
2825	211	75	7,198	348	232	313	354	374
2826	210	74	7,098	347	232	313	352	373
2827	209	74	7,098	346	231	312	351	372
2828	208	74	7,098	345	231	312	349	372
2829	207	74	6,998	344	231	312	348	371
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2831	204	74	6,898	341	230	311	344	368
2832	202	74	6,898	340	230	311	342	367
2833	200	74	6,898	339	229	311	340	365
2834	199	74	6,798	337	228	311	337	363
2835	197	74	6,798	336	227	310	335	361
2836	196	74	6,798	334	226	310	333	359
2837	194	74	6,698	334	225	310	331	357
2838	193	74	6,698	332	223	310	329	355
2839	192	75	6,698	331	221	309	326	353
2840	192	74	6,698	329	219	309	325	351
2841	191	74	6,598	328	218	309	323	348
2842	191	74	6,598	326	217	307	321	347
2843	190	74	6,598	325	215	309	319	344
2844	189	74	6,498	324	214	308	317	343
2845	188	74	6,498	323	213	308	315	341
2846	187	74	6,498	321	212	308	313	340
2847	186	74	6,398	320	211	307	312	338
2848	186	74	6,398	319	210	307	309	337
2849	185	74	6,398	318	210	307	307	335
2850	185	74	6,398	316	209	307	306	334
2851	184	74	6,298	316	208	307	305	333
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2853	183	74	6,298	314	207	306	303	330
2854	183	74	6,298	313	206	306	302	329
2855	183	74	6,198	312	206	306	301	328
2856	183	74	6,198	311	205	306	300	327
2857	183	74	6,198	310	205	306	299	326
2858	183	74	6,098	309	204	306	298	325
2859	183	74	6,098	308	204	306	297	324
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2861	183	74	5,998	307	203	306	296	323
2862	182	74	5,998	307	202	306	296	322
2863	183	74	5,998	306	202	306	295	322
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2865	183	74	5,898	305	202	306	295	321
2866	183	74	5,898	304	201	306	294	320
2867	182	74	5,797	304	201	306	294	320
2868	182	74	5,797	303	200	306	294	319
2869	182	74	5,797	303	200	307	293	319
2870	182	74	5,797	302	200	307	293	319
2871	182	73	5,698	302	199	307	293	318
2872	182	74	5,698	301	199	307	293	318
2873	182	74	5,698	301	199	307	293	317
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2875	181	74	5,598	300	199	308	292	317
2876	181	74	5,598	300	197	308	291	317
2877	181	74	5,498	299	196	309	291	316
2878	180	74	5,498	299	195	309	290	316
2879	180	74	5,498	299	195	309	290	315
2880	180	74	5,398	299	194	310	289	315
2881	179	74	5,398	298	194	310	289	314
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2894	177	74	4,998	295	194	314	283	312
2895	177	74	4,998	295	194	314	283	312
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2898	177	74	4,898	294	193	315	283	311
2899	177	74	4,898	294	193	315	283	311
2900	177	74	4,899	293	193	316	283	311
2901	177	74	4,899	293	193	316	282	310
2902	176	74	4,798	293	192	316	282	311
2903	176	74	4,799	292	192	317	282	310
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2905	176	74	4,699	292	193	318	281	310
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2909	176	74	4,599	291	193	319	281	310
2910	175	74	4,599	291	193	320	280	310
2911	175	74	4,599	290	193	320	280	310
2912	175	74	4,499	290	193	321	280	310
2913	175	73	4,499	290	193	321	280	309
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2915	175	73	4,399	289	193	322	280	310
2916	175	73	4,399	289	193	322	279	310
2917	174	73	4,399	289	193	323	279	310

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2919	175	73	4,299	289	192	323	279	310
2920	175	73	4,299	289	192	324	278	310
2921	175	73	4,299	289	193	324	278	310
2922	174	73	4,199	288	193	325	278	310
2923	173	73	4,199	288	192	325	278	310
2924	173	73	4,199	288	193	326	277	310
2925	173	73	4,199	288	193	326	277	310
2926	172	73	4,099	288	193	327	277	310
2927	172	73	4,099	288	193	327	276	310
2928	171	73	4,099	288	193	327	276	310
2929	171	73	3,999	288	193	328	276	310
2930	170	73	3,999	288	193	328	275	310
2931	170	73	3,999	288	193	329	275	310
2932	169	73	3,999	288	193	329	274	310
2933	168	73	3,899	288	193	329	274	310
2934	168	73	3,899	288	193	330	273	310
2935	168	73	3,899	287	193	330	273	309
2936	168	73	3,799	287	193	331	272	309
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2938	167	73	3,799	287	193	331	271	309
2939	167	73	3,799	287	193	332	271	309
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2947	165	73	3,599	285	193	333	267	306
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3001	158	73	2,800	286	192	339	253	299
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3013	159	73	2,600	288	195	341	255	298
3014	158	73	2,600	288	196	341	256	298
3015	159	73	2,600	288	196	341	255	298
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3084	157	72	1,700	282	209	341	255	289
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3099	155	72	1,600	276	209	334	252	287
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3102	155	72	1,500	275	209	333	250	286
3103	155	72	1,500	274	209	332	250	286
3104	155	72	1,500	274	209	332	250	286
3105	154	72	1,500	273	208	331	249	285
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3114	153	72	1,400	269	207	327	245	282
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3136	147	72	1,200	259	203	317	232	269
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3146	144	72	1,100	254	200	313	226	263
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3271	123	71	0,201	205	189	288	181	216
3272	122	71	0,201	204	189	288	180	216

## APPENDIX 5: Participants



**Danick Power ing.**  
v-p operation  
**Services Polytests inc.**  
450.741.3636  
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Eng. manager  
**Wolf Steel sld**

**Ryan De Rose**  
R&D Lab Technician | Research & Development  
**Wolf Steel sld**

## APPENDIX 6: Drawings and specifications

## APPENDIX 7: Operator's manual

This wood appliance needs periodic inspection and repair. It is against United States federal regulations to operate this wood appliance in a manner inconsistent with the operating instructions in this manual.



# INSTALLATION AND OPERATION MANUAL

## INSTALLER:

Leave this manual with the appliance.

## CONSUMER:

Retain this manual for future reference.

## SAFETY INFORMATION

### ! WARNING

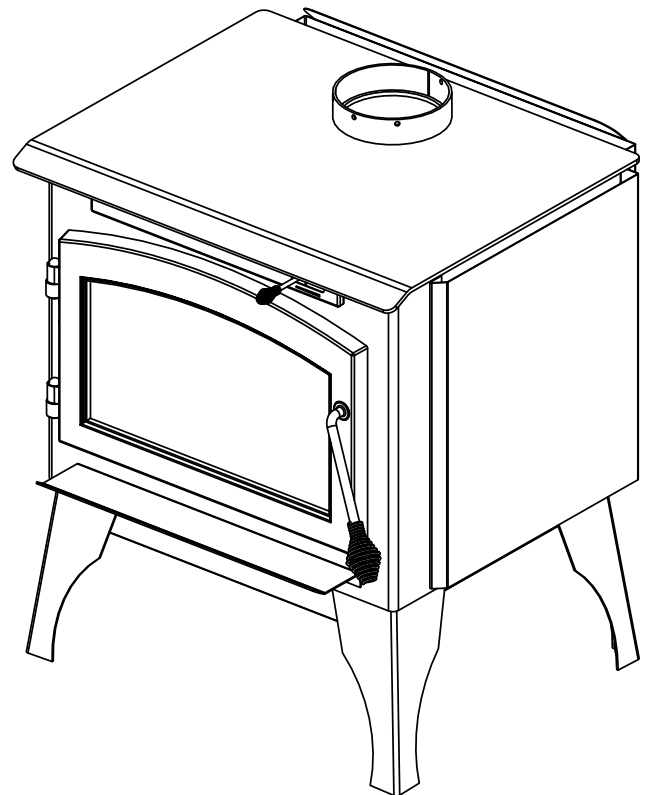
If the information in these instructions are not followed exactly, a fire or explosion may result causing property damage, personal injury or death. Please read the entire manual before you install and use your appliance. This heater has not been tested with an unvented gas log set. To reduce risk of fire or injury, do not install an unvented gas log set into the heater.

- This heater can be very hot when burning.
- Combustible materials such as firewood, wet clothing, etc. placed too close can catch fire.
- Children and pets must be kept from touching the heater when it is hot.
- The chimney must be sound and free of cracks. Before installing this appliance, contact the local building or fire authority and follow their guidelines.
- Operate only with the doors tightly closed.
- Burn wood behind the log retainer directly on the firebricks.
- Do not use an elevated grate or otherwise raise the fire.
- This appliance is designed to burn natural wood only. Higher efficiencies and lower emissions generally result when burning air dried seasoned hardwoods, as compared to softwoods or to green or freshly cut hardwoods.
- Do not start a fire with chemicals or fluids such as gasoline, engine oil, etc.
- Do not burn trash or garbage, lawn clippings/waste, rubber, waste petroleum products, paints or paint thinners/solvents, plastic, materials containing asbestos, construction debris, railroad ties or treated wood, manure or animal remains, salt water driftwood or salted materials, unseasoned wood, coal, charcoal, coloured paper, cardboard, plywood or particleboard. Burning these materials may result in release of toxic fumes or render the appliance ineffective and cause smoke.
- Do not let the appliance become hot enough for any part to glow red.

### Wood Stoves ONLY

- At least 14 squares inches (90.3 square centimeters) of outside air must be admitted to the room or directly to the appliance through a 4" (101.6mm) diameter pipe.
- KEEP THE STOVE TOP TEMPERATURE BELOW 700°F (371°C). Attempts to achieve heat output rates that exceed design specifications can result in steel distortion and damage.

## Timberwolf® Economizer Series (2200-1 leg model illustrated)



### FOR INDOOR USE ONLY

U.S. ENVIRONMENTAL PROTECTION AGENCY (E.P.A.) CERTIFIED TO COMPLY WITH 2020 PARTICULATE EMISSION STANDARDS USING CORD WOOD. THIS APPLIANCE HAS BEEN TESTED BY POLYTESTS AND LISTED BY OMNI-TEST LABORATORIES, INC. TO STANDARDS: CSA B366.2, ULC S627, AND UL1482.



Wolf Steel Ltd., 24 Napoleon Rd., Barrie, ON, L4M 0G8 Canada / 103 Miller Drive, Crittenden, Kentucky, USA, 41030  
Phone 1 (866) 820-8686 • www.timberwolffireplaces.com • ask@timberwolffireplaces.com


## WARNING

- This appliance is hot when operated and can cause severe burns if contacted.
- Any changes or alterations to this appliance or its controls can be dangerous and is prohibited.
- Do not operate appliance before reading and understanding operating instructions. Failure to operate appliance according to operating instructions could cause fire or injury.
- Before installing this appliance, contact the local building or fire authority and follow their guidelines.
- This appliance must be installed by a qualified installer. Never try to repair or replace any part of the appliance unless instructions are given in this manual. All other work should be done by a trained technician.
- Risk of burns. The appliance should be turned off and cooled before servicing.
- Do not operate without fully assembling all components. Do not install damaged, incomplete or substitute components.
- Do not let the appliance become hot enough for any part to glow red.
- Risk of cuts and abrasions. Wear protective gloves, footwear and safety glasses during installation. Sheet metal edges may be sharp.
- All wiring should be done by a qualified electrician and shall be in compliance with local codes. In the absence of local codes, use the current CSA22.1 Canadian Electric Code in Canada or the current National Electric Code ANSI/NFPA No. 70 in the United States.
- If equipped, burning your appliance with the ash dump door ajar creates a fire hazard that may result in discolouration to the door, internal damage to the appliance or a house and/or chimney fire.
- Do not connect this appliance to a chimney flue serving another appliance.
- Clothing or other flammable material should not be placed on or near the appliance. Objects placed in front of the appliance must be kept a minimum of 48" (121.9cm) away from the front face of the appliance.
- Due to high temperatures, the appliance should be located out of traffic and away from furniture and draperies.
- Even after the appliance is off, it will remain hot for an extended period of time.
- Any safety screen or guard removed for servicing must be replaced prior to operating the appliance.
- Under no circumstances should this appliance be modified.
- This appliance must not be connected to a chimney flue pipe servicing a separate solid fuel burning appliance.
- Do not operate the appliance with the glass door removed, cracked or broken. Replacement of the glass should be done by a licensed or qualified service person.
- Do not strike or slam shut the appliance glass door.
- Only doors / optional fronts certified with the appliance are to be installed on the appliance.
- If the appliance is not properly installed, a house fire may result. Do not expose the appliance to the elements (ex. rain, etc.) and keep the appliance dry at all times. Wet insulation will produce an odour when the appliance is used.
- The chimney must be sound and free of cracks. Clean your chimney a minimum of twice a year and as required.
- Children and adults should be alerted to the hazards of high surface temperature and should stay away to avoid burns or clothing ignition.
- Young children should be carefully supervised when they are in the same room as the appliance. Toddlers, young children and others may be susceptible to accidental contact burns. A physical barrier is recommended if there are at risk individuals in the house. To restrict access to an appliance or stove, install an adjustable safety gate to keep toddlers, young children and other at risk individuals out of the room and away from hot surfaces.
- Ensure you have incorporated adequate safety measures to protect infants/toddlers from touching hot surfaces.
- Check with your local hearth specialty dealer for safety screens and hearth guards to protect children from hot surfaces. These screens and guards must be fastened to the floor.
- Keep the packaging material out of reach of children and dispose of the material in a safe manner. As with all plastic bags, these are not toys and should be kept away from children and infants.
- Do not start a fire with chemicals or fluids such as gasoline, engine oil, etc.



 **WARNING**

- Your appliance requires periodic maintenance and cleaning. Failure to maintain your appliance may lead to smoke spillage in your home.
- Ashes must be disposed in a metal container with a tight lid and placed on a non-combustible surface well away from the home or structure until completely cool.
- Ensure clearances to combustibles are maintained when building a mantel or shelves above the appliance. Elevated temperatures on the wall or in the air above the appliance can cause melting, discolouration or damage to decorations, a T.V. or other electronic components.

 **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 chemicals including carbon monoxide, which are known to the State of California to cause birth defects or other reproductive harm. For more information, go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**For wood appliances:**

- Lower emissions generally result when burning air dried seasoned hardwoods, as compared to softwoods or too green or freshly cut hardwoods. Burning wet unseasoned wood can cause excessive creosote accumulation. When this is ignited it can cause a chimney fire that may result in a serious house fire.
- This appliance is designed to burn natural wood only. Do not burn trash or garbage, lawn clippings / waste, rubber, waste petroleum products, paints or paint thinners / solvents, plastic, materials containing asbestos, construction debris, railroad ties or treated wood, manure or animal remains, salt water driftwood or salted materials, unseasoned wood, coal, charcoal, coloured paper, gift wrapping, cardboard, plywood or particleboard. Burning these materials may result in release of toxic fumes or render the appliance ineffective and cause smoke.
- Burn wood directly on the firebricks. Do not elevate grate or otherwise raise the fire.
- Do not store wood within appliance installation clearances or within the space required for re-fueling and ash removal.
- If equipped, the catalyst must be installed and in good working order. It is recommended that the catalyst is inspected at least three times per heating season.

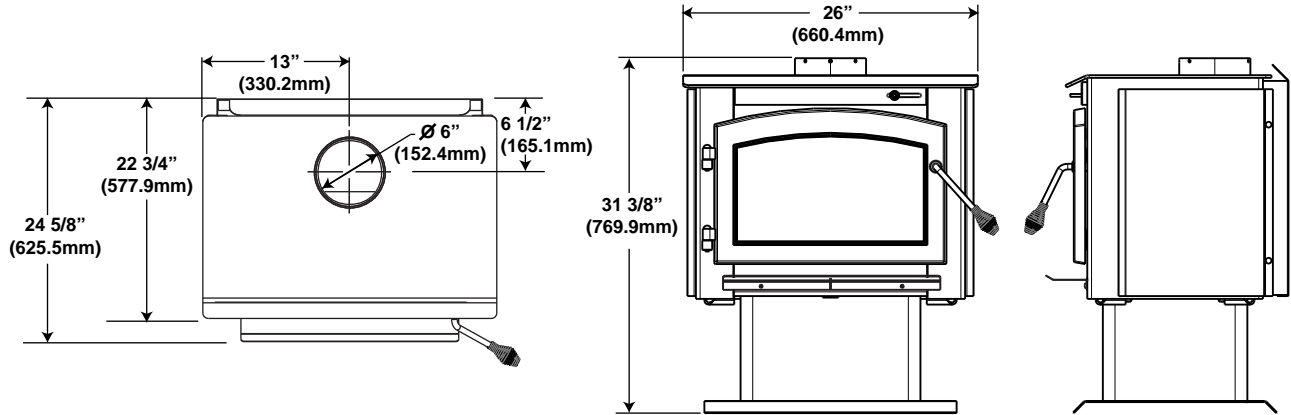
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## note:

The information throughout this manual is believed to be correct at the time of printing. Wolf Steel Ltd. reserves the right to change or modify any information within this manual at any time without notice. Changes, other than editorial, are denoted by a vertical line in the margin.

1.1 dimensions



1.2 specifications

Specifications	2200-1
Width	26" (660mm)
Depth	24 5/8" (549mm)
Flue center line to rear	6 1/2" (165mm)
Flue center line to side	13" (330mm)
Height pedestal model	29 7/8" (759mm)
Height leg model	31 3/8" (800mm)
Chamber (D.W.H)	14 5/8" x 20 7/8" x 11 5/8" (372mm x 530mm x 295mm)
Capacity	1.9 cubic feet (0.05 cubic meters)
Approx. area heated**	800-1800 square feet (74-167m <sup>2</sup> )
Maximum heat output***	53,127 BTU /Hr
Heat output*	12,944 - 53,127 BTU /Hr
Duration low fire**	8 hours
Weight w/o bricks	210 lbs (95kg)
Weight of bricks	60 lbs (27kg)
Ideal wood length	16" (406mm)
Efficiency Standard	B415.1-10

\* As tested using test method ALT-125.

\*\* Figures will vary considerably with individual conditions.

\*\*\* Wolf Steel Ltd. estimated realistic BTU/hr with hardwood logs and regular refueling.



## 1.3 general instructions

### WARNING

- All wiring should be done by a qualified electrician and shall be in compliance with local codes. In the absence of local codes, use the current CSA C22.1 Canadian Electric Code (in Canada) or the ANSI / NFPA N° 70 National Electric Code in the United States.
  - Burning your appliance with the ash well open or the ash door ajar creates a fire hazard and may cause internal damage to the appliance or a house and/or chimney fire.
  - Do not connect this appliance to a chimney flue serving another appliance. Do not connect to any air distribution duct or system.
  - Provide adequate clearance for servicing and operating the appliance.
  - Provide adequate ventilation.
  - Never obstruct the front opening of the appliance.
  - Objects placed in front of the appliance must be kept a minimum of 48" (121.9cm) from the front face of the appliance.
  - Do not install in a mobile home.
- 
- Before beginning your installation, consult with your local building code agency or fire officials and insurance representative to ensure compliance.
  - Non-toxic smoke will be emitted during the paint curing process, to help dissipate the smoke open a window near the appliance.
  - Remove any dust or debris off the top of the appliance before firing the appliance as the paint will become soft as the appliance heats up and will harden as the appliance cures. To cure the paint on your appliance burn your appliance moderately hot during the first few fires.
  - To keep the gasket from sticking to the appliance as the paint is curing, periodically open the door every 5-10 minutes.
  - For the first two weeks use generous amounts of fuel and burn the appliance with the damper wide open for an hour as the appliance goes through a process of eliminating moisture in the steel and firebricks. The initial heat output will be reduced while the moisture is being drawn from the appliance and it will be necessary to build several hot fires to remove this moisture. **DURING THIS PROCESS DO NOT OVERFIRE THE APPLIANCE. REDUCE THE AMOUNT OF AIR COMING INTO THE APPLIANCE IF THE APPLIANCE OR CHIMNEY BECOMES RED.**

## 1.4 general information

### **! WARNING**

- Do not operate this appliance without the legs or pedestal installed.

This appliance was specifically designed over many months of research to meet the 2020 U.S.A. EPA particulate emission standards and has been extensively tested in Canadian and American laboratories. This system is the most efficient, simple and trouble-free we know and works as follows:

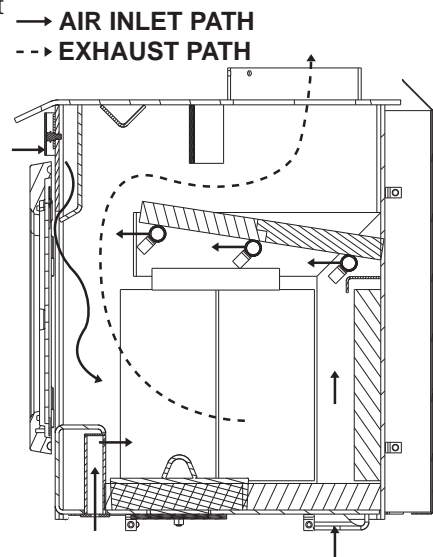
Secondary air from the rear hole travels up the back in the secondary air housing to the manifold located at the top and shoots out laterally to oxidize the gases below the smoke exit.

The lower combustion chamber is lined with high temperature firebricks on 2 sides, the back and across the bottom, with a layer of fibre baffles at the top to maintain a high temperature in the combustion chamber so that gases mixing with the preheated air from the secondary air manifold tube are easily ignited and burned. The appliance sides and back are shielded to direct the heat upwards and forwards into the room.

Be sure to provide sufficient combustion air. There are many other appliances in your home competing for air such as: a kitchen range hood, forced air heating devices, clothes dryer or a bathroom exhaust fan.

After extended periods of non-operation such as following a vacation or a warm weather season, the appliance may emit a slight odour for a few hours. This is caused by dust particles on the firebox burning off. Open a window to sufficiently ventilate the room.

If you experience smoking problems, you may need to open a door, a window or otherwise provide some method of supplying combustion air to the appliance.



## 1.5 EPA compliance

**Do not use makeshift compromises during installation. Do not block or restrict air, grille or louvre openings! Do not add a hood.**

**Burning your appliance with the door open or ajar creates a fire hazard that may result in a house and/or chimney fire.**

**All venting connections must be in compliance with the chimney manufacturers installation instructions. Clearances referred to throughout this manual are the minimum requirements.**

**Your appliance must be installed in accordance with all national and local building code standards and the standard of Chimney and Appliances, Vents and Solid Fuel Burning Appliances NFPA #211. Consult the authority having jurisdiction (such as municipal building department, fire department, fire prevention bureau, etc.) to determine the need to obtain a permit. If you are in doubt about the proper installation for your situation, contact your dealer or local building or fire official. The manufacturer does not guarantee that this appliance and its options will completely heat your entire home.**

**Expansion / contraction noises during heating up and cooling down cycles are normal and to be expected.**

**It is recommended that in all cases, the appliance be secured to the floor. Use the pallet packing brackets to accomplish this.**



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



# general information

## 1.6 rating plate information

This illustration is for reference only. Refer to the rating plate on the appliance for accurate information

**note:**

The rating plate must remain with the appliance at all times. It must not be removed.

Tested & Listed By:  Portland Oregon USA  
OMNI Test Laboratories, Inc.

**LISTED SOLID FUEL BURNING SPACE HEATER / POËLE À COMBUSTIBLE SOLIDE HOMOLOGUÉE.**  
**TESTED TO: / TESTÉ SELON: UL1482 - 2010 / ULC S627 - 00**  
**MODEL / MODÈLE: 2200**

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. / Ce poêle à bois doit inspection périodique et la réparation pour un fonctionnement correct. Consultez le manuel du propriétaire pour plus d'informations. Il est contre les règlements fédéraux pour faire fonctionner ce poêle à bois d'une manière incompatible avec les instructions de fonctionnement dans le manuel du propriétaire.

**REPORT NO. / NUMÉRO DE RAPPORT 415-S-02-2**

INSTALL AND USE ONLY IN ACCORDANCE WITH WOLF STEEL LTD'S INSTRUCTIONS. CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA. MINIMUM CEILING HEIGHT: 7'11" (2.13m)

**HEARTH EXTENSION / COMBUSTIBLE FLOOR PROTECTION:** IF INSTALLED ON A COMBUSTIBLE FLOOR, UNIT MUST BE PLACED ON A NON-COMBUSTIBLE FLOOR PROTECTOR EXTENDING 18" (455mm) IN FRONT AND 8" (203mm) TO THE SIDES AND BACK.

**CHIMNEY TYPE:** MINIMUM 6" (152mm) DIAMETER LISTED (UL 103HT) RESIDENTIAL CHIMNEY.

**CHIMNEY CONNECTOR:** 6" (152mm) DIAMETER MINIMUM 24 GAUGE STEEL. MINIMUM CLEARANCE FROM HORIZONTAL CONNECTOR AND CEILING 18" (455mm). DO NOT OBSTRUCT SPACE UNDER HEATER. SPECIAL METHODS ARE REQUIRED WHEN PASSING A CHIMNEY THROUGH A WALL OR CEILING. SEE INSTRUCTIONS AND BUILDING CODES. DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

**FUEL:** FOR USE WITH SOLID WOOD FUEL ONLY. DO NOT USE GRATE OR ELEVATE FIRE. BUILD WOOD FIRE DIRECTLY ON HEARTH.

**WARNING:** RISK OF SMOKE SPILLAGE. OPERATE ONLY WITH DOOR FULLY CLOSED. REPLACE GLASS ONLY WITH CERAMIC GLASS. DO NOT OVERFIRE. IF HEATER OR CHIMNEY CONNECTORS GLOW, YOU ARE OVERFIRING. INSPECT AND CLEAN CHIMNEY FREQUENTLY. UNDER CERTAIN CONDITIONS OF USE CREOSOTE BUILD-UP MAY OCCUR RAPIDLY.

**OPTIONAL LEGS:** IF TO BE INSTALLED WITH OPTIONAL LEGS, LEGS MUST BE INSTALLED PRIOR TO OPERATION.

**OPTIONAL BLOWER KIT:** EP-65, 115V, 60HZ, 0.82AMP. ROUTE CORD AWAY FROM UNIT.

**DANGER:** RISK OF ELECTRICAL SHOCK. DISCONNECT POWER BEFORE SERVICING UNIT.

**POUR INSTALLATION ET UTILISATION CONFORMÉMENT AUX INSTRUCTIONS DE WOLF STEEL LTD. RENSEIGNEZ-VOUS AUPRÈS DES AUTORITÉS LOCALES DU BÂTIMENT OU DU SERVICE DES INCENDIES AU SUJET DES RESTRICTIONS ET DES INSPECTIONS D'INSTALLATION DANS VOTRE RÉGION.**  
**HAUTEUR DE PLAFOND MINIMAL 7' (2,13m).**  
**PROLONGEMENT D'ÂTRE / PROTECTION DU PLANCHER COMBUSTIBLE:** SI INSTALLÉ SUR UN PLANCHER COMBUSTIBLE, L'APPAREIL DOIT ÊTRE PLACÉ SUR UNE PLAQUE PROTECTRICE INCOMBUSTIBLE S'ÉTENDANT SUR 18" (455mm) À L'AVANT ET 8" (203mm) À L'ARRIÈRE ET SUR LES CÔTÉS.  
**TYPE DE CHIMÉE:** CHIMÉE RÉSIDENNELLE DE 6" DE DIAMÈTRE (152 mm) HOMOLOGUÉE (UL 103HT).  
**RACCORD DE CHIMÉE:** DIAMÈTRE DE 6" (152mm) D'ACIER DE CALIBRE 24. MINIMUM 18" (455mm) DE DÉGAGEMENT MINIMAL ENTRE LE RACCORD HORIZONTAL ET LE PLAFOND. NE RIEN ENTREPOSER SOUS L'APPAREIL. DES MÉTHODES SPÉCIALES SONT REQUISES LORSQUE LA CHIMÉE TRAVERSE UN MUR OU UN PLAFOND. VOIR LES INSTRUCTIONS ET LES CODES DU BÂTIMENT. NE PAS RACCORDER À LA CHIMÉE D'UN AUTRE APPAREIL.  
**COMBUSTIBLE:** POUR USAGE AVEC LE BOIS SEULEMENT. N'UTILISEZ PAS DE CHENET OU NE SURELÈVEZ PAS LE BOIS. PRÉPAREZ LE FEU DIRECTEMENT SUR L'ÂTRE.  
**AVERTISSEMENT:** RISQUE D'ÉCHAPPEMENT DE FUMÉE. TENIR LA PORTE FERMÉE LORSQUE LE POËLE FONCTIONNE. REMPLACEZ LA VITRE PAR UNE VITRE EN CÉRAMIQUE SEULEMENT. NE SURCHAUFFEZ PAS L'APPAREIL. SI L'APPAREIL OU LES RACCORDS ROUGEOTENT, L'APPAREIL SURCHAUFFÉ. INSPECTEZ ET NETTOYEZ LA CHIMÉE FREQUÉMENT. DANS CERTAINES CONDITIONS, DES DÉPÔTS DE CREOSOTE PEUVENT SE FORMER RAPIDEMENT.  
**PATTES OPTIONNELLES:** SI LES PATTES OPTIONNELLES SONT INSTALLÉES, ELLES DOIVENT ÊTRE INSTALLÉES AVANT DE FAIRE FONCTIONNER L'APPAREIL.  
**SOUFFLERIE OPTIONNELLE:** EP-62, 115V, 60HZ, 0.82A. TENEZ LE CORDON ÉLECTRIQUE LOIN DE L'APPAREIL.  
**DANGER:** RISQUE DE SECOURS ÉLECTRIQUE. DÉBRANCHEZ AVANT DE PROCÉDER À L'ENTRETIEN.



	PARALLÈLE & CORNER / PARALLÈLE & COÛN	SINGLE WALL CONNECTOR / TUYAU DE RACCORDEMENT À PAROI SIMPLE	DOUBLE WALL CONNECTOR / TUYAU DE RACCORDEMENT À PAROI DOUBLE
Backwall / mur de côté (A)	19" (48.3cm)	19" (48.3cm)	19" (48.3cm)
Side wall / mur de côté à la base (B)	28 7/8" (73.3cm)	28 7/8" (73.3cm)	28 7/8" (73.3cm)
Backwall / mur arrière (C)	7 1/2" (44.5cm)	12 1/2" (81.8cm)	12 1/2" (81.8cm)
Backwall height / mur arrière à la base (D)	21" (53.3cm)	18" (45.7cm)	18" (45.7cm)
Clearance / coin (E)	11" (279mm)	7" (178mm)	7" (178mm)
Ceiling / plafond (F)	84" (213.4cm)	75" (190.5cm)	75" (190.5cm)
	ALCOVE / ALCÔVE		
Ceiling / plafond (G)	N/A	N/A	75" (190.5cm)
<b>MINIMUM FLOOR PROTECTION / PROTECTION MINIMAL DU PLANCHER</b>			
	FRONT / DEVANT (H)	SIDES / CÔTÉS (I)	BACK / ARRIÈRE (J)
CANADA	18" (45.7cm)	8" (203mm)	8" (203mm)
USA / É.U.	18" (45.7cm)	8" (203mm)	8" (203mm)

Clearances can be reduced with shielding acceptable to local authorities. Reduced installation must comply with NFPA 211 or CAN/CSA-B365. / Il est possible de réduire les dégagements à l'aide d'un protecteur conforme aux normes des autorités locales. Une installation réduite doit être conforme aux normes NFPA 211 ou au CAN/CSA B365.

MANUFACTURE DATE: / DATE DE FABRICATION:  
 YEAR:  2015  2016  2017  2018  2019  2020  
 MONTH:  1  2  3  4  5  6  7  8  9  10  11  12



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

**ATTENTION:** QUAND L'APPAREIL FONCTIONNE, LA SURFACE DEVIENT CHAUDE. NE PAS TOUCHER. TENIR LES ENFANTS, LES VÊTEMENTS ET LES MEUBLES À L'ÉCAR. LE CONTACT PEUT CAUSER DES BRÛLURES À LA PEAU. VOIR LA PLAQUE D'HOMOLOGATION ET LES INSTRUCTIONS.

**U.S. ENVIRONMENTAL PROTECTION AGENCY** Certified to comply with 2020 particulate emission standards using cordwood. Certifié conforme à la norme d'émission de particules de 2020 en utilisant bois de corde. 40 CFR Part 60, Subpart AAA  
 2.25 Grams Per Hour / 2020 Cordwood / 2.25 Grammes par heure / Bois de Corde 2020

**WOLF STEEL LTD.**  
 24 NAPOLEON ROAD, BARRIE, ON,  
 L4M 0G8 CANADA

**NAC GUANGZHOU P.R.C.**  
 NO.69 HEFENG ROAD, GUANGZHOU, CHINA

**2200** W385-2028 / A

## 2.1 appliance placement

Have an authorized dealer install the appliance. If you install the appliance yourself, have your dealer review your installation plans and/or installation. Draw out a detailed plan of the installation including dimensions and verify the dimensions with the requirements listed in this manual.

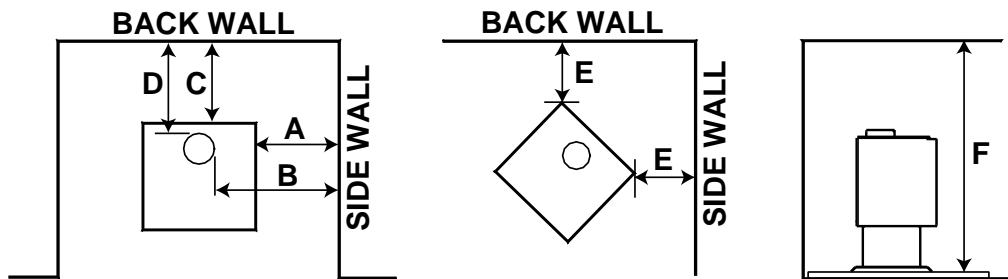
You may wish to adjust the appliance position slightly to ensure the vent does not intersect with a framing member. Appliance must be positioned so that no combustibles are within, or can swing within (e.g. drapes, doors), 48" (121.9cm) of the front of the appliance.

**Inserts only:** This appliance is equipped with levelling screws, level the appliance before installing into the final position. Levelling the appliance will eliminate rocking or excessive noise when the fan is in operation. Once the appliance is level, move it partially into place to allow for all connections to be made. It is not practical to level the appliance once it has been installed. Determine the required depth prior to installing the appliance and adjust the levelling screws accordingly.

## 2.2 minimum clearance to combustibles

### **! WARNING**

- Do not install into any area having less than 7 feet (2.1m) (ceiling to appliance bottom, excluding hearth height).

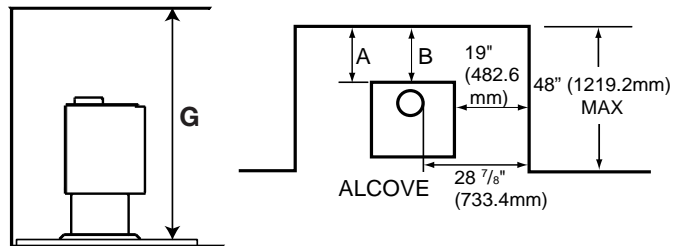


PARALLEL & CORNER	SINGLE WALL CONNECTOR	DOUBLE WALL CONNECTOR
Sidewall (A)	19" (48.3cm)	19" (48.3cm)
Sidewall to flue (B)	28 7/8" (73.3cm)	28 7/8" (73.3cm)
Backwall (C)	17 1/2" (44.5cm)	12 1/2" (31.8cm)
Backwall to flue (D)	21" (53.3cm)	16" (40.6cm)
Corner (E)	11" (279mm)	7" (178mm)
Ceiling (F)	84" (213.4cm)	75" (190.5cm)

Clearances can be reduced with shielding acceptable to local authorities. Reduced installation must comply with NFPA 211 or CAN/CSA-B365.

## 2.3 alcove installation

Your appliance may be installed, using a listed double wall connector, such as Security DL6 in Canada, the Simpson Duravent Plus DVL in the USA or an equivalent double wall connector, into an alcove having a depth of no more than 4 feet and a height of at least 6'3". The minimum clearances are as shown.



ALCOVE		
PARALLEL & CORNER	SINGLE WALL CONNECTOR	DOUBLE WALL CONNECTOR
Ceiling (G)	N/A	75" (190.5cm)

**NOTE: Minimum width 64" (162.6cm), Minimum depth 32" (81.3cm)**

# installation planning

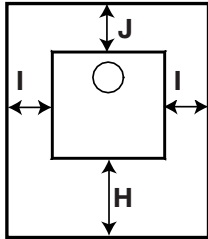
## 2.4 floor protection

If the appliance is to be installed on top of a combustible floor, it must be placed on an approved non-combustible hearth pad, that extends 8" (203mm) beyond the appliance sides and back and 18" (45.7cm) to the front. The reduced clearance from the back of the appliance may result in the appliance pad terminating shorter than 8" (203mm) beyond the appliance.

**note:**

Floor protection is required for spark and ash shielding, but not for limiting floor temperatures from the radiant heat of the appliance. The appliance was designed and safety-tested so that without any protection, the floor would not overheat.

Refer to local building codes for suitable floor protection materials.



MINIMUM FLOOR PROTECTION			
	FRONT (H)	SIDES (I)	BACK (J)
CANADA	18" (45.7cm)	8" (203mm)	8" (203mm)
USA	16" (40.6cm)	8" (203mm)	8" (203mm)

**note:**  
If a section of horizontal chimney connector is used, floor protection is required under the chimney connector and 2" (51mm) beyond each side.

## 2.5 outside air

The following are signs that fresh air may be required:

- When there is combustion present: Wood burns poorly, smoke spills, back-draft takes place and your chimney does not draw steadily.
- In the winter there is too much condensation on the windows.
- Opening a window seems to alleviate the above symptoms.
- A ventilation system is installed in the house.
- Other devices are present that exhaust house air.
- The house has tight fitting windows and/or is equipped with a well-sealed vapour barrier.

Systems such as HRV's are designed to bring fresh air into your home and will resolve these related performance issues with your appliance.

**! WARNING**

- Wear gloves, protective footwear and safety glasses for protection.
- Carefully follow the instructions for assembly of the pipe and other parts needed to install the appliance. Failure to do so may result in a fire, especially if combustibles are too close to the appliance or chimney and air spacers are blocked, preventing the free movement of cooling air.
- Do not draw outside air from garage spaces. Exhaust products of gasoline engines are hazardous. Do not install outside air ducts such that the air may be drawn from attic spaces, basements or above the roofing where other heating appliances or fans and chimneys exhaust or utilize air. These precautions will reduce the possibility of appliance smoking or air flow reversal. The outside air inlet must remain clear of leaves, debris, ice and/or snow. It must be unrestricted while appliance is in use to prevent room air starvation which can cause smoke spillage and an inability to maintain a fire. Smoke spillage can also set off smoke alarms.
- Negative pressure within your home may inadvertently affect your appliance.
- To prevent contact with sagging or loose insulation, the appliance must not be installed against vapour barriers or exposed insulation. Localized overheating could occur and a fire could result.
- Do not use makeshift compromises during installation. Do not block or restrict air, grille or louvre openings. Do not add a hood.
- To prevent personal injury, keep hand tools in good condition, sharpen cutting edges and make sure tool handles are secure.
- Always maintain the minimum air space required in the enclosure to prevent fires.
- Check with local building officials for any permits required for installation of this appliance and notify your insurance company prior to proceeding.

**3.1 chimney****! WARNING**

- Never install a single wall slip section or smoke pipe in a chase structure. The higher temperature of this single wall pipe may radiate sufficient heat to combustible chase materials to cause a fire.
- Do not connect this appliance to a chimney system serving another appliance.
- To avoid danger of fire, all instructions must be strictly followed, including the provision of air space clearance between chimney system and enclosure. To protect against the effects of corrosion on those parts exposed to the weather, we recommend that the chase top be painted with a rust-resistant paint.
- Do not fill any framed space around the chimney with insulation or any other material. Insulation placed in this area could cause adjacent combustibles to overheat.
- Maintain a minimum 2" (51mm) air clearance to all parts of the chimney system at all times (this excludes the chimney connection). Failure to maintain this 2" (51mm) air clearance will cause a structure fire. Never fill this space with any type of material.
- Detailed instructions for installation of the chase top, storm collar and termination cap are packaged with these parts.
- Do not cut rafters or ceiling joists without first consulting a building official to ensure structural integrity is not compromised.
- Firestop spacers must be used whenever the chimney penetrates a ceiling/floor area.
- The total horizontal vent length should not exceed 40% of the chimney height above the appliance all horizontal smoke pipe must slope slightly upwards a minimum of 1/4" (6.4mm) per foot and all connections must be tight and secured by three sheet metal screws equally spaced. An uninsulated smoke pipe shall not pass through an attic, roof space, closet or similar concealed space, or through a floor, ceiling, wall or partition, or any combustible constructions.
- Do not use any makeshift materials during installation.

Your appliance may be connected to a factory built or masonry chimney. If you are using a factory built chimney, it must comply with ULCS629 (Canada) or UL103 (USA) standards. It must therefore be a 6" (152mm) HT Type (2100°F) chimney. It is extremely important that it be installed according to the manufacturer's specifications. The manufacturer's installation instructions and specified clearances should always be followed in accordance with local and national codes. In Canada the CSA B365 and the CSA C22.1 installation codes are to be followed. In the USA the ANSI NFPA 70 and ANSI NFPA 211 installation codes are to be followed.

Chimney and chimney connector must be in good condition and kept clean.

### 3.1.1 chimney connection

Your chimney connector and chimney must have the same diameter as the appliance's exhaust flue outlet. The appliance pipe must be made of aluminized or cold roll steel with a minimum 24 gauge (0.6mm) thickness. It is strictly forbidden to use galvanized steel.

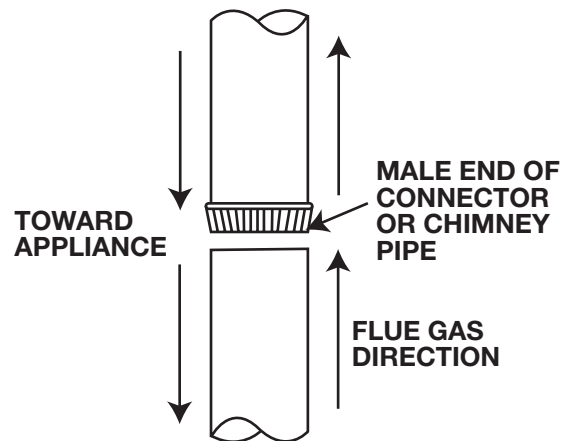
A 6" (152.4mm) diameter single or double wall chimney connector, used to connect the appliance to the chimney, must be installed with the crimped end toward the appliance. This will ensure that the moisture which condenses from the burning wood will flow back into the fire chamber. Each joint in the chimney connector must be secured with at least three sheet metal screws, equally spaced around the circumference.

For installation of your chimney connector, the following recommendations may be useful.

- The chimney connector must be short and straight. For optimum performance, it is recommended that all horizontal runs have a minimum 1/4" (6.4mm) rise per foot (0.3m), with the higher end of the section toward the chimney. For safe and proper operation of the appliance, see "INSTALLATION" instructions.
- To ensure a good draft, the total horizontal length of the connector should never exceed 8' (2.4m) to 10' (3.1m). In the case of vertical installation, the total length of the connector can be longer and connected without problem to the chimney at the ceiling level.
- There should never be more than two 90° elbows in the entire connector and chimney system. Never start with a 90° elbow. Always go up vertically for at least 2 feet (0.6m) from the flue collar before using a 90° elbow.
- The connector must not pass through any combustible material, nor may it pass through a concealed space (such as an attic, roof space, or closet). If passing through a wall, ceiling or into a masonry chimney, use either chimney components listed for that specific use, or means acceptable to local authorities having jurisdiction over the installation.

This appliance must be connected to:

- A chimney complying with the requirements for Type HT chimneys in the Standard for Chimneys, Factory-Built, Residential Type and Building Heating Appliance, or
- A code-approved masonry chimney with a flue liner. Vent the stove into a masonry chimney or an approved, insulated solid-fuel stainless-steel chimney with as short and straight a length of 6" (152.4mm) diameter chimney connector as possible. Connection to a masonry thimble cemented in place.

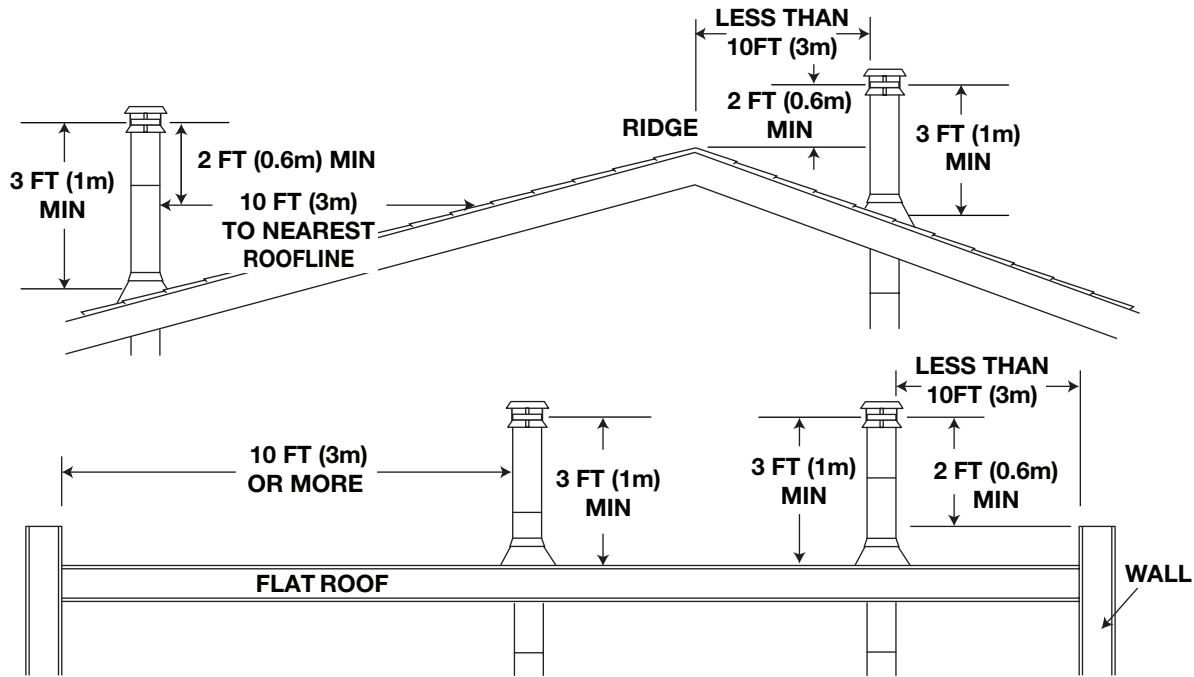




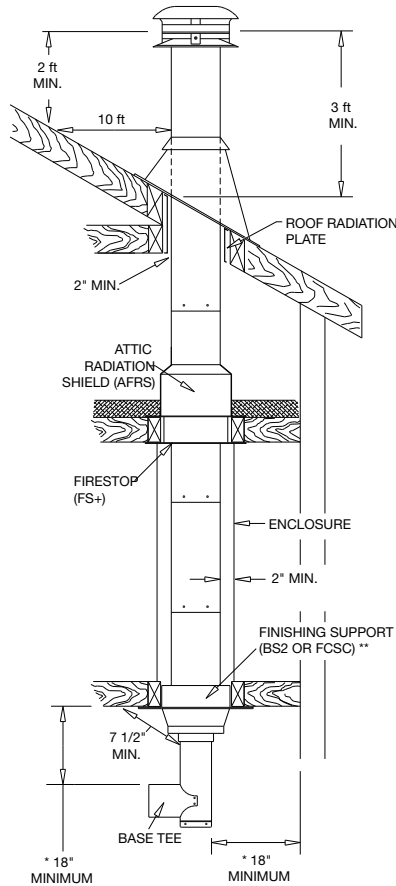
# installation

## 3.1.2 adding sections

Add chimney sections, according to the manufacturers installation instructions. If the chimney system passes through an attic space a rafter radiation shield or attic insulation shield is required. The chimney must extend at least 3ft (0.9m) above its point of contact with the roof and at least 2ft (0.6m) higher than any wall, roof or building within 10ft (3.1m). If the chimney extends more than 5ft (1.5m) above the roof, it must be secured using a roof brace or guide wires. A raincap must be installed to avoid internal damage and corrosion.



**note:**  
This illustration is for wood appliances only.

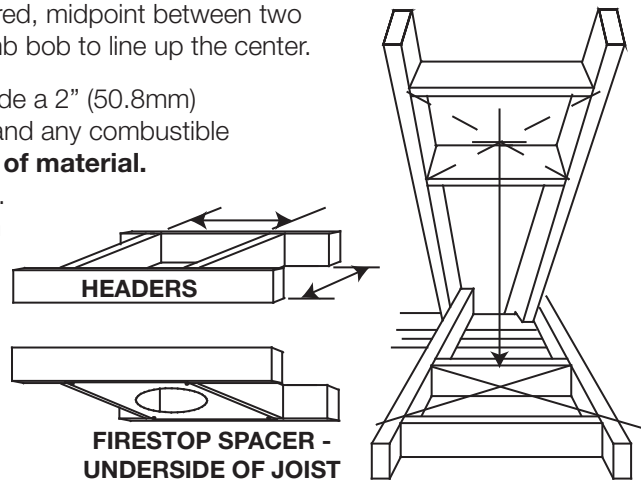


An insulated stainless steel chimney must be supported at the ceiling or roof and its installation must comply with its manufacturer's instructions.

\* CLEARANCE CAN BE REDUCED IF A LISTED CHIMNEY CONNECTOR IS USED.  
\*\* CLEARANCES CAN BE LESS THAN 2" WHERE ESTABLISHED BY THE SUPPORT.

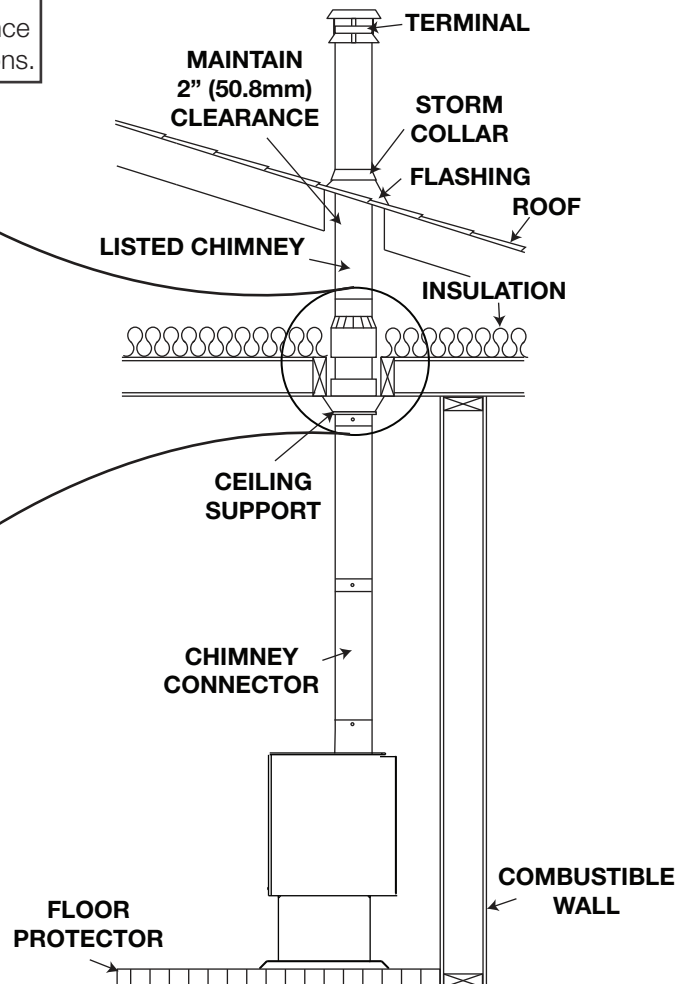
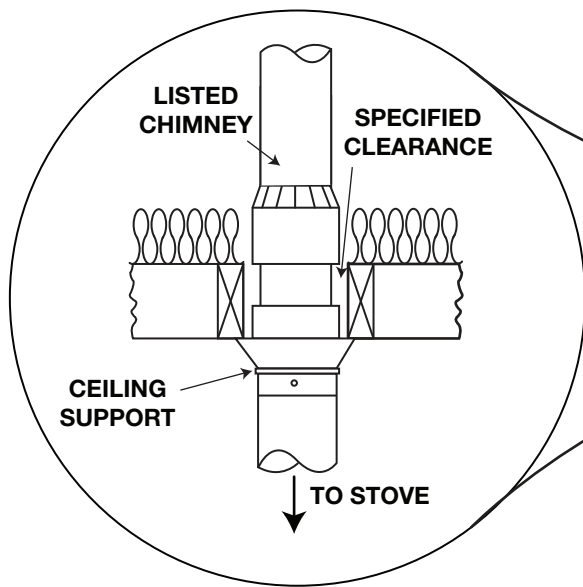
### 3.1.3 typical through the ceiling

- A. Move the stove into position with the flue centered, midpoint between two joists to prevent having to cut them. Use a plumb bob to line up the center.
- B. Cut and frame an opening in the ceiling to provide a 2" (50.8mm) clearance between the outside of the chimney and any combustible material. **Do not fill this space with any type of material.** Nail headers between the joist for extra support. Firestop spacers must be placed on the bottom of each framed opening in any floor or ceiling that the chimney passes through. If your chimney system is enclosed within the attic area, a rafter radiation shield is required.
- C. Hold a plumb bob from the underside of the roof to determine where the opening in the roof should be. Cut and frame the roof opening to maintain proper 2" (50.8mm) clearances.



**note:**

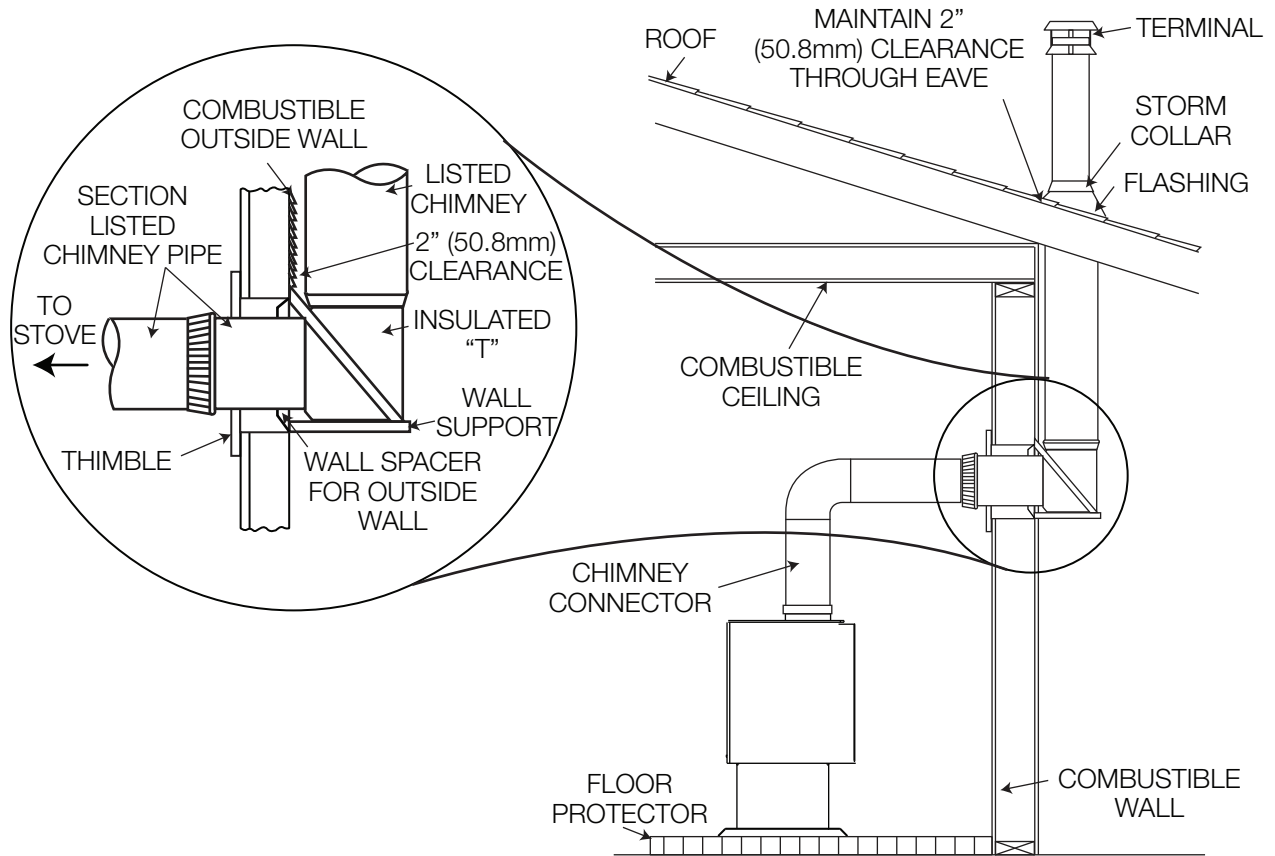
The chimney must be supported at the ceiling or roof so that its weight does not rest on the appliance and must comply with its manufacturer's instructions.



## 3.1.4 typical through the wall

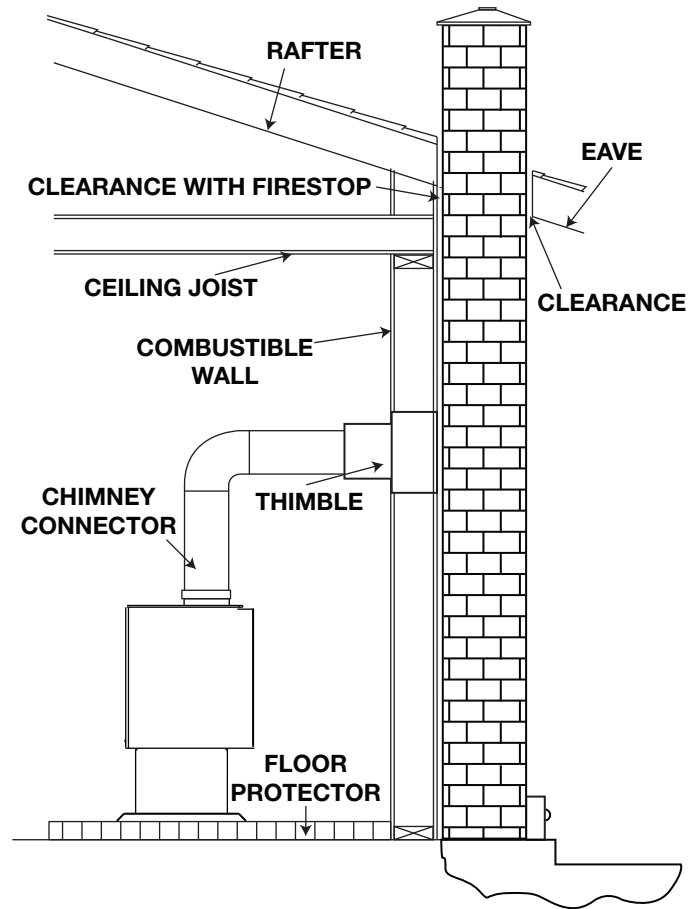
If possible, design the installation so that the connector does not pass through a combustible wall. If during your installation you must pass through a combustible wall, check with your building inspector before you begin. Also check with the chimney connector manufacturer for any specific requirements.

Consult with your dealer regarding special connection components available for use for wall pass-throughs. Use only parts that have been tested and listed for use in a wall pass-through.



### 3.1.5 typical existing masonry

You can also install your appliance using your existing masonry chimney. To do so, use the following guidelines. Use a factory-built thimble, or construct your own brick thimble. If you are using a masonry chimney, it is important that it be built in compliance with the specifications of the Building Code in your region. It must normally be lined with fire clay bricks, metal or clay tiles sealed together with fire cement. (Round flues are the most efficient). The maximum flue size is 8" (203.2mm) x 8" (203.2mm) square or 6" (152.4mm) round. For greater diameters it is necessary to install a 6" (152.4mm) stainless steel liner.



## 4.0 finishing

### 4.1 leg installation

#### **!** WARNING

- Do **not** remove knockout unless installing the optional ash drawer kit.

To avoid being damaged during shipping, the appliance has been bolted to the pallet and must be unbolted before the appliance can be installed.

#### **note:**

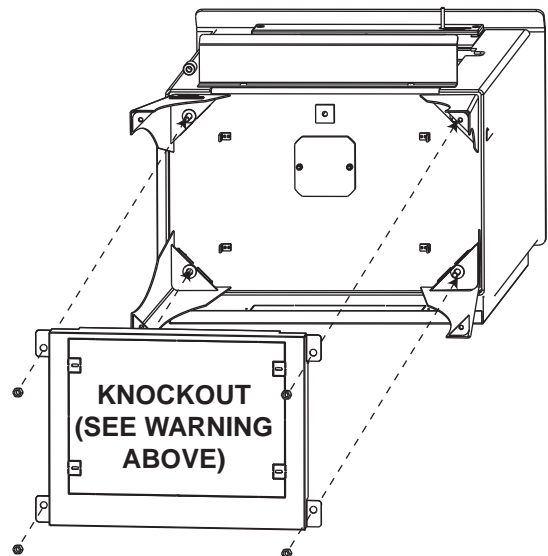
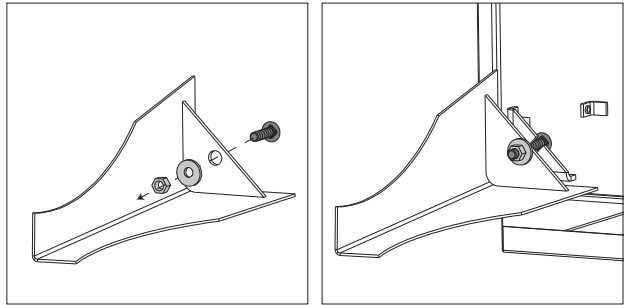
If installing the optional ash drawer, see “optional ash drawer kit (EP20LAD)” section prior to heat shield and leg installation. Legs may need to be adjusted in order to properly align with the heat shield holes.

- A.** With the bolt through the legs, feed the washer and lock washer onto the bolt. Thread the nut a thread or two onto the bolt and slide the leg onto the slot on appliance as illustrated.

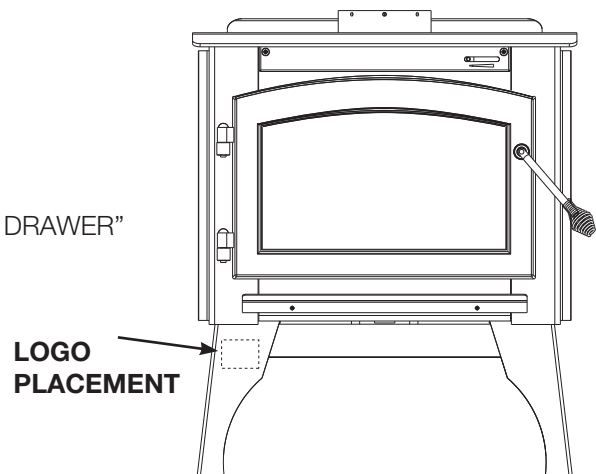
#### **note:**

Bolts must be tight prior to heat shield installation.

- B.** Slide the heat shield over the four bolts. Finally, secure the heat shield in place using the remaining nuts.
- C.** Lift the appliance up and gently set down on all four legs. Do not pivot appliance up on its legs, as this could result in damage to the legs.



For additional logo placement locations, see “OPTIONAL ASH DRAWER” section.



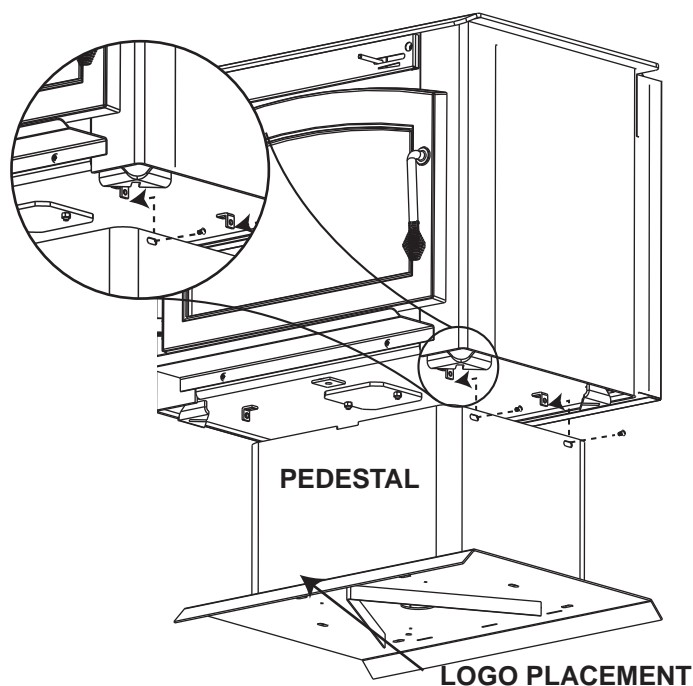
## 4.2 pedestal installation

### note:

If an optional ash drawer kit is to be installed, ensure open side of pedestal is at the front of the appliance. If not, opening should be at the back.

To avoid being damaged during shipping, the appliance has been bolted to the pallet and must be unbolted before the appliance can be installed.

- A. Using the machine screws supplied, secure the pedestal to the four brackets on the bottom of the firebox.
- B. Lift the appliance up and gently set down on pedestal. Do not pivot appliance up as it could result in damage to the pedestal.

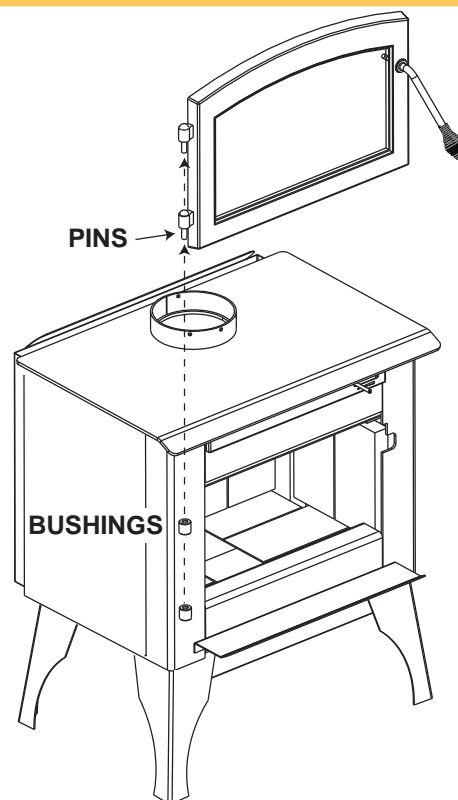


## 4.3 door removal

### ! WARNING

- Burning your appliance in with the doors open or ajar creates a fire hazard that may result in a house and/or chimney fire.
- Do not strike or slam door.
- Never remove the door when the appliance is hot.

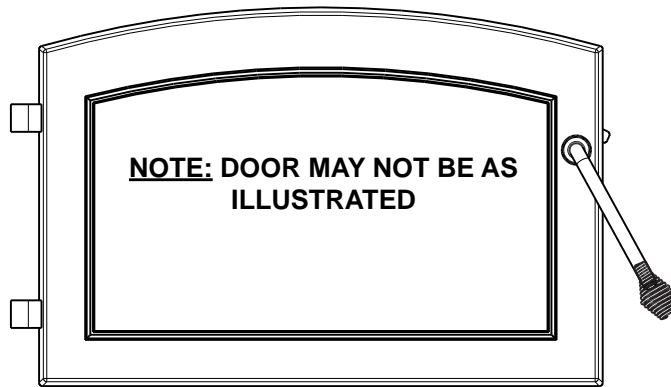
Pivot the door open and lift the door and pins off the bushings. Set the door aside being careful not to scratch the paint.



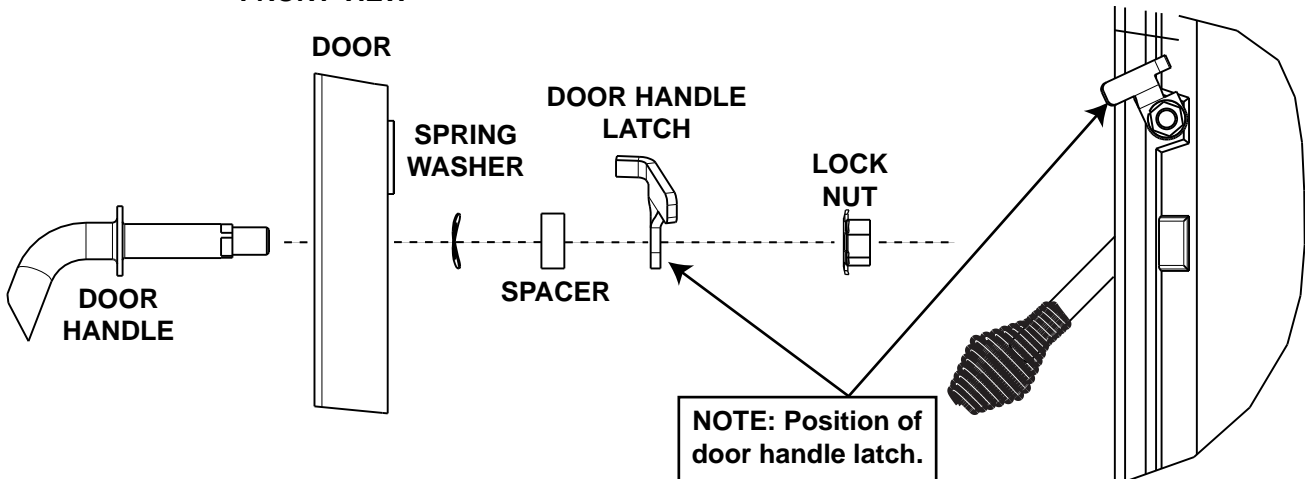
## 4.4 door handle installation

**! WARNING**

- Burning your appliance in with the doors open or ajar creates a fire hazard that may result in a house and/or chimney fire.
- Do not strike or slam door.
- Never remove the door when the appliance is hot.



FRONT VIEW



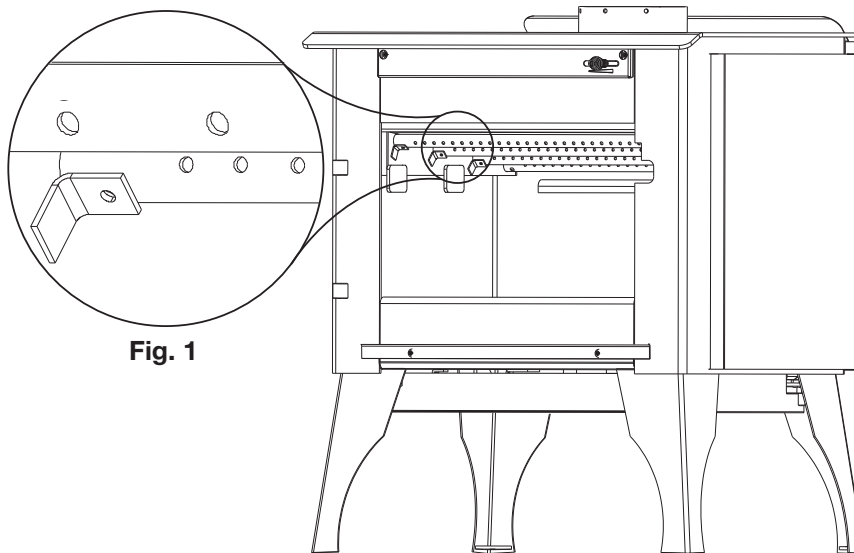
Twist the large wire handle over the end of the handle rod. Twist the smaller wire handle over the end of the air damper rod below the door.

## 4.5 secondary air tubes

1. Start at the back working forwards by sliding the secondary air tube in the firebox and inserting the tube into the hole.
2. Slide the tube into the opposite hole. With the holes on the secondary air tube pointing forward, align the tube with the tube retainer and insert the cotter pin.
3. Spread the cotter pin to retain.

**note:**

There are 4 secondary air tubes. One of the tubes has larger holes. This tube is to be located closest to the front of the appliance (**Fig. 1**).



**Fig. 1**



## 4.6 brick and baffle installation

**! WARNING**

- Operation of the appliance without the baffles can result in excessive temperatures that could damage the appliance, chimney and the surrounding enclosure.

With the appliance and chimney installation completed, move the bricks into place as illustrated below.

- Install the nine (A) bricks and one (B) brick, working from the back of the appliance forward (**Fig. 1**).
- Install four (A) bricks along both sides of the appliance. Install the four (A) bricks and one (E) brick along the back wall by pivoting the bricks up under the brick retainer (**Fig. 1**).

**note:**

Place narrow brick in center.

- Carefully pivot fibre baffles (F) up onto the secondary air tubes as illustrated (**Fig. 2**). Ensure that the top baffles are pushed all the way to the rear of the firebox, leaving a minimum of a 1 inch gap along the front. This will allow the flue gases to escape the firebox. Ensure overlap joint (**Fig 2**) is tight.
- Install the two (D) bricks along the front (**Fig. 1**).

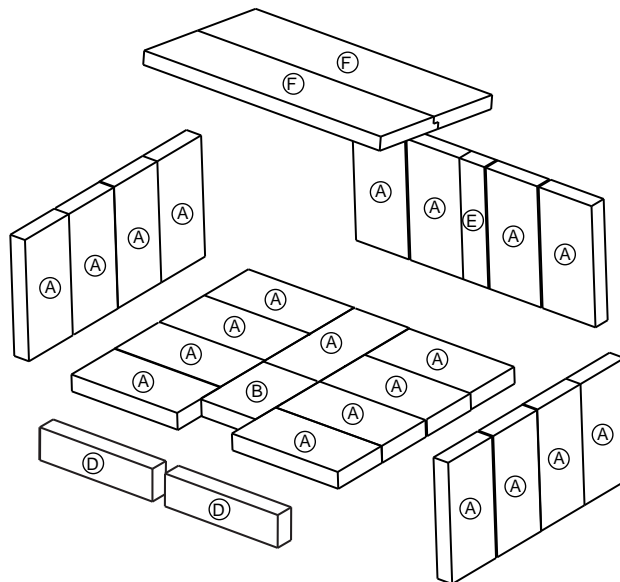


Fig. 1

**note:**

The fibre baffles are shipped in a box inside the firebox and must be removed from all special packaging prior to installation.

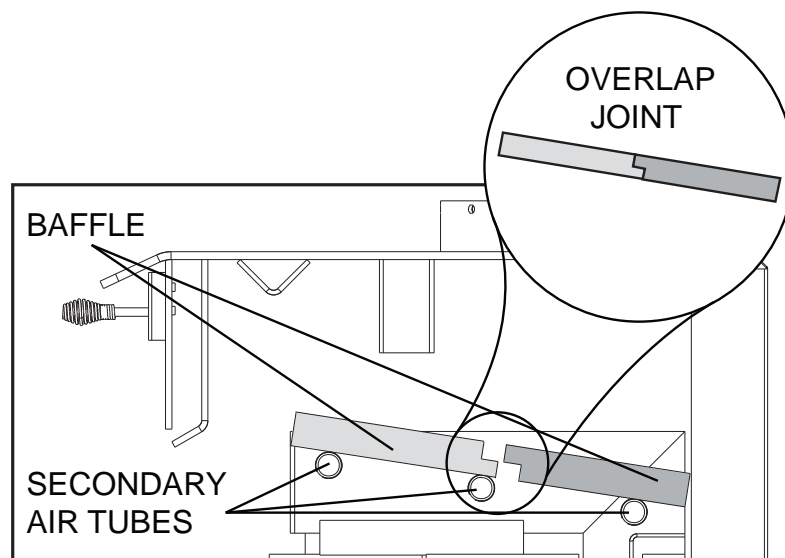
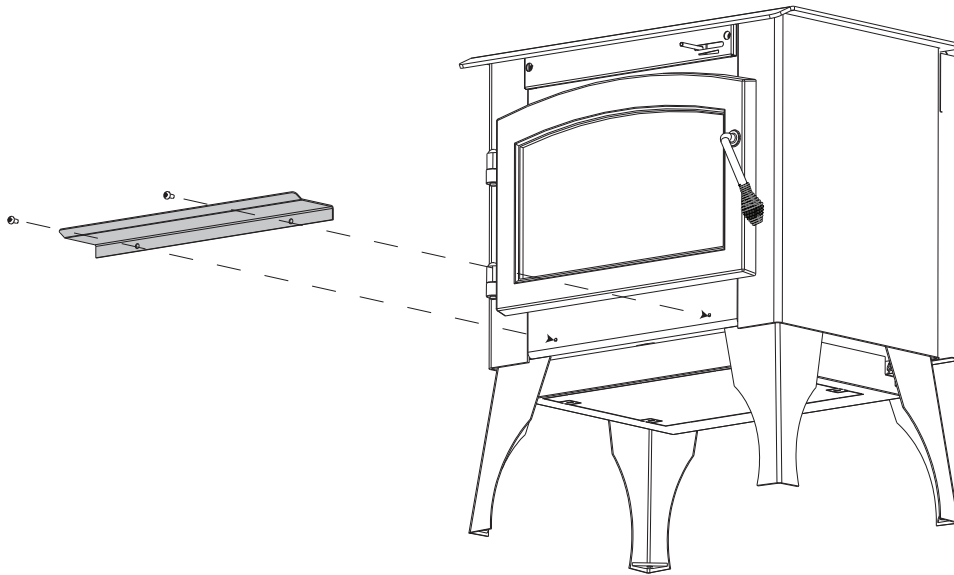


Fig. 2

## 4.7 ash lip installation

To avoid damage during transport, the ash lip has been shipped in the firebox. Using the two screws that secured the appliance to the shipping bracket, attach the ash lip as illustrated.



## 5.0 optional installation

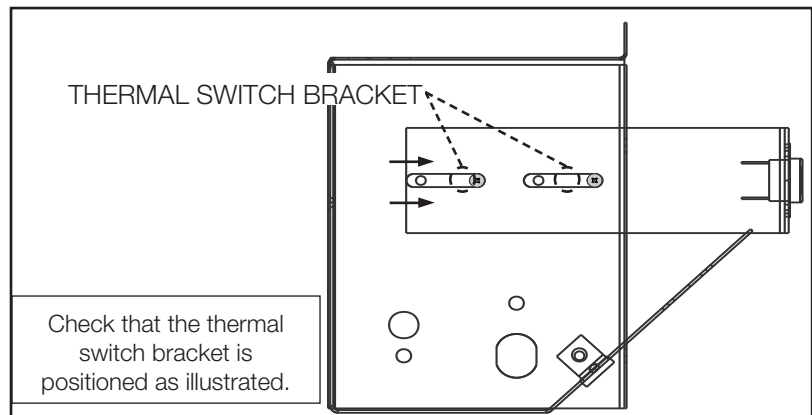
### 5.1 blower kit installation

#### **! WARNING**

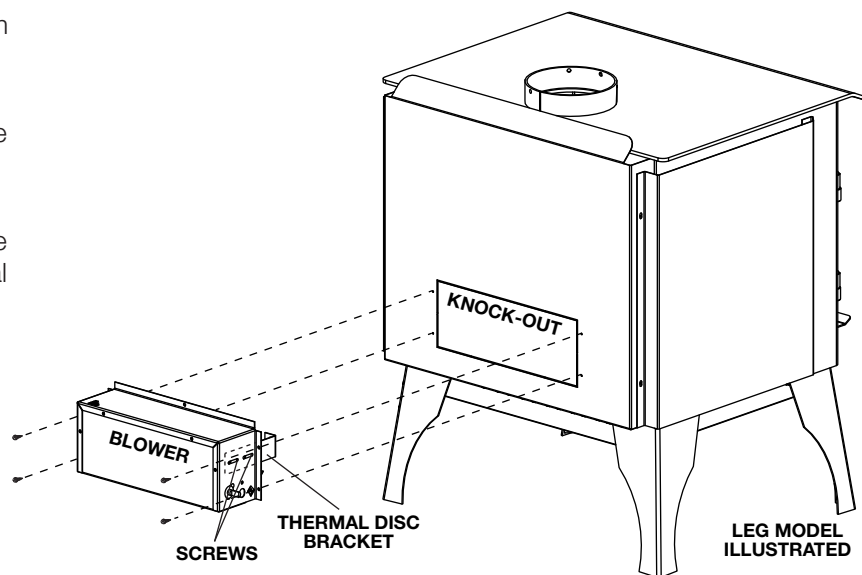
- Risk of fire and electrical shock!
- Turn off the gas and electrical power before servicing this appliance.
- Use only Wolf Steel approved optional accessories and replacement parts with this appliance. Using non-listed accessories (blowers, doors, louvres, trims, gas components, venting components, etc.) could result in a safety hazard and will void the warranty and certification.
- Ensure that the fan's power cord is not in contact with any surface of the appliance to prevent electrical shock or fire damage. Do not run the power cord beneath the appliance.
- The wire harness provided in the blower kit is a universal harness. When installed, ensure that any excess wire is contained, prevent it from making contact with moving or hot objects.

Drywall dust will penetrate into the blower bearings, causing irreparable damage. Care must be taken to prevent drywall dust from coming into contact with the blower or its compartment. Any damage resulting from this condition is not covered by the warranty policy. Use of the blower increases the output of heat.

Provisions have been made on this appliance to install an optional blower kit (EPT70) that comes complete with a variable speed switch to turn the blower ON/OFF, as well as adjusting the blower speed.



- Ensure the thermal disc bracket is in the correct position.
- Remove the knock-out from the back of the appliance.
- Install the blower and housing as shown using the 4 screws supplied.
- Loosen the thermal disc bracket (2 screws) and slide the bracket until the thermal disc is touching the rear of the firebox and secure.



## 5.2 ash drawer kit (EP20LAD)

### ! WARNING

- Failure to achieve a good seal between the ash opening and ash plug will result in an over-fire condition that could cause damage to the appliance.

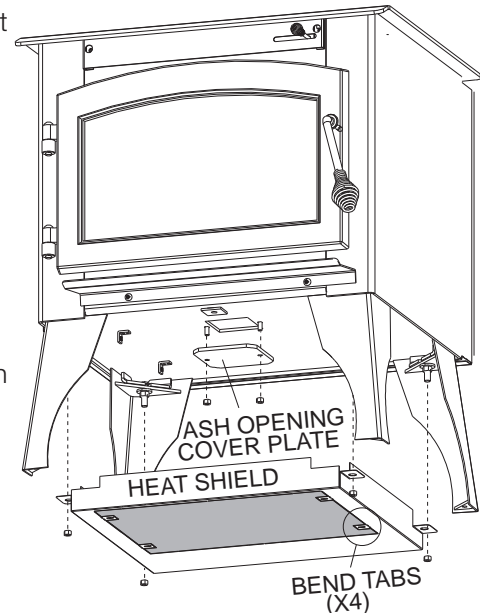
**Provisions have been made on the appliance to install an optional ash drawer kit. The kit allows for convenient removal of excess ash.**

- If the appliance has been previously operated, the appliance must be cold and the ashes must be removed in order to access the ash plug.

#### note:

Place the ash drawer from the kit underneath the appliance to catch falling ashes during the installation.

- From the underside of the appliance, remove the nuts that secures the heat shield and the ash opening cover plate.
- Remove the small light weight brick that is covering the ash opening, and discard. It is important that the area around the ash opening be cleaned well to ensure that a proper seal is created between the new ash plug and the ash opening.
- Once the area surrounding the opening has been cleaned, place the new ash plug (supplied) over the opening.
- Carefully remove the knock out from the heat shield by breaking the micro tabs.
- Bend out the four bend tabs at a 90 ° angle from the heat shield.
- Align the slots in the ash drawer housing with the four bend tabs. Secure using the four screws supplied.
- Secure the heat shield and ash drawer housing to the appliance using the nuts removed in step 2.
- Slide the ash drawer into the ash housing.



# optional installation

## 5.3 ash pan kit (EP20PAD)

### ! WARNING

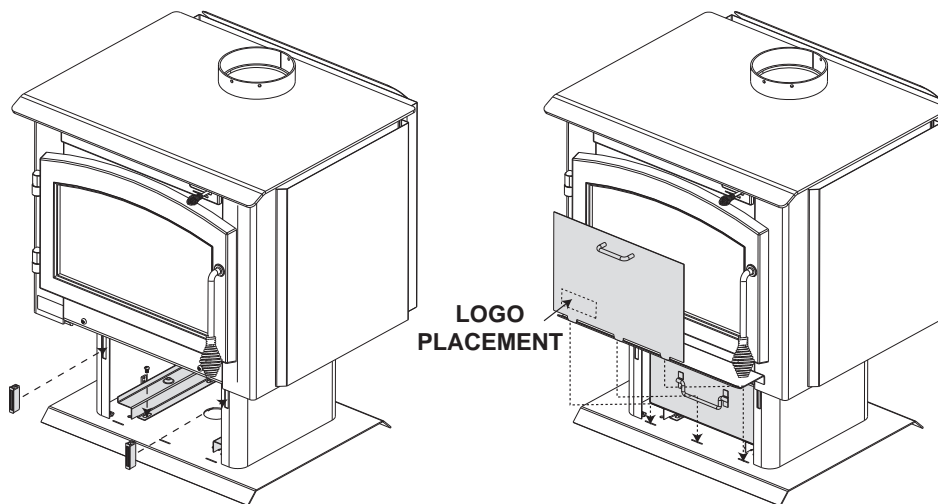
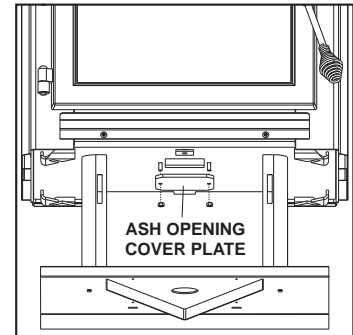
- Failure to achieve a good seal between the ash opening and ash plug will result in an over-fire condition that could cause damage to the appliance.

**Provisions have been made on the appliance to install an optional ash drawer kit.  
The kit allows for convenient removal of excess ash.**

#### note:

It is recommended to install the rails on the pedestal base prior to installing the pedestal assembly to the firebox.

- If the appliance has been previously operated, it must be cold and the ashes must be removed in order to access the ash plug.
- If the pedestal has been installed with the opening to the back, it will be necessary to lay the appliance onto its back, remove the pedestal and re-install it with the opening to the front. It is recommended all fire brick, including baffles, be removed prior to placing the appliance on its back.
- From the underside of the appliance, remove the nuts that secure the ash opening cover plate.
- Install the ash pan rails using the screws provided.
- Snap the magnets into place.
- Slide the ash drawer into the ash housing.
- Install the handle using the screws provided and affix the logo to the ash pan housing cover as illustrated.
- Place the ash pan housing cover in front of the opening, engaging it into the slots.
- Remove the small light weight brick that was covering the ash opening and discard. It is important that the area around the ash opening be cleaned well to ensure that a proper seal is created between the new ash plug and the ash opening.
- Once the area surrounding the opening has been cleaned, place the new ash plug (supplied) over the opening, allowing the protrusion on the brick to recess into the opening on the bottom of the firebox.



## WARNING

- Always operate this appliance with the door closed and latched except during startup and re-fueling. Always wear gloves to prevent injury. Do not leave the fire unattended when the door is unlatched as unstable wood could fall out of the fire chamber creating a fire hazard to your home.
- Never leave your children unattended when there is a fire burning in the appliance.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this appliance. Keep all such liquids well away from the appliance while it is in use.
- Objects placed in front of the appliance should be kept a minimum of 48" (121.9cm) from the front face.
- Any modification of the appliance that has not been approved in writing by the testing authority is considered breaching CSA B365 (Canada) and ANSI/NFPA 211 (USA).
- Open air control (and damper when fitted) before opening firing door.
- Hot while in operation. Keep children, clothing and furniture away. Contact may cause skin burns. Wear gloves to operate your appliance.
- Burning your appliance with the doors open or ajar creates a fire hazard that may result in a house and/or chimney fire.
- This wood appliance has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations in the United States to alter this setting or otherwise operate this wood appliance in a manner inconsistent with operating instructions in this manual.

Your Timberwolf EPA listed product is a Hi-tech appliance, designed with the most advanced technology. The appliance is extremely airtight.

The first fire(s) in your appliance will be difficult to get going and keep going with little amount of heat being generated. This is a result of the moisture being driven out of the fire brick. During the break-in period (the first 2 or 3 fires) create only small, fires using kindling; this will allow the firebrick to cure. Do not be alarmed if small hairline cracks develop in the firebrick. This is a normal occurrence and does not pose a safety hazard. The paint may also smell a little for the first few fires as it cures and you may wish to open a door or window to alleviate the smell.

To start, a brisk fire is required. Place loosely crumpled paper on the floor of the appliance and cover with dry kindling. Open the air control fully by sliding control all the way to the right. Light the paper and leave the door slightly ajar (1"/25.4mm) until all kindling is burning. To maintain a brisk fire, a hot coal bed must be established and sustained.

Slowly add larger wood (2x4 size pieces). Lay the pieces lengthwise from side to side in the hot coal bed with a shallow trench between, so that the primary air can flow directly into this trench and ignite the fuel above. When the fire seems to be at its peak, medium sized logs may be added. Once these logs have caught fire, carefully close the door. (Closing the door too quickly after refueling will reduce the firebox temperature and result in an unsatisfactory burn.) Remember it is more efficient to burn medium sized wood, briskly, and refuel frequently than to load the appliance with large logs that result in a smouldering, inefficient fire and dirty glass.

As soon as the door is closed, you will observe a change in the flame pattern. The flames will get smaller and lazier because less oxygen is getting into the combustion chamber. The flames, however, are more efficient. The flames will remain lazy but become larger again as soon as the firebricks have been heated thoroughly and the chimney becomes heated and provides a good draft. At this point, the roaring fire that you see when the door is opened is wastefully drawing heated room air up the chimney, certainly not desirable. Always operate with the door fully closed once the medium sized logs have caught fire.

You can now add larger pieces of wood and operate the appliance normally. Once the appliance is entirely hot, it will burn very efficiently with little smoke from the chimney. There will be a bed of orange coals in the firebox and secondary flames flickering just below the top baffles. You can safely fill the firebox with wood to the top of the door and will get best burns if you keep the appliance pipe temperatures between 250°F (120°C) and 450°F (270°C). A surface thermometer will help regulate this.

Without an appliance thermometer, you are working blindly and have no idea of how the appliance is operating! An appliance thermometer offers a guide to performance and should be located 18" (457mm) above the flue collar. Install the thermometer according to manufacturers instructions.

### **Can't get the fire going?**

Use more kindling and paper. Assuming the chimney and vent are sized correctly and there is sufficient combustion air, the lack of sufficiently dry quantities of small kindling is the problem. Thumb size is a good gauge for small kindling diameter.

### **Can't get heat out of the appliance?**

One of two things may have happened. The appliance door may have been closed prematurely and the appliance itself has not reached optimum temperature. Re-open the door and/or draft control to re-establish a brisk fire. The other problem may have been wet wood. The typical symptom is sizzling wood and moisture being driven from the wood.

# operation

## 6.1 optimum burn method

For optimal emissions performance and efficiency follow these simple guidelines when using your appliance:

- A. Maintain a 2" (51mm) deep, hot, glowing red coal bed.
- B. Burn dry seasoned wood with less than 20% moisture content and burn so that the glass door remains clean.
- C. A stove thermometer 18" (457mm) up on the single wall stove pipe should indicate 350°F (176°C) as an average temperature.
- D. Maintain a minimal trace of smoke coming from the chimney when the appliance is burning as intended.
- E. Inspect and replace all necessary components such as gaskets, manifolds, glass and other components which may affect the overall appliance performance.
- F. Ensure an adequate draft to control burn rate and temperature.

Refer to **"OPERATION"** and **"MAINTENANCE"** sections for detailed information.

## 6.2 air control

### **!** WARNING

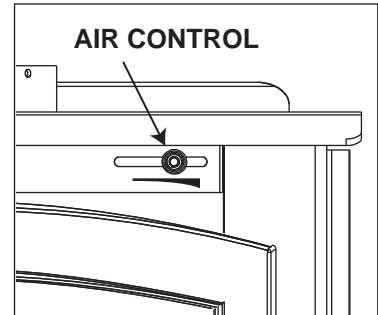
- This wood appliance has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations in the United States to alter the setting or otherwise operate this wood appliance in a manner inconsistent with operating instructions in this manual.

Draft is the force which moves air from the firebox up through the chimney. The amount of draft in your chimney depends on the length and diameter of chimney, local geography, nearby obstructions and other factors including the amount of heat generated by the fire which can be measured by an appliance thermometer.

Adjusting the air control all the way to the left reduces the temperature. The draft can be adjusted from low to high by moving the handle from left to right.

Inadequate draft may cause back-puffing into the room through the appliance and chimney connector points and may cause plugging of the chimney. Too much draft may cause an excessive temperature in the appliance, glowing red appliance parts or chimney connectors or an uncontrollable burn which can lead to a chimney fire or permanent damage to the appliance.

Do not operate your appliance for longer than 30 minutes with the draft control on "HIGH" (fully open).



## 6.3 fire extinguishers / smoke & carbon monoxide detectors

### note:

Always check your smoke and CO detectors are working properly.

All homes with a solid fuel burning appliance should have at least one fire extinguisher in a central location, known to all, at least one smoke detector and carbon monoxide (CO) detector in the room containing the appliance. If the smoke detector sounds an alarm, correct the cause but do not deactivate or relocate the smoke detector. If the carbon monoxide detector sounds an alarm, immediately vent the area, evacuate and call your local fire department.

## 6.4 fuel

### **!** WARNING

- Do not store fuel within the clearance to combustibles, or in the space required for re-fueling and ash removal.
- Burning wet, unseasoned wood can cause excessive creasote accumulation. When ignited, it can cause a chimney fire that may result in a serious house fire.

When loading the appliance, ensure that the two upper fibre baffles are not lifted up and off their ledge. For maximum efficiency, when the appliance is thoroughly hot, load it fully to the top of the door opening and burn at a medium low setting. Maximum heat for minimum fuel (optimum burn) occurs when the appliance top temperature is between 500°F (260°C) and 600°F (315°C). The bricks will be nearly all white and the glass mostly clear. The whiteness of the bricks and the cleanliness of the glass are good indicators of your operating efficiency. Not enough heat is produced when only one or two pieces of wood are burned or the wood may not burn completely. A minimum of three pieces are needed to encase a bed of coals that sustains the fire.

#### **note:**

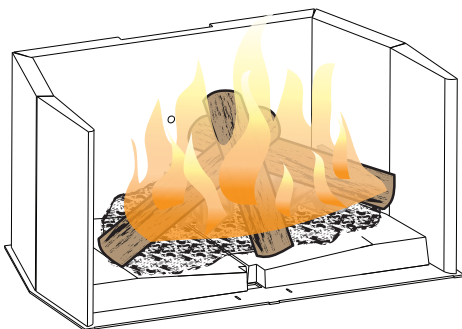
When loading the appliance, ensure to keep fuel back from the glass. If coals are to accumulate on the front lip, there is a chance they will fall out when the door is opened.

Loosely stacked wood burns quicker than a tightly packed load. Wood burns in cycles rather than giving a steady output of heat. It is best to plan these cycles around your household routine so that only enough coals are left to start the next load. In the evening, load your appliance, at least, a half-hour before bed to ensure a good fire, hot enough to close the draft control for an overnight burn.

Burn only dry seasoned wood with less than 20% moisture content. It produces more heat and less soot or creosote. Do not burn ocean beach wood. Its salt content can produce a metal-eating acid. When refueling open the door slowly to prevent smoke spillage. Use a pair of long gloves (barbecue gloves) when feeding the fire. Because these appliances burn at the front, they are clean and efficient, but they are also very hot and gloves are useful. Keep a small steel shovel nearby to use as a poker and to remove ashes. Do not store the wood within 3 feet (1m) of the appliance.

## 6.5 lighting a fire

### 6.5.1 flash fire



A flash fire is a small fire burned quickly when you don't need much heat. After your kindling has "caught", load at least 3 pieces of wood, stacked loosely. Burn with the draft control fully open or closed only slightly.



## operation

### 6.5.2 extended fire

Load your larger pieces of wood so they are tightly packed, close enough to prevent the flames from penetrating it completely. After approximately 30 minutes, depending on the size of the load, close the draft control completely making sure that the fire is not extinguished.

#### **DO NOT OVERFIRE THE APPLIANCE!**

##### **Overfiring can occur by:**

- A.** Burning large amounts of smaller wood pieces such as furniture scraps, skids or treated wood;
- B.** Vigorously burning large loads of wood with the draft control on "HIGH" (fully open) for long periods of time (one or two hours).
- C.** Operating the appliance with the ash dump door blocked open or a poor gasket seal on the main door.

### 6.6 smoking

A properly installed appliance should not smoke. If yours does, check the following:

- Has the chimney had time to get hot?
- Is the smoke passage blocked anywhere in the appliance, chimney connector or chimney?
- Is the room too airtight and the air intake not connected to the outside? Try with a window partly open.
- Is the smoke flow impeded by too long a horizontal pipe or too many bends?
- Is it a weak draft perhaps caused by a leaky chimney, a cold outside chimney, too large a diameter of a chimney, too short a chimney, or a chimney too close to trees or a higher roof?
- Is the moisture content of the wood greater than 20%?
- If equipped, has the catalyst bypass been closed or closed prematurely?

**! WARNING**

- Turn off the power before servicing the appliance.
- Appliance may be hot, do not service until appliance has cooled.
- Do not use abrasive cleaners.

Check your chimney and chimney connector for creosote and soot buildup weekly until a safe frequency for cleaning is established.

If accumulation is excessive, disconnect the appliance and clean both the chimney and the appliance. You may want to call a professional chimney sweep to clean them. Both have to be cleaned at least once a year or as often as necessary.

Remove fibre baffles and clean above them once a year.  
Replace any broken bricks.

**7.1 ash removal procedures****! WARNING**

- Improper disposal of ashes result in fires. Do not discard ashes in cardboard boxes, dump in backyards, or store in garages.
- If using a vacuum to clean up ashes, be sure the ashes are entirely cooled. Using a vacuum to clean up warm ashes could cause a fire inside the vacuum.
- Never operate your appliance with the grate cover removed.
- Failure to achieve a good seal between the ash opening, ash plug or ash well door will result in an over-fire condition that could cause damage to the appliance.

Allow the ashes in your firebox to accumulate to a depth of two or three inches; they tend to burn themselves up. When the fire has burned down and cooled, remove any excess ashes but leave an ash bed approximately 1 inch (25mm) deep on the firebox bottom to help maintain a hot charcoal bed.

**DISPOSAL OF ASHES:** Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a non-combustible floor or 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.

**7.1.1 ash removal with ash drawer**

- To remove the ashes, clear the ash away from the ash plug.
- Remove the ash plug. **It is recommended to use a poker.**
- Rake the excess ash into the ash drawer.
- **Do not overfill the ash drawer. Ash should not accumulate higher than the sides of the drawer.**
- Before removing the drawer, ensure that the area around the ash opening is clean. Tap the ash from the chute into the drawer, then place the ash plug back over opening. Only operate your appliance with a well sealed ash plug.

**7.2 creosote formation and removal**

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 cooler chimney flue or 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 creosote has accumulated, it should be removed to reduce the risk of a chimney fire.

**7.3 runaway or chimney fire****! WARNING**

- A chimney fire can permanently damage your chimney system. This damage can only be repaired by replacing the damaged component parts. Chimney fires are not covered by the lifetime limited warranty.

**CAUSES:**

- Using incorrect fuel, or small fuel pieces which would normally be used as kindling.
- Creosote build up in chimney.
- Leaving the door ajar too long and creating extreme temperatures as the air rushes in the open door.
- If equipped, burning your appliance with the ash plug not securely seated.

**SOLUTIONS:**

- Do not burn treated, painted, artificial, paper or processed wood logs, coal, charcoal, coloured paper or cardboard.
- Have chimney regularly cleaned.
- Be careful not to over-fire the appliance by leaving the door open too long after initial start-up. A thermometer on the chimney connector and/or appliance top helps to indicate the appliance operating temperature.
- If equipped, always operate the appliance with the ash plug properly installed.

**IN CASE OF A CHIMNEY FIRE:**

- Close glass door and air control (and damper, when equipped).
- Have a well understood plan for evacuation and a place outside for everyone to meet. Prepare to evacuate to ensure everyone's safety.
- Call local fire department. Have a fire extinguisher handy. Contact local authorities for further information on how to handle a chimney fire.
- After the chimney fire is out, clean and inspect the chimney or chimney liner for stress and cracks prior to lighting another fire. Also check combustibles around the chimney and the roof.

**7.4 chimney cleaning**

Both the chimney and the appliance must be inspected and cleaned if necessary at least once a year. For serious wood burners, chimney cleaning must be done as needed to avoid chimney fires; the venting systems for controlled combustion appliances may need cleaning as often as once a month. These rates, however, depend on the burning habits of the individual operating the appliance. For example, it is possible to clog a solid fuel appliance chimney in a few days if slow, smoldering fires are burned and the chimney is cold.

**note:**

Appliances burned consistently without hot fires may result in significant creosote accumulations in the chimney.

Certain items and considerations are important in chimney cleaning:

- Proper tools should be used, including a brush specifically designed for chimney cleaning.
- The chimney connector and dampers as well as the chimney should be cleaned.
- The appliance's firebox and baffle system should be cleaned if needed.
- The chimney should be inspected and repairs made if needed, preferably by a qualified chimney sweep or mason.

## 7.5 door glass replacement

### **WARNING**

- Do not use substitute materials.
- Glass may be hot. Do not touch glass until cooled.
- Care must be taken when removing and disposing of any broken door glass or damaged components. Be sure to vacuum up any broken glass from inside appliance before operation.
- Do not strike, slam, or scratch. Do not operate appliance with glass removed, cracked, broken, or scratched.

Replacement glass/frame assembly shall be replaced as a complete unit as supplied by the appliance manufacturer.

**note:**

Care must be taken when removing and disposing of any broken glass or damaged components. Be sure to vacuum up any broken glass from inside the appliance before operation.

## 7.6 gasket replacement

At the end of each burning season inspect the shield and gasket below the manifold for warping or deterioration. Replace if necessary. Both are held to the manifold with machine screws. The shield and the 1/8" (3.2mm) fibre cloth gasket are available from your Wolf Steel Ltd. dealer. At this time also check that the door gasket is not worn or loose. Replace with 3/8" (9.5mm) high density fiberglass rope if necessary.

The airwash gasket and shield above the door should also be inspected and replaced if deteriorated

**note:**

Do not operate the appliance if the manifold shield or fibre baffle is deteriorated or missing.

## 7.7 care of glass

### **WARNING**

- Do not clean glass when hot! Do not use abrasive cleaners to clean glass.

If the glass is not kept clean, permanent discolouration and/or blemishes may result. Normally a hot fire will clean the glass. The most common reasons for dirty glass include:

- Not using sufficient fuel to get the appliance thoroughly hot.
- Using green or wet wood.
- Closing the draft so far that there is insufficient air for complete combustion.



If it is necessary to clean the glass, buff lightly with a clean dry cloth and non-abrasive cleaner. Clean the glass after the first 10 hours of operation with a recommended appliance glass cleaner. Thereafter, clean as required.

The glass is very strong, but do not let burning fuel rest or fall against it and always close the door gently.

**NEVER FORCE OR SLAM IT SHUT!**

Do not operate the appliance with broken glass, as leakage of flue gases may result.

Contact your local authorized dealer/distributor for complete cleaning instructions.

If the glass should ever crack or break while the fire is burning, do not open the door until the fire is out. Do not operate the appliance until the glass has been replaced. Contact your local authorized dealer/distributor for replacement parts. **DO NOT SUBSTITUTE MATERIALS.**

## ! WARNING

- This appliance is designed to burn natural wood only. Do not burn treated wood, coal, charcoal, coloured paper, cardboard, solvents or garbage. This appliance has not been tested with an unvented gas log set. To reduce risk of fire or injury, do not install an unvented gas log set into the appliance.
- Higher efficiencies and lower emissions generally result when burning air dried seasoned hardwoods, as compared to softwoods or too green or freshly cut hardwoods.
- Burning wet, unseasoned wood can cause excessive creosote accumulation. When ignited, it can cause a chimney fire that may result in a serious house fire.
- Do not store fuel within the clearance to combustibles, or in the space required for re-fueling and ash removal.

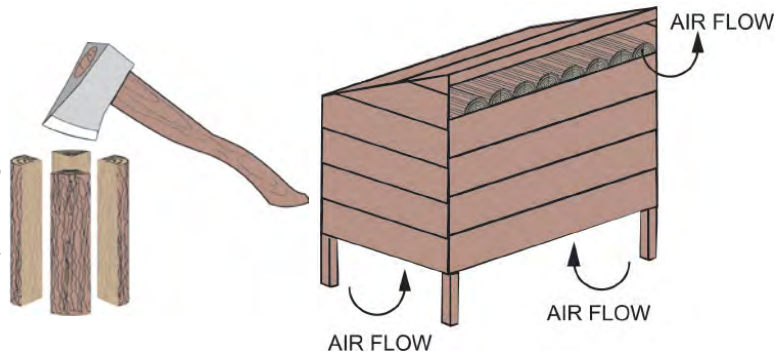
Before loading the appliance, ensure all required insulation and baffles are installed and situated properly. For maximum efficiency, when the appliance is thoroughly hot, load it fully to the specified maximum amount and burn at a medium low setting (if equipped). The whiteness of the bricks and the cleanliness of the glass are good indicators of your operating efficiency. Not enough heat is produced when only a few pieces of wood are burned or the wood may not burn completely.

**NOTE: When loading the appliance, ensure to keep fuel back from the glass. If coals are to accumulate on the front lip, there is a chance they will fall out when the door is opened.**

### TYPES OF WOOD

Both hardwood and softwood burn equally well in this appliance but hardwood is denser, will weigh more per cord and burn a little slower and longer.

Manufactured firelogs made by compressing 100% natural wood fibre can be safely used as fuel. Do not use manufactured firelogs if they contain additives such as paraffin, wax, binders etc. Never burn more than two manufactured firelogs at a time.



### MOISTURE CONTENT

Burn only dry, clean unpainted wood that has been seasoned. It produces more heat and less soot or creosote. Freshly cut wood contains about 50% moisture while after proper seasoning only about 20% of the water remains. As wood is burned, this water boils off consuming energy that should be used in heating. The wetter the wood, the less heat is given off and the more creosote is produced. Dry firewood has cracks in the end of the grain.

### STORING WOOD

Firewood should be split and stacked in a manner that allows for full air circulation and covered in early spring to be ready for burning that fall. Dry firewood has cracks in the end grain.

Cut the wood so that it will fit horizontally, front to back, making for easier loading and less of a likelihood that the wood will roll onto the glass.

Fuel for the appliance must not be stored closer than the required clearances to combustibles (heat sensitive material).

**NEVER STORE WOOD IN THE ASH PAN COMPARTMENT (if applicable).**

**! WARNING**

- Failure to position the parts in accordance with this manual or failure to use only parts specifically approved with this appliance may result in property damage or personal injury.

Contact your dealer for questions concerning prices and policies on replacement parts. Normally, all parts can be ordered through your Authorized dealer / distributor.

**For warranty replacement parts, a photocopy of the original invoice will be required to honour the claim.**

When ordering replacement parts always give the following information:

- Model & Serial Number of appliance
- Installation date of appliance
- Part number
- Description of part
- Finish

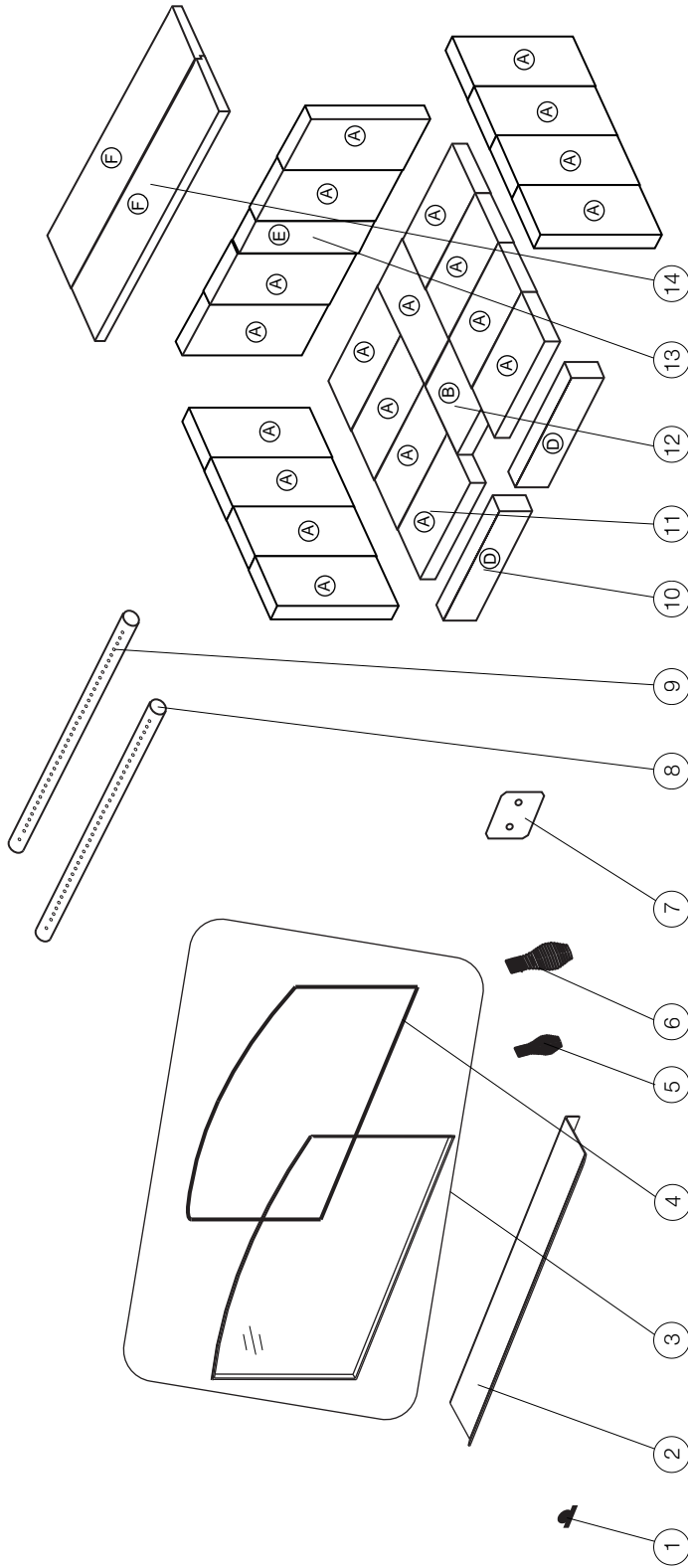
**Parts, part numbers, and availability are subject to change without notice.**

**Parts identified as stocked will be delivered within 2 to 5 business days for most delivery destinations.**

**Parts not identified as stocked will be delivered within a 2 to 4 week period, for most cases.**

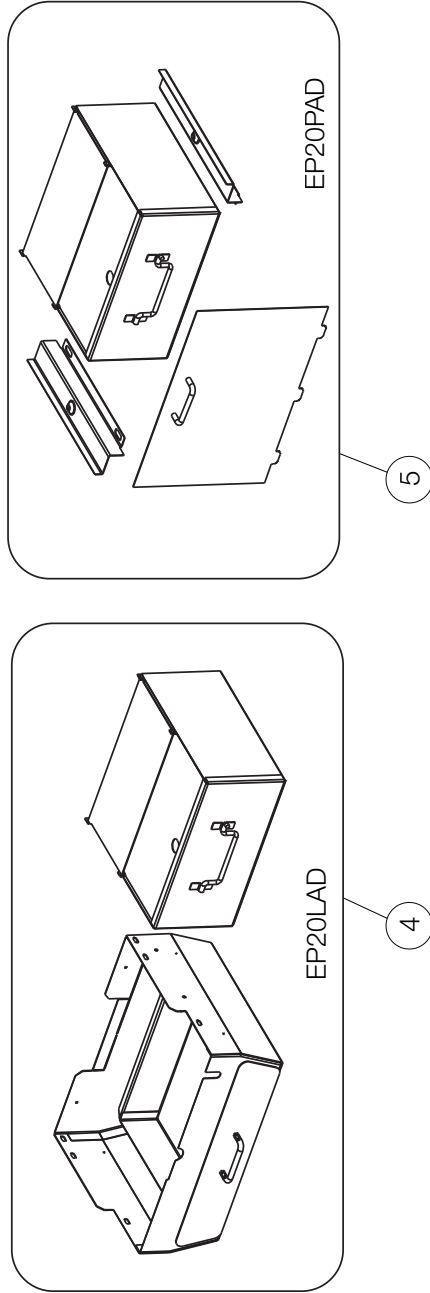
**Parts identified as 'SO' are special order and can take up to 90 days for delivery.**

8.1 overview



Items may not appear exactly as illustrated.

Ref. No.	Part Number	Description	Stocked	Ref. No.	Part Number	Description	Stocked
1	W385-0487	Timberwolf logo	Yes	8	W720-0135	Front secondary air tube	Yes
2	W710-0025	Ash lip		9	W720-0155	Rear secondary air tube	Yes
3	W010-2325	Glass / gasket assembly	Yes	10	W090-0018	Brick D (2.25" x 1.25" x 9")	Yes
4	W370-0121	Gasket kit		11	W090-0015	Brick A (4.5" x 1.25" x 9")	Yes
5	W325-0042	Spring handle (Small)	Yes	12	W090-0168	Brick B (4.5" x 1.25" x 6.25")	Yes
6	W325-0043	Spring handle (Large)	Yes	13	W090-0179	Brick E (2.625" x 1.25" x 9")	Yes
7	W510-0013-SER	Ash plug		14	W010-3563	Top fibre baffle (X2)	Yes



Items may not appear exactly as illustrated.

Ref. No.	Part Number	Description	Stocked
1 *	EPT70	Blower kit	
2 *	EP20P	Pedestal kit	
3 *	EP22L	Leg kit	
4	EP20PAD	Ash pan kit for EP20P pedestal kit	
5	EP20LAD	Ash pan kit for EP22L leg kit	

\* Parts not illustrated.



## 10.0 troubleshooting

### WARNING

- Turn off the appliance completely and let cool before servicing. Only a qualified service person should service and repair this electric appliance.
- Appliance may be hot, do not service until appliance has cooled.
- Do not use abrasive cleaners.
- When checking connections, installing jumper wires (for test purposes only) or replacing components, unplug appliance from the receptacle to prevent electrical shock or damage to the component.

symptom	test solution
Can't get the fire started.	Not enough kindling / paper? Add more.
	Not enough air? Ensure air control is fully open. Also ensure that the air opening is not obstructed.
	Cold air blockage? Burn a piece of paper to establish a draft.
	Use dry seasoned wood with 20% moisture content.
Smokes when door is open.	Flue blockage? Inspect chimney.
	Cold air blockage? Burn a piece of paper to establish a draft.
	Insufficient draft? Add more pipe.
	Let air stabilize before opening door.
Appliance emits odour.	Ensure baffles are positioned correctly.
	Negative pressure? Open a window near the appliance.
Stove doesn't burn hot enough.	Paint curing, see "general instructions" section.
	Wood has more than 20% moisture.
	Insufficient draft? Add more pipe.
Wood burns too fast.	Not enough air? Ensure air control is fully open. Also ensure that the air opening is not obstructed.
	Air control may need to be adjusted down.
	Check to see ash plug is properly seated (if equipped).
	Check door gasket for adequate seal.
Dirty glass.	Wood may be extremely dry.
	Air control may be closed too far.
	Burn hotter, smaller fires.
Blower does not run.	Use well seasoned wood with 20% moisture content.
	Appliance may not be up to temperature.
	Ensure blower has power.

TIMBERWOLF products are manufactured under the strict Standard of the World Recognized ISO 9001 : 2015 Quality Management System.

TIMBERWOLF products are designed with superior components and materials, assembled by trained craftsmen who take great pride in their work. The complete appliance is thoroughly inspected by a qualified and authorized installer, service agency or supplier before packaging to ensure that you, the customer, receives the quality product that you expect from TIMBERWOLF.

## **TIMBERWOLF WOOD APPLIANCE LIMITED WARRANTY**

The following materials and workmanship in your new TIMBERWOLF appliance are warranted against defects as defined below:

The combustion chamber is warranted against defects for a period of 5 years.

The secondary air tubes are warranted against defects for a period of 5 years.

Electrical (110V) components and wearable parts are covered and TIMBERWOLF will provide replacement parts free of charge during the first year of the limited warranty. This covers: blowers, thermal switches, switches, wiring, rheostats, firebrick, ceramic glass (thermal breakage only), fibre baffles and gasketing.\*

Any labour related to warranty repair is not covered.

\* Construction of models vary. Warranty applies only to components included with your specific appliance.

## **CONDITIONS AND LIMITATIONS**

Wolf Steel warrants its TIMBERWOLF products against manufacturing defects to the original purchaser only. Registering your warranty is not necessary. Simply provide your proof of purchase along with the model and serial number to make a warranty claim. Provided that the purchase was made through an authorized TIMBERWOLF dealer your appliance is subject to the following conditions and limitations:

Warranty coverage begins on the date of original installation.

This factory warranty is non-transferable and may not be extended whatsoever by any of our representatives.

The appliance must be installed by a qualified and authorized installer, service agency or supplier. Installation must be done in accordance with the installation instructions included with the product and all local and national building and fire codes.

This limited warranty does not cover damages caused by misuse, lack of maintenance, accident, alterations, abuse or neglect. Operating the appliance on high for extended periods of time, is neglect. Parts installed from other manufacturers will nullify this warranty.

This limited warranty further does not cover any scratches, dents, corrosion or discoloring caused by excessive heat, abrasive and chemical cleaners nor chipping on porcelain enamel parts, nor any venting components used in the installation of the appliance.

In the first year only, this warranty extends to the repair or replacement of warranted parts which are defective in material or workmanship provided that the product has been operated in accordance with the operation instructions and under normal conditions.

After the first year, with respect to the TIMBERWOLF'S Limited Warranty, Wolf Steel may, at its discretion, fully discharge all obligations with respect to this warranty by refunding to the original warranted purchaser the wholesale price of any warranted but defective parts.

After the first year, Wolf Steel Ltd. will not be responsible for installation, labour or any other costs or expenses related to the reinstallation of a warranted part, and such expenses are not covered by this warranty.

Notwithstanding any provisions contained in the TIMBERWOLF'S Limited Warranty, Wolf Steel's responsibility under this warranty is defined as above and it shall not in any event extend to any incidental, consequential or indirect damages.

This warranty defines the obligations and liability of Wolf Steel with respect to the TIMBERWOLF appliance and any other warranties expressed or implied with respect to this product, its components or accessories are excluded.

Wolf Steel neither assumes, nor authorizes any third party to assume, on its behalf, any other liabilities with respect to the sale of this product.

Wolf Steel will not be responsible for: over-firing, downdrafts, spillage caused by environmental conditions such as rooftops, buildings, nearby trees, hills, mountains, inadequate vents or ventilation, excessive venting configurations, insufficient makeup air, or negative air pressures which may or may not be caused by mechanical systems such as exhaust blowers, furnaces, clothes dryers, etc.

Any damages to appliance, combustion chamber, heat exchanger or other components due to water, weather damage, long periods of dampness, condensation, damaging chemicals or cleaners will not be the responsibility of Wolf Steel.

Regular cleaning of the fine ash generated during the operation of this appliance is a necessary part of maintaining your appliance. Failure of any components, which is attributed to poor maintenance, is not warrantable and will not be covered by this policy.

Wolf Steel reserves the right to have its representative inspect any TIMBERWOLF product or part thereof prior to honouring any warranty claim.

All parts replaced under the Limited Warranty Policy are subject to a single claim.

During the first 10 years Wolf Steel Ltd. will replace or repair the defective parts covered by the lifetime warranty at our discretion free of charge. From 10 years to life, Wolf Steel Ltd. will provide replacement parts at 50% of the current retail price.

All parts replaced under the warranty will be covered for a period of 90 days from the date of their installation.

The manufacturer may require that defective parts or products be returned or that digital pictures be provided to support the claim.

Returned products are to be shipped prepaid to the manufacturer for investigation. If a product is found to be defective, the manufacturer will repair or replace such defect.

Before shipping your appliance or defective components, your dealer must obtain an authorization number. Any merchandise shipped without authorization will be refused and returned to sender.

Shipping costs are not covered under this warranty.

Additional service fees may apply if you are seeking warranty service from a dealer.

Labour, travel, diagnostic tests, shipping and other related charges are not covered by this warranty.

ALL SPECIFICATIONS AND DESIGNS ARE SUBJECT TO CHANGE WITHOUT PRIOR NOTICE DUE TO ON-GOING PRODUCT IMPROVEMENTS.

# NAPOLEON CELEBRATING OVER 40 YEARS OF HOME COMFORT PRODUCTS



7200, Route Transcanadienne, Montréal, Québec H4T 1A3  
24 Napoleon Road, Barrie, Ontario, Canada L4M 0G8  
214 Bayview Drive, Barrie, Ontario, Canada L4N 4Y8  
103 Miller Drive, Crittenden, Kentucky, USA 41030

Phone: 1-866-820-8686  
[napoleonproducts.com](http://napoleonproducts.com)

C

**72%**

**TESTED OVERALL  
EFFICIENCY**

MODEL: 2200

WOLF STEEL HAS HAD THIS BIO-MASS BURNING  
HEATER INDEPENDENTLY TESTED. IT HAS BEEN  
DETERMINED THAT ITS THERMAL EFFICIENCY MEETS  
OR EXCEEDS THE REQUIREMENTS OF SECTION 25C OF  
THE INTERNAL REVENUE SERVICE CODE.

Manufactured by:



W385-0472 / C

**SPECIFICATIONS:** BLACK ON WHITE  
90 LB BOND PAPER  
5" x 7"  
HELVETIA TYPE

**WOLF STEEL**

**TITLE:** LABEL, EFFICIENCY (2200)

**DWG #:** W385-0472

**REV: C: UPDATED EFFICIENCY || 11.05.18\_**

**DATE:** 06.18.09

**LISTED SOLID FUEL BURNING SPACE HEATER / POËLE À COMBUSTIBLE SOLIDE HOMOLOGUÉ.**

**TESTED TO: / TESTÉ SELON:**

**UL1482 - 2010 / ULC S627 - 00**

**MODEL / MODÈLE: 2200**

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. / Ce poêle à bois doit inspection périodique et la réparation pour un fonctionnement correct. Consultez le manuel du propriétaire pour plus d'informations. Il est contre les règlements fédéraux pour faire fonctionner ce poêle à bois d'une manière incompatible avec les instructions de fonctionnement dans le manuel du propriétaire.

**REPORT NO. / NUMÉRO DE RAPPORT 415-S-02-2**

INSTALL AND USE ONLY IN ACCORDANCE WITH WOLF STEEL LTD'S INSTRUCTIONS. CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA. MINIMUM CEILING HEIGHT: 7FT (2.13m)

**HEARTH EXTENSION / COMBUSTIBLE FLOOR PROTECTION:** IF INSTALLED ON A COMBUSTIBLE FLOOR, UNIT MUST BE PLACED ON A NON-COMBUSTIBLE FLOOR PROTECTOR EXTENDING 18" (455mm) IN FRONT AND 8" (205mm) TO THE SIDES AND BACK.

**CHIMNEY TYPE:** MINIMUM 6" (152mm) DIAMETER LISTED (UL 103HT) RESIDENTIAL CHIMNEY.

**CHIMNEY CONNECTOR:** 6" (152mm) DIAMETER MINIMUM 24 GAUGE STEEL MINIMUM CLEARANCE FROM HORIZONTAL CONNECTOR AND CEILING 18" (455mm).

DO NOT OBSTRUCT SPACE UNDER HEATER.

SPECIAL METHODS ARE REQUIRED WHEN PASSING A CHIMNEY THROUGH A WALL OR CEILING. SEE INSTRUCTIONS AND BUILDING CODES.

DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

**FUEL:** FOR USE WITH SOLID WOOD FUEL ONLY. DO NOT USE GRATE OR ELEVATE FIRE. BUILD WOOD FIRE DIRECTLY ON HEARTH.

**WARNING:** RISK OF SMOKE SPILLAGE. OPERATE ONLY WITH DOOR FULLY CLOSED.

REPLACE GLASS ONLY WITH CERAMIC GLASS.

DO NOT OVERFIRE. IF HEATER OR CHIMNEY CONNECTORS GLOW, YOU ARE OVERFIRING. INSPECT AND CLEAN CHIMNEY FREQUENTLY. UNDER CERTAIN CONDITIONS OF USE CREOSOTE BUILD-UP MAY OCCUR RAPIDLY.

**OPTIONAL LEGS:** IF TO BE INSTALLED WITH OPTIONAL LEGS, LEGS MUST BE INSTALLED PRIOR TO OPERATION.

**OPTIONAL BLOWER KIT:** EP-65, 115V, 60HZ, 0.82AMP. ROUTE CORD AWAY FROM UNIT.

**DANGER:** RISK OF ELECTRICAL SHOCK. DISCONNECT POWER BEFORE SERVICING UNIT.

POUR INSTALLATION ET UTILISATION CONFORMÉMENT AUX INSTRUCTIONS DE WOLF STEEL LTÉE. RENSEIGNEZ-VOUS AUPRÈS DES AUTORITÉS LOCALES DU BÂTIMENT OU DU SERVICE DES INCENDIES AU SUJET DES RESTRICTIONS ET DES INSPECTIONS D'INSTALLATION DANS VOTRE RÉGION.

HAUTEUR DE PLAFOND MINIMAL 7" (2,13mm).

**PROLONGEMENT D'ÂTRE/PROTECTION DU PLANCHER COMBUSTIBLE:** SI INSTALLÉ SUR UN PLANCHER COMBUSTIBLE, L'APPAREIL DOIT ÊTRE PLACÉ SUR UNE PLAQUE PROTECTRICE INCOMBUSTIBLE S'ÉTENDANT SUR 18" (455mm) À L'AVANT ET 8" (205mm) À L'ARRIÈRE ET SUR LES CÔTÉS.

**TYPE DE CHIMNÉE:** CHEMINÉE RÉSIDENIELLE DE 6" DE DIAMÈTRE (152 mm) HOMOLOGUÉE (UL 103HT).

**RACCORD DE CHEMINÉE:** DIAMÈTRE DE 6" (152mm) D'ACIER DE CALIBRE 24 MINIMUM. 18" (455mm) DE DÉGAGEMENT MINIMAL ENTRE LE RACCORD HORIZONTAL ET LE PLAFOND.

NE RIEN ENTREPOSER SOUS L'APPAREIL.

DES MÉTHODES SPÉCIALES SONT REQUISES LORSQUE UNE CHEMINÉE TRAVERSE UN MUR OU UN PLAFOND. VOIR LES INSTRUCTIONS ET LES CODES DU BÂTIMENT. NE PAS RACCORDER À LA CHEMINÉE D'UN AUTRE APPAREIL.

**COMBUSTIBLE:** POUR USAGE AVEC LE BOIS SEULEMENT. N'UTILISEZ PAS DE CHENET OU NE SURÉLEVEZ PAS LE BOIS. PRÉPAREZ LE FEU DIRECTEMENT SUR L'ÂTRE.

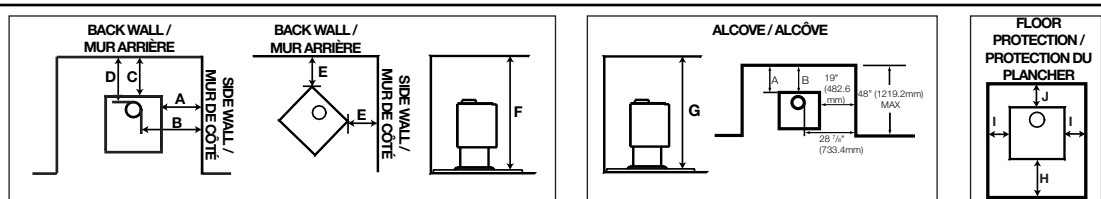
**AVERTISSEMENT:** RISQUE D'ÉCHAPPEMENT DE FUMÉE. TENIR LA PORTE FERMÉE LORSQUE LE POËLE FONCTIONNE. REMPLACEZ LA VITRE PAR UNE VITRE EN CÉRAMIQUE SEULEMENT.

NE SURCHAUFFEZ PAS L'APPAREIL. SI L'APPAREIL OU LES RACCORDS ROUGEIOENT, L'APPAREIL SURCHAUFFE. INSPECTEZ ET NETTOYEZ LA CHEMINÉE FRÉQUEMMENT. DANS CERTAINES CONDITIONS, DES DÉPÔTS DE CRÉOSOTE PEUVENT SE FORMER RAPIDEMENT.

**PATTES OPTIONNELLES:** SI LES PATTES OPTIONNELLES SONT INSTALLÉES, ELLES DOIVENT ÊTRE INSTALLÉES AVANT DE FAIRE FONCTIONNER L'APPAREIL.

**SOUFFLERIE OPTIONNELLE:** EP-62, 115V, 60HZ, 0,82A. TENEZ LE CORDON ÉLECTRIQUE LOIN DE L'APPAREIL.

**DANGER:** RISQUE DE SECOURS ÉLECTRIQUE. DÉBRANCHEZ AVANT DE PROCÉDER À L'ENTRETIEN.



	PARALLEL & CORNER / PARALLÈLE & COIN	SINGLE WALL CONNECTOR / TUYAU DE RACCORDEMENT À PAROI SIMPLE	DOUBLE WALL CONNECTOR / TUYAU DE RACCORDEMENT À PAROI DOUBLE
Sidewall / mur de côté (A)	19" (48.3cm)	19" (48.3cm)	19" (48.3cm)
Sidewall to flue / mur de côté à la buse (B)	28 7/8" (73.3cm)	28 7/8" (73.3cm)	28 7/8" (73.3cm)
Backwall / mur arrière (C)	17 1/2" (44.5cm)	12 1/2" (31.8cm)	12 1/2" (31.8cm)
Backwall to flue / mur arrière à la buse (D)	21" (53.3cm)	16" (40.6cm)	16" (40.6cm)
Corner / coin (E)	11" (27.9mm)	7" (178mm)	7" (178mm)
Ceiling / plafond (F)	84" (213.4cm)	75" (190.5cm)	75" (190.5cm)
<b>ALCOVE / ALCÔVE</b>			
Ceiling / plafond (G)	N/A	75" (190.5cm)	75" (190.5cm)
<b>MINIMUM FLOOR PROTECTION / PROTECTION MINIMAL DU PLANCHER</b>			
	FRONT / DEVANT (H)	SIDES / CÔTÉS (I)	BACK / ARRIÈRE (J)
CANADA	18" (45.7cm)	8" (203mm)	8" (203mm)
USA / É-U	16" (40.6cm)	8" (203mm)	8" (203mm)

Clearances can be reduced with shielding acceptable to local authorities. Reduced installation must comply with NFPA 211 or CAN/CSA-B365. / Il est possible de réduire les dégagements à l'aide d'un protecteur conforme aux normes des autorités locales. Une installation réduite doit être conforme aux normes NFPA 211 ou au CAN/CSA B365.

MANUFACTURE DATE: / DATE DE FABRICATION:

YEAR:  2015  2016  2017  2018  2019  2020

MONTH:  1  2  3  4  5  6  7  8  9  10  11  12



**CAUTION:**

**HOT WHILE IN OPERATION. DO NOT TOUCH. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS.**

**ATTENTION:**

**QUAND L'APPAREIL FONCTIONNE, LA SURFACE DEVIENT CHAUDE. NE PAS TOUCHER. TENIR LES ENFANTS, LES VÊTEMENTS ET LES MEUBLES À L'ÉCAR. LE CONTACT PEUT CAUSER DES BRÛLURES À LA PEAU. VOIR LA PLAQUE D'HOMOLOGATION ET LES INSTRUCTIONS.**

**U.S. ENVIRONMENTAL PROTECTION AGENCY** Certified to comply with 2020 particulate emission standards using cordwood. Certifié conforme à la norme d'émission de particules de 2020 en utilisant bois de corde. 40 CFR Part 60, Subpart AAA 2.25 Grams Per Hour / 2020 Cordwood / 2.25 Grammes par heure / Bois de Corde 2020

**WOLF STEEL LTD.**  
 24 NAPOLEON ROAD, BARRIE, ON,  
 L4M 0G8 CANADA

**NAC GUANGZHOU P.R.C.**  
 NO.69 HEFENG ROAD, GUANGZHOU, CHINA

**2200**

W385-2028 / A

**MAXIMUM SIZE:** 6" x 11.125"

SILVER ON BLACK BACKGROUND

CLASS III A-1 PERMANENT LABEL

WATERPROOF, NONWATER SOLUBLE ADHESIVE CAPABLE OF WITHSTANDING 300°F/149°C TEMPERATURES

SERIAL NUMBER TO BE ASCENDING FROM 2200 017696

CAUTION MINIMUM LETTER SIZE (18 POINT TYPE) AND 0.12" (8.64 POINT TYPE) FOR THE REMAINDER OF

THAT WARNING WITH VERTICAL SPACING BETWEEN LINES OF 0.046" (3.312 POINT TYPE).

LOG / FIRE WARNING SYMBOL TO BE RED

**WOLF STEEL LTD**

**TITLE: RATING PLATE LABEL 2200**

**REVISION: A: UPDATED WORDING/REQUIREMENTS TO MEET 2020 PARTICULATE EMISSION STANDARDS || 11.06.18**

**DWG#:** W385-2028

**DATE:** 07.09.15\_R.T.

Manufactured by WOLF STEEL LTD.

Model: Timberwolf 2200

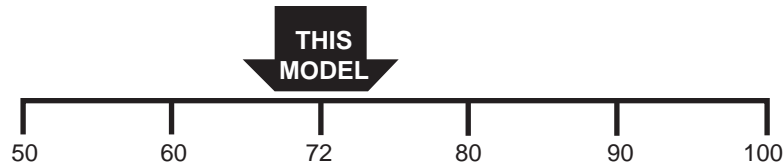
**US ENVIRONMENTAL PROTECTION AGENCY**

MEETS EPA PARTICULATE MATTER (SMOKE) CONTROL REQUIREMENTS FOR NONCATALYTIC WOOD HEATERS BUILT ON OR AFTER JULY 1, 1990

# SMOKE



# EFFICIENCY\*



Wood heaters with higher efficiencies cost less to operate.

\*(NOT TESTED FOR EFFICIENCY, THE VALUE INDICATED IS FOR SIMILAR NONCATALYTIC WOOD HEATERS.)

# HEAT OUTPUT

12,944 TO 54,127 Btu/Hr

Use this to choose the right size appliance for your needs.

**ASK DEALER FOR HELP**

This wood heater will achieve low smoke output and high efficiency only if properly operated and maintained. See owner's manual.

W385- 2250

**SPECIFICATIONS:** BLACK ON WHITE  
90 LB BOND PAPER  
5" x 7"  
ARIAL TYPE

**WOLF STEEL**

**TITLE:** LABEL, EPA HANG TAG (2200)

**DWG #:** W385-2250

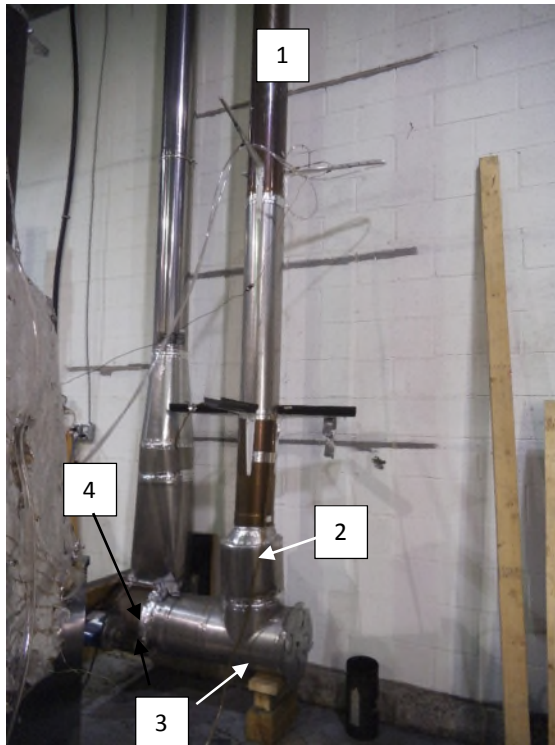
**REV:**

**DATE:** 11.06.18\_

## APPENDIX 8: Photographs of test set up

Dilution picture Dia 8

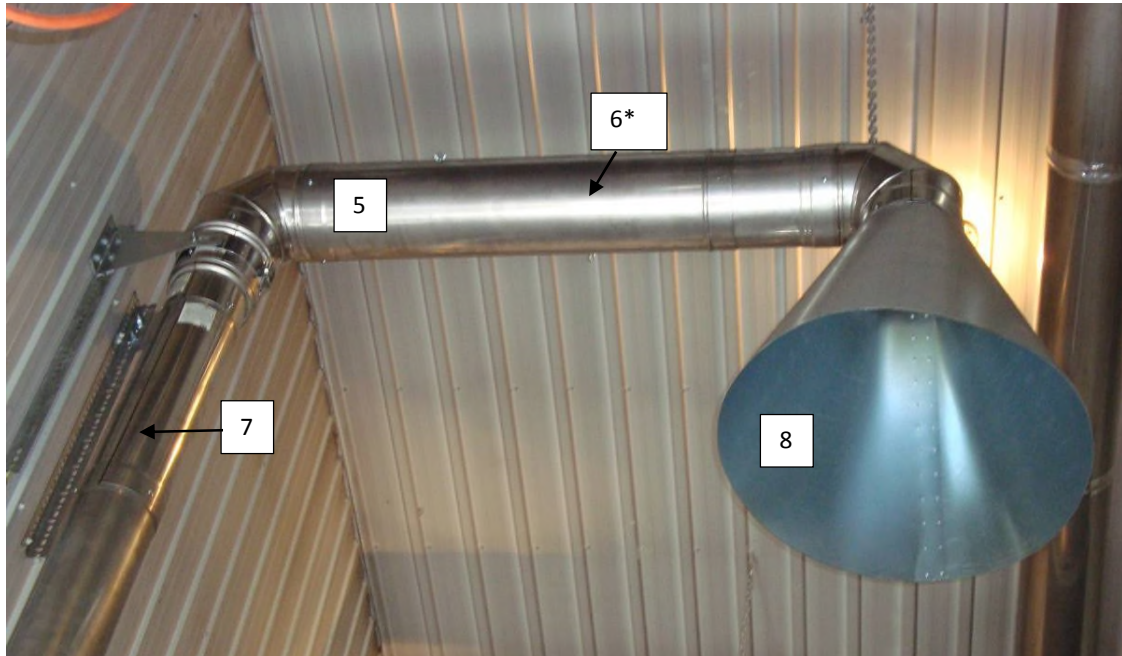
Picture 1: Sampling system



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



Picture 2: Hood and mixing baffle



\*The arrow point the deflectors inside of the pipe

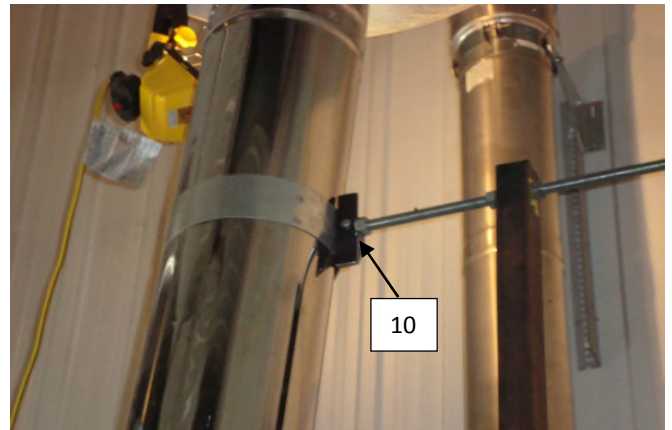
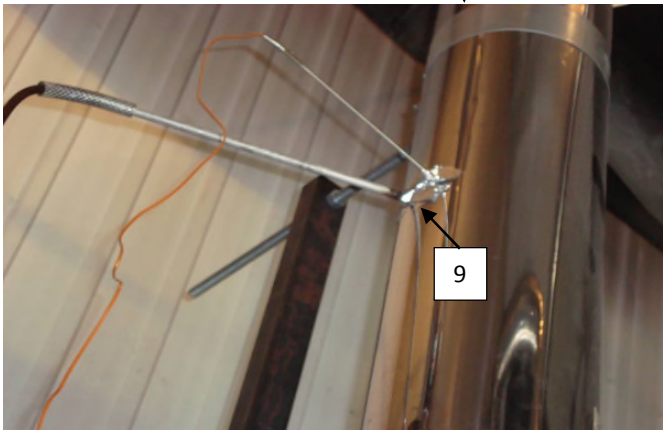
- 5 : 8 in. dia. Stainless steel pipe
- 6 : Mixing baffle (2) location 1 foot between baffles
- 7 : 10 feet long between velocity port and upper elbow
- 8 : 48 in. dia. Galvanized steel smoke captures hood

Picture 3: Stack sampling



Picture 3.1: Gas analysis and temperature probe

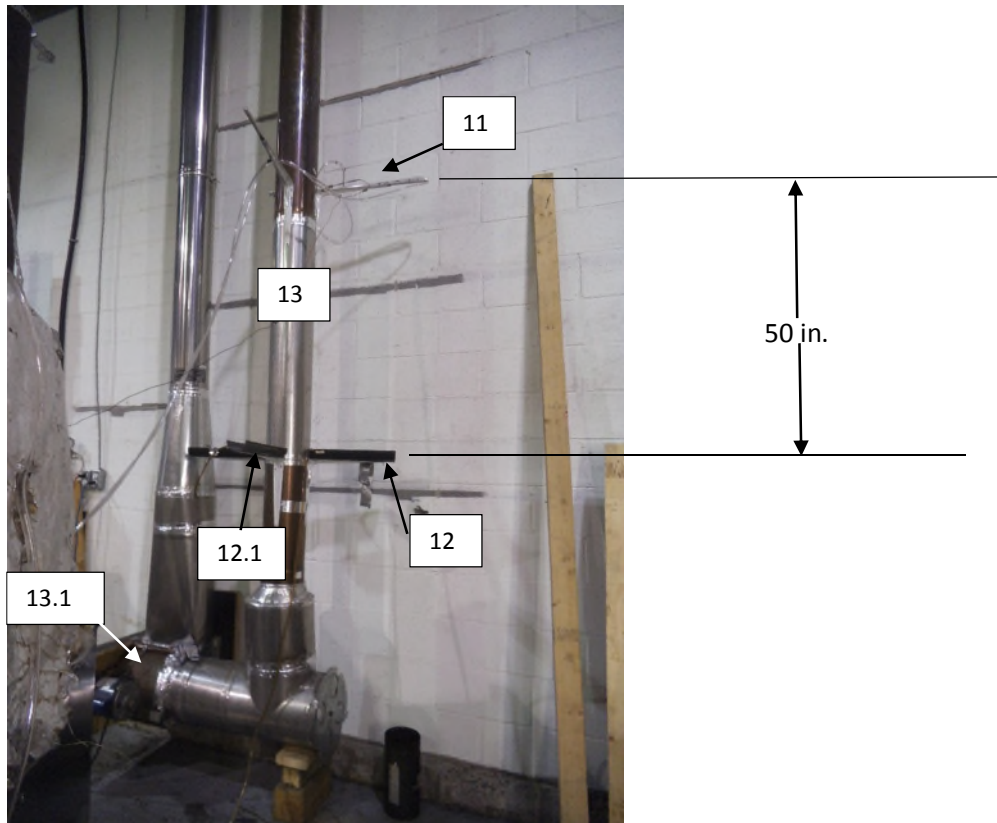
Picture 3.2: chimney support



9 : Temperature and gas analyser sampling ports located 9 feet above platform

10 : Exhaust system support bracket

Picture 4: Tunnel flow measurement and sampling probe



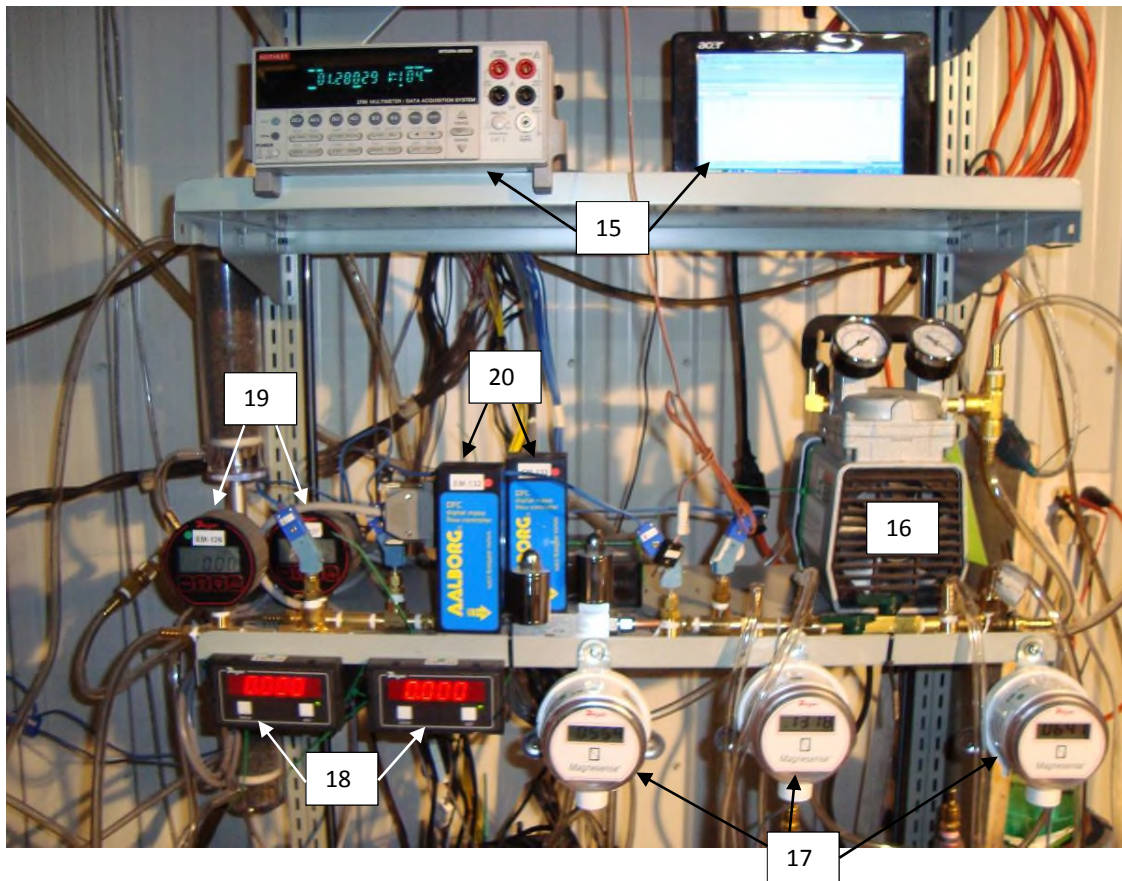
- 11 : Velocity port
- 12 : Sampling port, 2 sampling probes with 2x48 mm. dia.filter each. Filter used: Millipore AP4004700
- 12.1 : Sampling port, sampling probes with 2x48 mm. dia.filter each. Filter used: Millipore AP4004700, for first hour sampling
- 13 : 18 feet long dilution tunnel
- 13.1 : Extraction blower

Picture 5: Draft sampling



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

Picture 6: Equipments

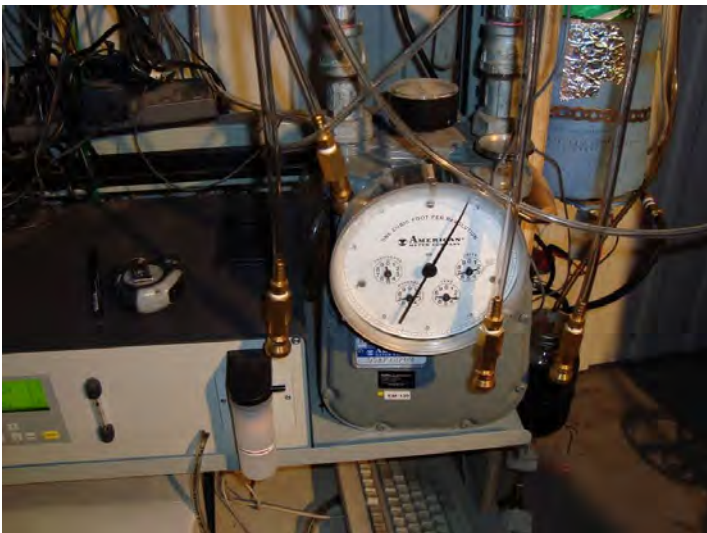


- 15 : Acquisition system
- 16 : Vacuum pump
- 17 : Digital manometer
- 18 : Digital read out for mass flow meter
- 19 : Digital vacuum gage
- 20 : Mass flow meter

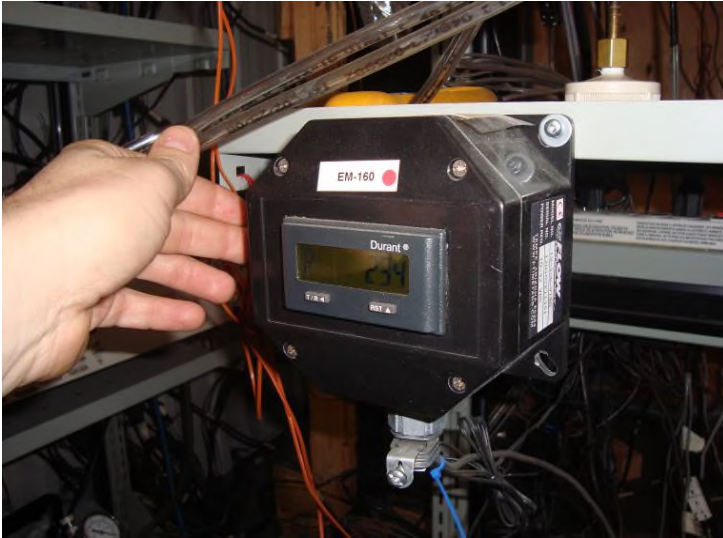
Picture 7: Gaz analyser



Picture 8: Reference dry gas meter



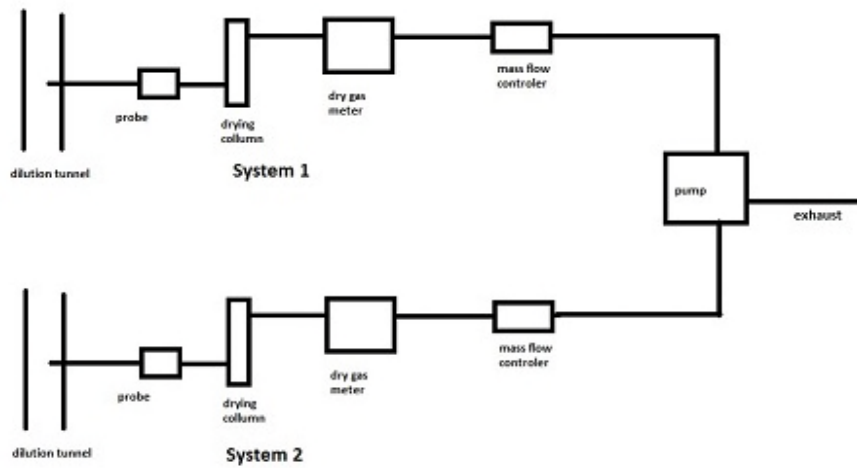
Picture 10: Water flow meter



Picture 11: Dry gas meter

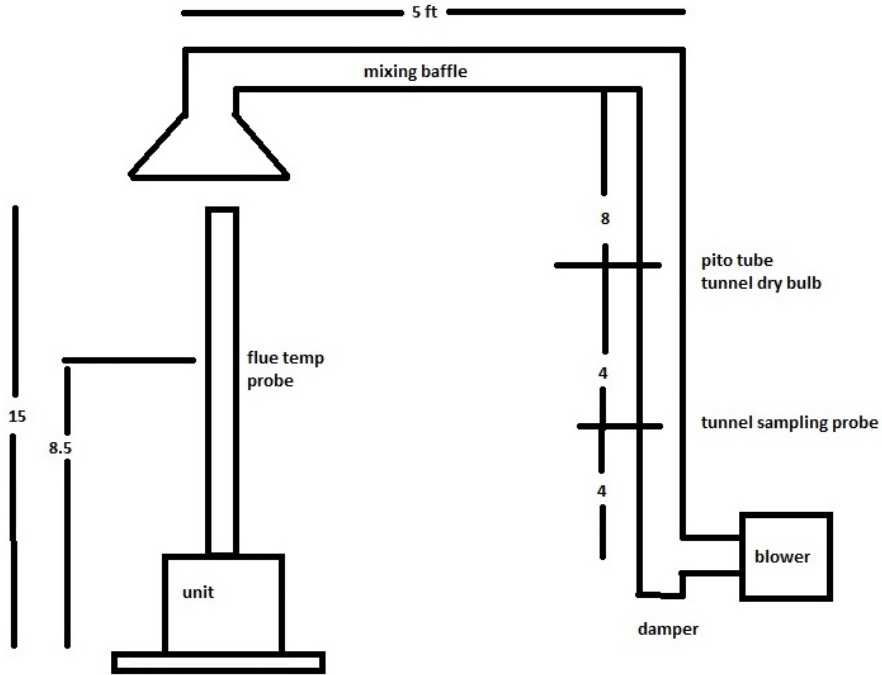


Picture 12 : Dilution tunnel sample system





Picture 13: Dilution tunnel



## APPENDIX 9: Test load photographs

**Run 1.1**



**Run 1.2**



**Run 2.1**



## APPENDIX 10: Laboratory Operating Procedures

## APPENDIX 13: Operating instruction

**Operating instruction for High burn rate Cord wood method ALT-125, ASTM E3053**

- Start the fire with approximately 8.6 lbs. of startup fuel, 4 lbs. of kindling.
- After one minute close the door.
- When left approximately 3 lbs. from the startup load, the high burn rate load can be inserted.
- The high burn rate load can be up to 20.1 lbs. open the door, load the stove with high burn load.
- Close the door after two minutes.
- After 40 minutes the convection fan can be started.

**Operating instruction for Medium burn rate Cord wood method ALT-125, ASTM E3053**

- From the high burn rate coal bed, when 4 lbs. left, the load can be inserted in the firebox.
- open the door
- Insert the 21 lbs. load in the wood heater
- Keep the door slightly open for five minutes following load insertion
- Keep the combustion air damper fully open for 13 minutes, then gradually close to air damper to the medium setting
- At 15 minutes close the combustion air damper to the medium setting.
- No fan for the medium setting.

**Operating instruction for Low burn rate Cord wood method ALT-125, ASTM E3053**

- From the high burn rate coal bed, when 4 lbs. left, the load can be inserted in the firebox.
- open the door
- Insert the 21 lbs. load in the wood heater
- Keep the door slightly open for five minutes following load insertion
- Keep the combustion air damper fully open for 13 minutes, then gradually close to air damper to the minimum setting
- At 15 minutes fully close the combustion air damper (lowest setting).
- No fan for the minimum setting.



## APPENDIX 14: Drawing Air flow pattern

## APPENDIX 15: Application for wood stove program

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

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

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A. <i>Summary Results – Adjustable Wood Burning Heaters</i> .....	7
B. <i>Summary Results – Single Burn Rate Wood Burning Heaters</i> .....	<b>Erreur ! Signet non défini.</b>
C. <i>Summary Results – Pellet Heaters</i> .....	<b>Erreur ! Signet non défini.</b>
Hydronic Heaters.....	<b>Erreur ! Signet non défini.</b>
II. Test Method 28WHH for Measurement of Particulate Emissions and Heating Efficiency of Wood-Fired Hydronic Heating Appliances	<b>Erreur ! Signet non défini.</b>
Table 1A. Data Summary Part A .....	<b>Erreur ! Signet non défini.</b>
.....	<b>Erreur ! Signet non défini.</b>
Table 1B. Data Summary Part B .....	<b>Erreur ! Signet non défini.</b>
Table 1C: Additional (Hangtag) Information .....	<b>Erreur ! Signet non défini.</b>
Table 2. Annual Weighting .....	<b>Erreur ! Signet non défini.</b>
III. Test Method 28WHH for Certification of Cord Wood-Fired Hydronic Heating Appliances With Partial Thermal Storage...	<b>Erreur ! Signet non défini.</b>
Table 2A. Data Summary Part A .....	<b>Erreur ! Signet non défini.</b>
Table 2B. Data Summary Part B .....	<b>Erreur ! Signet non défini.</b>
Table 3C. Data Summary Part D.....	<b>Erreur ! Signet non défini.</b>
Forced-Air Furnaces.....	<b>Erreur ! Signet non défini.</b>
IV. Forced-Air Furnaces .....	<b>Erreur ! Signet non défini.</b>

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

**GENERAL INFORMATION**

**Manufacturer's Name: Wolf Steel Ltd**

<b>Heater Type (Circle One):</b>	Adjustable Burn Rate Wood Heater	Pellet Stove	Single Burn Rate Heater	Hydronic Heater	Forced Air Furnace	Other:
<b>Hydronic Heater Type (Circle One):</b>	Traditional	Full Storage	Partial Storage	Indoor/Outdoor	Other:	
<b>Forced-Air Furnace Type (Circle One):</b>	Small (less than 65,000 BTU/hr heat output)		Large (greater than 65,000 BTU/hr heat output)		Other:	
<b>Fuel Tested:</b>	Crib	Pellet	Cordwood	Wood Chips	Other:	
<b>Test Method(s):</b> ALT-125 ; AMSTE3053 ; ASTME2515			<b>Catalyst:</b> no			

**Model Name and Design Number (The model name and design number must clearly distinguish one model from another. The name and design number cannot include the EPA symbol or logo or name or derivatives such as "EPA):** Timberwolf 2200, Timberwolf EPI22, Napoleon S20, Napoleon S20-i, Napoleon 2020-S, Napoleon 2020-Si.

<b>Physical Address (Street number and Address, not P.O. Box):</b> 9 NAPLOEON ROAD	<b>Mailing Address:</b> 9 NAPLOEON ROAD	
<b>City:</b> BARRIE	<b>State:</b> ON	<b>ZIP Code:</b> L4M 0G8
<b>Phone:</b> 705-721-1212	<b>Email:</b> PHODGES@NAPOLEONPRODUCTS.COM	<b>Website:</b> WWW.NAPOLEONPRODUCTS.COM

**EPA Submission Date of 30 day Notice:**

**MANUFACTURER'S AUTHORIZED REPRESENTATIVE INFORMATION**

<b>Name:</b> PAUL HODGES		
<b>Position/Title:</b> ENGINEERING MANAGER – EARTH R&D		
<b>Address:</b> 9 NAPLOEON ROAD		
<b>City:</b> BARRIE	<b>State:</b> ON	<b>ZIP Code:</b> L4M 0G8
<b>Phone:</b> 705-721-1212	<b>E-mail:</b> PHODGES@NAPOLEONPRODUCTS.COM	<b>Website:</b> WWW.NAPOLEONPRODUCTS.COM

**Remarks:**

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

**EPA-APPROVED TEST LABORATORY**

**Name of Test Laboratory:**  
Polytests Services inc.

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

**Position/Title:** VP operation

**Address:** 695-B Gaudette,

**City:** St-Jean-sur-Richelieu

**State:** Quebec, Canada

**ZIP Code:** J3B 7S7

**Phone:** 450 741-3636

**Email:** dpower@polytests.com

**Website:** www.polytests.com

**Remarks:**

**EPA-Approved Third Party Certifier**

**Name of Certifier Entity:** Omni

**Name of Person Authorized or Responsible for Reviewing Test Report and/or Issuing Certification of Conformity:**  
Ken Morgan

**Position/Title:** Project Manager

**Address:** 13327 NE Airport Way

**City:** Portland

**State:** OR

**ZIP Code:** 97230

**Phone:** 503 643-3788

**Email:**  
kmorgan@omni-test.com

**Website:**  
Omni-test.com

**Remarks:**


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

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

**FOR EMISSIONS DATA SUMMARY TABLES SEE ATTACHMENTS**

**1. Engineering Drawings Statement**

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.

**All components include dimensions and production tolerances which meet or exceed the prescribed requirements and facilitate inspection. Replacement procedures are clearly documented in service kits.**

**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.

**No – the firebox and any firebox component will not be made of different materials than what was used in the certification testing.**

**3. CBI**

Clear identification of any claimed confidential business information (CBI). Submit such information under separate cover to the EPA CBI Office; Attn: Residential Wood Heater Compliance Program Lead, 1200 Pennsylvania Ave., NW, Room 7138, MS:2227A, Washington, DC 20460. **Note that all emissions data, including all information necessary to determine emission rates in the format of the standard, cannot be claimed as CBI.**

**CBI was sent to EPA Testing Laboratory Polytest INC.**

**4. Valid Certification Statement**

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).

**Yes all requirements in the above section is covered as per the requirements in the test report.**

**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.

**All warranty data is included in the manual and includes the necessary statements as per this section.**

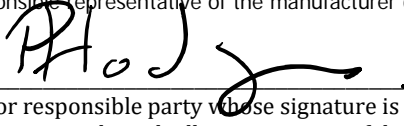
**6. Q/A Statement**

A statement that the manufacturer will conduct a quality assurance program for the model line that satisfies the requirements of paragraph (m) of this section.

**Yes, included with the report is Wolf Steel's SOP on quality assurance inspection program.**

<p><b>7. Laboratory Sealing of Unit</b></p> <p>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.</p> <p><b>The unit has been sealed at the testing facility by the technicians performing the test. There is metal banding encasing the unit preventing the door from being opened and modifications made. The unit is clearly permanently labeled as the EPA test unit.</b></p>	
<p><b>8. Statements that the wood heaters manufactured under this certificate will be—</b></p> <ul style="list-style-type: none"> <li>(i) Similar in all material respects that would affect emissions as defined in § 60.531 to the wood heater submitted for certification testing, and labeled as prescribed in § 60.536 and 60.5478.</li> <li>(ii) 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 Administrator and be available to the public on the manufacturer's web site.</li> </ul> <p><b>Yes, the wood heater manufactured will be of similar material to the wood heater tested. Each unit will be accompanied by its owner's manual and will be available on the Timberwolf and Napoleon websites.</b></p>	
<p><b>9. Third Party Certification Statement</b></p> <p>A statement that the manufacturer has entered into contracts with an approved laboratory and an approved third-party certifier that satisfy the requirements of paragraph (f) of this section.</p> <p><b>Yes, Wolf Steel has entered into a contract with Polytest as an approved EPA laboratory and Omni as a third party certifier.</b></p>	
<p><b>10. Approved laboratory/third party Statement</b></p> <p>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.</p> <p><b>Yes, both the approved laboratory and third party certifier have been given permission to submit information on behalf of Wolf Steel.</b></p>	
<p><b>11. Manufacturer's Website Certification Test Reports Availability Statement</b></p> <p>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 Administrator issues a certificate of compliance.</p> <p><b>We will place a copy of the certification test and summary on the Timberwolf and Napoleon websites within 30 days of the certificate.</b></p>	
<p><b>12. Transferability Acknowledgement Statement</b></p> <p>A statement of acknowledgment that the certificate of compliance cannot be transferred to another manufacturer or model line without written approval by the Administrator.</p> <p><b>We acknowledge that the certificate of compliance cannot be transferred to another manufacturer or model line without notification and written approval by the administrator.</b></p>	
<p><b>13. Statement about Selling Wood Heaters without an EPA Certificate</b></p> <p>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.</p> <p><b>We acknowledge that we cannot sell, distribute or offer to sell the wood heater without a valid certificate of compliance.</b></p>	
<p><b>Print Name and Title: PAUL HODGES, ENGINEERING MANAGER – HEARTH R&amp;D</b></p>	<p><b>Date: 12<sup>TH</sup> NOVEMBER 2018.</b></p>

Signature of responsible representative of the manufacturer certifying the accuracy of the above statements:

A handwritten signature in black ink, appearing to be "R. H. Jones", written over a horizontal line.

The authorized or responsible party whose signature is above is certifying that the manufacturer has complied with and will continue to comply with all requirements of the 2015 NSPS for compliance certification and that the manufacturer remains responsible for compliance regardless of any error by the test laboratory or third-party certifier.



**Attachments**

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

**WOOD BURNING HEATERS**

**I. Test Method 28R for Certification and Auditing of Wood Heaters**

**A. SUMMARY RESULTS – ADJUSTABLE WOOD BURNING HEATERS**

Model name / number	Timberwolf 2200		
Usable Firebox volume	1,91		
Convection air Fan ( no, Standard, option)	optional		
average for each test run category	L	M	H
burn rate kg/h DB	0,99	1,24	4,14
PM Emission rate - g/h	2,80	1,29	3,10
Co emission rate - g/h	129,02	95,42	97,73
Overall Efficiency - CSA B 415,1			
% HHV Basis	72,0%	72,7%	71,0%
% LHV Basis	77,4%	78,2%	76,4%
Heat output - Btu/hr	12944	17310	54127
Category weighting	0,4	0,4	0,2

**WEIGHTED AVERAGE FINAL RESULTS**

ASTM E 3053 Weighted averages			
PM Emission Rate - g/h	2,25		
CO Emission Rate g/h	109,3		
Overall Efficiency - CSA B415,1			
% HHV Basis	72,06%		
% LHV Basis	77,54%		
Heat output range - Btu/h	12 944	to	54127
Co Arithmetic average g/min	1.79		