



TEST REPORT

TEST OF A WOOD BURNING CORD WOOD FURNACE  
EMISSIONS AND EFFICIENCY  
PER  
ALT-134 and ASTM E 2515

Client:

**United States stove company**

227 industrial park rd.  
South pittsburg, TN 37380

Model Tested:

HB 1520

Attention: Rafael Sanchez

TESTED BY:

Services Polytests inc  
695-B Gaudette  
St-jean-sur-Richelieu

TEST DATES: From August 9<sup>th</sup> to August 17<sup>th</sup> 2022

REPORT DATE: September 1<sup>st</sup> 2022

Revision1: November 21<sup>st</sup> 2022

Revision 2: February 20<sup>th</sup> 2024

Project number: PI-20275

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Tested by:

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

Maxime Martin

Written by:

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

Danick Power P Eng.

Verified by third party certifier (PFS):

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### List of revision:

Revision 1: November 21<sup>st</sup> 2022

- Appendix 13 firebox volume detail calculation updated for usable volume.
- Report P. 11 updated to include the firebox volume.
- Appendix 4 first page, additional list of equipment used for testing with calibration date due.

Revision 2 (February 20<sup>th</sup> 2024):

- Additional new name for the same appliance
- Appendix 6, updated with new manual cover sheet with new names, and additional new names on markings
- Section 1.2, updated to include additional new names.

## **Appendixes**

- Appendix 1 Unit Operating Procedures
- Appendix 2 Raw data, forms and Results
- Appendix 3 Drawing and specifications
- Appendix 4 Equipment list, calibration certificates
- Appendix 5 Unit pre-burn
- Appendix 6 Operator's manual
- Appendix 7 Participant
- Appendix 8 Proportionality results
- Appendix 9 Test load photographs
- Appendix 10 photograph of the test setup
- Appendix 11 Drawing of air flow pattern
- Appendix 12 example calculation
- Appendix 13 Firebox Volume
- Appendix 14 ALT-134 Letter, 30 day notice, WHA, CoC

## 1 INTRODUCTION

### 1.1 GENERAL

#### Laboratory

- Location: Services Polytests Inc., 695-B Gaudette St-jean-sur-richelieu.
- Elevation: 100 feet above sea level.

#### Test program

- Purpose: 2020 Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters, and Forced-Air Furnaces, 40 CFR PART 60 SUBPARTS AAA AND QQQQ
- Test dates: From August 9<sup>th</sup> to August 17<sup>th</sup> 2022
- Test methods used: ALT-134 and ASTM E2515

### 1.2 TEST UNIT INFORMATION

#### General

- Manufacturer: United States Stove Company
- Product type: Cord wood, hot air furnace
- Combustion system: forced combustion air wood furnace with the combustion fan located at the upper back of the furnace, blowing into an air channel on top of the heat exchanger with primary air coming from the upper front and pilot air at the bottom front of the firebox. The Secondary air system located in the upper part of the firebox get is air from the combustion fan and from barometric damper air inlet located just above the loading door at the front of the appliance
- Unit tested: HB 1520
- model name and description:  
HB 1520: Thermostatic controlled cord wood hot air furnace. This furnace is thermostatically controlled by an on and off combustion Fan. This furnace is equipped with combustion fan located external on the upper back side of the furnace, blowing combustion air is controlled by the heat demand, switching between ON and OFF. The 6 inches exhaust is located at the top rear of the Furnace.

Particularities Options: None

Product line similarities: additional branding name: US1520, VG1520, N35, C2235, SWF1035 SWF1035K, WC1520, KWF1520, CGWF4000, DHWF4000 same appliance only names differ.

## 1.3 RESULTS

Emission results obtained

- Weighted average emission: 0.13 lbs/MMBTU output
- Maximum rate cap: 0.148 lbs/MMBTU output run run #4 cat 2

Conformity: Step 2 of EPA 2020 Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters, and Forced-Air Furnaces, after May 2020, 0.15 Lb/MMBtu heat output each run with cord wood.

## 1.4 PRETEST INFORMATION

Unit condition: The unit was received by a transporter in June, inspected, and found to be in good condition. The appliance was installed in July on a test bench for the 50hrs aging with red oak (cord wood 20 inches log log) with moisture content between 19% and 24%.

Set up

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

Break in period

- Duration: the 50 hrs pre-burn has been done at Polytests prior to the official test series at medium heat draw, data provided in appendix 5
- Average burn rate: Category II output
- Fuel: Red oak Cord wood between 19% and 24% moisture content

## 2 SUMMARY OF TEST RESULTS

### 2.1 TABLE 1A: DATA SUMMARY PART A

Run	Target Delivered Heat Output Range (BTU/hr)	Actual Delivered Heat Output Rate (BTU/hr)	Percent of Maximum Output based on the output (%)	First Hour Emissions Rate (lbs/mmbtu output)	Total Emissions Rate (lbs/mmbtu output)	HHV Heat Input Rate (BTU/hr)	Delivered HHV Efficiency (%)	Overall HHV Efficiency (%)	Overall Heat Output (BTU/hr)	CO Emissions Rate (g/hr)	ASTM E2515 Emissions – First Hour (g/hr)
1	55 000	53 042	96.4	0.167	0.133	101 231	52.7	64.4	65 258	502	5.70
2	15 900	15 997	30.2	0.365	0.087	21 967	73.0	74,4	16 351	148	5.93
3	35 000	29 737	56.1	0.389	0.144	46 023	64.8	70.37	32 386	260	7.46
4	23 000	21 922	41.3	0.604	0.148	30 730	71.5	71.6	22 004	198	10.75
<b>Average particulate emission: 0.13 lbs/MMbtu output</b>											
<b>Overall thermal efficiency (HHV): 70 %</b>											
<b>Overall Delivered Heat Efficiency: 66 %</b>											

## 2.2 HANG TAG INFORMATION

MANUFACTURER:	United State Stove Company		
MODEL NUMBER:	HB 1520		
MAXIMUM OUTPUT RATING:	Q <sub>max</sub>	53 042	BTU/HR
ANNUAL EFFICIENCY RATING:	D <sub>avg</sub>	66	(Using higher heating value)
PARTICLE EMISSIONS:	E <sub>avg</sub>	1.8	GRAMS/HR (average)
		0.13	LBS/MILLION BTU OUTPUT
CARBON MONOXIDE:	CO <sub>g</sub> /MIN	4.6	GRAMS/MINUTE

## 2.3 TEST FACILITY CONDITION

Run Number	Room Temperature		Barometric pressure		Relative humidity		Air Velocity	
	Before (F)	After (F)	Before (in.Hg)	After (in.Hg)	Before (%)	After (%)	Before (ft/min)	After (ft/min)
1	68	74	29,68	29,80	70,1	59,1	0	0
2	75	77	29,91	29,77	60,6	56,4	0	0
3	76	78	29,88	29,91	55,6	52,1	0	0
4	75	82	29,94	29,77	55,4	52,6	0	0

## 2.4 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number	Pre-test Load			Test Load				
	Loading Weight Wet Basis (lbs)	Moisture Content Dry Basis (%)	Coal bed Weight (lbs)	Weight Wet Basis (lbs)	Density Wet Basis (lbs/cuft)	Moisture Content Dry Basis (%)	Piece Length (in.)	Number of pieces
1	40,32	20,42	9,9	40,02	10,13	20,04	20	6
2	41,02	20,44	9,7	39,34	9,959	20,54	20	6
3	41,52	19,96	9,0	41,78	10,577	21,10	20	6
4	41,88	21,13	10,5	42,56	10,775	20,55	20	6

## 2.5 DILUTION TUNNEL FLOW RATE MEASUREMENTS AND SAMPLING DATA (SECTION 6.23 ASTM E2515)

Average dilution tunnel measurements				Sample Data			
Run Number	Burn Rate (Min)	Volumetric Flow Rate (dscf/min)	Total Temperature s (°R)	Volume sampled (DSCF)		Particulate catch (mg)	
				1	2	1	2
1	169	313,59	605,76	30,691	31,215	5,40	5,20
2	763	338,83	545,95	139,445	138,838	4,70	4,30
3	385	327,13	571,99	70,913	70,500	7,40	7,10
4	590	373,15	557,86	108,511	108,113	7,60	7,10

## 2.6 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number	Sample Ratio		Total Emission (g)			
	Train 1	Train 2	Train 1	Train 2	% Deviation	Deviation g/Kg
1	1726,78	1697,79	9,32	8,83	2,73%	0,033
2	1854,03	1862,14	8,31	7,79	3,24%	0,035
3	1776,02	1786,44	12,74	12,28	1,84%	0,029
4	2028,88	2036,34	14,96	14,00	3,32%	0,060

### 3 PROCESS DESCRIPTION

All runs have been found appropriate, no anomalies happened and all runs below have been validate and found compliant. All load logs have been positioned front to back direction into the firebox. No logs have been debarked, all logs were split to meet individual and total load weight range for the firebox. None of them have been squared. Filters have been weighted in pairs as required by the ALT-134 testing method to reduce weighting error propagation.

#### 3.1 DISCUSSION

During the 1<sup>st</sup> run (cat. 4) the air inlet is maintained fully open to aim for the maximum power of 55 000 Btu/hr. The furnace delivers during the test an average of 53 042 Btu/hr at 5.37 kg/hr burn rate, and reach within 10% the targeted output delivery category of the maximum burn rate. The delivery efficiency at this output category was 52.7 % and emission of 0.133 lb/MMBtu output, 40.0 lbs of fuel have been consumed with 9.07 gr total emission.

During the 2<sup>nd</sup> run the wood furnace was set to a category 1 burn rate at least one hour before beginning the sampling. The combustion air fan is maintained to ON position for a 5 minutes-period following the load insertion and then switch to OFF (minimum burn rate position) for the rest of the test. The furnace delivers during the test an average of 15 997 Btu/hr at 1.164 kg/hr and reaches the targeted output delivery category of the category 1. The delivery efficiency at this output category was 73.0 % and emission of 0.087 lb/MMBtu output, 39.34 lbs of fuel have been consumed with 8.05 gr total emission.

During the 3<sup>rd</sup> run the wood furnace was set to category 3 burn rates at least one hour before beginning the sampling. The furnace delivers during the test an average of 29 737 Btu/hr, and reach the targeted category 3. The delivery efficiency at this output category was 64.8 % and emission of 0.144 lb/MMBtu output, 41.78 lbs of fuel have been consumed with 12.5 gr total emission. During this test the combustion fan have been cycled between on and off to maintain target output delivery within the category 3.

During the 4<sup>th</sup> run the wood furnace was set to category 2 burn rate output at least one hour before beginning the sampling. The combustion air fan is maintained to ON position for a 5 minutes-period following the load insertion and then switch to OFF. The combustion fan was manually open and close during test to aim for the targeted output category 2. The furnace delivers during the test an average of 21 922 Btu/hr output at 1.63 kg/hr burn rate, and reach the targeted output delivery category of the category 2. The delivery efficiency at this output category was 71.5 % and emission of 0.148 lb/MMBtu output, 42.56 lbs of fuel have been consumed with 14.48 gr total emission.



**Appliance:** Cord Wood thermostatic Hot air furnace

**Model:** HB 1520

**Type:** Thermostatic controlled

**Materials of Construction:** The firebox and heat exchanger are constructed primarily of mild steel. The secondary combustion system (flame tube) is made of stainless steel. The unit's enclosure is all painted steel. Dimensions 45 in. wide X 23.5 in. height X 49 in. Depth

**Internal Baffles:** Refractory baffle 1 3/16 inch thick. Details Appendix c drawings

**Other Features:** Fan blowers. Details Appendix 3 drawings

**Flue Outlet:** The 6-inch diameter flue outlet is located at the rear top.

**Firebox Volume:** 3,948 cu.ft, all detail in appendix 13.

## 3.2 AIR SUPPLY SYSTEM

**Air Introduction System:** forced combustion air wood furnace with the combustion fan located at the upper back of the furnace, blowing into an air channel on top of the heat exchanger with primary air coming from the upper front and pilot air at the bottom front of the firebox. The Secondary air system located in the upper part of the firebox get is air from the combustion fan and from barometric damper air inlet located just above the loading door at the front of the appliance. All the combustion air is controlled by the fan switching between ON and Off as per the loading demand. During maximum output the fan is at ON position for minimum burns the fan is turned OFF and combustion air can go through the system with natural draft. For testing purpose, a switch was installed on the fan to manually control the deliver output for different category of the testing sequence. Secondary air is pre-heated in the upper portion of the firebox from Stainless steel tubes, goes e back of the firebox and come front to back in the top section of firebox and going out from the secondary system. Primary air from holes at the front lower part of the firebox.

**Combustion Control Mechanisms:** Thermostatic controlled combustion air inlet. For all details refer to appendix 3

### 3.3 PROCESS OPERATION DURING TEST

#### Unit operation

- 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.

Run	Fuel / Combustion Air	Target output	% Of max
1	Fuel: 40.02 Lbs Combustion fan: ON	Target: 55 000 Btu/hr Results: 53 042 Btu/hr	96.4
2	Fuel: 39.34 Lbs Combustion fan: OFF	Target: Category 1 Results: 15 997 Btu/hr	30.2
3	Fuel: 41.78 Lbs Combustion fan: ON & OFF aiming for the output target	Target: Category 3 Results: 32 386 Btu/hr	56.1
4	Fuel: 42.56 Lbs Combustion fan: ON & OFF aiming for the output target	Target: Category 2 Results: 21 922 Btu/hr	41.4

#### Test fuel

- Test fuel: Cord wood, (Red Oak) between 18% and 28% moisture content.
- Sourcing: Polytests Services.
- Handling and storage: keep all logs in the same humidity and temperature-controlled room all wrap together to ensure the stability of the moisture.

### 3.4 START-UP OPERATION

The complete firing procedure of each burn rate category is fully described in appendix.

## 4 SAMPLING SYSTEMS

### 4.1 SAMPLING LOCATIONS

Particulate samples are collected from the dilution tunnel. The tunnel has two elbows. The sampling section is a continuous section of 8-inch diameter pipe straight over its entire length. Tunnel velocity pressure is determined by a standard pitot tube located upstream from the sampling section. Thermocouple is installed on the Pitot tube to measure the dry bulb temperature MC is assumed, as allowed, to be 2%. Tunnel samplers are located downstream of the Pitot tube and upstream from the end of this section. All details of the dilution tunnel can be found in Appendix 10.

### 4.2 DRAWINGS

Various drawings of the stack gas sampling train and of dilution tunnel system are found in Appendix 9.

### 4.3 EMISSIONS EFFICIENCY TESTING EQUIPMENT LIST

The complete test equipment list together with all corresponding calibration data can be found in Appendix 10.

## 5 SAMPLING METHODS

### 5.1 PARTICULATE SAMPLING

Particulates were sampled in strict accordance with ASTM E2515. This method uses two identical sampling systems with 47mm Teflon-coated glass fiber filters (PALL TX40) are used and weighted in pair. The dryers used in the sample systems are filled with "Drierite" before each test run.

## 6 QUALITY ASSURANCE

### 6.1 INSTRUMENT CALIBRATION

#### 6.1.1 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 .001 fr', the resolution is .1 %, giving an accuracy higher than the 2% required by the standard. All gas Meter are ISO 17025 Calibrated every 6 months.

#### 6.1.2 STACK SAMPLE MASS FLOW CONTROLLER

The stack sample mass flow meter regulates each flow rate used during the test program. The flow rate is acquisitioning every minute during the test run and use for the proportionality calculation. The dry gas meter volume measured is then corrected to standard temperature and pressure conditions.

#### 6.1.3 GAS ANALYZERS

The continuous analyzers are zeroed and spanned before each test with NIST 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.

At the conclusion of each unit test program, a three-point calibration check is made and must meet accuracy requirements of the applicable standards. Consistent deviations between analyzer readings and calibration gas concentrations are used to correct data before computer processing.

## 6.2 TEST METHOD PROCEDURES

### 6.2.1 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.

### 6.2.2 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.

### 6.2.3 PM SAMPLING PROPORTIONALITY (ASTME2515)

Proportionality was calculated in accordance with ASTM E2515. The data and results are in appendix.

### 6.2.4 HEAT OUTPUT MEASUREMENT

Output measurement is done with Thermocouple grid in the outlet duct and Pitot Type S for flow measurement of duct air outlet. Data Acquisition system log every minute for output calculation. Before the ignition of the test a pitot factor is measured and calculated with a vane Anemometer.

## **Appendix 1 Unit Operating Procedures**



July 25, 2022  
Danick Powers  
Services PolyTests Inc.  
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## Furnace loading procedure

### High burn

- Start the fire with approx 12 lbs kindling, keeping the door slightly open for good ignition and start combustion fan
- Add another 12 to 15 lbs of kindling when the fire is well ignited
- Let the piece ignite with the door slightly open for 3 minutes
- Close the door
- When the kindling weight reach 8 lbs preload can be added in the firebox
- Following insertion close the door and keep the combustion fan ON
- At 10 lbs , open door insert main load( 39.5 lbs +- 10%), the door can be slightly open for 3 minutes for good ignition, then close the door, Keep the combustion fan always ON
- Try to keep gaps between load to help the ignition and good fire
- The maximum output should be around 53 000 Btu/hr for maximum burn

### Medium high category 3 burn

- Start the fire with approx 12 lbs kindling, keeping the door slightly open for good ignition and start combustion fan
- Add another 12 to 15 lbs of kindling when the fire is well ignited
- Let the piece ignite with the door slightly open for 3 minutes
- Close the door
- When the kindling weight reach 8 lbs preload can be added in the firebox
- Following insertion close the door and keep the combustion fan ON
- Between 9 to 10 lbs , open door insert main load( 39.5 lbs +- 10%) , the door can be slightly open for 3 minutes for good ignition, then close the door.
- Try to keep gaps between load to help the ignition and good fire
- The combustion fan will be switch between ON and OFF targeting the Category 3 output.

### Medium Low Category 2 burn

- Start the fire with approx 12 lbs kindling, keeping the door slightly open for good ignition and start combustion fan
- Add another 12 to 15 lbs of kindling when the fire is well ignited

- Let the piece ignite with the door slightly open for a few minutes
- Close the door
- When the kindling weight reach 8 lbs preload can be added in the firebox
- Following insertion close the door and keep the combustion fan ON
- At 1.5lbs above the upper end loading bracket (around 11.5 lbs) set the combustion air for cat 2 (turn OFF the combustion fan)
- Between 9 to 10 lbs and after at least 1hr, open door insert main load( 39.5 lbs +- 10%) , once the fuel is loaded the door can be closed after 5 minutes for good ignition.
- Try to keep gaps between load to help the ignition and good fire
- The combustion fan will be switch between ON and OFF targeting the Category 2 output.

#### Mimimum Category 1 burn

- Start the fire with approx 12 lbs kindling, keeping the door slightly open for good ignition and start combustion fan
- Add another 12 to 15 lbs of kindling when the fire is well ignited
- Let the piece ignite with the door slightly open for a few minutes
- Close the door
- When the kindling weight reach 8 lbs preload can be added in the firebox
- Following insertion close the door and keep the combustion fan ON
- At 1.5lbs above the upper end loading bracket (around 11.5 lbs) set the combustion air for the minimum output (turn OFF the combustion fan)
- Between 9 to 10 lbs and after at least 1hr, open door insert main load( 39.5 lbs +- 10%), once the fuel is loaded the door can be closed after 5 minutes for good ignition.
- Try to keep gaps between load to help the ignition and good fire

Let me know if you have any questions.

Sincerely:



John D. Voorhees  
VP of Compliance

## **Appendix 2    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:

### Description du test

Test standard	B415
Run #	1
Date	09-08-2022
Technicien	M.M
Project #	PI 20275

### Description de l'unité

Manufacturier	US STOVE	
Modèle	HB1520	
Combustion system	Non-Cat	
Appliance type	FURNACE	
Firebox volume	3,95	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

### Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	55 000	BTU/h Donnée fournie par le manufacturier
Targeted category	4	
Targeted output	55000	BTU/h
Cp steel	0,1	BTU/lb-°F

### Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	1,003	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	1,014	Dimensionless
Equipment number (DGM #2):	EM 318	
Calibration Factor (DGM #3):	0,997	Dimensionless
Equipment number (DGM #3):	EM 179	

### Tunnel

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

### Fournaise

Fp	3,0939900	
V m/sec No fan	na	
Outlet section		
H	7,000	in
W	8,250	in
Section		0,4010 sqft
		0,03725799 m2

<b>Project nu.</b>	PI 20275
<b>Date</b>	09-08-2022
<b>Technicien</b>	M.M

### Fuel data

Fuel type	Cord
Fuel specie	Oak
HHV	19887,0 kJ/kg
%C	50,0
%H	6,6
%O	42,9
%Ash	0,5
HHV	8552,3 Btu/lb
LHV	7480,0 Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
<b>HHV</b>	19 810	19 887
<b>%C</b>	48,73	50
<b>%H</b>	6,87	6,6
<b>%O</b>	43,9	42,9
<b>%Ash</b>	0,5	0,5
<b>HHV (Btu/lb)</b>	8519	8552
<b>LHV (Btu/lb)</b>	7451	7480



OverallEfficiency

121.00	333.00	2,27	70,43	120,77	27,96	0,024	8,622	7,776	1255,82	28,75	36101,60	601,69	0,60	62495	34220	55000
122.00	334.00	2,26	70,64	120,37	27,63	0,023	8,484	7,657	1236,53	28,41	35128,03	585,47	0,59	62258	33297	55000
123.00	335.00	2,17	70,95	119,83	27,16	0,023	8,481	7,661	1237,23	27,92	34542,63	575,71	0,58	62020	32742	55000
124.00	336.00	2,07	71,31	119,60	26,63	0,025	8,903	8,045	1299,26	27,58	35838,87	597,31	0,60	61795	33970	55000
125.00	337.00	2,07	70,45	119,05	27,00	0,024	8,681	7,853	1268,14	27,76	35200,38	586,67	0,59	61569	33365	55000
126.00	338.00	1,97	71,67	118,77	26,17	0,023	8,420	7,620	1230,55	26,91	33109,58	551,83	0,55	61332	31383	55000
127.00	339.00	1,97	70,93	118,37	26,36	0,023	8,470	7,671	1238,79	27,10	33569,04	559,48	0,56	61101	31819	55000
128.00	340.00	1,88	70,72	117,79	26,15	0,025	8,883	8,053	1300,42	26,89	34962,15	582,70	0,58	60884	33139	55000
129.00	341.00	1,97	70,85	117,45	25,89	0,023	8,405	7,624	1231,27	26,62	32771,52	546,19	0,55	60655	31063	55000
130.00	342.00	1,88	71,34	116,95	25,34	0,021	8,084	7,339	1185,20	26,05	30870,58	514,51	0,51	60415	29261	55000
131.00	343.00	1,78	70,19	116,39	25,66	0,026	8,972	8,153	1316,63	26,38	34735,51	578,93	0,58	60207	32925	55000
132.00	344.00	1,68	70,80	115,97	25,09	0,023	8,395	7,635	1232,96	25,80	31809,15	530,15	0,53	59981	30151	55000
133.00	345.00	1,68	70,57	115,68	25,06	0,026	9,056	8,240	1330,65	25,76	34282,50	571,38	0,57	59776	32495	55000
134.00	346.00	1,58	70,64	115,64	25,00	0,022	8,292	7,546	1218,56	25,70	31317,01	521,95	0,52	59553	29684	55000
135.00	347.00	1,58	71,33	115,41	24,49	0,022	8,314	7,569	1222,26	25,18	30770,68	512,84	0,51	59330	29167	55000
136.00	348.00	1,58	70,48	115,26	24,88	0,023	8,384	7,634	1232,80	25,58	31532,92	525,55	0,53	59115	29889	55000
137.00	349.00	1,47	70,74	114,92	24,54	0,023	8,520	7,763	1253,60	25,23	31629,52	527,16	0,53	58904	29981	55000
138.00	350.00	1,38	71,14	114,63	24,16	0,024	8,575	7,816	1262,25	24,84	31353,79	522,56	0,52	58694	29719	55000
139.00	351.00	1,37	70,74	114,25	24,17	0,022	8,317	7,586	1225,11	24,85	30444,34	507,41	0,51	58481	28857	55000
140.00	352.00	1,27	71,02	114,14	23,95	0,022	8,247	7,524	1215,07	24,63	29921,28	498,69	0,50	58267	28361	55000
141.00	353.00	1,27	70,34	113,83	24,16	0,024	8,606	7,855	1268,56	24,84	31509,14	525,15	0,53	58067	29866	55000
142.00	354.00	1,18	70,70	113,40	23,72	0,026	8,891	8,122	1311,55	24,39	31988,91	533,15	0,53	57873	30321	55000
143.00	355.00	1,17	70,48	113,12	23,69	0,020	7,937	7,253	1171,37	24,35	28526,57	475,44	0,48	57659	27039	55000
144.00	356.00	1,08	70,87	113,06	23,44	0,025	8,775	8,021	1295,27	24,10	31212,79	520,21	0,52	57465	29586	55000
145.00	357.00	1,08	70,35	112,78	23,57	0,025	8,727	7,981	1288,79	24,23	31233,66	520,56	0,52	57274	29605	55000
146.00	358.00	1,08	70,85	112,62	23,21	0,023	8,464	7,743	1250,36	23,86	29829,47	497,16	0,50	57077	28274	55000
147.00	359.00	0,98	71,29	112,70	23,00	0,023	8,425	7,706	1244,39	23,65	29426,36	490,44	0,49	56880	27892	55000
148.00	360.00	0,88	71,39	112,68	22,94	0,024	8,634	7,897	1275,30	23,58	30076,84	501,28	0,50	56690	28509	55000
149.00	361.00	0,88	71,14	112,51	22,98	0,024	8,607	7,875	1271,75	23,62	30043,66	500,73	0,50	56501	28477	55000
150.00	362.00	0,88	71,39	112,33	22,75	0,024	8,632	7,900	1275,74	23,39	29835,57	497,26	0,50	56315	28280	55000
151.00	363.00	0,79	70,79	112,13	22,97	0,022	8,317	7,614	1229,59	23,61	29033,73	483,90	0,48	56125	27520	55000
152.00	364.00	0,79	70,48	111,58	22,83	0,024	8,551	7,837	1265,53	23,47	29702,28	495,04	0,50	55942	28154	55000
153.00	365.00	0,67	71,22	111,56	22,41	0,022	8,291	7,598	1227,07	23,04	28272,01	471,20	0,47	55753	26798	55000
154.00	366.00	0,67	70,43	111,22	22,66	0,021	8,129	7,454	1203,78	23,29	28040,68	467,34	0,47	55565	26579	55000
155.00	367.00	0,67	70,78	111,18	22,45	0,025	8,822	8,090	1306,53	23,08	30151,59	502,53	0,50	55392	28580	55000
156.00	368.00	0,57	71,10	111,06	22,20	0,023	8,492	7,789	1257,85	22,83	28711,20	478,52	0,48	55212	27214	55000
157.00	369.00	0,47	71,10	110,75	22,03	0,023	8,421	7,729	1248,09	22,65	28268,03	471,13	0,47	55033	26794	55000
158.00	370.00	0,47	70,94	110,41	21,93	0,024	8,543	7,845	1266,87	22,54	28560,58	476,01	0,48	54857	27072	55000
159.00	371.00	0,38	71,15	110,24	21,72	0,025	8,701	7,992	1290,64	22,33	28815,12	480,25	0,48	54685	27313	55000
160.00	372.00	0,38	71,24	110,15	21,61	0,022	8,276	7,603	1227,86	22,22	27284,34	454,74	0,45	54506	25862	55000
161.00	373.00	0,38	70,65	109,59	21,63	0,024	8,611	7,918	1278,75	22,24	28442,39	474,04	0,47	54335	26960	55000
162.00	374.00	0,38	70,61	109,41	21,55	0,024	8,573	7,886	1273,55	22,16	28218,06	470,30	0,47	54166	26747	55000
163.00	375.00	0,28	70,43	109,11	21,49	0,021	8,075	7,432	1200,19	22,09	26515,22	441,92	0,44	53989	25133	55000
164.00	376.00	0,28	70,97	109,00	21,13	0,023	8,345	7,682	1240,54	21,73	26951,20	449,19	0,45	53817	25546	55000
165.00	377.00	0,28	70,85	108,81	21,09	0,023	8,400	7,735	1249,14	21,68	27081,42	451,36	0,45	53647	25670	55000
166.00	378.00	0,18	71,00	108,87	21,04	0,022	8,268	7,612	1229,34	21,63	26590,51	443,18	0,44	53477	25204	55000
167.00	379.00	0,09	70,84	108,66	21,01	0,020	7,893	7,270	1174,06	21,60	25360,97	422,68	0,42	53302	24039	55000
168.00	380.00	0,09	71,00	108,26	20,70	0,023	8,337	7,685	1241,00	21,29	26415,63	440,26	0,44	53134	25039	55000
169.00	381.00	0,00	71,45	129,02	31,98	0,022	8,353	7,428	1199,61	32,88	39441,12	657,35	0,66	53042	37385	55000

	Start	End
Barometer (kPa):	100,5	100,9
Barometer (in.Hg):	29,677639	29,795759
Dry Bulb (F):	68,3	73,6
Humidity (%):	70,1	59,1
Air velocity (ft/min)	0	0

DGM #1	Final: 23701,552 cuft	Initial: 23669,376 cuft
DGM #2	Final: 14808,810 cuft	Initial: 14776,511 cuft
DGM room	Final: 13927,900 cuft	Initial: 13902,532 cuft

Final: 671153,190	Liter
Initial: 670242,070	Liter
Final: 419338,780	Liter
Initial: 418424,180	Liter
Final: 394394,210	Liter
Initial: 393675,860	Liter

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

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

Pression statique (mmHg)	0,370
Pression statique (in.H2O)	0,200
consommation électrique (KWatt)	0,376

Duct velocity	8,820	8,780	8,360
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<b>Project nu.</b>	PI 20275
<b>Date</b>	09-08-2022
<b>Technicien</b>	M.M



**FUEL LOAD DATA SHEET, CSA B415**

Test Load Weight:

Lower	Ideal	Upper
35,6	39,5	43,5

\* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume:  cu. ft      Loading Density:      10,1    lbs./ft3

Number of Spaces:       Load Density (wet):      32,8    lbs./ft3

Spacer weight:  lbs      Dry Wood Density:      27,3    lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content			Ave. MC x Weight	Volume Cubic Inches	Ave. MC %
Thick	Wide	Length		Dry Uncorrected %					
4	3,25	20	5,14	20,80	20,10	20,10	104,51333	260,00	20,3
3	3,5	20	5,04	20,60	19,10	19,30	99,12	210,00	19,7
4	3	20	4,96	19,60	21,60	20,30	101,68	240,00	20,5
5	5,5	20	8,98	22,70	19,60	19,30	184,38933	550,00	20,5
4,5	5	20	8,04	19,60	19,20	19,20	155,44	450,00	19,3
5	4	20	7,86	21,10	19,10	19,60	156,676	400,00	19,9
								0,00	
								0,00	
								0,00	
								0,00	
								0,00	
								0,00	
								0,00	
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								0,00	
								0,00	
								0,00	
								0,00	
								0,00	
								0,00	
							SUM MCx	801,81867	20,1 %

Test Load Weight:  lbs.      Dry Weight:  kg.

Average Moisture Content: %

Dry:  Dry(EPA)    20,05            Wet:

                         Dry(B415)    20,04      **Must be 18-28**      **must be 15,2-22**

Coal Bed Range:  lbs.      to       lbs.

TEST CHARGE:      Coal bed weight:  lbs.  
**Must be between 10 and 25% of test load**

**Project nu.** PI 20275  
**Date** 09-08-2022  
**Technicien**

### Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,2 in. H2O  
 Barometer: 29,678 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!	0,0000

PITOT CONSTANT=  
0,9450

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

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,078	72,3	0,2793
B center	0,077	72,2	0,2775
A1	0,065	72,3	0,2550
A2	0,076	72,3	0,2757
A3	0,068	72,3	0,2608
A4	0,064	72,3	0,2530
B1	0,064	72,2	0,2530
B2	0,085	72,0	0,2915
B3	0,067	72,0	0,2588
B4	0,066	72,0	0,2569
AVERAGE	0,069375	72,2	0,2631

<b>Project nu.</b>	PI 20275
<b>Date</b>	09-08-2022
<b>Technicien</b>	M.M

## Filter set weight

identification	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		
Before (1)	10	600	601	10	30	602	603	11	42	604	605	31	606		
Before (2)															
Before (3)															
Before (4)															
Before (5)	94,6356	0,1806		35,3085	110,2130	0,1783		34,6948	110,3113	0,1822		33,9561	0,0913	2022-08-08	17:00
Before (6)	94,6355	0,1806		35,3086	110,2131	0,1784		34,6947	110,3113	0,1822		33,9562	0,0914	2022-08-09	09:00
After (1)	94,6361	0,1845		35,3098	110,2138	0,1815		34,6959	110,3130	0,1876		33,9587	0,0915	2022-08-09	14:00
After (2)	94,6355	0,1838		35,3089	110,2132	0,1802		34,6949	110,3115	0,1869		33,9566	0,0914	2022-08-15	09:00
After (3)	94,6355	0,1837		35,3088	110,2132	0,1802		34,6949	110,3114	0,1869		33,9566	0,0914	2022-08-16	09:00
After (4)															
After (5)															
After (6)	94,6355	0,1837		35,3088	110,2132	0,1802		34,6949	110,3114	0,1869		33,9566	0,0914	2022-08-16	09:00
Difference	0,0000	0,0031	0,0000	0,0002	0,0001	0,0018	0,0000	0,0002	0,0001	0,0047	0,0000	0,0004	0,0000		
Total (mg)		3,3				5,4				5,2					0
Total ajusté (mg)		<b>3,30</b>				<b>5,40</b>				<b>5,20</b>					

Project nu.	PI 20275
Date	09-08-2022
Technicien	M.M



Particulates Calculations

*		*	*	*	*	*1	*2	*3	Mass flow 1	Mass flow 1	Mass flow 1
Elapsed		Weight				Flue	Room	Tunnel	Reading	Inlet T	Outlet T
Time	Raw data row	Remaining	CO	CO <sub>2</sub>	O <sub>2</sub>	Gas	Temp	Dry Bulb			
min		lbs	%	%	%	°F	°F	°F	cuft/min	oF	oF
0,00	212,00	40,0	0,3	4,2	0,0	448,8	69,2	140,0	0,18	69,12	69,35
1,0	213,0	39,8	0,2	2,1	0,0	444,2	69,1	151,0	0,18	69,35	69,58
2,0	214,0	39,2	0,3	2,9	0,0	468,7	68,6	157,8	0,18	69,41	69,67
3,0	215,0	38,6	0,4	9,3	0,0	490,4	69,5	148,7	0,18	69,45	69,71
4,0	216,0	37,9	0,6	13,3	0,0	537,5	69,2	153,3	0,18	69,61	69,77
5,0	217,0	37,2	1,0	15,5	0,0	574,4	69,8	159,0	0,18	69,80	69,84
6,0	218,0	36,4	1,4	16,1	0,0	603,6	69,6	163,7	0,18	70,01	69,91
7,0	219,0	35,7	1,6	16,4	0,0	627,6	69,4	168,7	0,18	69,91	69,94
8,0	220,0	34,9	2,3	16,6	0,0	645,1	70,2	172,8	0,18	69,94	69,95
9,0	221,0	34,1	2,7	16,7	0,0	661,7	69,4	176,1	0,18	69,99	69,97
10,0	222,0	33,3	3,0	16,7	0,0	675,6	69,5	178,9	0,18	70,03	69,98
11,0	223,0	32,5	3,1	16,7	0,0	687,1	69,3	181,3	0,18	70,05	70,01
12,0	224,0	31,8	3,0	16,8	0,0	694,7	69,4	182,8	0,18	70,03	70,01
13,0	225,0	31,0	2,9	16,8	0,0	703,1	69,1	184,8	0,18	70,03	70,01
14,0	226,0	30,3	2,8	16,9	0,0	709,2	68,9	186,1	0,18	69,96	69,97
15,0	227,0	29,5	2,7	16,9	0,0	715,1	69,1	186,7	0,18	69,92	69,97
16,0	228,0	28,8	2,6	17,0	0,0	720,7	69,4	187,2	0,18	70,00	69,96
17,0	229,0	28,1	2,4	17,0	0,0	723,8	69,4	187,8	0,18	70,04	69,98
18,0	230,0	27,5	2,2	16,9	0,0	726,8	69,5	188,5	0,18	70,12	70,00
19,0	231,0	26,8	2,2	16,9	0,0	729,9	69,6	189,5	0,18	70,22	70,01
20,0	232,0	26,1	2,2	16,9	0,0	733,3	69,5	189,8	0,18	70,28	70,04
21,0	233,0	25,5	2,1	16,9	0,0	735,8	69,3	189,5	0,18	70,29	70,05
22,0	234,0	24,8	2,1	16,9	0,0	737,2	69,3	190,5	0,18	70,25	70,06
23,0	235,0	24,2	2,1	16,9	0,0	739,7	69,3	190,8	0,18	70,22	70,03
24,0	236,0	23,6	2,1	16,9	0,0	742,5	69,4	191,5	0,18	70,24	70,03
25,0	237,0	23,0	2,1	16,9	0,0	743,6	69,6	191,2	0,18	70,27	70,03
26,0	238,0	22,4	2,1	16,9	0,0	745,6	69,8	191,3	0,18	70,42	70,07
27,0	239,0	21,8	2,0	16,9	0,0	746,3	69,8	191,4	0,18	70,50	70,09
28,0	240,0	21,2	1,9	16,9	0,0	749,2	69,8	190,8	0,18	70,56	70,11
29,0	241,0	20,6	1,7	16,8	0,0	752,4	70,0	191,5	0,18	70,59	70,14
30,0	242,0	20,0	1,6	16,8	0,0	753,3	70,0	191,6	0,18	70,67	70,17
31,0	243,0	19,4	1,6	16,8	0,0	754,4	70,0	191,5	0,18	70,70	70,21
32,0	244,0	18,9	1,5	16,8	0,0	754,0	70,0	190,4	0,18	70,72	70,24
33,0	245,0	18,3	1,3	16,8	0,0	757,4	70,0	191,3	0,18	70,78	70,27
34,0	246,0	17,8	1,2	16,8	0,0	757,5	70,0	190,4	0,18	70,81	70,27
35,0	247,0	17,3	1,1	16,7	0,0	757,2	70,0	190,4	0,18	70,82	70,30
36,0	248,0	16,8	1,0	16,7	0,0	759,5	69,9	190,2	0,18	70,84	70,32
37,0	249,0	16,4	0,8	16,8	0,0	760,1	70,0	189,8	0,18	70,88	70,35
38,0	250,0	15,7	0,7	16,7	0,0	760,3	70,1	188,6	0,18	70,91	70,39
39,0	251,0	15,3	0,6	16,6	0,0	760,2	70,3	188,3	0,18	71,00	70,40
40,0	252,0	14,9	0,4	16,5	0,0	756,6	70,3	187,8	0,18	71,07	70,45
41,0	253,0	14,4	0,3	16,2	0,0	751,0	70,2	186,2	0,18	71,11	70,48
42,0	254,0	13,9	0,2	16,0	0,0	743,2	70,2	184,8	0,18	71,14	70,50
43,0	255,0	13,6	0,2	15,8	0,0	737,6	70,2	183,4	0,18	71,22	70,54
44,0	256,0	13,1	0,2	15,6	0,0	734,3	70,1	182,4	0,18	71,16	70,55
45,0	257,0	12,8	0,2	15,4	0,0	729,2	70,3	181,5	0,18	71,21	70,57
46,0	258,0	12,3	0,2	15,2	0,0	724,5	70,4	180,6	0,18	71,27	70,61
47,0	259,0	12,0	0,2	15,0	0,0	719,8	70,3	179,5	0,18	71,25	70,64
48,0	260,0	11,5	0,1	14,7	0,0	714,6	70,4	177,8	0,18	71,22	70,65

Particulates Calculations

49,0	261,0	11,2	0,1	14,4	0,0	710,4	70,1	176,6	0,18	71,22	70,66
50,0	262,0	10,8	0,1	14,0	0,0	704,1	70,0	175,3	0,18	71,21	70,67
51,0	263,0	10,5	0,1	13,7	0,0	699,9	70,1	173,7	0,18	71,19	70,68
52,0	264,0	10,2	0,1	13,4	0,0	695,2	70,0	173,1	0,18	71,27	70,70
53,0	265,0	9,9	0,1	13,2	0,0	690,6	70,3	171,7	0,18	71,25	70,70
54,0	266,0	9,6	0,1	13,0	0,0	686,3	70,2	170,6	0,18	71,30	70,75
55,0	267,0	9,2	0,1	12,8	0,0	683,8	70,3	170,2	0,18	71,34	70,75
56,0	268,0	9,0	0,0	12,5	0,0	678,1	70,0	168,7	0,18	71,36	70,78
57,0	269,0	8,7	0,0	12,3	0,0	674,0	70,2	167,4	0,18	71,41	70,80
58,0	270,0	8,4	0,0	12,1	0,0	669,4	70,2	166,7	0,18	71,41	70,82
59,0	271,0	8,1	0,0	11,9	0,0	665,5	70,1	166,1	0,18	71,41	70,84
60,0	272,0	7,9	0,1	11,6	0,0	660,7	70,4	165,7	0,18	71,44	70,87
61,0	273,0	7,6	0,1	11,5	0,0	655,6	70,3	164,3	0,18	71,46	70,87
62,0	274,0	7,3	0,1	11,3	0,0	651,3	70,3	163,6	0,18	71,45	70,89
63,0	275,0	7,1	0,1	11,1	0,0	647,1	70,3	162,7	0,19	71,51	70,92
64,0	276,0	6,9	0,1	10,9	0,0	643,2	70,5	162,0	0,18	71,51	70,93
65,0	277,0	6,7	0,1	10,7	0,0	639,2	70,3	160,8	0,18	71,59	70,96
66,0	278,0	6,4	0,1	10,4	0,0	633,2	70,4	160,0	0,18	71,64	71,00
67,0	279,0	6,3	0,1	9,9	0,0	626,4	70,5	158,7	0,18	71,75	71,03
68,0	280,0	6,1	0,1	9,7	0,0	622,0	70,4	157,7	0,18	71,72	71,04
69,0	281,0	5,9	0,1	9,6	0,0	616,3	70,8	156,7	0,18	71,78	71,08
70,0	282,0	5,8	0,0	9,0	0,0	609,6	70,9	154,6	0,18	71,85	71,11
71,0	283,0	5,6	0,0	8,7	0,0	603,1	70,6	153,4	0,18	71,93	71,14
72,0	284,0	5,5	0,0	8,3	0,0	596,9	70,9	151,8	0,18	72,01	71,20
73,0	285,0	5,3	0,0	8,0	0,0	589,5	70,4	150,7	0,18	72,00	71,21
74,0	286,0	5,3	0,0	7,5	0,0	582,2	70,2	150,1	0,18	71,92	71,23
75,0	287,0	5,1	0,0	7,2	0,0	574,9	70,1	149,0	0,18	71,84	71,23
76,0	288,0	5,1	0,1	7,1	0,0	568,7	70,3	147,9	0,18	71,77	71,22
77,0	289,0	4,9	0,1	6,9	0,0	560,7	70,2	146,3	0,18	71,78	71,24
78,0	290,0	4,8	0,1	6,8	0,0	554,3	70,2	144,7	0,18	71,80	71,24
79,0	291,0	4,8	0,1	6,6	0,0	548,0	70,1	143,4	0,18	71,80	71,25
80,0	292,0	4,7	0,1	6,5	0,0	541,7	70,7	143,1	0,18	71,85	71,29
81,0	293,0	4,6	0,1	6,3	0,0	535,9	70,7	142,1	0,18	71,91	71,30
82,0	294,0	4,5	0,0	6,0	0,0	526,9	71,8	141,9	0,19	72,06	71,33
83,0	295,0	4,5	0,0	5,7	0,0	522,1	74,4	141,2	0,18	72,40	71,43
84,0	296,0	4,4	0,0	5,6	0,0	515,6	74,7	140,4	0,18	72,79	71,55
85,0	297,0	4,3	0,0	5,6	0,0	509,4	75,1	139,9	0,18	73,15	71,69
86,0	298,0	4,3	0,0	5,5	0,0	504,9	75,2	139,1	0,18	73,49	71,80
87,0	299,0	4,2	0,0	5,5	0,0	499,6	76,6	138,7	0,18	73,81	71,95
88,0	300,0	4,1	0,1	5,4	0,0	493,7	76,6	137,9	0,18	74,11	72,09
89,0	301,0	4,1	0,1	5,4	0,0	490,0	76,7	137,1	0,18	74,37	72,24
90,0	302,0	4,0	0,1	5,4	0,0	485,9	75,9	136,7	0,18	74,60	72,38
91,0	303,0	3,9	0,1	5,4	0,0	481,2	76,5	136,2	0,18	74,75	72,49
92,0	304,0	3,9	0,1	5,3	0,0	476,9	73,7	135,4	0,18	74,80	72,58
93,0	305,0	3,8	0,1	5,2	0,0	473,6	71,8	134,8	0,18	74,30	72,58
94,0	306,0	3,8	0,1	5,2	0,0	470,2	71,1	133,5	0,18	73,74	72,50
95,0	307,0	3,7	0,1	5,3	0,0	468,0	70,7	132,8	0,18	73,46	72,43
96,0	308,0	3,6	0,2	5,2	0,0	464,6	70,7	131,8	0,18	73,21	72,37
97,0	309,0	3,6	0,1	4,9	0,0	460,2	70,4	131,2	0,18	72,98	72,31
98,0	310,0	3,5	0,1	4,7	0,0	455,9	70,6	130,4	0,18	72,81	72,25
99,0	311,0	3,5	0,1	4,7	0,0	452,7	70,9	129,7	0,18	72,77	72,21
100,0	312,0	3,4	0,1	4,6	0,0	448,7	71,2	129,2	0,18	72,82	72,19
101,0	313,0	3,4	0,2	4,6	0,0	445,6	70,9	128,5	0,18	72,84	72,19
102,0	314,0	3,3	0,2	4,5	0,0	442,0	70,7	128,1	0,18	72,78	72,18

Particulates Calculations

103,0	315,0	3,3	0,3	4,6	0,0	440,1	70,8	128,0	0,18	72,71	72,15
104,0	316,0	3,2	0,4	4,6	0,0	436,9	70,8	127,3	0,18	72,65	72,15
105,0	317,0	3,1	0,5	4,4	0,0	433,7	70,6	126,6	0,18	72,69	72,13
106,0	318,0	3,1	0,6	4,4	0,0	431,4	70,2	126,0	0,18	72,58	72,10
107,0	319,0	3,0	0,5	4,3	0,0	427,8	70,2	125,6	0,18	72,41	72,08
108,0	320,0	3,0	0,5	4,2	0,0	424,8	70,2	125,3	0,18	72,29	71,99
109,0	321,0	2,9	0,5	4,1	0,0	421,6	70,1	124,9	0,18	72,22	71,95
110,0	322,0	2,9	0,5	4,0	0,0	418,6	70,3	124,1	0,18	72,15	71,94
111,0	323,0	2,8	0,6	4,0	0,0	414,9	70,8	123,7	0,18	72,23	71,91
112,0	324,0	2,8	0,6	3,9	0,0	412,4	70,7	123,2	0,18	72,28	71,92
113,0	325,0	2,7	0,6	3,8	0,0	408,7	70,4	122,5	0,18	72,31	71,93
114,0	326,0	2,6	0,6	3,7	0,0	405,6	70,1	122,2	0,18	72,21	71,91
115,0	327,0	2,6	0,7	3,7	0,0	403,1	70,1	121,8	0,18	72,10	71,88
116,0	328,0	2,6	0,8	3,6	0,0	399,4	70,1	121,4	0,18	72,06	71,86
117,0	329,0	2,5	0,8	3,6	0,0	396,6	70,2	121,0	0,19	72,00	71,83
118,0	330,0	2,5	0,8	3,5	0,0	393,5	70,1	120,5	0,18	71,97	71,80
119,0	331,0	2,4	0,9	3,4	0,0	390,3	70,2	119,9	0,18	71,97	71,78
120,0	332,0	2,4	0,9	3,4	0,0	387,2	70,2	119,6	0,18	71,98	71,78
121,0	333,0	2,3	0,9	3,5	0,0	384,8	70,0	119,3	0,18	71,91	71,76
122,0	334,0	2,3	0,9	3,5	0,0	382,8	70,1	118,9	0,18	71,90	71,75
123,0	335,0	2,2	0,9	3,4	0,0	379,6	70,4	118,5	0,18	71,98	71,73
124,0	336,0	2,1	0,8	3,4	0,0	377,2	70,3	118,0	0,18	72,04	71,74
125,0	337,0	2,1	0,8	3,3	0,0	374,9	70,1	117,5	0,18	72,06	71,78
126,0	338,0	2,0	0,8	3,3	0,0	372,6	70,4	117,1	0,18	72,02	71,75
127,0	339,0	2,0	0,8	3,3	0,0	370,4	70,3	116,6	0,18	72,06	71,77
128,0	340,0	1,9	0,8	3,2	0,0	368,4	70,2	116,5	0,18	71,99	71,75
129,0	341,0	2,0	0,8	3,3	0,0	367,0	70,0	116,2	0,18	71,95	71,75
130,0	342,0	1,9	0,8	3,3	0,0	364,7	70,0	116,1	0,18	71,92	71,74
131,0	343,0	1,8	0,7	3,4	0,0	363,3	69,8	116,0	0,18	71,85	71,70
132,0	344,0	1,7	0,7	3,5	0,0	362,2	70,0	115,7	0,18	71,82	71,68
133,0	345,0	1,7	0,7	3,4	0,0	361,1	69,8	115,3	0,18	71,85	71,67
134,0	346,0	1,6	0,7	3,4	0,0	360,2	69,9	115,0	0,18	71,76	71,64
135,0	347,0	1,6	0,7	3,3	0,0	358,8	70,1	114,4	0,18	71,76	71,62
136,0	348,0	1,6	0,7	3,3	0,0	357,0	70,2	114,3	0,18	71,84	71,62
137,0	349,0	1,5	0,7	3,3	0,0	356,2	70,0	114,5	0,18	71,82	71,60
138,0	350,0	1,4	0,7	3,3	0,0	354,8	69,8	114,2	0,18	71,76	71,60
139,0	351,0	1,4	0,7	3,3	0,0	354,1	69,7	114,1	0,18	71,73	71,58
140,0	352,0	1,3	0,7	3,3	0,0	352,3	69,9	113,9	0,18	71,67	71,57
141,0	353,0	1,3	0,6	3,2	0,0	351,0	69,8	113,6	0,18	71,66	71,54
142,0	354,0	1,2	0,6	3,2	0,0	349,7	69,8	113,4	0,18	71,62	71,52
143,0	355,0	1,2	0,6	3,2	0,0	348,4	69,7	113,4	0,18	71,53	71,48
144,0	356,0	1,1	0,6	3,3	0,0	348,4	69,7	112,9	0,18	71,49	71,47
145,0	357,0	1,1	0,6	3,3	0,0	347,0	69,9	112,9	0,18	71,54	71,46
146,0	358,0	1,1	0,6	3,3	0,0	346,6	69,9	112,8	0,18	71,59	71,46
147,0	359,0	1,0	0,5	3,3	0,0	345,7	70,1	112,8	0,18	71,61	71,45
148,0	360,0	0,9	0,5	3,3	0,0	345,7	70,2	112,5	0,18	71,67	71,45
149,0	361,0	0,9	0,4	3,3	0,0	345,0	70,6	112,6	0,18	71,82	71,50
150,0	362,0	0,9	0,4	3,3	0,0	344,1	70,4	112,3	0,18	71,86	71,51
151,0	363,0	0,8	0,4	3,2	0,0	342,7	70,4	112,1	0,18	71,90	71,56
152,0	364,0	0,8	0,5	3,1	0,0	341,6	69,9	112,2	0,18	71,89	71,57
153,0	365,0	0,7	0,4	3,0	0,0	340,2	70,8	111,9	0,18	71,73	71,52
154,0	366,0	0,7	0,5	2,9	0,0	338,6	70,3	111,5	0,18	71,72	71,52
155,0	367,0	0,7	0,5	2,9	0,0	336,9	70,2	111,4	0,18	71,72	71,51
156,0	368,0	0,6	0,5	2,8	0,0	335,3	70,1	111,0	0,18	71,74	71,52

Particulates Calculations

157,0	369,0	0,5	0,6	2,9	0,0	334,1	70,2	111,1	0,18	71,81	71,53
158,0	370,0	0,5	0,6	2,8	0,0	332,2	70,3	111,1	0,18	71,80	71,55
159,0	371,0	0,4	0,5	2,9	0,0	330,6	70,2	110,8	0,18	71,86	71,55
160,0	372,0	0,4	0,5	2,9	0,0	329,6	70,4	110,5	0,18	71,95	71,57
161,0	373,0	0,4	0,5	2,8	0,0	328,2	70,0	110,3	0,18	71,91	71,59
162,0	374,0	0,4	0,5	2,8	0,0	327,0	69,9	110,6	0,18	71,84	71,56
163,0	375,0	0,3	0,5	2,8	0,0	325,7	69,9	110,0	0,18	71,75	71,54
164,0	376,0	0,3	0,5	2,8	0,0	325,1	70,0	109,8	0,18	71,75	71,53
165,0	377,0	0,3	0,5	2,8	0,0	323,6	70,2	109,5	0,18	71,81	71,54
166,0	378,0	0,2	0,5	2,8	0,0	322,8	70,7	109,6	0,18	71,94	71,58
167,0	379,0	0,1	0,5	2,8	0,0	321,1	70,5	109,2	0,18	72,05	71,60
168,0	380,0	0,1	0,5	2,8	0,0	320,4	70,3	109,1	0,18	72,02	71,61
169,0	381,0	0,0	0,5	2,8	0,0	322,3	70,2	108,7	0,18	71,97	71,61

Particulates Calculations

Filter 1	Mass flow 2	Mass flow 2	Mass flow 2	Filter 2	Tunnel Veloc	Flue draft
Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure
					in wc	in wc
oF	cuft/min	oF	oF	oF	in wc	in wc
83,94	0,18	69,06	70,65	86,10	0,07	0,06
86,03	0,18	69,29	70,73	88,26	0,07	0,06
86,92	0,18	69,42	70,80	89,26	0,07	0,07
85,55	0,18	69,55	70,86	88,20	0,07	0,08
85,24	0,18	69,77	70,91	87,36	0,07	0,08
85,41	0,18	70,07	71,03	87,10	0,07	0,08
85,60	0,18	70,38	71,14	87,05	0,07	0,08
85,93	0,18	70,49	71,25	87,14	0,07	0,08
86,25	0,18	70,67	71,36	87,16	0,07	0,09
86,56	0,18	70,89	71,47	87,11	0,07	0,09
86,56	0,18	71,08	71,51	87,14	0,07	0,09
86,55	0,18	71,28	71,68	87,38	0,07	0,09
86,63	0,18	71,40	71,83	87,42	0,07	0,09
86,43	0,18	71,55	71,95	87,44	0,07	0,09
86,16	0,18	71,61	72,03	87,51	0,06	0,09
86,05	0,18	71,69	72,15	87,42	0,07	0,09
85,70	0,18	71,86	72,23	87,35	0,07	0,09
85,38	0,18	72,03	72,33	87,72	0,06	0,09
85,09	0,18	72,21	72,45	87,74	0,07	0,09
84,52	0,18	72,37	72,61	87,89	0,06	0,09
84,35	0,18	72,51	72,74	87,83	0,07	0,09
84,28	0,18	72,62	72,78	87,86	0,06	0,09
84,15	0,18	72,67	72,84	87,87	0,06	0,09
85,06	0,18	72,72	72,87	87,84	0,07	0,09
84,91	0,18	72,79	72,93	87,98	0,06	0,09
84,77	0,18	72,84	72,99	87,98	0,06	0,09
84,68	0,18	73,01	73,06	87,42	0,06	0,09
84,73	0,18	73,13	73,18	87,40	0,07	0,09
84,67	0,18	73,21	73,29	87,52	0,07	0,09
84,64	0,18	73,31	73,46	87,70	0,06	0,09
84,67	0,18	73,45	73,60	87,84	0,06	0,09
84,68	0,18	73,50	73,76	88,05	0,06	0,09
84,72	0,18	73,61	73,86	88,12	0,06	0,09
84,75	0,18	73,70	73,90	88,24	0,06	0,09
85,24	0,18	73,73	73,95	88,16	0,07	0,09
85,75	0,18	73,79	74,13	88,14	0,06	0,09
85,98	0,18	73,82	74,29	88,14	0,06	0,09
85,91	0,18	73,91	74,43	88,25	0,06	0,09
85,77	0,18	73,95	74,59	88,20	0,07	0,09
85,75	0,18	74,02	74,66	88,16	0,07	0,09
85,72	0,18	74,12	74,80	88,05	0,07	0,09
85,62	0,18	74,17	74,92	87,94	0,07	0,09
85,46	0,18	74,18	74,98	87,73	0,07	0,09
85,37	0,18	74,27	75,05	87,52	0,07	0,09
85,27	0,18	74,23	75,11	87,24	0,07	0,09
85,14	0,18	74,32	75,15	87,05	0,06	0,09
84,99	0,18	74,41	75,25	86,84	0,07	0,09
84,88	0,18	74,41	75,36	86,67	0,07	0,09
84,86	0,18	74,38	75,46	86,35	0,07	0,09

Particulates Calculations

84,98	0,18	74,45	75,56	86,02	0,07	0,09
85,04	0,18	74,44	75,55	85,78	0,07	0,09
84,94	0,18	74,45	75,59	85,60	0,07	0,09
85,01	0,18	74,51	75,71	85,39	0,07	0,09
84,99	0,18	74,48	75,80	85,14	0,07	0,09
85,01	0,18	74,55	75,84	84,92	0,07	0,08
85,02	0,18	74,60	75,83	84,75	0,07	0,09
84,88	0,18	74,62	75,87	84,56	0,07	0,09
84,75	0,18	74,66	75,93	84,28	0,07	0,09
84,73	0,18	74,66	75,98	84,12	0,07	0,09
85,31	0,18	74,69	76,03	84,68	0,07	0,09
84,78	0,18	74,72	76,10	85,42	0,07	0,09
83,35	0,18	74,75	76,10	85,94	0,07	0,08
88,72	0,18	74,78	76,17	86,30	0,07	0,09
89,27	0,18	74,84	76,19	86,51	0,07	0,09
89,42	0,18	74,84	76,23	86,69	0,07	0,08
89,49	0,18	74,86	76,23	86,90	0,07	0,09
89,80	0,18	74,94	76,25	87,01	0,07	0,08
89,56	0,18	75,01	76,24	87,04	0,07	0,08
89,59	0,19	75,05	76,34	87,09	0,07	0,08
89,18	0,18	75,06	76,45	87,13	0,07	0,08
88,51	0,18	75,10	76,51	87,07	0,07	0,08
87,56	0,18	75,19	76,57	86,91	0,07	0,08
86,74	0,18	75,23	76,63	86,83	0,07	0,08
86,24	0,18	75,25	76,64	86,68	0,07	0,08
86,48	0,18	75,23	76,65	86,72	0,07	0,08
86,80	0,18	75,17	76,66	86,75	0,07	0,08
86,91	0,18	75,13	76,71	86,67	0,07	0,08
86,77	0,18	75,18	76,71	86,57	0,07	0,08
86,47	0,18	75,15	76,67	86,49	0,07	0,08
86,24	0,19	75,19	76,68	86,38	0,07	0,08
86,28	0,18	75,21	76,66	86,12	0,07	0,07
86,50	0,18	75,26	76,58	85,98	0,07	0,07
86,72	0,18	75,37	76,57	85,99	0,07	0,07
86,92	0,18	75,58	76,58	85,95	0,07	0,07
86,96	0,18	75,82	76,65	85,99	0,07	0,07
86,94	0,18	76,10	76,71	86,08	0,07	0,07
86,95	0,18	76,38	76,79	86,13	0,07	0,07
87,00	0,18	76,70	76,87	86,16	0,07	0,07
87,05	0,18	76,94	76,95	86,17	0,07	0,07
87,08	0,18	77,16	77,04	86,28	0,07	0,07
87,11	0,18	77,38	77,12	86,26	0,07	0,07
87,14	0,18	77,56	77,19	86,39	0,07	0,07
87,14	0,18	77,67	77,27	86,46	0,07	0,07
87,14	0,18	77,38	77,28	86,46	0,07	0,07
87,11	0,18	76,96	77,20	86,34	0,07	0,07
87,05	0,18	76,79	77,06	86,25	0,07	0,07
87,05	0,18	76,58	76,94	86,14	0,07	0,07
86,97	0,19	76,41	76,85	86,12	0,07	0,07
86,89	0,18	76,24	76,77	86,07	0,07	0,07
86,79	0,18	76,21	76,71	86,00	0,07	0,07
86,71	0,18	76,18	76,66	85,98	0,07	0,07
86,64	0,18	76,20	76,68	85,89	0,07	0,06
86,58	0,18	76,15	76,70	85,84	0,07	0,06

Particulates Calculations

86,52	0,18	76,08	76,65	85,81	0,07	0,06
86,43	0,18	76,05	76,62	85,79	0,07	0,07
86,31	0,18	76,06	76,60	85,72	0,07	0,07
86,24	0,18	75,93	76,55	85,65	0,07	0,06
86,16	0,18	75,80	76,50	85,62	0,07	0,06
86,03	0,18	75,73	76,49	85,53	0,07	0,06
85,90	0,18	75,64	76,47	85,51	0,07	0,06
85,78	0,18	75,58	76,47	85,41	0,07	0,06
85,67	0,18	75,62	76,42	85,33	0,07	0,06
85,56	0,18	75,67	76,39	85,27	0,07	0,06
85,44	0,18	75,69	76,42	85,19	0,07	0,06
85,33	0,18	75,62	76,40	85,15	0,07	0,06
85,19	0,18	75,53	76,37	85,03	0,07	0,06
85,09	0,18	75,47	76,37	84,96	0,07	0,06
84,99	0,18	75,41	76,34	84,89	0,07	0,06
84,89	0,18	75,38	76,34	84,88	0,07	0,06
84,76	0,18	75,40	76,43	84,83	0,07	0,06
84,64	0,18	75,38	76,42	84,79	0,07	0,06
84,50	0,18	75,33	76,48	84,73	0,07	0,06
84,39	0,18	75,32	76,49	84,70	0,07	0,06
84,27	0,18	75,37	76,52	84,56	0,07	0,06
84,15	0,18	75,43	76,52	84,48	0,07	0,06
84,04	0,18	75,40	76,48	84,39	0,07	0,06
83,92	0,18	75,38	76,47	84,30	0,07	0,06
83,76	0,18	75,41	76,50	84,20	0,07	0,06
83,64	0,18	75,37	76,48	84,17	0,07	0,06
83,54	0,18	75,36	76,49	84,22	0,07	0,06
83,40	0,19	75,33	76,50	84,17	0,07	0,06
83,27	0,18	75,25	76,50	84,08	0,07	0,06
83,16	0,18	75,23	76,50	83,96	0,07	0,05
83,08	0,18	75,22	76,49	83,85	0,07	0,06
82,99	0,18	75,19	76,50	83,78	0,07	0,06
82,90	0,18	75,19	76,49	83,70	0,07	0,05
82,78	0,18	75,23	76,47	83,65	0,07	0,05
82,72	0,18	75,24	76,40	83,60	0,07	0,05
82,64	0,18	75,19	76,39	83,55	0,07	0,06
82,54	0,18	75,15	76,38	83,52	0,07	0,05
82,45	0,18	75,11	76,42	83,44	0,07	0,05
82,36	0,18	75,08	76,41	83,35	0,07	0,05
82,23	0,18	75,04	76,41	83,23	0,07	0,05
82,16	0,18	75,00	76,44	83,17	0,07	0,05
82,25	0,18	74,96	76,47	83,20	0,07	0,05
82,42	0,18	74,97	76,49	83,31	0,07	0,05
82,59	0,18	75,01	76,55	83,35	0,07	0,05
82,72	0,18	75,01	76,55	83,48	0,07	0,05
82,81	0,18	75,08	76,58	83,55	0,07	0,05
82,92	0,18	75,16	76,62	83,60	0,07	0,05
82,97	0,18	75,21	76,57	83,66	0,07	0,05
83,06	0,18	75,26	76,60	83,72	0,07	0,05
83,12	0,18	75,25	76,66	83,78	0,07	0,05
83,17	0,18	75,15	76,65	83,80	0,07	0,05
83,12	0,18	75,15	76,71	83,82	0,07	0,05
83,11	0,18	75,16	76,67	83,80	0,07	0,05
83,09	0,18	75,16	76,70	83,82	0,07	0,05

Particulates Calculations

83,09	0,18	75,18	76,70	83,83	0,07	0,05
83,14	0,18	75,20	76,68	83,83	0,07	0,05
83,14	0,18	75,22	76,72	83,86	0,07	0,05
83,15	0,18	75,25	76,72	83,84	0,07	0,05
83,13	0,18	75,23	76,72	83,87	0,07	0,05
83,09	0,18	75,19	76,70	83,87	0,07	0,05
83,05	0,18	75,13	76,72	83,82	0,07	0,05
82,99	0,18	75,16	76,77	83,79	0,07	0,05
82,95	0,18	75,19	76,74	83,76	0,07	0,05
82,94	0,18	75,26	76,74	83,74	0,07	0,05
82,90	0,18	75,37	76,72	83,75	0,07	0,05
82,89	0,18	75,37	76,67	83,68	0,07	0,05
82,83	0,18	75,28	76,67	83,69	0,07	0,05



SFBA EPA EMISSION RESULTS

RESULTS

**Average emission rate:** 3,22 g/hr

Burn Rate : 5,369 Dry kg/hr

**Test Duration:** 169 min

PRESSURE FACTOR: DGM 1 0,95755  
 DGM 2 0,96574  
 DGM 3 0,99387

BAROMETRIC PRESSURE  
 Average: 29,737 in Hg  
 Start: 29,678 in Hg  
 End: 29,796 in Hg

TEMPERATURE FACTORS  
 DGM 1 0,99363  
 DGM 2 0,98684  
 DGM 3 0,99540

DRY GAS METER VALUES  
 DGM #1 Final: 23701,552 Cuft  
 Initial: 23669,376 Cuft

VOLUMES SAMPLED  
 DGM 1 30,69091 Scft  
 DGM 2 31,21496 Scft  
 DGM 3 25,00943 Scft

DGM #2 Final: 14808,810 Cuft  
 Initial: 14776,511 Cuft  
 DGM #3 Final: 13927,900 Cuft  
 Initial: 13902,532 Cuft

TOTAL TUNNEL VOLUME : 52996 Scft

SAMPLE RATIOS  
 Sample Train 1: 1726,778  
 Sample Train 2: 1697,788

TEMPERATURES  
 DGM #1 531,385 °R  
 DGM #2 535,043 °R

Patriculate concentration  
 Sample Train 1 0,000176 g/dscf  
 Sample Train 2 0,000167 g/dscf  
 Room 0,000000 g/dscf

CALIBRATION FACTORS  
 DGM #1 1,0025  
 DGM #2 1,0141  
 DGM #3 0,9965

TOTAL EMISSIONS  
 Sample Train 1 9,32 g  
 Sample Train 2 8,83 g

TUNNEL FLOW RATE: 313,588 Dscfm

EMISSION RATES  
 Sample Train 1 3,31 g/hr  
 Sample Train 2 3,13 g/hr

PARTICULATE CATCH  
 Total Sample Train 1: 5,40 mg  
 Total Sample Train 2: 5,20 mg  
 Total Sample Train 1 1st hour: 3,30 mg

1st hour emission rate 5,70 g/hr

DEVIATION: 2,73%

Cs Train 1 Train 2  
 0,0001759 0,000166587



93,00	1,71	0,07	5,24	273,4%	20,64	15,37	245,4	22,1	99,8%	61,7%	61,5%
94,00	1,71	0,08	5,24	272,1%	20,63	15,35	243,5	21,7	99,5%	61,9%	61,5%
95,00	1,66	0,12	5,29	266,2%	20,63	15,28	242,2	21,5	98,9%	62,2%	61,6%
96,00	1,62	0,16	5,24	266,8%	20,63	15,31	240,3	21,5	98,2%	62,2%	61,2%
97,00	1,62	0,12	4,89	295,1%	20,65	15,70	237,9	21,4	98,9%	60,8%	60,1%
98,00	1,59	0,11	4,73	309,1%	20,66	15,88	235,5	21,5	98,9%	60,2%	59,5%
99,00	1,58	0,13	4,71	308,8%	20,66	15,88	233,7	21,6	98,6%	60,4%	59,5%
100,00	1,53	0,14	4,56	321,1%	20,67	16,04	231,5	21,8	98,4%	59,8%	58,9%
101,00	1,53	0,19	4,60	313,5%	20,66	15,97	229,8	21,6	97,5%	60,3%	58,8%
102,00	1,49	0,24	4,53	314,6%	20,67	16,01	227,8	21,5	96,6%	60,2%	58,1%
103,00	1,49	0,33	4,59	302,6%	20,66	15,90	226,7	21,5	95,2%	60,7%	57,8%
104,00	1,44	0,41	4,61	294,1%	20,65	15,83	225,0	21,6	93,8%	61,1%	57,3%
105,00	1,39	0,49	4,42	302,9%	20,66	15,99	223,2	21,4	92,3%	60,2%	55,6%
106,00	1,39	0,58	4,36	301,6%	20,66	16,01	221,9	21,2	91,0%	60,0%	54,6%
107,00	1,35	0,53	4,27	312,4%	20,66	16,13	219,9	21,2	91,5%	59,8%	54,7%
108,00	1,35	0,51	4,15	324,9%	20,67	16,27	218,2	21,2	91,7%	59,2%	54,3%
109,00	1,30	0,55	4,10	326,5%	20,67	16,30	216,4	21,2	90,9%	59,2%	53,8%
110,00	1,30	0,55	4,01	334,4%	20,68	16,39	214,8	21,3	90,8%	58,9%	53,4%
111,00	1,26	0,61	3,95	334,5%	20,68	16,42	212,7	21,5	89,7%	58,8%	52,7%
112,00	1,26	0,59	3,87	344,4%	20,68	16,52	211,4	21,5	89,8%	58,4%	52,5%
113,00	1,21	0,60	3,80	350,1%	20,69	16,59	209,3	21,3	89,5%	58,3%	52,1%
114,00	1,17	0,62	3,70	357,8%	20,69	16,68	207,5	21,2	88,8%	57,8%	51,3%
115,00	1,17	0,72	3,66	352,0%	20,69	16,67	206,2	21,2	87,2%	57,8%	50,3%
116,00	1,17	0,82	3,62	346,1%	20,68	16,65	204,1	21,2	85,5%	57,8%	49,5%
117,00	1,13	0,84	3,58	347,9%	20,69	16,68	202,5	21,2	85,0%	57,8%	49,1%
118,00	1,12	0,85	3,50	355,8%	20,69	16,77	200,8	21,2	84,6%	57,4%	48,6%
119,00	1,08	0,85	3,44	361,7%	20,69	16,83	199,1	21,2	84,3%	57,2%	48,2%
120,00	1,08	0,91	3,42	357,9%	20,69	16,82	197,3	21,2	83,4%	57,4%	47,9%
121,00	1,03	0,90	3,45	355,6%	20,69	16,79	196,0	21,1	83,7%	57,9%	48,5%
122,00	1,03	0,95	3,49	345,7%	20,68	16,72	194,9	21,2	83,1%	58,5%	48,6%
123,00	0,98	0,87	3,39	365,0%	20,70	16,87	193,1	21,3	83,8%	57,9%	48,6%
124,00	0,94	0,84	3,35	372,1%	20,70	16,93	191,8	21,3	84,2%	57,9%	48,7%
125,00	0,94	0,85	3,32	375,4%	20,70	16,96	190,5	21,2	83,9%	57,8%	48,5%
126,00	0,90	0,83	3,29	379,9%	20,70	16,99	189,2	21,3	84,1%	57,9%	48,7%
127,00	0,90	0,79	3,25	390,2%	20,71	17,06	188,0	21,3	84,7%	57,7%	48,9%
128,00	0,85	0,78	3,24	392,9%	20,71	17,08	186,9	21,2	84,8%	57,8%	49,0%
129,00	0,89	0,76	3,31	386,2%	20,71	17,02	186,1	21,1	85,3%	58,5%	49,9%
130,00	0,85	0,76	3,34	382,3%	20,70	16,98	184,9	21,1	85,4%	59,0%	50,4%
131,00	0,81	0,73	3,38	381,5%	20,70	16,96	184,0	21,0	86,1%	59,5%	51,2%
132,00	0,76	0,72	3,48	371,2%	20,70	16,86	183,4	21,1	86,5%	60,3%	52,2%
133,00	0,76	0,71	3,43	378,4%	20,70	16,92	182,8	21,0	86,5%	60,0%	51,9%
134,00	0,72	0,70	3,38	385,3%	20,71	16,98	182,3	21,1	86,5%	59,7%	51,7%
135,00	0,72	0,70	3,35	389,8%	20,71	17,01	181,5	21,2	86,6%	59,7%	51,6%
136,00	0,72	0,68	3,32	395,6%	20,71	17,05	180,6	21,2	86,8%	59,6%	51,7%
137,00	0,67	0,67	3,30	398,8%	20,71	17,08	180,1	21,1	86,9%	59,5%	51,7%
138,00	0,63	0,67	3,29	399,1%	20,71	17,08	179,3	21,0	86,8%	59,6%	51,7%
139,00	0,62	0,66	3,32	397,6%	20,71	17,06	179,0	21,0	87,1%	59,9%	52,2%
140,00	0,58	0,66	3,35	394,5%	20,71	17,03	177,9	21,0	87,3%	60,3%	52,7%
141,00	0,58	0,59	3,23	418,4%	20,72	17,20	177,2	21,0	88,1%	59,4%	52,3%
142,00	0,53	0,58	3,19	425,4%	20,72	17,24	176,5	21,0	88,3%	59,2%	52,3%
143,00	0,53	0,58	3,20	424,5%	20,72	17,24	175,8	20,9	88,3%	59,4%	52,5%
144,00	0,49	0,55	3,30	414,2%	20,72	17,14	175,8	20,9	89,0%	60,2%	53,6%
145,00	0,49	0,56	3,32	410,2%	20,72	17,11	175,0	21,1	89,0%	60,6%	54,0%
146,00	0,49	0,58	3,32	408,1%	20,72	17,11	174,8	21,1	88,6%	60,7%	53,8%
147,00	0,44	0,55	3,30	413,9%	20,72	17,14	174,3	21,2	89,1%	60,6%	54,0%
148,00	0,40	0,50	3,33	417,2%	20,72	17,14	174,3	21,2	90,2%	60,9%	54,9%
149,00	0,40	0,44	3,32	426,3%	20,72	17,18	173,9	21,4	91,3%	60,9%	55,5%
150,00	0,40	0,45	3,29	429,5%	20,73	17,21	173,4	21,4	91,1%	60,7%	55,3%
151,00	0,36	0,43	3,16	451,1%	20,73	17,36	172,6	21,3	91,1%	59,7%	54,4%
152,00	0,36	0,46	3,11	454,9%	20,73	17,40	172,0	21,1	90,4%	59,4%	53,7%
153,00	0,30	0,44	2,99	476,8%	20,74	17,53	171,2	21,5	90,5%	58,5%	53,0%
154,00	0,30	0,47	2,92	485,4%	20,75	17,60	170,3	21,3	89,8%	57,9%	52,0%
155,00	0,30	0,50	2,88	485,7%	20,75	17,61	169,4	21,2	89,0%	57,8%	51,4%
156,00	0,26	0,54	2,84	485,8%	20,75	17,63	168,5	21,2	88,0%	57,6%	50,7%
157,00	0,22	0,56	2,85	481,3%	20,74	17,62	167,8	21,2	87,6%	57,9%	50,7%
158,00	0,22	0,56	2,85	481,3%	20,74	17,62	166,8	21,3	87,5%	58,1%	50,8%
159,00	0,17	0,52	2,87	483,0%	20,74	17,61	165,9	21,2	88,3%	58,5%	51,6%
160,00	0,17	0,49	2,86	490,3%	20,75	17,64	165,3	21,3	89,0%	58,5%	52,0%
161,00	0,17	0,51	2,84	490,2%	20,75	17,65	164,6	21,1	88,5%	58,5%	51,8%
162,00	0,17	0,51	2,84	491,4%	20,75	17,66	163,9	21,0	88,5%	58,5%	51,7%
163,00	0,13	0,49	2,84	493,8%	20,75	17,66	163,2	21,1	88,9%	58,7%	52,2%
164,00	0,13	0,51	2,83	493,8%	20,75	17,67	162,8	21,1	88,6%	58,7%	52,0%
165,00	0,13	0,49	2,76	510,0%	20,75	17,75	162,0	21,2	88,7%	58,1%	51,5%
166,00	0,08	0,50	2,78	504,2%	20,75	17,73	161,6	21,5	88,5%	58,5%	51,8%
167,00	0,04	0,51	2,80	498,5%	20,75	17,70	160,6	21,4	88,3%	58,9%	52,0%
168,00	0,04	0,51	2,80	498,7%	20,75	17,70	160,2	21,3	88,4%	59,0%	52,2%
169,00	0,00	0,51	2,79	499,6%	20,75	17,70	161,3	21,2	88,4%	58,7%	51,8%

DATA 2022-08-09 EPA PI 20275 RUN 1 CAT 4

Temps acquisition minutes	Flue	Room	Tunnel	scale	Tunnel Velocity	Flue draft	duct	duct
	temp	temp	dry bulb		Pressure	Pressure	in	out
	°F	°F	°F	lbs	in. Wc	in. Wc	°F	°F
1	70,64	67,96	71,51	12,55	0,0775	0,0011	67,71	69,61
2	70,60	68,01	71,37	12,55	0,0780	0,0011	68,38	69,78
3	72,00	68,03	71,58	15,84	0,0780	0,0024	68,73	69,81
4	77,53	67,93	71,88	15,74	0,0771	0,0041	68,86	69,85
5	82,04	67,92	72,23	12,46	0,0759	0,0046	68,90	69,93
6	86,61	67,89	72,60	12,46	0,0768	0,0066	68,90	70,13
7	99,96	67,82	73,92	12,24	0,0770	0,0097	68,93	70,42
8	120,91	67,78	76,72	12,14	0,0756	0,0170	69,03	70,98
9	159,82	67,84	82,29	11,95	0,0745	0,0259	69,12	72,04
10	206,39	67,75	89,78	11,65	0,0768	0,0137	69,10	74,24
11	263,00	67,74	99,28	11,15	0,0736	0,0423	68,90	77,77
12	305,32	67,79	107,28	10,84	0,0736	0,0190	68,80	83,07
13	355,43	67,88	117,19	10,35	0,0717	0,0219	68,76	89,67
14	399,40	67,96	126,83	9,85	0,0720	0,0589	68,54	98,06
15	435,37	68,01	135,74	13,61	0,0736	0,0613	68,64	107,09
16	429,65	68,09	135,18	20,53	0,0722	0,0611	68,59	116,23
17	426,15	68,13	140,29	24,81	0,0704	0,0613	68,51	105,40
18	417,74	68,12	130,32	24,42	0,0724	0,0571	67,80	98,94
19	369,71	67,97	116,87	24,01	0,0720	0,0584	68,58	115,45
20	354,85	67,98	115,54	23,72	0,0732	0,0556	68,18	126,70
21	400,16	67,95	123,41	23,22	0,0712	0,0628	68,06	102,46
22	447,74	68,07	131,79	22,54	0,0704	0,0638	68,21	101,51
23	502,63	68,00	140,71	21,72	0,0697	0,0715	68,36	103,93
24	544,74	68,00	149,02	20,94	0,0693	0,0821	69,16	108,20
25	572,78	68,01	155,09	20,22	0,0685	0,0750	68,24	113,02
26	596,28	67,91	159,09	19,44	0,0678	0,0894	68,29	118,05
27	615,34	67,98	162,97	18,74	0,0672	0,0819	67,85	123,00
28	631,79	68,10	165,59	18,04	0,0675	0,0800	68,57	127,99
29	645,29	68,15	168,20	17,34	0,0683	0,0896	68,59	132,75
30	656,08	68,25	168,99	16,64	0,0660	0,0906	68,05	136,39
31	661,55	68,19	169,14	16,04	0,0685	0,0854	68,60	140,37
32	668,42	68,24	170,22	15,44	0,0676	0,0877	68,47	143,35
33	671,89	68,46	170,10	14,85	0,0649	0,0872	68,46	145,48
34	673,89	68,39	170,23	14,35	0,0676	0,0879	68,78	147,24
35	672,65	68,40	169,54	13,84	0,0663	0,0843	68,85	148,97
36	667,85	68,43	168,49	13,45	0,0672	0,0851	69,09	150,07
37	662,50	68,45	167,30	12,95	0,0672	0,0853	68,70	150,65
38	655,04	68,61	165,22	12,55	0,0685	0,0794	68,81	150,69
39	645,08	68,66	163,34	12,15	0,0665	0,0877	70,24	150,13
40	634,41	68,53	161,21	11,85	0,0670	0,0822	68,40	148,70
41	624,79	68,58	159,92	11,45	0,0678	0,0821	69,03	147,53
42	616,04	68,51	158,45	11,16	0,0678	0,0750	68,46	146,29
43	607,79	68,51	156,58	10,84	0,0678	0,0870	68,64	144,82
44	598,58	68,52	154,94	10,55	0,0695	0,0728	68,83	143,49
45	590,17	68,43	153,69	10,26	0,0685	0,0761	68,68	142,09
46	583,95	68,43	152,73	9,95	0,0683	0,0855	68,82	140,88
47	578,10	68,47	151,31	9,65	0,0697	0,0770	68,43	139,77
48	572,39	68,40	150,27	9,46	0,0681	0,0812	69,43	139,02
49	566,79	68,46	149,25	9,15	0,0693	0,0755	69,42	138,06
50	561,54	68,44	148,52	8,96	0,0693	0,0692	69,17	136,93
51	557,02	68,49	147,52	8,76	0,0676	0,0704	68,97	136,34
52	552,55	68,61	146,72	8,45	0,0688	0,0812	69,67	135,79
53	546,11	68,55	145,85	8,26	0,0681	0,0798	68,79	134,67
54	539,39	68,46	144,41	8,06	0,0688	0,0702	68,91	133,69
55	573,53	68,53	166,94	20,38	0,0672	0,0774	68,73	133,20
56	568,89	68,42	168,55	47,76	0,0676	0,0762	68,96	132,87
57	592,20	68,63	165,17	47,13	0,0667	0,0840	68,95	134,90
58	615,76	68,70	167,52	46,46	0,0678	0,0808	70,24	138,58
59	635,10	68,69	169,55	45,88	0,0653	0,0866	68,39	142,31
60	650,52	68,77	171,43	45,16	0,0676	0,0849	69,18	146,66
61	661,19	68,73	172,17	44,67	0,0652	0,0889	68,70	150,52
62	666,82	68,67	173,20	44,08	0,0653	0,0910	69,22	153,43
63	671,25	68,61	173,54	43,47	0,0663	0,0881	68,12	156,15
64	675,72	68,63	174,33	42,98	0,0663	0,0867	68,66	158,52
65	678,01	68,74	174,02	42,48	0,0653	0,0881	68,80	160,85

Raw Data  
preburn

DATA 2022-08-09 EPA PI 20275 RUN 1 CAT 4

66	679,63	68,78	174,00	41,99	0,0653	0,0859	68,78	162,03
67	679,42	68,85	173,97	41,49	0,0665	0,0850	68,48	163,52
68	679,14	68,89	174,22	40,88	0,0661	0,0872	68,54	164,34
69	679,69	68,97	174,29	40,49	0,0644	0,0838	69,66	165,10
70	677,82	68,81	174,48	39,99	0,0663	0,0865	69,66	165,51
71	678,23	68,75	174,03	39,49	0,0653	0,0888	69,34	166,10
72	678,39	68,75	174,32	39,00	0,0669	0,0873	68,58	166,24
73	679,02	68,76	174,12	38,49	0,0651	0,0894	68,74	166,69
74	679,22	68,79	173,84	37,99	0,0663	0,0894	68,94	166,82
75	679,02	68,82	173,43	37,50	0,0665	0,0877	69,57	167,20
76	677,08	68,78	173,22	37,09	0,0663	0,0844	69,00	167,29
77	674,97	68,80	172,99	36,60	0,0663	0,0899	69,11	167,51
78	672,48	68,80	172,90	36,19	0,0661	0,0853	68,23	167,19
79	670,49	68,78	171,87	35,69	0,0670	0,0870	68,68	167,32
80	668,92	68,76	171,30	35,30	0,0672	0,0849	68,72	166,67
81	666,40	68,77	170,75	34,89	0,0670	0,0850	68,58	166,52
82	665,20	68,72	170,26	34,42	0,0650	0,0881	68,26	166,48
83	664,96	68,66	169,87	33,99	0,0680	0,0830	68,87	166,51
84	666,61	68,79	170,27	33,52	0,0678	0,0843	69,08	166,85
85	667,49	68,72	170,49	33,11	0,0665	0,0876	68,58	166,22
86	667,59	68,70	170,19	32,71	0,0665	0,0872	69,47	166,72
87	669,14	68,95	170,41	32,20	0,0676	0,0864	69,00	167,01
88	669,42	69,00	170,52	31,80	0,0646	0,0862	68,43	167,68
89	669,81	69,18	171,23	31,41	0,0683	0,0876	68,98	168,20
90	670,15	69,13	171,25	30,90	0,0665	0,0925	69,14	168,08
91	669,11	69,21	171,06	30,51	0,0665	0,0889	68,97	168,23
92	668,58	69,14	170,55	30,00	0,0665	0,0870	68,55	168,18
93	668,12	69,13	170,17	29,62	0,0670	0,0865	69,47	168,69
94	668,11	69,18	169,84	29,21	0,0670	0,0872	69,17	169,12
95	667,05	69,27	170,39	28,82	0,0678	0,0892	69,43	168,92
96	667,53	69,24	170,05	28,38	0,0649	0,0840	69,71	168,89
97	667,16	69,28	170,36	27,90	0,0672	0,0887	68,85	169,19
98	666,78	69,26	170,21	27,52	0,0668	0,0857	69,47	169,71
99	667,02	69,26	169,95	27,11	0,0663	0,0887	69,21	169,59
100	666,45	69,25	170,10	26,73	0,0681	0,0863	68,99	169,45
101	665,04	69,31	169,34	26,32	0,0670	0,0814	68,56	169,54
102	665,03	69,24	168,60	25,92	0,0670	0,0893	68,77	169,54
103	663,05	69,32	168,87	25,52	0,0676	0,0855	68,90	169,64
104	661,99	69,39	168,33	25,12	0,0683	0,0828	69,19	169,61
105	661,64	69,40	167,98	24,72	0,0685	0,0870	68,99	169,26
106	660,66	69,33	167,87	24,33	0,0678	0,0896	69,19	169,61
107	660,43	69,44	168,09	23,92	0,0670	0,0799	69,25	169,79
108	659,59	69,44	168,35	23,63	0,0681	0,0833	69,62	169,40
109	659,26	69,31	167,97	23,12	0,0668	0,0876	69,43	169,67
110	658,63	69,39	167,73	22,78	0,0681	0,0914	69,24	169,17
111	657,48	69,45	166,92	22,42	0,0693	0,0837	69,28	169,35
112	654,35	69,32	165,51	22,03	0,0685	0,0867	69,38	169,43
113	651,42	69,25	164,63	21,72	0,0676	0,0874	69,28	169,05
114	648,95	69,19	163,87	21,34	0,0672	0,0877	69,34	168,67
115	646,60	69,10	163,89	21,04	0,0688	0,0831	69,02	168,00
116	645,38	69,04	164,30	20,73	0,0680	0,0841	69,39	167,46
117	643,28	69,21	164,32	20,34	0,0678	0,0777	69,28	167,75
118	641,40	69,34	163,96	20,03	0,0693	0,0843	69,45	167,10
119	640,58	69,24	163,35	19,64	0,0663	0,0817	69,27	166,56
120	640,20	69,04	163,32	19,33	0,0654	0,0859	69,16	166,42
121	638,24	69,32	162,77	19,04	0,0683	0,0800	68,91	166,40
122	637,18	69,27	162,08	18,63	0,0685	0,0840	69,36	166,26
123	635,23	69,22	159,98	18,44	0,0695	0,0811	69,30	166,15
124	634,18	69,32	160,69	18,04	0,0676	0,0822	69,27	165,84
125	633,91	68,98	160,24	17,73	0,0685	0,0837	68,19	165,67
126	632,41	68,95	159,67	17,44	0,0695	0,0871	68,98	165,53
127	631,41	68,95	159,94	17,03	0,0651	0,0821	69,31	165,22
128	629,50	69,02	159,98	16,74	0,0681	0,0778	69,45	165,54
129	625,27	68,98	159,63	16,45	0,0683	0,0793	68,84	165,09
130	622,83	69,03	159,10	16,23	0,0685	0,0816	68,88	164,43
131	619,23	69,24	158,09	15,94	0,0672	0,0864	69,65	163,84
132	617,38	69,14	157,32	15,65	0,0683	0,0815	70,61	163,23
133	614,05	68,85	156,64	15,34	0,0683	0,0842	67,95	162,48

Raw Data  
preburn

DATA 2022-08-09 EPA PI 20275 RUN 1 CAT 4

134	609,90	68,79	154,89	15,15	0,0666	0,0870	68,57	161,97
135	606,46	68,83	153,90	14,85	0,0683	0,0755	68,90	161,41
136	603,80	68,85	152,33	14,64	0,0651	0,0799	68,87	160,64
137	600,36	68,93	152,37	14,34	0,0685	0,0846	69,50	160,23
138	598,63	68,81	152,16	14,15	0,0688	0,0811	69,22	159,64
139	598,19	68,93	152,50	13,84	0,0685	0,0784	69,60	159,22
140	597,73	69,02	152,23	13,65	0,0685	0,0791	69,03	159,28
141	596,60	69,16	152,01	13,45	0,0685	0,0808	70,99	159,04
142	594,81	69,13	151,78	13,14	0,0693	0,0808	69,60	158,54
143	591,47	69,23	151,19	12,94	0,0689	0,0748	70,32	158,49
144	586,78	69,28	150,39	12,75	0,0688	0,0743	70,87	157,64
145	577,72	69,07	148,61	12,66	0,0693	0,0790	69,69	156,96
146	568,63	69,07	146,02	12,46	0,0704	0,0788	69,03	155,65
147	559,50	69,09	144,33	12,34	0,0700	0,0738	69,29	154,03
148	551,29	69,05	143,32	12,25	0,0693	0,0781	68,81	152,45
149	544,86	69,17	142,45	12,05	0,0700	0,0779	69,61	151,00
150	537,59	69,12	141,55	12,05	0,0707	0,0777	69,54	149,36
151	530,68	69,13	140,95	11,95	0,0693	0,0742	68,55	147,71
152	523,97	69,00	140,28	11,76	0,0695	0,0742	69,45	145,70
153	518,81	68,77	139,20	11,66	0,0707	0,0706	69,30	144,22
154	513,39	68,79	138,36	11,54	0,0706	0,0733	69,34	143,05
155	509,42	68,88	137,69	11,54	0,0707	0,0686	69,68	141,75
156	504,08	68,83	136,96	11,45	0,0702	0,0781	69,41	140,69
157	498,77	68,85	135,17	11,35	0,0707	0,0699	69,35	139,60
158	493,51	68,76	134,01	11,16	0,0704	0,0686	69,28	138,44
159	488,78	68,75	133,66	11,16	0,0702	0,0713	69,15	137,47
160	484,18	68,83	132,84	10,97	0,0707	0,0679	69,63	136,70
161	479,82	68,79	132,76	10,96	0,0724	0,0668	69,41	135,57
162	476,03	68,74	132,15	10,85	0,0697	0,0690	68,88	134,63
163	472,29	68,64	131,84	10,75	0,0707	0,0685	68,67	133,62
164	467,08	68,63	131,16	10,65	0,0722	0,0677	69,32	132,93
165	463,45	68,69	130,50	10,65	0,0708	0,0652	68,93	132,13
166	459,99	68,74	129,72	10,55	0,0724	0,0657	69,33	131,43
167	455,85	68,75	129,08	10,36	0,0702	0,0618	69,39	130,77
168	451,10	68,75	128,20	10,36	0,0722	0,0686	69,30	129,89
169	447,68	68,70	127,16	10,26	0,0697	0,0655	69,05	129,33
170	444,10	68,74	126,13	10,23	0,0698	0,0624	69,33	128,54
171	440,31	68,78	125,24	10,16	0,0707	0,0658	69,35	127,96
172	436,55	68,97	124,74	10,05	0,0722	0,0637	69,25	127,59
173	432,72	69,11	124,51	9,93	0,0702	0,0631	69,18	126,82
174	429,13	69,08	124,13	9,95	0,0712	0,0631	69,40	126,19

2026-08-09

Date: 2022 Manufacturer: US Stove Model: HB1520  
 Project #: PJ 20275 Run: 1 Tech: MM Reviewer: SP

- Kindling 125 LBS START FIRE
- Door open, Fan ON with Restriction and front damper open
- At 9.8 LBS insert 135 LBS kindling
- After 3 min close Door, Front Damper and remove Restriction on the Fan
- At 8.00 LBS insert preload close Door immediately
- At 10 LBS insert load
- After 3 min close Door

TEST LOAD CONFIGURATION

8.80	8.78	8.26
8.95	8.71	8.08
8.71	8.74	8.46
8.14		

Date: 2022-08-09 Manufacturer: US stove Model: AB1520  
 Project #: PI 2275 Run: 1 Tech: MM Reviewer: [Signature]

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-334	7:30	ok	ok

Pre-Test

Post-Test

**Facility Conditions:**

Air Velocity from less than 2 feet .....  
 Smoke Capture Check (tunnel velocity).....  
 Picture.....

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

**Wood Heater Conditions:**

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

2022-08-09
2022-08-09
ok
ok

**Temperature System:**

Ambient (65°-90°F).....

ok °F
-------

**Proportional Checks:**

Thermocouple check.....  
 Pitot Clean.....  
 Pitot verification.....  
 Pictures for report.....

ok
ok
ok

Pictures for report.....

Side	ok
Coal bed	ok
Load	ok
Load in stove	ok
Fuel adjustment	ok

Load Length approximately 5/6 of firebox Length.....

ok
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Date: 2022-08-09 Manufacturer: US stove Model: #131520  
 Project #: PT 20275 Run: 1 Tech: MM Reviewer: [Signature]

**Leakage Checks Tunnel Samplers**

Unplugged Flow Rate = .25cfm	System 1 <sup>st</sup> hour		System 1		System 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)
Vacuum (inches Hg.)	-15	-10	-10	-10	-10	-10
Final 1 minute DGM (Liter)	670241 41	671153 82	670241 44	671153 94	418424 C1	419339 78
Initial 1 minute DGM (Liter)	670241 40	671153 80	670241 42	671153 90	418424 C1	419339 78
Change (Liter)	0.01	0.02	0.02	0.04	0	0
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	0.20	0.20	0.20	0.20	0.20	0.20
Check OK	OK	OK	OK	OK	OK	OK

Date: 2022-08-09 Manufacturer: VS STOVE Model: HB1520  
 Project #: PT 20275 Run: 1 Tech: MM Reviewer: DO

**Leakage Checks Flue Gas Sampler**

Plugged Probe	Pre Test	Post Test
Vacuum (inches Hg.)	-5	-5
Rotometer 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	.4	3	5
Check OK (no change after 15 sec.)	OK	OK	OK	OK

**Scales checks**

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Platform	EM-205	100 <sup>105mm</sup> lbs, Class F	100 <sup>105mm</sup> lbs
Wood	EM-090	440 lbs, Class F	440 lbs
Analytical	EM 335	100 mg, Class S	100 mg
Analytical	EM 129	200 g, Class S	200 g

**LIMITS OF WEIGHT RANGES**

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

Date: 2022-08-09 Manufacturer: US STUBB Model: AB1520  
 Project #: PT 20275 Run: 1 Tech: MM Reviewer: [Signature]

FOR TUNNELS < 12 in

Barometric pressure ( $P_{bar}$ ) 100.5 (KPa.) Static pressure ( $P_q$ ) 0.28 (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	0.078	72.29
B - Centroid	3.00	3.50	4	0.077	72.21
A-1	0.40	0.50	0.50	0.065	72.29
A-2	1.50	1.75	2	0.076	72.27
A-3	4.50	5.25	6	0.068	72.27
A-4	5.60	6.5	7.5	0.067	72.28
B-1	0.40	0.50	0.50	<del>0.064</del> <sup>0.064</sup>	72.21
B-2	1.50	1.75	2	0.085	71.98
B-3	4.50	5.25	6	0.067	71.98
B-4	5.60	6.5	7.5	0.066	71.95
				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.



Date: 2022-08-09 Manufacturer: US Stone Model: HB1520  
 Project #: PI 20275 Run: 1 Tech: MM Reviewer: BP

## Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
	Actual	Should Be	Actual	Should Be	Actual	Should Be
CO	0	0	3008	3000	0996	1000
Tolerance CO	0	+/- 0.02	0008	+/- 0.15	0004	+/- 0.05
CO <sub>2</sub>	0	0	1790	1800	978	1000
Tolerance CO <sub>2</sub>	0	+/- 0.02	010	+/- 0.5	022	+/- 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	3004	0999	0	0.02	0004	0.15	0003	0.05	✓	
CO <sub>2</sub>	0	1794	984	0	0.02	004	0.5	006	0.5	✓	

Date: 2022-08-09 Manufacturer: VS stove Model: HB1520  
 Project #: PI 6275 Run: 1 Tech: MM Reviewer: DP

**RAW DRY GAS METER READINGS**

	System 1	System 2	Blanck
Final (Liter)	671153.19	419338.78	394374.21
Initial (Liter)	670242.07	418424.18	393675.86

**AMBIENT CONDITIONS**

	Before	After
Barometer (kPa):	100.5	100.9
Dry Bulb (F):	68.3	<del>MM 59</del> 73.6
Humidity (%):	70.1	<del>MM 73.6</del> 59.1

**Flow Meter**

	Start	End
Flow meter reading	N.A	N.A

**Flow Meter Verification**

	Before	After
Flow meter Check (liters)	N.A	N.A
Scale Weight ( Kg)	N.A	N.A

## FUEL DATA

Date: 2021-08-09      Manufacturer: US stove      Model: HB1520  
 Project #: PT 20275      Run: 1      Tech: MM      Reviewer: DP

### FUEL DESCRIPTION:

Type of wood:

### PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*		
5 3/4 x 400 x 20 in.	630 lbs.	21'	21'	23'
5.00 x 4 1/4 x 20 in.	634 lbs.	203	203	201
5.00 x 3 1/4 x 20 in.	634 lbs.	198	197	200
4.00 x 4.50 x 20 in.	702 lbs.	196	192	193
5.00 x 4.25 x 20 in.	670 lbs.	241	193	201
5.00 x 5.00 x 20 in.	762 lbs.	216	213	194
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.			
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.			
x x in.	lbs.			
x x in.	lbs.			
x x in.	lbs.			

TEST LOAD WEIGHT: 40,34 lbs



**FUEL DATA**

Date: 2022-08-09 Manufacturer: US Stove Model: HB 15 20  
 Project #: PI 20 275 Run: 1 Tech: MM Reviewer: SP

**FUEL DESCRIPTION:**

Type of wood :

**TEST LOAD**

Piece Size	Weight	Meter Moisture Content (% dry)*
400 X 325 X 20 in.	514 lbs.	20.8
300 X 350 X 20 in.	504 lbs.	20.6
400 X 300 X 20 in.	496 lbs.	19.6
500 X 550 X 20 in.	898 lbs.	22.7
450 X 500 X 20 in.	804 lbs.	19.6
500 X 400 X 20 in.	786 lbs.	21.1
X X in.	lbs.	
X X in.	lbs.	
X X in.	lbs.	
X X in.	lbs.	
X X in.	lbs.	
X X in.	lbs.	
X X in.	lbs.	
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.	
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.	

**TEST LOAD WEIGHT:** 4002 lbs Min 20%: 400 Max 25%: 1000  
10%



DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-08-08 Manufacturer: VS 5626 Model: AB1520  
 Project #: PI 20275 Run: 1 Tech: JMM Reviewer: BP

		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	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
Date	Time	10	600	10	601	602	603	11	30	602	603	11	606
2022-08-08	17:00	94 6356	01806	35 3085		01783		34 6948	110 2130	01783		34 6948	00913
2022-08-09	9:00	94 6355	01806	35 3086		01784		34 6947	110 2131	01784		34 6947	00914

		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	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
Date	Time	10	600	10	601	602	603	11	30	602	603	11	606
2022-08-09	17:00	94 6361	01845	35 3098		01815		34 6959	110 2138	01815		34 6959	00915
2022-08-15	9:00	94 6355	01838	35 3089		01802		34 6949	110 2132	01802		34 6949	00914
2022-08-16	9:00	94 6355	01837	35 3088		01802		34 6949	110 2132	01802		34 6949	00914





# DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-08-08 Project #: DT 20275 Run: 1 Manufacturer: US Stove Model: HB/S 20  
 Tech: MP Reviewer: DR

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	72	604	605	31
2022-08-08	17:00	110 3113	01822		33 9561
2022-08-09	9:00	110 3113	01822		33 9562

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	72	604	605	31
2022-08-09	14:00	110 3130	01876		33 9587
2022-08-15	9:00	110 3115	01869		33 9566
2022-08-16	9:00	110 3114	01869		33 9566

## Paramètres

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

Code verrouillage:

### Description du test

Test standard	B415
Run #	2
Date	10-08-2022
Technicien	M.M
Project #	PI 20275

### Description de l'unité

Manufacturier	US STOVE	
Modèle	HB1520	
Combustion system	Non-Cat	
Appliance type	FURNACE	
Firebox volume	3,95	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

### Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	53 000	BTU/h Donnée fournie par le manufacturier
Targeted category	1	
Targeted output	15900	BTU/h
Cp steel	0,1	BTU/lb-°F

### Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	1,003	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	1,014	Dimensionless
Equipment number (DGM #2):	EM 318	
Calibration Factor (DGM #3):	0,997	Dimensionless
Equipment number (DGM #3):	EM 179	

### Tunnel

Targeted tunnel flow rate	330	scfm
Tunnel diameter	8	in.
Molecular weight	29	May be assumed to be 29 (EPA) 28,78 (HYDRONIC VUL)
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

### Fournaise

Fp	3,1050000	
V m/sec No fan	0,800	
Outlet section		
H	7,000	in
W	8,250	in
Section	0,4010	sqft
	0,03725799	m2

Project nu.	PI 20275
Date	10-08-2022
Technicien	M.M

### Fuel data

Fuel type	Cord	
Fuel specie	Oak	
HHV	19887,0	kJ/kg
%C	50,0	
%H	6,6	
%O	42,9	
%Ash	0,5	
HHV	8552,3	Btu/lb
LHV	7480,0	Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480









Table with 16 columns of numerical data. Each row contains 16 values, likely representing various metrics or components. The data is organized in a grid-like structure.









Table with 16 columns of numerical data representing various metrics or components across different categories, ranging from 531.00 to 597.00.





732,00	999,00	0,28	79,54	128,35	27,11	0,00	0,800	0,718	115,93	27,88	3231,66	53,86	0,05	16263	3063	15900
733,00	1000,00	0,38	78,17	109,02	17,14	0,02	8,397	7,792	1258,28	17,62	22166,73	369,45	0,37	16269	21011	15900
734,00	1001,00	0,38	81,00	105,58	13,66	0,02	8,571	8,001	1292,08	14,04	18140,13	302,34	0,30	16271	17194	15900
735,00	1002,00	0,38	82,30	103,34	11,69	0,03	8,946	8,385	1354,04	12,01	16266,44	271,11	0,27	16269	15418	15900
736,00	1003,00	0,28	80,72	113,92	18,45	0,00	0,800	0,736	118,85	18,97	2254,15	37,57	0,04	16250	2137	15900
737,00	1004,00	0,28	79,84	119,61	22,09	0,00	0,800	0,729	117,68	22,71	2672,82	44,55	0,04	16232	2533	15900
738,00	1005,00	0,28	79,35	122,22	23,82	0,00	0,800	0,725	117,15	24,49	2868,77	47,81	0,05	16213	2719	15900
739,00	1006,00	0,28	79,07	124,57	25,28	0,00	0,800	0,723	116,68	25,99	3032,68	50,54	0,05	16195	2875	15900
740,00	1007,00	0,18	79,08	126,31	26,24	0,00	0,800	0,720	116,34	26,98	3138,25	52,30	0,05	16178	2975	15900
741,00	1008,00	0,28	77,93	111,48	18,64	0,03	9,053	8,364	1350,69	19,17	25887,31	431,46	0,43	16189	24538	15900
742,00	1009,00	0,28	78,94	106,39	15,24	0,03	8,978	8,369	1351,48	15,67	21181,18	353,02	0,35	16194	20077	15900
743,00	1010,00	0,28	79,72	103,59	13,26	0,03	8,868	8,308	1341,61	13,63	18288,20	304,80	0,30	16196	17335	15900
744,00	1011,00	0,28	79,27	101,61	12,41	0,02	8,637	8,120	1311,32	12,76	16735,81	278,93	0,28	16195	15863	15900
745,00	1012,00	0,18	80,69	107,96	15,15	0,00	0,800	0,744	120,10	15,57	1870,51	31,18	0,03	16176	1773	15900
746,00	1013,00	0,18	79,86	115,53	19,82	0,00	0,800	0,734	118,52	20,37	2414,58	40,24	0,04	16157	2289	15900
747,00	1014,00	0,18	78,86	118,84	22,21	0,00	0,800	0,730	117,84	22,83	2690,78	44,85	0,04	16139	2550	15900
748,00	1015,00	0,18	79,35	121,31	23,31	0,00	0,800	0,727	117,34	23,97	2812,18	46,87	0,05	16121	2666	15900
749,00	1016,00	0,18	79,24	123,06	24,35	0,00	0,800	0,724	116,98	25,03	2928,36	48,81	0,05	16103	2776	15900
750,00	1017,00	0,08	79,46	125,19	25,40	0,00	0,800	0,722	116,56	26,11	3043,92	50,73	0,05	16086	2885	15900
751,00	1018,00	0,18	80,02	113,14	18,40	0,02	8,596	7,919	1278,84	18,92	24190,71	403,18	0,40	16095	22930	15900
752,00	1019,00	0,18	82,45	106,85	13,55	0,03	8,981	8,365	1350,92	13,93	18821,98	313,70	0,31	16097	17841	15900
753,00	1020,00	0,18	80,09	103,83	13,19	0,03	8,746	8,190	1322,53	13,56	17931,42	298,86	0,30	16098	16997	15900
754,00	1021,00	0,08	80,19	112,92	18,18	0,00	0,800	0,737	119,06	18,69	2225,38	37,09	0,04	16080	2109	15900
755,00	1022,00	0,08	79,31	119,08	22,10	0,00	0,800	0,729	117,79	22,72	2675,71	44,60	0,04	16062	2536	15900
756,00	1023,00	0,08	79,12	121,81	23,72	0,00	0,800	0,726	117,23	24,39	2859,11	47,65	0,05	16044	2710	15900
757,00	1024,00	0,08	79,02	123,91	24,94	0,00	0,800	0,723	116,81	25,64	2994,60	49,91	0,05	16027	2838	15900
758,00	1025,00	0,08	79,32	125,84	25,84	0,00	0,800	0,721	116,43	26,57	3093,54	51,56	0,05	16010	2932	15900
759,00	1026,00	0,08	78,35	116,14	20,99	0,02	8,803	8,067	1302,80	21,58	28116,64	468,61	0,47	16024	26651	15900
760,00	1027,00	0,08	77,87	106,93	16,14	0,03	9,257	8,621	1392,24	16,60	23105,63	385,09	0,39	16031	21901	15900
761,00	1028,00	0,08	80,00	103,82	13,24	0,03	8,744	8,189	1322,37	13,61	17993,15	299,89	0,30	16033	17055	15900
762,00	1029,00	0,08	79,93	116,40	20,26	0,00	0,800	0,733	118,34	20,83	2464,51	41,08	0,04	16015	2336	15900
763,00	1030,00	0,00	79,25	120,90	23,14	0,00	0,800	0,727	117,42	23,79	2793,17	46,55	0,05	15997	2648	15900

	Start	End
Barometer (kPa):	101,3	100,8
Barometer (in.Hg):	29,913879	29,766229
Dry Bulb (F):	74,9	76,8
Humidity (%):	60,6	56,4
Air velocity (ft/min)	0	0

DGM #1	Final: ##### cuft
	Initial: ##### cuft
DGM #2	Final: ##### cuft
	Initial: ##### cuft
DGM room	Final: ##### cuft
	Initial: ##### cuft

Final:	675311,250	Liter
Initial:	671155,360	Liter
Final:	423433,090	Liter
Initial:	419339,860	Liter
Final:	397847,490	Liter
Initial:	394394,210	Liter

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

267

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

Pression statique (mmHg)	0,370
Pression statique (in.H2O)	0,200
consomation electrique (KWatt)	0,376

Duct velocity	8,400	8,800	8,060
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<b>Project nu.</b>	PI 20275
<b>Date</b>	10-08-2022
<b>Technicien</b>	M.M





FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower 35,6 Ideal 39,5 Upper 43,5

\* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume: 1,09 cu. ft

Loading Density: 10,0 lbs./ft3

Number of Spaces: 0
Spacer weight: 0 lbs

Load Density (wet): 36,2 lbs./ft3
Dry Wood Density: 30,1 lbs./ft3

Table with columns: Piece Size (in): Thick, Wide, Length; Weight lbs; Meter Moisture Content Dry Uncorrected %; Ave. MC x Weight; Volume Cubic Inches; Ave. MC %

SUM MCx 808,09 20,3 %

Test Load Weight: 39,34 lbs.

Dry Weight: 14,80 kg.

Average Moisture Content: %

Dry: 20,54 Dry(EPA) 20,31 Dry(B415) 20,54

20,54 Must be 18-28

Wet: 17,04 must be 15,2-22

Coal Bed Range: 3,9 lbs. to 9,8 lbs.

TEST CHARGE:

Coal bed weight: 9,70 lbs. Must be between 10 and 25% of test load

Project nu. PI 20275 Date 10-08-2022 Technician M.M

## Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,26 in. H2O  
 Barometer: 29,914 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!	0,0000

PITOT CONSTANT=  
0,9364

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

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,075	71,8	0,2739
B center	0,074	71,8	0,2720
A1	0,061	71,8	0,2470
A2	0,072	71,8	0,2683
A3	0,061	71,8	0,2470
A4	0,061	71,8	0,2470
B1	0,062	71,8	0,2490
B2	0,082	71,8	0,2864
B3	0,064	71,8	0,2530
B4	0,061	71,8	0,2470
AVERAGE	0,065500	71,8	0,2556

<b>Project nu.</b>	PI 20275
<b>Date</b>	10-08-2022
<b>Technicien</b>	M.M

## Filter set weight

identification	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		
Before (1)	3	607	608	5	5	609	610	33	37	611	612	40	613		
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,4539	0,1799		34,6071	61,5006	0,1799		33,8287	107,9748	0,1815		34,2630	0,0896	2022-08-09	17:00
Before (6)	61,4539	0,1799		34,6070	61,5007	0,1799		33,8286	107,9747	0,1815		34,2629	0,0897	2022-08-10	14:00
After (1)	61,4550	0,1834		34,6096	61,5012	0,1819		33,8306	107,9757	0,1867		34,2656	0,0898	2022-08-11	08:00
After (2)	61,4542	0,1827		34,6074	61,5009	0,1812		33,8286	107,9750	0,1854		34,2631	0,0898	2022-08-15	09:00
After (3)	61,4542	0,1826		34,6074	61,5009	0,1811		33,8286	107,9750	0,1854		34,2631	0,0898	2022-08-16	09:00
After (4)															
After (5)															
After (6)	61,4541	0,1826		34,6074	61,5009	0,1811		33,8286	107,9750	0,1854		34,2631	0,0898	2022-08-16	09:00
Difference	0,0002	0,0027	0,0000	0,0004	0,0002	0,0012	0,0000	0,0000	0,0003	0,0039	0,0000	0,0002	0,0001		
Total (mg)		3,3				4,7				4,4			0,1		
Total ajusté (mg)		<b>3,20</b>				<b>4,60</b>				<b>4,30</b>					

<b>Project nu.</b>	PI 20275
<b>Date</b>	10-08-2022
<b>Technicien</b>	M.M























SFBA EPA EMISSION RESULTS

RESULTS

**Average emission rate:** 0,63 g/hr  
 Burn Rate : 1,164 Dry kg/hr

**Test Duration:** 763 min

PRESSURE FACTOR: DGM 1 0,96898  
 DGM 2 0,97499  
 DGM 3 0,99733

BAROMETRIC PRESSURE  
 Average: 29,840 in Hg  
 Start: 29,914 in Hg  
 End: 29,766 in Hg

TEMPERATURE FACTORS  
 DGM 1 0,97808  
 DGM 2 0,97144  
 DGM 3 0,98187

DRY GAS METER VALUES  
 DGM #1 Final: 23848,392 Cuft  
 Initial: 23701,628 Cuft

VOLUMES SAMPLED  
 DGM 1 139,44470 Scft  
 DGM 2 138,83779 Scft  
 DGM 3 119,00455 Scft

DGM #2 Final: 14953,399 Cuft  
 Initial: 14808,848 Cuft  
 DGM #3 Final: 14049,852 Cuft  
 Initial: 13927,900 Cuft

TOTAL TUNNEL VOLUME : 258535 Scft

SAMPLE RATIOS  
 Sample Train 1: 1854,034  
 Sample Train 2: 1862,139

TEMPERATURES  
 DGM #1 539,833 °R  
 DGM #2 543,521 °R

Paticulate concentration  
 Sample Train 1 **0,000033** g/dscf  
 Sample Train 2 **0,000031** g/dscf  
 Room **0,000001** g/dscf

CALIBRATION FACTORS  
 DGM #1 1,0025  
 DGM #2 1,0141  
 DGM #3 0,9965

TOTAL EMISSIONS  
 Sample Train 1 **8,31** g  
 Sample Train 2 **7,79** g

TUNNEL FLOW RATE: 338,840 Dscfm

EMISSION RATES  
 Sample Train 1 **0,65** g/hr  
 Sample Train 2 **0,61** g/hr

PARTICULATE CATCH  
 Total Sample Train 1: 4,60 mg  
 Total Sample Train 2: 4,30 mg  
 Total Sample Train 1 1st hour: 3,20 mg

1st hour emission rate **5,93** g/hr

DEVIATION: 3,24%

Cs Train 1 Train 2  
 3,299E-05 3,0971E-05

















DATA 2022-08-10 EPA PI 20275 RUN 2 CAT 1  
preburn

Temps  
acquisition  
minutes

	Flue	Room	Tunnel	scale	Tunnel Velocity	Flue draft	duct	duct
	temp	temp	dry bulb		Pressure	Pressure	in	out
	°F	°F	°F	lbs	in. Wc	in. Wc	°F	°F
1	73,66	73,23	74,36	14,95	0,0720	0,0024	73,57	74,23
2	79,02	73,21	74,40	12,24	0,0700	0,0044	73,59	74,22
3	87,03	73,15	75,13	12,15	0,0720	0,0077	73,68	74,20
4	132,57	73,15	80,20	12,03	0,0695	0,0228	73,65	74,39
5	187,75	73,14	87,85	11,75	0,0685	0,0328	73,68	75,76
6	244,86	73,13	97,22	11,25	0,0677	0,0408	73,60	78,94
7	286,05	73,21	104,58	10,84	0,0684	0,0469	73,70	83,35
8	315,38	73,25	110,93	10,44	0,0665	0,0501	73,71	88,58
9	327,06	73,23	115,32	10,04	0,0661	0,0527	73,54	94,24
10	358,40	73,22	121,96	9,56	0,0650	0,0565	73,25	100,56
11	385,22	73,24	130,21	19,33	0,0638	0,0543	73,54	108,24
12	385,59	73,31	132,14	24,01	0,0637	0,0598	73,60	114,62
13	385,28	73,38	132,26	23,62	0,0629	0,0601	73,54	120,65
14	411,11	73,46	136,99	23,12	0,0634	0,0613	73,65	125,78
15	422,94	73,51	141,33	22,83	0,0626	0,0635	73,53	103,63
16	449,16	73,54	146,21	22,32	0,0633	0,0653	73,38	103,60
17	440,44	73,58	132,33	21,83	0,0661	0,0647	73,77	104,58
18	392,78	73,61	121,19	21,60	0,0649	0,0619	73,59	104,04
19	402,12	73,63	125,18	21,14	0,0639	0,0630	73,57	103,16
20	445,57	73,56	131,08	20,62	0,0663	0,0662	74,07	104,22
21	503,00	73,48	141,35	20,03	0,0635	0,0737	73,23	107,43
22	542,41	73,35	149,21	19,13	0,0639	0,0817	73,35	112,51
23	574,88	73,45	155,96	18,33	0,0610	0,0808	73,47	118,54
24	600,22	73,58	161,11	17,63	0,0602	0,0786	73,85	124,63
25	621,04	73,78	164,89	16,84	0,0590	0,0862	73,99	130,68
26	637,93	73,98	167,75	16,04	0,0600	0,0889	74,05	136,05
27	650,38	74,16	169,92	15,24	0,0585	0,0852	74,42	141,23
28	662,44	74,26	170,65	14,64	0,0594	0,0850	74,37	145,92
29	669,64	74,25	171,30	18,53	0,0594	0,0881	74,66	150,91
30	675,19	74,50	171,59	13,45	0,0585	0,0893	74,51	153,01
31	679,77	74,64	171,26	12,94	0,0592	0,0913	74,48	155,93
32	681,06	74,78	170,99	12,46	0,0588	0,0925	74,74	158,04
33	679,05	74,71	169,77	12,01	0,0610	0,0881	75,08	159,86
34	669,10	74,81	167,71	11,55	0,0605	0,0821	74,11	160,32
35	656,59	74,88	165,23	11,19	0,0598	0,0853	74,71	160,00
36	646,25	74,99	163,74	10,84	0,0612	0,0836	74,76	158,95
37	634,37	75,02	162,21	10,55	0,0600	0,0836	75,12	157,73
38	623,92	75,05	160,79	10,26	0,0610	0,0857	75,23	156,25
39	613,82	75,08	159,24	9,95	0,0605	0,0804	75,45	154,69
40	605,19	75,11	158,01	9,66	0,0633	0,0871	75,48	153,21
41	596,57	75,03	156,06	9,37	0,0619	0,0753	74,00	151,38
42	588,55	74,72	154,59	9,15	0,0633	0,0872	73,99	149,66
43	579,98	74,72	153,19	8,96	0,0638	0,0830	74,60	148,31
44	569,52	74,74	150,62	8,76	0,0619	0,0771	74,39	146,79
45	560,78	74,86	149,46	8,57	0,0631	0,0728	74,68	145,39
46	552,91	74,74	148,46	8,36	0,0637	0,0823	74,43	143,60
47	546,12	74,61	147,53	8,16	0,0653	0,0789	74,89	142,19
48	540,17	74,74	145,99	8,06	0,0639	0,0733	74,31	140,85
49	546,74	74,76	150,70	11,40	0,0626	0,0764	74,67	139,93
50	584,97	74,97	179,22	48,48	0,0633	0,0800	74,94	139,20
51	579,07	74,90	165,32	47,88	0,0629	0,0811	75,11	139,79
52	602,64	75,07	167,99	47,16	0,0614	0,0867	75,13	142,57
53	621,68	75,04	170,24	46,57	0,0616	0,0808	74,70	146,01
54	638,87	75,20	172,68	45,98	0,0629	0,0903	75,19	149,97
55	653,48	75,24	174,46	45,28	0,0614	0,0882	75,60	154,06
56	666,57	75,41	176,32	44,67	0,0614	0,0833	75,42	157,76
57	675,96	75,48	177,71	44,07	0,0614	0,0861	75,05	161,54
58	685,36	75,63	178,74	43,56	0,0610	0,0872	76,22	164,44
59	691,41	75,71	180,10	42,88	0,0617	0,0914	75,94	167,34
60	695,64	75,81	181,53	42,29	0,0585	0,0903	76,01	170,10
61	700,46	75,83	182,13	41,78	0,0602	0,0928	76,12	172,17
62	703,16	75,94	182,93	41,19	0,0621	0,0928	75,97	173,79
63	705,74	75,98	183,58	40,60	0,0606	0,0874	75,85	175,68
64	707,71	76,05	183,66	39,99	0,0612	0,0918	75,42	177,03
65	708,99	76,07	184,37	39,39	0,0617	0,0901	75,48	178,23

## preburn

66	710,78	76,22	184,33	38,79	0,0629	0,0921	75,92	179,09
67	710,68	76,25	184,51	38,29	0,0633	0,0892	76,13	180,54
68	711,16	76,33	184,77	37,79	0,0617	0,0888	76,30	181,06
69	711,29	76,33	184,64	37,19	0,0614	0,0885	76,04	181,47
70	710,83	76,39	184,25	36,70	0,0618	0,0915	76,12	182,32
71	710,04	76,45	183,58	36,20	0,0614	0,0880	75,91	182,86
72	710,11	76,41	183,53	35,67	0,0619	0,0905	76,22	183,58
73	710,31	76,56	182,81	35,12	0,0631	0,0874	76,25	184,07
74	709,29	76,41	182,46	34,61	0,0621	0,0932	75,64	183,95
75	709,72	76,53	182,68	34,09	0,0626	0,0880	75,64	184,44
76	706,49	76,57	182,12	33,62	0,0631	0,0916	76,05	184,58
77	704,75	76,53	182,29	33,11	0,0633	0,0925	76,05	184,87
78	703,24	76,49	181,84	32,60	0,0642	0,0916	75,65	184,97
79	702,50	76,40	181,60	32,11	0,0637	0,0937	75,22	184,42
80	701,98	76,14	181,37	31,61	0,0617	0,0921	74,81	184,23
81	701,57	76,25	181,26	31,11	0,0621	0,0881	75,85	184,68
82	701,58	76,27	181,36	30,62	0,0637	0,0910	75,45	184,65
83	701,17	76,05	180,34	30,10	0,0638	0,0908	75,11	184,68
84	701,46	76,22	180,76	29,62	0,0642	0,0909	75,11	184,86
85	700,93	76,18	180,07	29,11	0,0637	0,0900	75,50	184,99
86	699,56	76,12	180,16	28,70	0,0617	0,0906	75,37	185,00
87	700,46	75,98	180,03	28,22	0,0626	0,0923	75,30	185,28
88	700,07	76,20	180,52	27,72	0,0614	0,0899	75,63	185,21
89	699,66	76,28	180,21	27,32	0,0617	0,0910	75,63	185,85
90	699,29	76,39	179,87	26,81	0,0637	0,0864	75,54	186,19
91	698,41	76,41	179,82	26,31	0,0630	0,0884	75,30	185,97
92	697,58	76,44	179,25	25,92	0,0631	0,0846	75,35	185,94
93	697,64	76,43	178,81	25,42	0,0636	0,0923	75,34	186,24
94	699,08	76,25	179,15	25,03	0,0629	0,0870	75,34	186,18
95	699,46	76,06	178,46	24,52	0,0631	0,0905	74,90	186,19
96	699,52	76,22	178,51	24,02	0,0619	0,0794	75,89	186,11
97	699,81	76,41	178,01	23,72	0,0631	0,0865	75,71	186,09
98	698,27	76,44	177,38	23,22	0,0639	0,0877	75,34	186,14
99	695,57	76,16	176,97	22,84	0,0621	0,0898	75,33	185,78
100	694,01	76,12	177,05	22,43	0,0634	0,0910	75,75	185,55
101	691,66	76,39	175,95	22,04	0,0631	0,0901	75,82	185,17
102	689,05	76,44	175,44	21,63	0,0637	0,0967	75,43	184,84
103	686,73	76,53	174,65	21,24	0,0636	0,0877	75,86	184,46
104	684,46	76,46	173,70	20,92	0,0653	0,0830	75,73	184,29
105	681,88	76,59	173,09	20,54	0,0649	0,0859	75,94	183,93
106	680,31	76,57	172,07	20,12	0,0638	0,0872	75,76	182,95
107	678,29	76,53	171,45	19,74	0,0631	0,0896	75,79	183,07
108	675,69	76,63	171,29	19,33	0,0646	0,0884	76,14	182,45
109	673,58	76,61	171,21	19,04	0,0639	0,0825	76,06	182,40
110	672,68	76,51	170,87	18,63	0,0644	0,0804	76,06	181,72
111	671,68	76,75	170,64	18,34	0,0646	0,0851	76,46	181,50
112	670,33	76,86	170,24	17,95	0,0654	0,0872	76,69	181,19
113	669,38	76,87	169,82	17,64	0,0637	0,0859	76,17	180,90
114	667,42	76,92	169,02	17,35	0,0658	0,0859	75,84	180,53
115	665,28	76,74	168,78	17,04	0,0646	0,0883	76,21	180,53
116	661,72	76,83	167,83	16,65	0,0644	0,0793	76,35	180,16
117	659,15	76,86	166,86	16,35	0,0649	0,0888	75,92	179,59
118	653,70	76,82	166,18	16,14	0,0639	0,0811	76,58	178,46
119	650,10	76,77	164,29	15,84	0,0644	0,0825	76,05	177,61
120	646,25	76,60	164,26	15,56	0,0651	0,0799	75,95	176,77
121	641,99	76,37	163,58	15,25	0,0646	0,0837	75,53	175,59
122	639,68	76,25	163,34	15,05	0,0668	0,0839	75,80	175,23
123	636,95	76,47	162,52	14,85	0,0646	0,0872	75,66	174,26
124	634,28	76,41	162,12	14,54	0,0658	0,0835	75,54	173,48
125	631,78	76,34	161,29	14,35	0,0647	0,0866	75,65	172,81
126	628,41	76,47	161,06	14,16	0,0661	0,0907	76,19	172,46
127	624,52	76,52	160,03	13,84	0,0658	0,0835	76,36	171,78
128	620,44	76,58	158,54	13,65	0,0673	0,0859	76,29	170,97
129	616,26	76,53	157,78	13,46	0,0658	0,0793	76,81	170,09
130	611,95	76,60	156,38	13,29	0,0650	0,0782	76,55	169,30
131	607,80	76,73	156,05	13,14	0,0661	0,0796	76,31	168,21
132	604,12	76,67	155,66	12,95	0,0658	0,0803	76,48	167,03
133	599,76	76,56	155,45	12,75	0,0665	0,0780	76,48	166,11

## preburn

134	594,74	76,73	154,35	12,56	0,0665	0,0830	76,37	164,97
135	589,77	76,70	153,53	12,34	0,0663	0,0786	76,04	164,08
136	582,52	76,51	153,02	12,25	0,0670	0,0755	76,61	163,03
137	574,82	76,65	151,93	12,06	0,0665	0,0811	76,78	161,72
138	566,11	76,65	150,30	11,96	0,0661	0,0822	76,99	160,30
139	558,82	76,83	148,96	11,86	0,0688	0,0749	76,26	158,87
140	552,14	76,62	147,84	11,67	0,0673	0,0779	76,48	157,64
141	544,98	76,61	146,39	11,55	0,0665	0,0735	76,81	156,03
142	538,28	76,68	144,75	11,45	0,0673	0,0781	76,52	154,68
143	532,22	76,78	144,33	11,35	0,0683	0,0785	76,65	153,42
144	497,54	76,63	134,07	11,25	0,0676	0,0618	76,05	151,55
145	395,33	76,66	113,54	11,26	0,0702	0,0591	76,30	149,77
146	356,76	76,43	107,44	11,16	0,0707	0,0563	75,84	147,63
147	334,58	76,43	104,18	11,16	0,0695	0,0536	75,77	145,49
148	318,63	75,97	101,65	11,06	0,0707	0,0528	75,33	143,37
149	305,86	75,85	99,85	11,06	0,0707	0,0508	75,14	141,59
150	295,07	75,81	98,42	10,96	0,0707	0,0496	75,49	140,02
151	285,49	75,88	96,89	10,96	0,0702	0,0489	75,84	138,97
152	277,44	75,71	95,96	10,96	0,0722	0,0472	75,48	137,26
153	270,40	75,75	95,20	10,96	0,0715	0,0462	75,81	135,84
154	264,33	75,83	94,42	10,84	0,0717	0,0447	76,21	134,61
155	259,19	75,88	93,71	10,84	0,0704	0,0457	76,19	133,44
156	254,23	75,90	93,43	10,84	0,0739	0,0424	75,57	132,20
157	249,86	75,83	92,69	10,75	0,0720	0,0428	75,73	131,18
158	246,55	75,83	92,36	10,75	0,0696	0,0418	75,58	130,12
159	242,20	75,87	91,88	10,65	0,0722	0,0417	75,77	129,26
160	237,42	75,95	91,40	10,65	0,0713	0,0403	76,20	128,47
161	233,34	75,97	90,62	10,65	0,0715	0,0399	76,25	127,67
162	229,94	75,78	90,24	10,65	0,0720	0,0392	75,63	126,35
163	226,69	75,70	90,02	10,55	0,0697	0,0381	75,24	125,39
164	223,19	75,64	89,94	10,65	0,0732	0,0376	75,59	124,58
165	220,47	75,54	89,68	10,55	0,0713	0,0374	75,71	123,70
166	217,35	75,61	89,43	10,55	0,0715	0,0364	75,73	122,94
167	214,49	75,70	88,86	10,55	0,0715	0,0357	75,99	122,25
168	211,75	75,80	88,35	10,46	0,0720	0,0348	75,99	121,77
169	208,90	75,74	87,96	10,45	0,0719	0,0348	75,54	121,02
170	206,53	75,74	87,79	10,45	0,0732	0,0343	75,59	120,15
171	204,22	75,71	87,45	10,46	0,0729	0,0333	76,05	119,60
172	201,55	75,80	87,38	10,46	0,0717	0,0333	76,22	119,01
173	199,79	75,90	86,95	10,36	0,0707	0,0326	76,15	118,19
174	197,22	75,94	86,75	10,36	0,0724	0,0319	75,93	117,88
175	194,99	75,79	86,71	10,36	0,0722	0,0315	76,07	116,99
176	192,95	75,82	86,71	10,36	0,0735	0,0313	75,97	116,48
177	190,95	75,82	86,39	10,36	0,0715	0,0306	75,83	116,09
178	189,13	75,75	86,49	10,36	0,0722	0,0304	75,75	115,42
179	187,21	75,71	86,09	10,36	0,0724	0,0297	75,72	114,96
180	185,23	75,71	85,93	10,36	0,0717	0,0294	75,81	114,46
181	183,76	75,65	85,75	10,26	0,0712	0,0289	76,08	114,00
182	182,25	75,65	85,55	10,26	0,0729	0,0286	75,93	113,62
183	180,54	75,64	85,49	10,26	0,0741	0,0282	75,94	113,11
184	178,81	75,66	85,39	10,16	0,0744	0,0279	76,17	112,89
185	177,21	75,61	85,40	10,16	0,0729	0,0275	75,56	112,51
186	175,84	75,51	85,14	10,17	0,0717	0,0270	75,77	111,98
187	174,35	75,67	85,14	10,16	0,0705	0,0270	76,13	111,62
188	172,92	75,76	84,99	10,16	0,0736	0,0268	76,44	111,39
189	171,42	75,85	84,87	10,05	0,0720	0,0263	76,89	111,21
190	170,50	75,90	84,64	10,04	0,0704	0,0257	76,69	110,81
191	169,32	75,87	84,58	10,05	0,0711	0,0257	75,68	110,34
192	167,96	75,75	84,51	10,05	0,0746	0,0252	76,13	110,04
193	166,67	75,86	84,47	10,05	0,0713	0,0250	76,37	109,65
194	165,60	75,86	84,29	10,05	0,0715	0,0248	76,31	109,43
195	164,81	75,89	84,21	9,95	0,0717	0,0250	75,53	109,00
196	163,75	75,82	84,17	9,95	0,0707	0,0243	76,09	108,79
197	162,50	75,80	84,15	9,95	0,0717	0,0241	76,17	108,60
198	161,52	75,75	84,04	9,95	0,0736	0,0240	76,04	108,14
199	160,20	75,80	83,85	9,85	0,0709	0,0230	75,98	116,92
200	158,40	75,79	83,74	9,75	0,0732	0,0235	75,96	129,86
201	158,78	75,84	83,39	9,85	0,0736	0,0247	75,81	118,37



DATA 2022-08-10 EPA PI 20275 RUN 2 CAT 1  
preburn

202	160,71	75,93	83,12	9,85	0,0717	0,0240	76,20	114,02
203	160,90	76,00	82,93	9,85	0,0736	0,0240	76,07	112,05
204	159,97	75,99	83,03	9,75	0,0732	0,0235	76,08	110,48
205	159,08	75,90	83,39	9,83	0,0741	0,0233	76,18	109,46
206	157,31	75,94	83,23	9,66	0,0720	0,0228	76,21	122,86
207	156,12	76,02	83,11	9,66	0,0715	0,0231	76,18	132,86

Date: 2021-08-10 Manufacturer: US STOVE Model: HBI520  
 Project #: PT 20275 Run: 2 Tech: AM Reviewer: SP

- Kindling 12.4 LBS START FIRE
- Door open Fan on with restriction and Front Dampen open
- At 9.5 LBS insert 14.5 LBS kindling
- At 22 LBS close Door Front Dampen and Remove Restriction on the Fan
- 8.00 LBS insert preload
- close Door immediately
- At 11.3 LBS close Fan
- At 9.7 LBS (1:03) insert load
- open Fan
- At 6 min close Door and Fan

TEST LOAD CONFIGURATION  
8 1/4

7'

8.40	8.80	8.06
8.46	8.75	8.15
8.40	8.70	8.30

# PRE / POST CHECKS

Date: 2022-08-10 Manufacturer: US STOVE Model: AB1520  
 Project #: PT 20275 Run: 2 Tech: MM Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-334	7:00	OK	OK

Pre-Test

Post-Test

**Facility Conditions:**

Air Velocity from less than 2 feet .....  
 Smoke Capture Check (tunnel velocity).....  
 Picture.....

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

**Wood Heater Conditions:**

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

2022-08-09
2022-08-09
OK
OK

**Temperature System:**

Ambient (65°-90°F).....

OK	°F
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**Proportional Checks:**

Thermocouple check.....  
 Pitot Clean.....  
 Pitot verification.....  
 Pictures for report.....

OK
OK
OK

Pictures for report.....

Side	OK
Coal bed	OK
Load	OK
Load in stove	OK
Fuel adjustment	OK

Load Length approximately 5/6 of firebox Length.....

OK
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Date: 2022-08-10 Manufacturer: US STOVE Model: AB1520  
 Project #: PI 20275 Run: 2 Tech: MM Reviewer: SP
**Leakage Checks Tunnel Samplers**

Unplugged Flow Rate = .25cfm	System 1 <sup>st</sup> hour		System 1		System 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)
Vacuum (inches Hg.)	-10	-10	-10	-10	-10	-10
Final 1 minute DGM (Liter)	621154 74	6275611 82	627154 87	6275611 90	419 339 51	423 734 39
Initial 1 minute DGM (Liter)	621154 73	6275611 81	627154 85	6275611 90	419 339 40	423 734 38
Change (Liter)	0.01	0.01	0.02	0	0.11	0.01
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	0.20	0.20	0.20	0.20	0.20	0.20
Check OK	ok	ok	ok	ok	ok	ok



Date: 2022-08-10 Manufacturer: US 5/04E Model: AB1520  
 Project #: PI 20275 Run: 2 Tech: JM Reviewer: DO

**Leakage Checks Flue Gas Sampler**

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

**Leakage Checks Pitot**

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

**Scales checks**

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	4.4 lbs, Class F	4.4 lbs
Platform	EM-205	10.00 <sup>15g mm</sup> lbs, Class F	10.00 <sup>15g mm</sup> lbs
Wood	EM 090	4.40 lbs, Class F	4.40 lbs
Analytical	<sup>334</sup> EM-20 mm	100 mg, Class S	100 mg
Analytical	EM 129	200 g, Class S	200 g

**LIMITS OF WEIGHT RANGES**

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

Date: 2022-08-10 Manufacturer: US stove Model: AB1520  
 Project #: PT 20275 Run: 2 Tech: MM Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure ( $P_{bar}$ ) 1013 (KPa.) Static pressure ( $P_q$ ) 0.26 (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	0.075	71.84
B - Centroid	3.00	3.50	4	0.074	71.81
A-1	0.40	0.50	0.50	0.061	71.84
A-2	1.50	1.75	2	0.072	71.83
A-3	4.50	5.25	6	0.061	71.83
A-4	5.60	6.5	7.5	0.061	71.81
B-1	0.40	0.50	0.50	0.062	71.82
B-2	1.50	1.75	2	0.082	71.82
B-3	4.50	5.25	6	0.064	71.83
B-4	5.60	6.5	7.5	0.061	71.83
				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.

Date: 2022-08-10 Manufacturer: US stove Model: HB1520  
 Project #: 01 20275 Run: 2 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	3038	3000	1029	1000
Tolerance CO	0	+/- 0.02	0038	+/- 0.15	0029	+/- 0.05
CO <sub>2</sub>	0	0	1804	1800	987	1000
Tolerance CO <sub>2</sub>	0	+/- 0.02	004	+/- 0.5	013	+/- 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	3029	1024	0	0.02	0009	0.15	0005	0.05	✓	
CO <sub>2</sub>	0	1801	982	0	0.02	003	0.5	005	0.5	✓	



## FUEL DATA

Date: 2023-08-10 Manufacturer: US Stove Model: 4B1520  
 Project #: PI 20275 Run: 2 Tech: MM Reviewer: BP

### FUEL DESCRIPTION:

Type of wood:

### PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*
450 x 400 x 20 in.	630 lbs. 200	194
400 x 425 x 20 in.	730 lbs. 191	192
425 x 450 x 20 in.	706 lbs. 231	194
400 x 400 x 20 in.	682 lbs. 268	214
550 x 400 x 20 in.	636 lbs. 191	193
500 x 400 x 20 in.	718 lbs. 231	191
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.	
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.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	

TEST LOAD WEIGHT: 4,000 lbs



## TEST DATA LOG

Date: 2022-08-10 Manufacturer: US SLOVE Model: H13120  
 Project #: PI 20275 Run: 2 Tech: MP Reviewer: SP

### RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	67531, 25	423433, 09	397847, 49
Initial (Liter)	671155, 36	419339, 86	394394, 21

### AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101,3	100,8
Dry Bulb (F):	74,9	76,8
Humidity (%):	60,6	56,4

### Flow Meter

	Start	End
Flow meter reading	N.A	N.A

### Flow Meter Verification

	Before	After
Flow meter Check (liters)	N.A	N.A
Scale Weight ( Kg)	N.A	MA



# FUEL DATA

Date: 2022-08-10 Manufacturer: US Stone Model: HB1520  
 Project #: PT 20275 Run: 2 Tech: MM Reviewer: SJP

## FUEL DESCRIPTION:

Type of wood :

## TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*		
300 x350 x 20 in.	482 lbs.	196	192	193
300 x 305 x 20 in.	520 lbs.	196	193	198 + 198
325 x 325 x 20 in.	482 lbs.	207	191	217
450 <sup>5.00</sup> x 450 x 20 in.	968 lbs.	261	211	209
450 x 500 x 20 in.	780 lbs.	199	200	198
400 x 450 x 20 in.	702 lbs.	211	193	191
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.			
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.			
x x in.	lbs.			
x x in.	lbs.			
x x in.	lbs.			
x x in.	lbs.			
x x in.	lbs.			
x x in.	lbs.			

TEST LOAD WEIGHT: 3930 lbs Min 20%: 393 Max 25%: 982  
*100% MC*





# DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-08-09      Manufacturer: US stove      Model: HB1520  
 Project #: PJ 20275      Tech: M.H.      Reviewer: DO

		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1				
Pre-test Weight Record	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank	
		003	607	608	5	005	609	610	33	613	
2022-08-09	17:00	614539	01799		346071	615006	01799		33 8287	00896	
2022-08-10	14:00	614539	01799		346070	615007	01799		33 8286	00897	

		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1				
Post-test Weight Record	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank	
		003	607	608	5	005	609	610	33	613	
2022-08-11	8:00	614550	01834		346096	615012	01819		33 8306	00898	
2022-08-15	9:00	614542	01827		346074	615009	01812		33 8286	00898	
2022-08-16	9:00	614542	01826		346074	615009	01811		33 8286	00898	



# DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-08-09      Project #: PI 20274      Run: 2      Manufacturer: US 5602      Model: HBS20  
 Tech: MM      Reviewer: DO

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	37	611	612	40
2022-08-09	17:00	<del>107 9748</del> <del>328267</del>	01815		34 2630
2022-08-10	14:00	107 9747	01815		34 2629

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	37	611	612	40
2022-08-11	8:00	107 9757	<del>01867</del> 01867		34 2656
2022-08-15	9:00	107 9750	01854		34 2631
2022-08-16	9:00	107 9750	01854		34 2631

## Paramètres

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

Code verrouillage:

### Description du test

Test standard	B415
Run #	3
Date	15-08-2022
Technicien	m.m
Project #	pi 20275

### Description de l'unité

Manufacturier	US Stove	
Modèle	HB1520	
Combustion system	Non-Cat	
Appliance type	furnace	
Firebox volume	3,95	cu ft.
Appliance weight empty	n.a	lbs
Appliance weight full	n.a	lbs

### Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	53 000	BTU/h Donnée fournie par le manufacturier
Targeted category	3	
Targeted output	35000	BTU/h
Cp steel	0,1	BTU/lb-°F

### Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	1,003	Dimensionless
Equipment number (DGM #1):	em 178	
Calibration Factor (DGM #2):	1,014	Dimensionless
Equipment number (DGM #2):	em 318	
Calibration Factor (DGM #3):	0,997	Dimensionless
Equipment number (DGM #3):	em 179	

### Tunnel

Targeted tunnel flow rate	350	scfm
Tunnel diameter	8	in.
Molecular weight	29	May be assumed to be 29 (EPA) 28,78 (HYDRONIC VUL)
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

### Fournaise

Fp	3,2000000	
V m/sec No fan	0,210	
Outlet section		
H	7,000	in
W	8,250	in
Section	0,4010	sqft
	0,03725799	m2

Project nu.	pi 20275
Date	15-08-2022
Technicien	m.m

### Fuel data

Fuel type	Cord	
Fuel specie	Oak	
HHV	19887,0	kJ/kg
%C	50,0	
%H	6,6	
%O	42,9	
%Ash	0,5	
HHV	8552,3	Btu/lb
LHV	7480,0	Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480









373.00	662.00	0,38	88,64	116,68	15,58	0,03	9,468	8,659	1398,38	16,02	22396,10	373,27	0,37	30013	21229	35000
374.00	663.00	0,38	89,33	116,68	15,19	0,03	9,503	8,692	1403,66	15,62	21926,32	365,44	0,37	29988	20783	35000
375.00	664.00	0,38	88,37	116,49	15,62	0,02	9,085	8,312	1342,28	16,06	21560,07	359,33	0,36	29963	20436	35000
376.00	665.00	0,28	88,17	116,54	15,76	0,03	9,680	8,856	1430,18	16,20	23174,46	386,24	0,39	29942	21966	35000
377.00	666.00	0,28	88,18	116,46	15,71	0,03	9,806	8,972	1448,93	16,15	23397,88	389,96	0,39	29921	22178	35000
378.00	667.00	0,19	88,64	116,49	15,47	0,03	9,502	8,694	1403,96	15,91	22331,44	372,19	0,37	29898	21167	35000
379.00	668.00	0,19	88,21	116,32	15,62	0,03	9,680	8,859	1430,67	16,06	22972,75	382,88	0,38	29877	21775	35000
380.00	669.00	0,09	88,65	116,36	15,39	0,03	9,714	8,890	1435,61	15,83	22718,70	378,64	0,38	29855	21534	35000
381.00	670.00	0,09	88,56	116,21	15,36	0,03	9,283	8,498	1372,31	15,79	21672,55	361,21	0,36	29830	20543	35000
382.00	671.00	0,09	88,61	116,17	15,31	0,03	9,624	8,810	1422,78	15,74	22399,54	373,33	0,37	29808	21232	35000
383.00	672.00	0,09	88,54	116,02	15,27	0,03	9,550	8,745	1412,17	15,70	22168,57	369,48	0,37	29785	21013	35000
384.00	673.00	0,09	88,57	115,97	15,22	0,03	9,498	8,698	1404,58	15,65	21981,76	366,36	0,37	29762	20836	35000
385.00	674.00	0,00	88,58	115,95	15,21	0,03	9,280	8,498	1372,36	15,63	21454,88	357,58	0,36	29737	20336	35000

	Start	End
Barometer (kPa):	101,2	101,3
Barometer (in.Hg):	29,884349	29,913879
Dry Bulb (F):	76,2	78,4
Humidity (%):	55,6	52,1
Air velocity (ft/min)	0	0

DGM #1	Final: 23933,772 cuft	Initial: 23859,034 cuft
DGM #2	Final: 15037,744 cuft	Initial: 14964,030 cuft
DGM room	Final: 14107,252 cuft	Initial: 14049,852 cuft

Final: 677728,930	Liter
Initial: 675612,600	Liter
Final: 425821,480	Liter
Initial: 423734,140	Liter
Final: 399472,890	Liter
Initial: 397847,490	Liter

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

289

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

Pression statique (mmHg)	0,370
Pression statique (in.H2O)	0,200
consommation électrique (KWatt)	0,376

Duct velocity	8,570	8,900	8,120
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<b>Project nu.</b>	pi 20275
<b>Date</b>	15-08-2022
<b>Technicien</b>	m.m



**FUEL LOAD DATA SHEET, CSA B415**

Test Load Weight:

Lower Ideal Upper

\* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume:  cu. ft

Loading Density: 10,6 lbs./ft3

Number of Spaces:   
 Spacer weight:  lbs

Load Density (wet): 30,4 lbs./ft3  
 Dry Wood Density: 25,1 lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content				Ave. MC x Weight	Volume Cubic Inches	Ave. MC %
Thick	Wide	Length		Dry Uncorrected %						
4,5	4	20	4,98	24,60	19,80	19,30	105,742	360,00	21,2	
4	4	20	4,84	25,50	19,10	19,40	103,25333	320,00	21,3	
4	4	20	5,14	25,10	19,80	19,10	109,65333	320,00	21,3	
4,5	4,75	20	8,58	23,70	24,00	22,10	199,628	427,50	23,3	
5	4,5	20	8,68	22,10	19,10	20,30	177,94	450,00	20,5	
5	5	20	9,56	19,60	19,30	19,20	185,14533	500,00	19,4	
								0,00		
								0,00		
								0,00		
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								0,00		
								0,00		
							SUM MCx	881,362	21,2 %	

Test Load Weight:  lbs.

Dry Weight:  kg.

Average Moisture Content: %

Dry:  Dry(EPA) 21,17  
 Dry(B415) 21,10

Must be 18-28

Wet:   
 must be 15,2-22

Coal Bed Range:  lbs. to

lbs.

TEST CHARGE:

Coal bed weight:   
 Must be between 10 and 25% of test load

lbs.

**Project nu.** pi 20275  
**Date** 15-08-2022  
**Technicien**

## Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,23 in. H2O  
 Barometer: 29,884 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!	0,0000

PITOT CONSTANT=  
0,9416

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

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,069	74,4	0,2627
B center	0,068	74,4	0,2608
A1	0,055	74,4	0,2345
A2	0,069	74,4	0,2627
A3	0,057	74,4	0,2387
A4	0,055	74,3	0,2345
B1	0,055	74,4	0,2345
B2	0,080	74,2	0,2828
B3	0,061	74,2	0,2470
B4	0,056	74,5	0,2366
AVERAGE	0,061000	74,4	0,2464

Project nu. pi 20275  
 Date 15-08-2022  
 Technicien m.m

## Filter set weight

identification	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		
7	614	615	1	13	633	634	18	34	635	636	45	637			
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,4739	0,1839		34,5036	95,1455	0,1821		33,2939	110,1038	0,1799		34,2877	0,0906	2022-08-11	17:00
Before (6)	61,4739	0,1839		34,5037	95,1456	0,1821		33,2940	110,1038	0,1799		34,2876	0,0907	2022-08-15	09:00
After (1)	61,4741	0,1898		34,5054	95,1494	0,1863		33,2952	110,1052	0,1881		34,2882	0,0909	2022-08-15	19:00
After (2)	61,4741	0,1881		34,5038	95,1457	0,1852		33,2940	110,1040	0,1867		34,2879	0,0908	2022-08-22	09:00
After (3)	61,4740	0,1880		34,5038	95,1457	0,1851		33,2940	110,1039	0,1867		34,2878	0,0908	2022-08-24	09:00
After (4)															
After (5)															
After (6)	61,4740	0,1880		34,5038	95,1457	0,1851		33,2940	110,1039	0,1867		34,2878	0,0908	2022-08-24	09:00
Difference	0,0001	0,0041	0,0000	0,0001	0,0001	0,0030	0,0000	0,0000	0,0001	0,0068	0,0000	0,0002	0,0001		
Total (mg)		4,3				7,4				7,1			0,1		
Total ajusté (mg)		<b>4,20</b>				<b>7,30</b>				<b>7,00</b>					

<b>Project nu.</b>	pi 20275
<b>Date</b>	15-08-2022
<b>Technicien</b>	m.m













SFBA EPA EMISSION RESULTS

RESULTS

**Average emission rate:** 1,95 g/hr  
 Burn Rate : 2,439 Dry kg/hr

**Test Duration:** 385 min

PRESSURE FACTOR: DGM 1 0,97409  
 DGM 2 0,97624  
 DGM 3 0,99930

BAROMETRIC PRESSURE  
 Average: 29,899 in Hg  
 Start: 29,884 in Hg  
 End: 29,914 in Hg

TEMPERATURE FACTORS  
 DGM 1 0,97162  
 DGM 2 0,96608  
 DGM 3 0,97480

DRY GAS METER VALUES  
 DGM #1 Final: 23933,772 Cuft  
 Initial: 23859,034 Cuft

VOLUMES SAMPLED  
 DGM 1 70,91338 Scft  
 DGM 2 70,49989 Scft  
 DGM 3 55,72007 Scft

DGM #2 Final: 15037,744 Cuft  
 Initial: 14964,030 Cuft  
 DGM #3 Final: 14107,252 Cuft  
 Initial: 14049,852 Cuft

TOTAL TUNNEL VOLUME : 125944 Scft

SAMPLE RATIOS  
 Sample Train 1: 1776,021  
 Sample Train 2: 1786,437

TEMPERATURES  
 DGM #1 543,424 °R  
 DGM #2 546,539 °R

Paticulate concentration  
 Sample Train 1 **0,000103** g/dscf  
 Sample Train 2 **0,000099** g/dscf  
 Room **0,000002** g/dscf

CALIBRATION FACTORS  
 DGM #1 1,0025  
 DGM #2 1,0141  
 DGM #3 0,9965

TOTAL EMISSIONS  
 Sample Train 1 **12,74** g  
 Sample Train 2 **12,28** g

TUNNEL FLOW RATE: 327,126 Dscfm

EMISSION RATES  
 Sample Train 1 **1,99** g/hr  
 Sample Train 2 **1,91** g/hr

PARTICULATE CATCH  
 Total Sample Train 1: 7,30 mg  
 Total Sample Train 2: 7,00 mg  
 Total Sample Train 1 1st hour: 4,20 mg

1st hour emission rate **7,46** g/hr

DEVIATION: 1,84%

Cs Train 1 Train 2  
 0,0001029 9,9291E-05







321,00	1,21	0,29	2,93	516,0%	20,76	17,68	152,5	28,4	93,9%	63,1%	59,3%
322,00	1,17	0,29	2,95	509,6%	20,75	17,65	152,5	28,4	93,8%	63,3%	59,4%
323,00	1,16	0,30	2,96	508,5%	20,75	17,65	152,7	28,5	93,7%	63,3%	59,4%
324,00	1,13	0,28	2,97	508,1%	20,75	17,64	152,3	28,5	94,1%	63,6%	59,8%
325,00	1,08	0,28	2,98	506,9%	20,75	17,63	152,7	28,5	94,2%	63,6%	59,9%
326,00	1,08	0,25	2,93	522,0%	20,76	17,70	152,6	28,5	94,9%	63,2%	59,9%
327,00	1,08	0,25	2,93	521,6%	20,76	17,70	152,6	28,5	94,8%	63,2%	59,9%
328,00	1,03	0,26	2,92	522,9%	20,76	17,71	152,4	28,5	94,6%	63,1%	59,7%
329,00	1,03	0,25	2,95	518,3%	20,76	17,68	152,6	28,6	94,9%	63,3%	60,1%
330,00	1,03	0,24	2,97	518,0%	20,76	17,67	152,9	28,6	95,2%	63,4%	60,4%
331,00	0,98	0,24	2,97	517,7%	20,76	17,67	152,5	28,6	95,3%	63,5%	60,5%
332,00	0,98	0,24	3,02	507,7%	20,75	17,61	152,9	28,6	95,3%	63,8%	60,8%
333,00	0,94	0,24	3,07	498,8%	20,75	17,56	153,1	28,6	95,3%	64,1%	61,1%
334,00	0,94	0,23	3,09	497,4%	20,75	17,55	153,3	28,6	95,7%	64,3%	61,5%
335,00	0,90	0,22	3,10	496,0%	20,75	17,54	153,9	28,6	95,8%	64,3%	61,6%
336,00	0,90	0,22	3,08	500,8%	20,75	17,56	154,0	28,6	95,9%	64,1%	61,4%
337,00	0,85	0,21	3,06	504,5%	20,75	17,58	154,0	28,6	96,0%	63,9%	61,4%
338,00	0,85	0,20	3,07	505,6%	20,75	17,58	153,9	28,6	96,2%	64,0%	61,5%
339,00	0,85	0,20	3,06	507,9%	20,75	17,59	154,3	28,6	96,4%	63,9%	61,6%
340,00	0,81	0,19	3,07	507,8%	20,75	17,59	154,4	28,6	96,5%	63,9%	61,6%
341,00	0,76	0,19	3,08	505,8%	20,75	17,58	154,7	28,6	96,5%	63,9%	61,6%
342,00	0,76	0,19	3,07	506,7%	20,75	17,58	155,1	28,6	96,5%	63,8%	61,6%
343,00	0,72	0,19	3,09	504,4%	20,75	17,57	155,3	28,6	96,6%	63,9%	61,7%
344,00	0,72	0,18	3,08	505,7%	20,75	17,58	155,6	28,6	96,7%	63,8%	61,7%
345,00	0,67	0,18	3,08	506,9%	20,75	17,58	155,7	28,6	96,8%	63,7%	61,7%
346,00	0,67	0,18	3,07	508,7%	20,75	17,59	156,0	28,6	96,8%	63,6%	61,6%
347,00	0,67	0,18	3,07	509,7%	20,75	17,60	156,3	28,6	96,8%	63,5%	61,5%
348,00	0,62	0,18	3,07	510,1%	20,75	17,60	156,2	28,6	96,8%	63,5%	61,5%
349,00	0,62	0,18	3,07	510,6%	20,75	17,60	156,5	28,7	96,9%	63,5%	61,5%
350,00	0,58	0,18	3,04	515,5%	20,76	17,63	156,2	28,6	96,8%	63,3%	61,3%
351,00	0,58	0,18	2,97	530,2%	20,76	17,71	155,8	28,6	96,8%	62,8%	60,8%
352,00	0,58	0,18	2,95	532,0%	20,76	17,72	155,7	28,6	96,6%	62,6%	60,5%
353,00	0,53	0,18	2,93	537,3%	20,76	17,74	155,8	28,6	96,7%	62,4%	60,4%
354,00	0,53	0,18	2,93	536,6%	20,76	17,74	155,7	28,6	96,6%	62,4%	60,3%
355,00	0,49	0,19	2,92	535,9%	20,76	17,74	155,5	28,6	96,4%	62,5%	60,2%
356,00	0,49	0,20	2,93	532,4%	20,76	17,73	155,4	28,7	96,1%	62,6%	60,1%
357,00	0,49	0,21	2,91	534,9%	20,76	17,74	155,1	28,7	96,0%	62,5%	60,0%
358,00	0,45	0,21	2,85	545,5%	20,76	17,80	154,8	28,6	95,7%	62,0%	59,3%
359,00	0,45	0,22	2,84	546,7%	20,76	17,81	154,7	28,6	95,4%	61,9%	59,0%
360,00	0,40	0,22	2,82	552,0%	20,77	17,84	154,3	28,6	95,5%	61,8%	59,0%
361,00	0,40	0,23	2,81	550,8%	20,77	17,84	154,0	28,6	95,3%	61,8%	58,9%
362,00	0,40	0,25	2,83	544,4%	20,76	17,81	153,8	28,6	94,8%	62,0%	58,8%
363,00	0,36	0,25	2,83	544,0%	20,76	17,81	153,8	28,7	94,8%	62,0%	58,8%
364,00	0,36	0,25	2,82	544,9%	20,76	17,82	153,3	28,6	94,8%	62,1%	58,9%
365,00	0,30	0,24	2,79	555,3%	20,77	17,86	153,1	28,6	95,0%	61,7%	58,7%
366,00	0,30	0,24	2,78	556,2%	20,77	17,87	153,1	28,6	95,0%	61,7%	58,6%
367,00	0,31	0,23	2,79	553,9%	20,77	17,85	153,2	28,6	95,1%	61,8%	58,8%
368,00	0,26	0,23	2,80	553,5%	20,77	17,85	152,7	28,7	95,1%	62,0%	58,9%
369,00	0,26	0,23	2,78	555,9%	20,77	17,86	152,6	28,6	95,1%	61,9%	58,8%
370,00	0,22	0,24	2,79	554,1%	20,77	17,86	152,5	28,7	94,9%	61,9%	58,8%
371,00	0,22	0,24	2,78	555,9%	20,77	17,87	152,0	28,7	94,9%	62,0%	58,8%
372,00	0,17	0,23	2,76	563,7%	20,77	17,90	151,9	28,7	95,2%	61,8%	58,8%
373,00	0,17	0,20	2,67	589,6%	20,78	18,00	151,5	28,7	95,8%	61,0%	58,4%
374,00	0,17	0,21	2,63	596,4%	20,78	18,04	151,3	28,7	95,4%	60,7%	57,9%
375,00	0,17	0,22	2,60	601,6%	20,78	18,06	151,1	28,6	95,2%	60,4%	57,5%
376,00	0,13	0,22	2,59	604,7%	20,78	18,08	150,8	28,6	95,1%	60,3%	57,3%
377,00	0,13	0,23	2,58	605,8%	20,78	18,09	150,1	28,6	94,9%	60,4%	57,3%
378,00	0,08	0,23	2,57	605,3%	20,78	18,09	149,9	28,6	94,7%	60,4%	57,2%
379,00	0,08	0,24	2,56	607,9%	20,78	18,10	149,6	28,6	94,5%	60,3%	57,0%
380,00	0,04	0,24	2,56	605,8%	20,78	18,09	149,1	28,7	94,5%	60,5%	57,2%
381,00	0,04	0,24	2,55	608,1%	20,78	18,10	148,8	28,6	94,4%	60,5%	57,1%
382,00	0,04	0,24	2,56	606,6%	20,78	18,10	148,4	28,6	94,5%	60,6%	57,3%
383,00	0,04	0,24	2,58	603,8%	20,78	18,08	148,0	28,6	94,6%	60,9%	57,6%
384,00	0,04	0,24	2,61	594,6%	20,78	18,04	148,2	28,6	94,7%	61,2%	58,0%
385,00	0,00	0,24	2,63	589,7%	20,78	18,03	147,9	28,6	94,5%	61,4%	58,1%



DATA 2022-08-15 EPA PI 20275 RUN 3 CAT 3  
preburn

Temps  
acquisition  
minutes

Flue	Room	Tunnel	scale	Tunnel Velocity	Flue draft	duct	duct	
temp	temp	dry bulb		Pressure	Pressure	in	out	
°F	°F	°F	lbs	in. Wc	in. Wc	°F	°F	
1	73,22	72,08	74,45	12,85	0,0720	0,0024	73,31	73,51
2	74,50	72,14	74,49	12,66	0,0712	0,0048	73,02	73,52
3	89,98	72,10	75,74	12,56	0,0707	0,0068	72,99	73,55
4	90,91	72,21	75,77	12,56	0,0709	0,0075	73,27	73,74
5	93,83	72,02	76,15	12,56	0,0704	0,0091	73,34	74,08
6	95,06	72,08	76,17	12,46	0,0711	0,0084	72,78	74,41
7	108,22	72,06	77,97	12,46	0,0709	0,0155	72,92	74,73
8	129,23	72,08	80,73	12,25	0,0704	0,0219	73,06	75,27
9	188,59	72,15	90,09	11,92	0,0693	0,0365	73,17	76,63
10	259,76	72,17	102,06	11,45	0,0685	0,0501	73,12	79,95
11	333,50	72,32	115,08	10,75	0,0675	0,0594	73,09	85,78
12	410,95	72,40	129,79	10,05	0,0653	0,0687	73,02	94,84
13	479,26	72,51	144,78	9,25	0,0624	0,0743	72,96	107,31
14	534,98	72,46	159,12	8,45	0,0606	0,0811	72,65	122,74
15	572,32	72,48	173,63	16,53	0,0585	0,0828	73,03	112,13
16	556,07	72,45	177,46	29,88	0,0598	0,0898	72,74	113,64
17	508,02	72,33	149,26	22,13	0,0635	0,0722	72,49	113,95
18	470,29	72,49	134,56	21,84	0,0649	0,0744	72,86	113,41
19	493,81	72,44	142,65	21,43	0,0651	0,0759	72,21	112,83
20	492,93	72,36	143,42	21,14	0,0633	0,0783	72,69	112,48
21	497,04	72,28	145,01	20,63	0,0625	0,0675	72,60	112,34
22	502,50	72,30	146,41	20,24	0,0639	0,0831	72,76	112,80
23	519,06	72,46	150,92	19,64	0,0614	0,0870	72,91	114,10
24	565,63	72,57	162,20	18,94	0,0619	0,0863	72,81	117,80
25	594,21	72,58	169,79	18,05	0,0607	0,0825	72,68	122,75
26	616,68	72,78	176,55	17,15	0,0582	0,0867	72,84	128,35
27	634,71	72,88	180,89	16,36	0,0575	0,0881	72,72	133,67
28	649,22	72,99	183,84	15,44	0,0573	0,0918	73,65	139,10
29	660,85	73,15	186,10	14,64	0,0594	0,0949	73,20	143,84
30	668,17	73,42	187,26	13,85	0,0571	0,0916	73,32	148,16
31	676,02	73,51	187,68	13,05	0,0598	0,0914	73,46	152,19
32	682,70	73,46	188,24	12,35	0,0598	0,0935	73,81	155,30
33	689,01	73,46	188,38	11,75	0,0607	0,0918	73,86	158,41
34	693,15	73,33	189,00	11,06	0,0578	0,0923	73,14	161,37
35	699,17	73,45	188,77	10,46	0,0602	0,0899	73,34	163,92
36	704,31	73,63	188,41	9,86	0,0605	0,0954	72,83	166,28
37	706,89	73,70	187,24	9,37	0,0612	0,0910	73,10	168,56
38	697,33	73,98	184,10	8,87	0,0617	0,0891	73,76	169,15
39	685,01	74,17	180,59	8,57	0,0614	0,0904	73,22	169,27
40	674,76	73,98	177,90	8,16	0,0614	0,0918	74,02	168,19
41	677,47	74,03	183,09	9,27	0,0614	0,0945	73,92	167,36
42	728,17	74,32	220,26	48,84	0,0602	0,0936	73,23	165,93
43	700,61	74,38	202,38	47,96	0,0598	0,0949	73,33	166,47
44	702,25	74,11	201,45	47,27	0,0598	0,0928	73,68	168,38
45	706,54	74,13	201,00	46,57	0,0598	0,0911	73,49	170,14
46	710,04	74,32	200,11	45,77	0,0585	0,0914	73,45	172,26
47	715,93	74,44	199,65	45,10	0,0598	0,0938	73,73	173,82
48	720,95	74,39	199,83	44,48	0,0594	0,0961	73,54	175,32
49	724,47	74,36	199,91	43,88	0,0598	0,0928	73,29	176,44
50	728,07	74,48	200,04	43,19	0,0592	0,0938	73,85	178,19
51	729,65	74,49	199,79	42,58	0,0602	0,0954	73,43	179,39
52	732,51	74,59	200,56	41,99	0,0592	0,0946	73,61	180,73
53	736,08	74,81	200,69	41,39	0,0598	0,0952	73,73	182,35
54	739,68	75,08	201,04	40,75	0,0598	0,0928	74,75	183,74
55	741,71	74,97	201,14	40,09	0,0610	0,0958	73,92	184,55
56	743,69	75,01	201,77	39,49	0,0609	0,0950	73,93	185,43
57	744,45	75,17	201,68	38,90	0,0592	0,0940	74,39	186,23
58	745,42	75,24	201,55	38,39	0,0605	0,0915	74,58	187,12
59	745,46	75,34	201,72	37,79	0,0612	0,0948	74,32	187,28
60	744,61	75,36	201,70	37,20	0,0610	0,0947	74,38	187,98
61	744,84	75,33	201,26	36,60	0,0602	0,0954	74,40	188,32
62	744,95	75,14	200,90	36,01	0,0607	0,0916	73,73	187,84
63	743,51	75,17	200,39	35,60	0,0610	0,0960	74,47	188,29
64	741,92	75,38	199,51	34,90	0,0594	0,0938	75,13	188,76
65	740,15	75,45	198,97	34,41	0,0605	0,0922	74,33	188,79

## preburn

66	734,68	75,31	197,77	33,91	0,0621	0,0945	74,20	188,44
67	731,18	75,40	197,13	33,40	0,0610	0,0918	74,57	188,32
68	727,38	75,39	195,91	32,92	0,0624	0,0917	75,32	188,51
69	725,17	75,67	195,57	32,41	0,0626	0,0980	74,74	188,23
70	722,54	75,86	194,58	31,92	0,0598	0,0894	74,82	187,83
71	720,95	75,91	193,99	31,42	0,0610	0,0921	74,79	187,74
72	719,37	75,86	193,72	31,01	0,0617	0,0968	74,67	187,15
73	717,34	75,76	192,77	30,43	0,0610	0,0952	74,81	187,27
74	714,28	75,87	191,97	30,02	0,0612	0,0910	74,77	186,69
75	712,20	75,62	190,66	29,50	0,0621	0,0946	73,99	186,37
76	710,52	75,41	190,49	29,01	0,0632	0,0866	75,07	186,31
77	706,52	75,45	189,50	28,61	0,0629	0,0947	74,83	185,62
78	703,75	75,46	188,32	28,13	0,0639	0,0960	74,52	185,60
79	702,05	75,71	188,65	27,72	0,0637	0,0857	75,06	185,61
80	701,69	75,97	187,93	27,23	0,0619	0,0927	75,07	185,26
81	698,52	75,99	186,98	26,82	0,0626	0,0892	75,51	184,96
82	696,58	75,73	186,43	26,43	0,0646	0,0918	74,76	184,45
83	694,55	75,78	186,22	25,93	0,0624	0,0952	74,51	184,19
84	692,48	75,62	185,96	25,51	0,0619	0,0884	74,55	183,86
85	691,55	75,52	185,06	25,12	0,0626	0,0901	74,84	183,25
86	688,82	75,45	184,58	24,72	0,0631	0,0906	74,66	183,12
87	686,55	75,69	184,11	24,33	0,0649	0,0884	75,35	183,20
88	684,19	75,95	183,21	23,83	0,0624	0,0881	75,38	182,99
89	681,70	76,08	182,36	23,54	0,0629	0,0920	75,29	182,55
90	679,76	76,37	181,86	23,03	0,0642	0,0888	76,16	182,53
91	676,42	76,39	181,49	22,73	0,0642	0,0906	75,34	182,36
92	675,60	76,53	180,60	22,23	0,0649	0,0908	75,57	181,89
93	673,33	76,55	180,55	21,94	0,0634	0,0888	75,80	181,53
94	672,22	76,44	179,74	21,63	0,0634	0,0890	75,73	181,38
95	670,37	76,52	179,03	21,24	0,0629	0,0877	75,64	180,91
96	668,09	76,27	178,23	20,83	0,0644	0,0954	75,17	180,46
97	666,79	76,14	178,00	20,54	0,0643	0,0871	76,00	180,37
98	666,75	76,37	177,95	20,13	0,0649	0,0941	76,58	180,91
99	664,67	76,63	177,06	19,74	0,0649	0,0840	76,02	180,89
100	663,51	76,71	176,85	19,45	0,0631	0,0903	77,01	180,51
101	660,21	76,86	175,79	19,13	0,0649	0,0914	76,52	180,47
102	657,17	76,87	174,89	18,84	0,0626	0,0906	76,52	179,84
103	654,28	76,85	174,23	18,53	0,0631	0,0870	76,10	179,37
104	652,93	76,77	173,88	18,24	0,0644	0,0949	75,98	178,31
105	650,42	76,75	172,65	17,95	0,0639	0,0870	75,73	178,00
106	648,17	76,81	172,22	17,64	0,0642	0,0859	75,83	177,38
107	644,24	76,75	171,19	17,44	0,0644	0,0839	76,00	177,06
108	639,64	76,93	170,60	17,15	0,0642	0,0863	76,69	176,02
109	634,94	76,97	168,62	16,94	0,0661	0,0826	76,57	175,18
110	631,33	77,03	168,21	16,75	0,0653	0,0855	76,07	174,64
111	627,65	77,04	167,13	16,55	0,0652	0,0861	76,80	173,43
112	621,27	77,10	166,30	16,36	0,0649	0,0825	76,44	172,01
113	614,82	77,14	165,26	16,05	0,0644	0,0866	76,92	171,17
114	607,30	77,24	163,76	15,94	0,0634	0,0864	76,51	169,45
115	599,58	77,23	162,00	15,75	0,0661	0,0870	76,30	167,34
116	591,77	77,03	161,12	15,65	0,0656	0,0830	76,38	165,45
117	583,87	77,06	160,06	15,44	0,0658	0,0756	76,62	163,82
118	574,28	77,05	158,27	15,34	0,0653	0,0781	77,33	162,14
119	566,30	77,10	156,87	15,15	0,0673	0,0808	76,97	160,03
120	558,03	77,11	155,82	15,05	0,0649	0,0803	76,72	158,02
121	550,68	77,05	154,39	14,95	0,0670	0,0799	76,31	156,30
122	543,60	77,04	153,47	14,86	0,0673	0,0784	76,22	154,52
123	536,58	76,91	152,13	14,64	0,0658	0,0777	76,19	152,74
124	530,37	76,87	150,82	14,54	0,0670	0,0778	76,15	151,01
125	523,96	76,71	149,82	14,45	0,0673	0,0737	76,37	149,50
126	518,31	76,66	148,87	14,35	0,0656	0,0780	76,65	148,26
127	514,41	76,66	148,65	14,26	0,0656	0,0744	75,94	146,57
128	508,89	76,52	147,92	14,16	0,0673	0,0733	76,57	145,82
129	505,61	76,58	147,25	14,06	0,0665	0,0737	76,22	144,61
130	501,53	76,68	146,56	13,94	0,0676	0,0759	76,78	143,88
131	497,06	76,90	145,98	13,84	0,0675	0,0711	77,50	143,53
132	492,99	77,02	145,04	13,65	0,0658	0,0720	77,77	142,61
133	487,91	77,11	144,29	13,55	0,0673	0,0713	76,85	141,73

## preburn

134	484,20	76,95	143,72	13,45	0,0658	0,0742	76,52	140,46
135	480,56	76,91	143,16	13,45	0,0658	0,0706	76,39	139,67
136	476,96	76,88	142,55	13,26	0,0676	0,0682	76,81	138,82
137	474,31	76,91	142,25	13,14	0,0681	0,0671	76,77	138,29
138	472,12	76,85	141,60	13,14	0,0676	0,0703	76,63	137,56
139	469,89	76,69	141,07	13,05	0,0661	0,0715	76,78	136,97
140	468,01	76,63	140,45	12,95	0,0658	0,0730	76,11	136,47
141	465,86	76,69	140,50	12,85	0,0675	0,0696	76,61	136,10
142	463,91	76,81	140,14	12,75	0,0665	0,0691	76,75	135,87
143	462,26	76,89	139,85	12,56	0,0676	0,0647	77,39	135,60
144	460,65	76,98	139,42	12,46	0,0680	0,0694	77,03	135,37
145	458,49	77,08	139,33	12,35	0,0681	0,0696	77,34	135,09
146	457,28	77,11	139,00	12,25	0,0681	0,0691	77,52	134,71
147	455,25	77,22	138,64	12,15	0,0670	0,0698	77,99	134,49
148	453,53	77,25	138,29	12,15	0,0670	0,0699	76,92	134,24
149	451,70	77,23	138,26	12,06	0,0661	0,0662	77,24	133,96
150	450,86	77,31	138,09	11,86	0,0678	0,0651	77,65	133,83
151	449,10	77,34	137,85	11,86	0,0665	0,0685	77,65	133,63
152	446,77	77,43	137,57	11,76	0,0689	0,0660	77,40	133,26
153	444,66	77,46	137,07	11,66	0,0685	0,0698	77,71	133,12
154	442,54	77,55	136,73	11,55	0,0675	0,0691	77,48	132,75
155	440,03	77,48	136,08	11,45	0,0695	0,0665	77,40	132,41
156	437,34	77,49	135,94	11,35	0,0685	0,0671	77,52	131,96
157	435,06	77,53	135,61	11,28	0,0678	0,0662	77,64	131,80
158	432,26	77,51	135,14	11,16	0,0685	0,0663	78,07	131,41
159	429,96	77,60	134,29	11,16	0,0688	0,0657	77,79	130,95
160	427,28	77,67	133,97	11,06	0,0681	0,0671	77,48	130,50
161	424,59	77,02	138,64	10,96	0,0689	0,0651	77,24	130,05
162	421,91	77,11	138,29	10,87	0,0689	0,0685	77,65	129,61
163	419,22	76,95	138,26	10,77	0,0685	0,0660	77,65	129,16
164	416,53	76,91	138,09	10,67	0,0675	0,0698	77,40	128,72
165	413,85	76,88	137,85	10,57	0,0695	0,0691	77,71	128,27
166	411,16	76,91	137,57	10,48	0,0685	0,0665	77,48	127,83
167	408,48	76,85	137,07	10,27	0,0678	0,0671	77,40	127,38
168	405,79	76,69	136,73	10,27	0,0685	0,0662	77,52	126,94
169	403,10	76,63	136,08	10,27	0,0688	0,0663	77,64	126,49
170	409,12	76,69	131,19	10,27	0,0672	0,0613	77,91	127,89
171	406,93	76,81	130,92	10,26	0,0693	0,0625	78,31	127,51
172	403,26	76,89	130,21	10,26	0,0683	0,0638	78,12	127,28
173	400,72	76,98	129,64	10,17	0,0688	0,0638	78,82	126,91
174	397,16	77,84	129,24	10,17	0,0695	0,0623	78,21	126,50
175	394,14	77,83	128,60	10,05	0,0690	0,0618	78,48	126,40
176	391,78	77,84	128,13	10,05	0,0676	0,0620	78,53	125,92
177	388,86	77,88	128,15	9,95	0,0676	0,0603	78,13	125,27
178	384,85	77,89	127,70	9,95	0,0697	0,0608	79,24	125,00
179	382,47	77,96	127,24	9,86	0,0688	0,0594	78,99	124,59
180	379,70	78,04	126,91	9,85	0,0678	0,0603	78,50	124,13
181	377,34	78,09	126,71	9,76	0,0673	0,0601	78,92	123,69
182	374,60	78,12	126,32	9,76	0,0683	0,0591	78,97	123,17
183	372,11	78,23	125,96	9,66	0,0690	0,0591	79,25	123,06
184	369,15	78,19	125,63	9,66	0,0707	0,0583	79,03	122,51
185	367,02	78,24	125,36	9,56	0,0704	0,0591	78,79	122,23
186	365,26	78,26	125,10	9,56	0,0687	0,0596	79,01	121,96
187	363,38	78,33	124,89	9,47	0,0690	0,0601	78,70	121,41
188	360,84	78,38	124,80	9,47	0,0683	0,0581	79,07	121,23
189	359,43	78,31	123,94	9,37	0,0697	0,0580	78,42	120,83
190	357,47	78,24	123,91	9,25	0,0681	0,0569	78,91	120,47
191	355,09	78,33	123,66	9,25	0,0673	0,0581	79,12	120,35
192	354,11	78,34	123,43	9,15	0,0690	0,0562	78,87	120,03
193	352,68	78,22	123,18	9,16	0,0695	0,0582	78,55	119,70
194	351,31	78,35	122,87	9,06	0,0695	0,0557	78,43	119,40
195	349,66	78,21	122,28	8,96	0,0693	0,0554	78,36	119,17
196	348,55	78,06	122,27	9,06	0,0693	0,0574	77,86	118,66

Date: 2022-08-15 Manufacturer: US STOVE Model: HB1520  
 Project #: PT 20275 Run: 3 Tech: MM Reviewer: DP

- Kindling 12.8 LBS START FIRE
- Door open, Fan ON with restriction and Front Damper open
- At 8.7 LBS insert 14.5 LBS kindling
- At 22 LBS close DOOR Front damper and Remove restriction on the Fan
- At 8.00 LBS insert preload
- close DOOR immediately AFTER
- At 9.00 LBS insert load
- close DOOR immediately
- At 10 min 35000 btu close air inlet (FAN)
- At 8.8 LBS 35000 btu open Fan

TEST LOAD CONFIGURATION

8.14

	8.57	8.90	8.12
7	8.56	8.92	8.21
	8.30	8.8	8.30

Date: 2022-08-15 Manufacturer: \_\_\_\_\_ Model: AB 1520  
 Project #: PI 20275 Run: 3 Tech: MM Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-334	7:00	OK	OK

Pre-Test

Post-Test

**Facility Conditions:**

Air Velocity from less than 2 feet .....  
 Smoke Capture Check (tunnel velocity).....  
 Picture.....

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

**Wood Heater Conditions:**

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

2022-08-09
2022-08-09
OK
OK

**Temperature System:**

Ambient (65°-90°F).....

OK	°F
----	----

**Proportional Checks:**

Thermocouple check.....  
 Pitot Clean.....  
 Pitot verification.....  
 Pictures for report.....

OK	
OK	
OK	
Side	OK
Coal bed	OK
Load	OK
Load in stove	OK
Fuel adjustment	OK
Load Length approximately 5/6 of firebox Length.....	OK



Date: 2022-08-15 Manufacturer: US Slove Model: HB1520  
 Project #: PL 2025 Run: 3 Tech: MR Reviewer: [Signature]
**Leakage Checks Tunnel Samplers**

Unplugged Flow Rate = .25cfm	System 1 <sup>st</sup> hour		System 1		System 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)
Vacuum (inches Hg.)	-10	-10	-10	-10	-10	-10
Final 1 minute DGM (Liter)	G15G1215	G17772944	G15G1228	G17772954	42373458	42582258
Initial 1 minute DGM (Liter)	G15G1215	G17772944	<del>42373458</del> G15G1224	G17772954	42373458	42582258
Change (Liter)	∅	0.02	0.04	∅	∅	∅
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	0.20	0.20	0.20	0.20	0.20	0.20
Check OK	OK	OK	OK	OK	OK	OK

### PRE-TEST SCALE AUDIT

Date: 2022-08-15 Manufacturer: US 5 to UE Model: AB 1520  
 Project #: PI 2075 Run: 3 Tech: MM Reviewer: DP

#### Leakage Checks Flue Gas Sampler

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

#### Leakage Checks Pitot

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

#### Scales checks

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Platform	EM-205	10.00 kg mm lbs, Class F	10.00 lbs kg mm
Wood	EM-090	440 lbs, Class F	440 lbs
Analytical	EM-335	100 mg, Class S	100 mg
Analytical	EM-129	200 g, Class S	200 g

#### LIMITS OF WEIGHT RANGES

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

Date: 2022-08-15 Manufacturer: US Stove Model: HB1520  
 Project #: PT 20275 Run: 3 Tech: MM Reviewer: SP

FOR TUNNELS &lt; 12 in

 Barometric pressure ( $P_{bar}$ ) 1012 (KPa.) Static pressure ( $P_q$ ) 0.24 (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	0069	74.39
B - Centroid	3.00	3.50	4	0068	74.40
A-1	0.40	0.50	0.50	0055	74.39
A-2	1.50	1.75	2	0069	74.38
A-3	4.50	5.25	6	0057	74.38
A-4	5.60	6.5	7.5	0055	74.34
B-1	0.40	0.50	0.50	0055	74.40
B-2	1.50	1.75	2	0080	74.23
B-3	4.50	5.25	6	0061	74.23
B-4	5.60	6.5	7.5	0056	74.46
				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: 2022-08-15      Manufacturer: VS STOVE      Model: 4B1520  
 Project #: PI 20275      Run: 3      Tech: MM      Reviewer: [Signature]

### Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
	Actual	Should Be	Actual	Should Be	Actual	Should Be
CO	0	0	3020	3000	1014	1000
Tolerance CO	0	+/- 0.02	0.020	+/- 0.15	0.014	+/- 0.05
CO <sub>2</sub>	0	0	1799	1800	980	1000
Tolerance CO <sub>2</sub>	0	+/- 0.02	0.01	+/- 0.5	0.20	+/- 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	3015	1008	0	0.02	0.005	0.15	0.006	0.05	✓	
CO <sub>2</sub>	0	1798	984	0	0.02	0.01	0.5	0.04	0.5	✓	

Date: 2022-08-15 Manufacturer: US STOVE Model: 4B1520  
 Project #: PT 20275 Run: 3 Tech: MM Reviewer: [Signature]

**RAW DRY GAS METER READINGS**

	System 1	System 2	Blank
Final (Liter)	677 728 93	425 821 48 <del>425</del> mm	399 472 89
Initial (Liter)	675612 60	423 734 14	397 847 49

**AMBIENT CONDITIONS**

	Before	After
Barometer (kPa):	101.2	101.3
Dry Bulb (F):	76.2	78.4
Humidity (%):	55.6	52.1

**Flow Meter**

	Start	End
Flow meter reading	N.A	N.A

**Flow Meter Verification**

	Before	After
Flow meter Check (liters)	N.A	N.A
Scale Weight ( Kg)	N.A	N.A

## FUEL DATA

Date: 2022-08-15 Manufacturer: US STOVE Model: HB 1520  
 Project #: PL 20275 Run: 3 Tech: MM Reviewer: DP

### FUEL DESCRIPTION:

Type of wood:

### PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*		
400 x 400 x 20 in.	628 lbs.	20'	20 <sup>4</sup>	193
500 x 450 x 20 in.	674 lbs.	21'	19 <sup>3</sup>	192
500 x 475 x 20 in.	750 lbs.	23 <sup>5</sup>	20 <sup>4</sup>	199
450 x 400 x 20 in.	716 lbs.	19 <sup>9</sup>	20'	20'
500 x 450 x 20 in.	740 lbs.	193	194	194
400 x 400 x 20 in.	644 lbs.	191	192	192
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.			
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.			
x x in.	lbs.			
x x in.	lbs.			
x x in.	lbs.			
x x in.	lbs.			

TEST LOAD WEIGHT: 4150 lbs



**FUEL DATA**

Date: 2022-08-15      Manufacturer: US stove      Model: HB 1520  
Project #: PI 20275      Run: 3      Tech: MM      Reviewer: JP

**FUEL DESCRIPTION:**

Type of wood :

**TEST LOAD**

Piece Size	Weight	Meter Moisture Content (% dry)*					
450 X 400 X 20 in.	498 lbs.	246		198		193	
400 X 400 X 20 in.	484 lbs.	255		191		194	
400 X 400 X 20 in.	514 lbs.	251		198		191	
450 X 475 X 20 in.	858 lbs.	237		240		221	
500 X 450 X 20 in.	808 lbs.	221		191		203	
500 X 500 X 20 in.	956 lbs.	196		193		192	
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.						
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.						
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.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						

**TEST LOAD WEIGHT:** 4178 lbs      Min ~~20~~ <sup>100</sup>%: 418      Max 25%: 1045



# DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-08-11 Manufacturer: US S 40 VE Model: 1131520

Project #: PT 20275 Run: 3 Tech: M/M Reviewer: DP

		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1				
Pre-test Weight Record	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanc	
		007	614	615	01	13	633	634	18	637	
2022-08-11	17:00	614739	01839		345036	951455	01821		332939	00906	
2022-08-15	9:00	614739	01839		345037	951456	01821		332940	00907	

		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1				
Post-test Weight Record	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanc	
		007	614	615	01	13	633	634	18	637	
2022-08-15	19:00	614741	01898		345054	951494	01863		332952	00909	
2022-08-22	9:00	614741	01881		345038	951457	01852		332940	00908	
2022-08-24	9:00	614740	01880		345038	951457	01851		332940	00908	



**DILUTION TUNNEL PARTICULATE SAMPLER DATA**

Date: 2022-08-15 Project #: PT 20275 Run: 3 Manufacturer: US 5606 Model: HB/S20  
 Tech: WJM Reviewer: [Signature]

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	34	635	636	637
2022-08-11	17:00	1101038	01799		34 2877
2022-08-15	9:00	1101038	01799		34 2876

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	34	635	636	637
2022-08-15	19:00	1101052	01881		34 2882
2022-08-22	9:00	1101050	01867		34 2879
2022-08-24	9:00	1101039	01867		34 2878



## Paramètres

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

Code verrouillage: USS

### Description du test

Test standard	B415
Run #	4
Date	17-08-2022
Technicien	M.M
Project #	PI 20275

### Description de l'unité

Manufacturier	US STOVE	
Modèle	HB1520	
Combustion system	Non-Cat	
Appliance type	FURNACE	
Firebox volume	3,95	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

### Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	53 000	BTU/h Donnée fournie par le manufacturier
Targeted category	2	
Targeted output	23000	BTU/h
Cp steel	0,1	BTU/lb-°F

### Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	1,003	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	1,014	Dimensionless
Equipment number (DGM #2):	EM 318	
Calibration Factor (DGM #3):	0,997	Dimensionless
Equipment number (DGM #3):	EM 179	

### Tunnel

Targeted tunnel flow rate	350	scfm
Tunnel diameter	8	in.
Molecular weight	29	May be assumed to be 29 (EPA) 28,78 (HYDRONIC VUL)
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

### Fournaise

Fp	3,2999990	
V m/sec No fan	0,800	
Outlet section		
H	7,000	in
W	8,250	in
Section	0,4010	sqft
Surface duct	0,03725799	m2

Project nu.	PI 20275
Date	17-08-2022
Technicien	M.M

### Fuel data

Fuel type	Cord	
Fuel specie	Oak	
HHV	19887,0	kJ/kg
%C	50,0	
%H	6,6	
%O	42,9	
%Ash	0,5	
HHV	8552,3	Btu/lb
LHV	7480,0	Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480













Key in data

	Start	End
Barometer (kPa):	101,4	100,8
Barometer (in.Hg):	29,943409	29,766229
Dry Bulb (F):	74,9	82,3
Humidity (%):	55,4	52,6
Air velocity (ft/min)	0	0

DGM #1	Final: 24048,705 cuft
	Initial: 23933,877 cuft
DGM #2	Final: 15151,303 cuft
	Initial: 15037,813 cuft
DGM room	Final: 14196,383 cuft
	Initial: 14107,252 cuft

Final:	680983,480	Liter
Initial:	677731,910	Liter
Final:	429037,120	Liter
Initial:	425823,440	Liter
Final:	401996,800	Liter
Initial:	399472,880	Liter

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

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

Pression statique (mmHg)	0,370
Pression statique (in.H2O)	0,200
consommation électrique (KWatt)	0,376

Duct velocity	8,720	8,830	8,230
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<b>Project nu.</b>	PI 20275
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**Preload data sheet**

Test Load Weight:

Lower	Ideal	Upper
35,55	39,50	43,45

\* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume:  cu. ft

Loading Density: 10,603 lbs./ft3

Number of Spaces:

Load Density (wet): 31,060 lbs./ft3

Spacer weight (lbs):

Dry Wood Density: 25,641716

Thick	Piece Size (in):			Weight lbs	Meter Moisture Content				Ave. MC x Weight	Volume Cubic Inches
	Wide	x	Length		Dry Uncorrected %					
5,25	4		20	6,78	19,6		19,1	19,2	130,854	420,00
3,75	4		20	7,02	19,4		19,3	19,6	136,422	300,00
5	4		20	7,44	24,3		21,1	19,3	160,456	400,00
4	5		20	5,76	27,4		20,3	19,4	128,832	400,00
4,5	4,5		20	7,5	27,4		19,6	24,3	178,25	405,00
4,5	4,5		20	7,38	21,1		19,8	20,1	150,06	405,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
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										0,00
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										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
SUM MC:									884,874	

SUM MC: 884,874

PreTest Load Weight:  lbs.

Dry Weight:  kg.

Dry:  Average Moisture Content: %  Must be 18-28 Wet:  must be 15,2-22

Project nu. PI 20275  
 Date 17-08-2022  
 Technicien



## Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,23 in. H2O  
 Barometer: 29,943 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!	0,0000

PITOT CONSTANT=  
0,9335

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

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,071	82,6	0,2665
B center	0,070	82,5	0,2646
A1	0,057	82,6	0,2387
A2	0,068	82,8	0,2608
A3	0,060	82,6	0,2449
A4	0,058	82,6	0,2408
B1	0,057	82,6	0,2387
B2	0,078	82,5	0,2793
B3	0,059	82,5	0,2429
B4	0,056	82,5	0,2366
AVERAGE	0,061625	82,6	0,2479

<b>Project nu.</b>	PI 20275
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## Filter set weight

identification	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		
1	638	639	15	16	640	641	29	21	642	643	30	644			
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,0941	0,1810		34,5855	108,7515	0,1798		34,2798	108,7372	0,1807		34,6902	0,0903	2022-08-16	17:00
Before (6)	61,0942	0,1810		34,5854	108,7516	0,1798		34,2799	108,7372	0,1807		34,6903	0,0902	2022-08-17	09:00
After (1)	61,0953	0,1876		34,5872	108,7524	0,1825		34,2822	108,7386	0,1886		34,6917	0,0905	2022-08-17	21:00
After (2)	61,0944	0,1862		34,5856	108,7518	0,1818		34,2801	108,7374	0,1874		34,6905	0,0903	2022-08-23	09:00
After (3)	61,0944	0,1862		34,5855	108,7517	0,1818		34,2800	108,7373	0,1875		34,6905	0,0903	2022-08-24	09:00
After (4)															
After (5)															
After (6)	61,0943	0,1862		34,5855	108,7517	0,1818		34,2800	108,7373	0,1875		34,6905	0,0903	2022-08-24	09:00
Difference	0,0001	0,0052	0,0000	0,0001	0,0001	0,0020	0,0000	0,0001	0,0001	0,0068	0,0000	0,0002	0,0001		
Total (mg)		5,4				7,6				7,1			0,1		
Total ajusté (mg)		<b>5,30</b>				<b>7,50</b>				<b>7,00</b>					

<b>Project nu.</b>	PI 20275
<b>Date</b>	17-08-2022
<b>Technicien</b>	M.M

















Particulates Calculations

542,0	793,0	1,5	0,3	2,2	0,0	254,4	83,7	105,5	0,19	85,64	85,39	87,36	0,19	89,67	90,08	86,75	0,09	0,04
543,0	794,0	1,4	0,3	2,2	0,0	254,5	83,7	105,5	0,19	85,61	85,38	87,34	0,18	89,67	90,07	86,75	0,09	0,04
544,0	795,0	1,4	0,3	2,2	0,0	254,5	83,7	105,6	0,19	85,59	85,36	87,34	0,19	89,63	90,06	86,73	0,09	0,04
545,0	796,0	1,4	0,3	2,2	0,0	254,9	83,7	105,6	0,19	85,61	85,34	87,31	0,18	89,60	90,05	86,74	0,09	0,04
546,0	797,0	1,3	0,3	2,2	0,0	254,8	83,7	105,7	0,19	85,58	85,34	87,26	0,19	89,60	90,05	86,74	0,09	0,05
547,0	798,0	1,3	0,3	2,2	0,0	255,3	83,7	105,8	0,19	85,54	85,33	87,29	0,19	89,57	90,01	86,71	0,09	0,04
548,0	799,0	1,3	0,3	2,2	0,0	255,1	83,6	105,7	0,19	85,52	85,31	87,27	0,19	89,54	90,02	86,66	0,09	0,04
549,0	800,0	1,3	0,3	2,3	0,0	256,0	83,6	105,7	0,19	85,48	85,30	87,28	0,19	89,49	89,98	86,67	0,09	0,04
550,0	801,0	1,2	0,3	2,2	0,0	256,2	83,6	105,7	0,19	85,45	85,27	87,24	0,19	89,48	89,97	86,65	0,09	0,04
551,0	802,0	1,2	0,3	2,2	0,0	256,2	83,6	105,8	0,19	85,47	85,25	87,28	0,18	89,45	89,93	86,66	0,09	0,04
552,0	803,0	1,2	0,3	2,2	0,0	256,3	83,6	105,6	0,19	85,49	85,25	87,26	0,19	89,45	89,92	86,62	0,09	0,04
553,0	804,0	1,1	0,2	2,2	0,0	256,5	83,6	105,7	0,19	85,50	85,25	87,26	0,18	89,45	89,92	86,62	0,09	0,04
554,0	805,0	1,1	0,2	2,2	0,0	256,3	83,6	105,8	0,19	85,50	85,23	87,24	0,19	89,47	89,92	86,62	0,09	0,05
555,0	806,0	1,0	0,3	2,2	0,0	256,5	83,6	105,7	0,19	85,45	85,22	87,22	0,19	89,49	89,94	86,62	0,09	0,04
556,0	807,0	1,0	0,3	2,2	0,0	256,7	83,5	105,7	0,19	85,40	85,19	87,24	0,19	89,46	89,89	86,60	0,09	0,04
557,0	808,0	1,0	0,3	2,1	0,0	256,7	83,5	105,5	0,19	85,38	85,16	87,19	0,19	89,39	89,86	86,59	0,09	0,04
558,0	809,0	1,0	0,3	2,1	0,0	256,7	83,5	105,5	0,19	85,38	85,16	87,21	0,19	89,40	89,86	86,54	0,09	0,04
559,0	810,0	0,9	0,3	2,1	0,0	256,1	83,5	105,5	0,19	85,35	85,16	87,15	0,18	89,39	89,82	86,55	0,09	0,04
560,0	811,0	0,9	0,3	2,1	0,0	256,3	83,5	105,4	0,19	85,33	85,13	87,18	0,19	89,35	89,83	86,53	0,09	0,04
561,0	812,0	0,9	0,2	2,1	0,0	256,3	83,4	105,7	0,19	85,26	85,10	87,15	0,19	89,28	89,80	86,50	0,09	0,04
562,0	813,0	0,9	0,2	2,1	0,0	256,4	83,4	105,5	0,19	85,29	85,10	87,12	0,19	89,27	89,78	86,51	0,09	0,04
563,0	814,0	0,9	0,2	2,1	0,0	255,9	83,5	105,5	0,18	85,31	85,09	87,12	0,18	89,27	89,77	86,52	0,09	0,04
564,0	815,0	0,8	0,2	2,1	0,0	255,7	83,4	105,5	0,19	85,27	85,06	87,12	0,19	89,27	89,75	86,46	0,09	0,04
565,0	816,0	0,8	0,2	2,1	0,0	255,9	83,4	105,5	0,19	85,24	85,06	87,10	0,19	89,24	89,74	86,48	0,09	0,05
566,0	817,0	0,7	0,2	2,1	0,0	255,9	83,4	105,5	0,19	85,23	85,05	87,07	0,19	89,22	89,72	86,46	0,09	0,04
567,0	818,0	0,7	0,2	2,1	0,0	255,4	83,4	105,6	0,19	85,24	85,02	87,07	0,19	89,20	89,69	86,45	0,09	0,05
568,0	819,0	0,7	0,2	2,2	0,0	255,8	83,4	105,5	0,19	85,23	85,01	87,05	0,19	89,22	89,68	86,44	0,09	0,04
569,0	820,0	0,7	0,2	2,2	0,0	255,5	83,4	105,4	0,19	85,18	85,00	87,06	0,19	89,16	89,67	86,41	0,09	0,04
570,0	821,0	0,6	0,2	2,2	0,0	255,4	83,4	105,6	0,19	85,19	84,98	87,06	0,18	89,14	89,65	86,40	0,09	0,04
571,0	822,0	0,6	0,2	2,2	0,0	255,7	83,3	105,3	0,19	85,17	84,97	87,02	0,19	89,12	89,63	86,41	0,09	0,04
572,0	823,0	0,6	0,3	2,2	0,0	255,8	83,3	105,5	0,19	85,15	84,95	87,04	0,18	89,09	89,63	86,37	0,09	0,04
573,0	824,0	0,5	0,3	2,3	0,0	256,2	83,3	105,4	0,19	85,22	84,96	87,02	0,19	89,13	89,63	86,38	0,09	0,04
574,0	825,0	0,5	0,3	2,2	0,0	256,2	83,4	105,3	0,19	85,20	84,94	86,97	0,19	89,12	89,60	86,38	0,09	0,04
575,0	826,0	0,5	0,3	2,2	0,0	255,9	83,3	105,4	0,19	85,20	84,92	86,98	0,19	89,16	89,58	86,37	0,09	0,04
576,0	827,0	0,4	0,3	2,2	0,0	256,2	83,3	105,3	0,19	85,15	84,91	86,98	0,19	89,16	89,58	86,32	0,09	0,04
577,0	828,0	0,3	0,3	2,2	0,0	256,3	83,3	105,1	0,19	85,15	84,92	86,98	0,19	89,12	89,53	86,30	0,09	0,04
578,0	829,0	0,4	0,3	2,2	0,0	256,3	83,3	105,5	0,19	85,14	84,90	86,95	0,19	89,12	89,53	86,32	0,09	0,04
579,0	830,0	0,3	0,3	2,2	0,0	256,2	83,3	105,4	0,19	85,11	84,87	86,94	0,18	89,11	89,50	86,34	0,09	0,04
580,0	831,0	0,3	0,3	2,2	0,0	256,1	83,3	105,3	0,19	85,09	84,87	86,96	0,19	89,10	89,47	86,34	0,09	0,05
581,0	832,0	0,3	0,3	2,1	0,0	255,6	83,2	105,3	0,19	85,06	84,87	86,89	0,19	89,06	89,43	86,29	0,09	0,04
582,0	833,0	0,2	0,3	2,1	0,0	255,2	83,2	105,3	0,19	85,05	84,84	86,90	0,19	89,02	89,42	86,28	0,09	0,04
583,0	834,0	0,2	0,3	2,1	0,0	255,3	83,2	105,2	0,19	85,04	84,84	86,88	0,19	88,98	89,40	86,24	0,09	0,04
584,0	835,0	0,1	0,3	2,1	0,0	254,8	83,2	105,2	0,19	85,06	84,84	86,87	0,19	89,00	89,39	86,27	0,09	0,04
585,0	836,0	0,1	0,3	2,1	0,0	254,4	83,2	105,0	0,19	85,06	84,82	86,86	0,18	89,01	89,39	86,20	0,09	0,04
586,0	837,0	0,1	0,3	2,1	0,0	254,2	83,2	105,1	0,19	85,03	84,78	86,87	0,19	89,00	89,34	86,18	0,09	0,04
587,0	838,0	0,1	0,3	2,1	0,0	253,6	83,2	105,2	0,19	85,03	84,78	86,83	0,19	89,02	89,37	86,17	0,09	0,04
588,0	839,0	0,1	0,3	2,0	0,0	253,6	83,2	104,8	0,19	85,03	84,77	86,83	0,19	88,99	89,32	86,13	0,09	0,04
589,0	840,0	0,1	0,3	2,0	0,0	252,9	83,1	104,8	0,19	85,02	84,77	86,81	0,19	88,98	89,31	86,16	0,09	0,04
590,0	841,0	0,0	0,3	2,0	0,0	252,2	83,1	104,7	0,19	85,01	84,78	86,79	0,19	88,98	89,27	86,14	0,09	0,04

SFBA EPA EMISSION RESULTS

RESULTS

**Average emission rate:** 1,47 g/hr  
 Burn Rate : 1,629 Dry kg/hr

**Test Duration:** 590 min

PRESSURE FACTOR: DGM 1 0,97241  
 DGM 2 0,97374  
 DGM 3 0,99782

BAROMETRIC PRESSURE  
 Average: 29,855 in Hg  
 Start: 29,943 in Hg  
 End: 29,766 in Hg

TEMPERATURE FACTORS  
 DGM 1 0,96936  
 DGM 2 0,96474  
 DGM 3 0,97149

DRY GAS METER VALUES  
 DGM #1 Final: 24048,705 Cuft  
 Initial: 23933,877 Cuft

VOLUMES SAMPLED  
 DGM 1 108,51099 Scft  
 DGM 2 108,11338 Scft  
 DGM 3 86,10063 Scft

DGM #2 Final: 15151,303 Cuft  
 Initial: 15037,813 Cuft  
 DGM #3 Final: 14196,383 Cuft  
 Initial: 14107,252 Cuft

TOTAL TUNNEL VOLUME : 220156 Scft

SAMPLE RATIOS  
 Sample Train 1: 2028,879  
 Sample Train 2: 2036,340

TEMPERATURES  
 DGM #1 544,691 °R  
 DGM #2 547,299 °R

Paticulate concentration  
 Sample Train 1 **0,000069** g/dscf  
 Sample Train 2 **0,000065** g/dscf  
 Room **0,000001** g/dscf

CALIBRATION FACTORS  
 DGM #1 1,0025  
 DGM #2 1,0141  
 DGM #3 0,9965

TOTAL EMISSIONS  
 Sample Train 1 **14,96** g  
 Sample Train 2 **14,00** g

TUNNEL FLOW RATE: 373,145 Dscfm

EMISSION RATES  
 Sample Train 1 **1,52** g/hr  
 Sample Train 2 **1,42** g/hr

PARTICULATE CATCH  
 Total Sample Train 1: 7,50 mg  
 Total Sample Train 2: 7,00 mg  
 Total Sample Train 1 1st hour: 5,30 mg

1st hour emission rate **10,75** g/hr

DEVIATION: 3,32%

Cs Train 1 Train 2  
 6,912E-05 6,4747E-05

Manufacturer: US STOVE  
 Model: HB1520

Run: 4  
 Project #: PI 20275  
 Test Duration: 590 min

Overall Heating Efficiency: 71,61%  
 Combustion Efficiency: 91,63%  
 Heat Transfer Efficiency: 78,15%

	HHV	LHV
Eff	71,61%	77,13%
Comb Eff	91,63%	91,63%
HT Eff	78,15%	84,18%
Output	23 199	kJ/h
Burn Rate	1,63	kg/h
Grams CO	1 948	g
Input	32 395	kJ/h
MC wet	17,05	

Ultimate CO<sub>2</sub>  
 CO<sub>2-ult</sub> 19,80  
 F<sub>0</sub>  
 1,051

Heat Output:	22 007 Btu/h
Heat Input:	30 730 Btu/h
Burn Duration:	9,83 h
Burn Rate:	3,59 lb/h
Stack Temp:	221,9 Deg. F

Averages		0,77	5,90	3,07	20,56	14,27	105,53	28,61	90,3%	77,6%	#DIV/0!
INPUT DATA			Oxygen Calculation				Input Data		Combust	Heat	Net
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO <sub>2</sub> [d]	Excess Air EA	Total O <sub>2</sub>	Calc. % O <sub>2</sub> [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Eff %
0,00	19,31	0,47	0,93	1323,7%	20,86	19,70	126,2	25,3	75,8%	29,4%	22,3%
1,00	19,23	0,25	1,98	785,3%	20,81	18,70	140,5	25,4	92,7%	54,3%	50,4%
2,00	18,96	0,63	2,77	481,2%	20,74	17,65	149,7	25,4	85,7%	61,9%	53,1%
3,00	18,69	0,91	4,68	254,3%	20,62	15,48	181,4	25,4	87,0%	68,0%	59,2%
4,00	18,38	0,49	10,02	88,5%	20,34	10,07	229,8	25,5	96,3%	75,3%	72,5%
5,00	18,01	0,44	12,79	49,6%	20,18	7,17	272,2	25,5	97,3%	75,5%	73,4%
6,00	17,70	0,85	14,65	27,7%	20,05	4,97	268,8	25,6	95,4%	77,1%	73,5%
7,00	17,42	0,94	14,70	26,6%	20,04	4,87	265,3	25,6	94,9%	77,3%	73,4%
8,00	17,24	0,76	13,33	40,5%	20,13	6,42	210,6	25,6	95,5%	79,5%	75,9%
9,00	17,15	1,96	11,89	43,0%	20,14	7,27	192,2	25,6	88,2%	79,2%	69,8%
10,00	17,02	1,77	11,27	51,9%	20,19	8,04	182,4	25,6	88,6%	79,4%	70,4%
11,00	16,92	1,82	11,14	52,8%	20,20	8,15	176,0	25,6	88,2%	79,7%	70,3%
12,00	16,79	1,92	11,22	50,7%	20,19	8,01	171,3	25,6	87,8%	80,0%	70,2%
13,00	16,65	2,08	11,29	48,1%	20,17	7,85	168,0	25,6	87,0%	80,2%	69,8%
14,00	16,56	2,21	11,43	45,2%	20,16	7,62	165,6	25,6	86,4%	80,4%	69,5%
15,00	16,42	2,36	11,57	42,2%	20,14	7,39	163,6	25,6	85,8%	80,6%	69,1%
16,00	16,29	2,52	11,60	40,2%	20,13	7,27	161,8	25,6	85,1%	80,7%	68,6%
17,00	16,15	2,53	11,71	39,0%	20,12	7,14	160,8	25,7	85,1%	80,8%	68,8%
18,00	16,06	2,45	11,81	38,8%	20,12	7,08	159,4	25,7	85,6%	81,0%	69,3%
19,00	15,93	2,26	11,94	39,4%	20,12	7,05	158,0	25,7	86,7%	81,2%	70,4%
20,00	15,79	2,29	11,98	38,7%	20,12	7,00	157,1	25,7	86,5%	81,3%	70,3%
21,00	15,70	2,40	11,99	37,6%	20,11	6,92	156,5	25,7	86,0%	81,3%	69,9%
22,00	15,61	2,31	12,08	37,6%	20,11	6,88	155,9	25,7	86,5%	81,4%	70,4%
23,00	15,47	2,23	12,11	38,1%	20,12	6,89	155,6	25,7	86,9%	81,5%	70,8%
24,00	15,34	2,19	12,14	38,1%	20,12	6,88	155,1	25,7	87,2%	81,5%	71,1%
25,00	15,22	2,12	12,14	38,9%	20,12	6,92	154,4	25,7	87,5%	81,6%	71,4%
26,00	15,11	2,11	12,09	39,4%	20,12	6,98	154,0	25,7	87,5%	81,6%	71,4%
27,00	14,97	2,09	12,08	39,7%	20,13	7,00	153,5	25,7	87,6%	81,6%	71,5%
28,00	14,89	2,07	12,02	40,5%	20,13	7,07	153,1	25,6	87,7%	81,6%	71,6%
29,00	14,79	2,01	11,99	41,4%	20,14	7,14	152,7	25,7	88,0%	81,6%	71,8%
30,00	14,66	2,00	11,90	42,5%	20,14	7,25	152,3	25,7	87,9%	81,6%	71,8%
31,00	14,57	1,96	11,89	42,9%	20,14	7,27	152,2	25,7	88,1%	81,6%	72,0%
32,00	14,48	1,94	11,88	43,3%	20,15	7,30	151,8	25,7	88,2%	81,7%	72,0%
33,00	14,39	1,93	11,91	43,1%	20,14	7,27	151,5	25,8	88,3%	81,7%	72,2%
34,00	14,25	1,92	11,95	42,8%	20,14	7,24	151,4	25,8	88,4%	81,7%	72,2%
35,00	14,12	1,94	11,98	42,3%	20,14	7,19	151,2	25,8	88,3%	81,8%	72,2%
36,00	14,02	1,99	12,01	41,4%	20,14	7,13	151,1	25,8	88,1%	81,8%	72,0%
37,00	13,89	2,00	12,08	40,7%	20,13	7,05	151,1	25,8	88,1%	81,8%	72,0%
38,00	13,80	1,98	12,09	40,7%	20,13	7,05	150,9	25,8	88,2%	81,8%	72,2%
39,00	13,70	1,97	12,09	40,8%	20,13	7,05	150,7	26,8	88,3%	81,9%	72,3%

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40,00	13,57	1,92	12,13	41,0%	20,13	7,05	150,2	27,4	88,5%	82,0%	72,6%
41,00	13,48	1,89	12,11	41,4%	20,14	7,08	150,2	27,7	88,7%	82,0%	72,7%
42,00	13,39	1,84	12,13	41,8%	20,14	7,09	150,1	27,7	88,9%	82,0%	73,0%
43,00	13,26	1,83	12,14	41,7%	20,14	7,08	149,9	27,6	89,0%	82,1%	73,0%
44,00	13,16	1,84	12,13	41,7%	20,14	7,09	149,6	27,4	88,9%	82,1%	73,0%
45,00	13,08	1,85	12,16	41,4%	20,14	7,05	149,9	27,3	88,9%	82,1%	73,0%
46,00	12,94	1,80	12,16	41,8%	20,14	7,08	149,6	27,3	89,2%	82,1%	73,2%
47,00	12,85	1,76	12,16	42,3%	20,14	7,10	149,6	27,5	89,4%	82,1%	73,4%
48,00	12,76	1,72	12,16	42,6%	20,14	7,12	149,4	27,6	89,6%	82,1%	73,6%
49,00	12,62	1,65	12,16	43,4%	20,15	7,16	149,0	27,5	90,0%	82,2%	73,9%
50,00	12,53	1,63	12,14	43,7%	20,15	7,19	148,7	27,6	90,1%	82,2%	74,0%
51,00	12,44	1,60	12,14	44,1%	20,15	7,21	148,6	27,4	90,2%	82,2%	74,2%
52,00	12,35	1,56	12,14	44,5%	20,15	7,23	148,3	27,7	90,4%	82,3%	74,4%
53,00	12,25	1,54	12,11	45,1%	20,16	7,28	147,9	27,7	90,6%	82,3%	74,5%
54,00	12,13	1,51	12,09	45,5%	20,16	7,31	147,6	27,6	90,7%	82,3%	74,6%
55,00	12,04	1,45	12,09	46,2%	20,16	7,34	147,2	27,5	91,0%	82,3%	75,0%
56,00	11,94	1,44	12,08	46,5%	20,16	7,36	146,9	27,3	91,1%	82,3%	75,0%
57,00	11,85	1,44	12,05	46,8%	20,17	7,40	146,3	27,3	91,0%	82,4%	75,0%
58,00	11,76	1,42	12,05	47,0%	20,17	7,41	146,1	27,3	91,1%	82,4%	75,1%
59,00	11,67	1,41	12,03	47,4%	20,17	7,44	145,7	27,4	91,2%	82,4%	75,2%
60,00	11,58	1,39	12,03	47,6%	20,17	7,45	145,4	27,4	91,3%	82,4%	75,3%
61,00	11,49	1,39	12,06	47,2%	20,17	7,41	145,3	27,4	91,3%	82,5%	75,3%
62,00	11,40	1,38	12,06	47,3%	20,17	7,42	145,1	27,5	91,4%	82,5%	75,4%
63,00	11,31	1,38	12,04	47,5%	20,17	7,43	144,8	27,7	91,4%	82,5%	75,4%
64,00	11,22	1,34	12,08	47,6%	20,17	7,42	144,9	27,5	91,6%	82,5%	75,6%
65,00	11,13	1,35	12,06	47,7%	20,17	7,44	144,4	27,5	91,6%	82,5%	75,6%
66,00	11,04	1,36	12,06	47,6%	20,17	7,43	144,2	27,4	91,5%	82,5%	75,5%
67,00	10,95	1,35	12,06	47,6%	20,17	7,43	144,0	27,4	91,6%	82,5%	75,6%
68,00	10,85	1,34	12,13	47,1%	20,17	7,37	143,9	27,4	91,7%	82,6%	75,7%
69,00	10,77	1,31	12,09	47,7%	20,17	7,42	143,3	27,7	91,8%	82,6%	75,9%
70,00	10,68	1,30	12,08	48,1%	20,17	7,45	142,9	27,9	91,9%	82,7%	76,0%
71,00	10,59	1,29	12,04	48,5%	20,17	7,48	142,9	27,5	91,9%	82,6%	75,9%
72,00	10,49	1,29	12,09	48,0%	20,17	7,43	142,6	27,5	91,9%	82,7%	76,0%
73,00	10,40	1,29	12,08	48,1%	20,17	7,45	142,3	27,4	91,9%	82,7%	76,0%
74,00	10,31	1,28	12,09	48,1%	20,17	7,44	142,2	27,7	92,0%	82,7%	76,1%
75,00	10,23	1,34	12,10	47,4%	20,17	7,40	142,1	27,5	91,7%	82,7%	75,8%
76,00	10,14	1,40	12,05	47,3%	20,17	7,42	142,0	27,5	91,3%	82,6%	75,4%
77,00	10,04	1,32	12,08	47,7%	20,17	7,43	141,5	27,6	91,7%	82,7%	75,9%
78,00	10,00	1,21	12,05	49,4%	20,18	7,53	140,7	27,6	92,4%	82,8%	76,5%
79,00	9,91	1,12	11,95	51,5%	20,19	7,68	140,3	27,6	92,8%	82,8%	76,9%
80,00	9,81	0,99	11,91	53,5%	20,20	7,79	139,7	27,5	93,6%	82,9%	77,6%
81,00	9,77	0,94	11,85	54,8%	20,21	7,89	139,1	27,6	93,9%	82,9%	77,8%
82,00	9,63	0,84	11,78	56,9%	20,22	8,02	138,4	27,5	94,5%	83,0%	78,4%
83,00	9,59	0,78	11,75	58,0%	20,22	8,08	137,7	27,6	94,8%	83,0%	78,7%
84,00	9,49	0,74	11,58	60,6%	20,23	8,28	137,2	27,7	95,0%	83,0%	78,8%
85,00	9,45	0,70	11,50	62,3%	20,24	8,39	136,5	27,7	95,3%	83,0%	79,1%
86,00	9,40	0,68	11,37	64,3%	20,25	8,54	135,8	27,6	95,3%	83,0%	79,1%
87,00	9,32	0,68	11,37	64,4%	20,25	8,54	134,9	27,8	95,4%	83,0%	79,2%
88,00	9,23	0,69	11,29	65,3%	20,25	8,62	134,4	27,9	95,2%	83,0%	79,1%
89,00	9,18	0,65	11,22	66,8%	20,26	8,71	133,5	27,8	95,5%	83,1%	79,3%
90,00	9,09	0,70	11,10	67,7%	20,26	8,80	132,8	27,7	95,1%	83,0%	78,9%
91,00	9,04	0,67	11,04	69,1%	20,27	8,89	132,3	27,7	95,3%	83,0%	79,2%
92,00	8,96	0,61	11,02	70,2%	20,27	8,94	131,9	27,7	95,7%	83,1%	79,5%
93,00	8,91	0,56	10,97	71,7%	20,28	9,02	131,8	27,9	96,0%	83,1%	79,8%
94,00	8,87	0,50	10,95	72,8%	20,28	9,08	131,7	27,9	96,5%	83,1%	80,2%
95,00	8,82	0,47	10,92	73,8%	20,29	9,13	131,2	27,9	96,7%	83,1%	80,4%
96,00	8,73	0,44	10,87	75,0%	20,29	9,20	130,8	27,9	96,9%	83,1%	80,5%
97,00	8,68	0,44	10,90	74,5%	20,29	9,16	130,4	27,9	96,9%	83,2%	80,6%
98,00	8,64	0,43	10,90	74,7%	20,29	9,17	130,2	27,8	97,0%	83,2%	80,7%
99,00	8,59	0,42	10,92	74,6%	20,29	9,16	129,6	27,9	97,0%	83,3%	80,8%
100,00	8,51	0,43	10,94	74,1%	20,29	9,13	129,3	27,9	97,0%	83,3%	80,8%

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101,00	8,41	0,45	10,95	73,7%	20,29	9,11	128,9	28,1	96,9%	83,3%	80,7%
102,00	8,36	0,49	11,07	71,3%	20,28	8,96	128,8	28,1	96,6%	83,4%	80,6%
103,00	8,32	0,50	11,09	70,8%	20,27	8,94	128,5	28,4	96,5%	83,4%	80,5%
104,00	8,28	0,58	11,10	69,5%	20,27	8,88	128,0	28,4	96,0%	83,4%	80,1%
105,00	8,19	0,58	11,07	69,9%	20,27	8,91	127,7	28,4	95,9%	83,4%	80,0%
106,00	8,14	0,54	11,02	71,2%	20,28	8,98	127,5	28,3	96,2%	83,4%	80,3%
107,00	8,09	0,50	10,94	73,1%	20,28	9,10	127,2	28,1	96,5%	83,4%	80,5%
108,00	8,04	0,47	10,92	73,8%	20,29	9,13	127,1	28,4	96,7%	83,4%	80,7%
109,00	7,96	0,46	10,87	74,8%	20,29	9,19	126,8	28,6	96,8%	83,5%	80,8%
110,00	7,91	0,43	10,81	76,2%	20,29	9,27	126,5	28,6	96,9%	83,5%	80,9%
111,00	7,87	0,42	10,78	76,9%	20,30	9,31	126,4	28,1	97,0%	83,4%	81,0%
112,00	7,83	0,43	10,72	77,5%	20,30	9,36	126,2	28,5	96,9%	83,4%	80,8%
113,00	7,78	0,44	10,71	77,6%	20,30	9,37	125,8	28,6	96,8%	83,4%	80,8%
114,00	7,68	0,46	10,73	77,0%	20,30	9,34	126,2	28,6	96,7%	83,4%	80,6%
115,00	7,64	0,78	10,36	77,8%	20,30	9,55	126,0	28,5	94,3%	83,1%	78,3%
116,00	7,59	0,77	10,18	80,8%	20,31	9,74	125,4	28,6	94,2%	83,0%	78,2%
117,00	7,55	0,74	10,13	82,2%	20,32	9,82	124,8	28,5	94,4%	83,0%	78,4%
118,00	7,46	0,65	10,08	84,6%	20,32	9,92	124,2	28,5	95,1%	83,1%	79,0%
119,00	7,42	0,55	9,97	88,4%	20,34	10,10	123,6	28,5	95,8%	83,1%	79,7%
120,00	7,37	0,51	9,83	91,4%	20,35	10,26	123,1	28,7	96,0%	83,1%	79,8%
121,00	7,32	0,54	9,82	91,2%	20,34	10,26	122,7	28,6	95,8%	83,1%	79,6%
122,00	7,28	0,58	9,87	89,5%	20,34	10,18	122,3	28,6	95,5%	83,1%	79,4%
123,00	7,23	0,61	9,83	89,6%	20,34	10,20	122,6	28,6	95,3%	83,1%	79,2%
124,00	7,19	0,83	9,98	83,2%	20,32	9,92	122,3	28,5	93,7%	83,1%	77,9%
125,00	7,15	0,80	9,97	84,0%	20,32	9,96	122,0	28,5	93,9%	83,1%	78,1%
126,00	7,06	0,79	10,12	81,6%	20,31	9,80	122,1	28,3	94,1%	83,2%	78,3%
127,00	7,06	0,73	10,18	81,5%	20,31	9,77	121,8	28,8	94,5%	83,3%	78,8%
128,00	6,96	0,56	10,16	84,6%	20,32	9,88	121,6	28,8	95,8%	83,4%	79,9%
129,00	6,92	0,51	10,16	85,4%	20,33	9,90	121,4	28,8	96,1%	83,4%	80,2%
130,00	6,87	0,48	10,21	85,2%	20,33	9,87	120,6	29,0	96,4%	83,5%	80,6%
131,00	6,83	0,51	10,12	86,3%	20,33	9,95	120,1	28,8	96,2%	83,5%	80,3%
132,00	6,78	0,53	9,92	89,6%	20,34	10,16	119,4	28,8	95,9%	83,4%	80,0%
133,00	6,74	0,48	9,72	94,2%	20,35	10,40	118,8	28,7	96,2%	83,4%	80,2%
134,00	6,69	0,44	9,49	99,4%	20,37	10,66	118,2	29,0	96,5%	83,3%	80,4%
135,00	6,64	0,48	9,37	101,1%	20,37	10,77	117,6	28,9	96,2%	83,3%	80,1%
136,00	6,60	0,53	9,26	102,3%	20,38	10,85	117,0	29,0	95,7%	83,2%	79,6%
137,00	6,56	0,55	9,22	102,7%	20,38	10,88	116,5	29,1	95,5%	83,2%	79,5%
138,00	6,51	0,48	9,36	101,3%	20,37	10,78	115,8	28,8	96,1%	83,4%	80,2%
139,00	6,47	0,39	9,19	106,8%	20,39	11,01	115,0	28,9	96,9%	83,4%	80,8%
140,00	6,42	0,31	9,02	112,1%	20,40	11,22	114,4	29,2	97,5%	83,4%	81,3%
141,00	6,38	0,25	8,86	117,3%	20,42	11,43	113,5	29,1	98,0%	83,4%	81,7%
142,00	6,32	0,18	8,78	120,9%	20,43	11,55	112,8	29,1	98,6%	83,4%	82,3%
143,00	6,32	0,15	8,72	123,4%	20,43	11,64	112,2	29,2	98,9%	83,4%	82,6%
144,00	6,28	0,14	8,69	124,5%	20,43	11,68	111,5	29,2	99,1%	83,5%	82,7%
145,00	6,26	0,13	8,64	125,8%	20,44	11,73	110,9	28,9	99,1%	83,5%	82,7%
146,00	6,24	0,13	8,58	127,5%	20,44	11,80	110,5	29,0	99,1%	83,5%	82,7%
147,00	6,15	0,14	8,72	123,6%	20,43	11,64	109,8	28,8	99,0%	83,6%	82,8%
148,00	6,15	0,15	8,68	124,1%	20,43	11,67	109,4	29,1	98,9%	83,6%	82,7%
149,00	6,11	0,14	8,62	126,0%	20,44	11,75	109,1	29,0	99,0%	83,6%	82,8%
150,00	6,06	0,14	8,64	125,6%	20,44	11,73	108,8	29,0	99,0%	83,7%	82,8%
151,00	6,02	0,14	8,65	125,2%	20,43	11,71	108,3	29,0	99,0%	83,7%	82,9%
152,00	6,02	0,15	8,68	124,3%	20,43	11,68	108,0	29,2	98,9%	83,8%	82,9%
153,00	5,96	0,15	8,67	124,6%	20,43	11,69	108,0	29,1	98,9%	83,7%	82,8%
154,00	5,92	0,14	8,67	124,8%	20,43	11,69	107,9	29,2	99,0%	83,8%	82,9%
155,00	5,87	0,14	8,72	123,7%	20,43	11,65	107,6	29,2	99,1%	83,8%	83,0%
156,00	5,83	0,14	8,70	124,1%	20,43	11,66	107,5	29,1	99,1%	83,8%	83,0%
157,00	5,79	0,13	8,71	124,1%	20,43	11,66	107,1	29,0	99,1%	83,8%	83,1%
158,00	5,79	0,15	8,60	126,2%	20,44	11,76	106,8	29,0	98,9%	83,8%	82,9%
159,00	5,74	0,18	8,65	124,3%	20,43	11,69	106,7	28,8	98,6%	83,8%	82,7%
160,00	5,70	0,25	8,58	124,4%	20,43	11,73	106,1	29,2	98,0%	83,8%	82,1%
161,00	5,65	0,31	8,37	128,3%	20,44	11,92	105,8	28,9	97,3%	83,6%	81,4%

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162,00	5,60	0,29	8,28	131,0%	20,45	12,02	105,5	29,1	97,5%	83,6%	81,5%
163,00	5,56	0,28	8,07	137,2%	20,46	12,25	105,2	28,9	97,6%	83,5%	81,4%
164,00	5,57	0,27	8,06	137,7%	20,46	12,27	104,9	29,0	97,6%	83,5%	81,5%
165,00	5,51	0,29	7,97	139,9%	20,47	12,36	104,4	29,1	97,5%	83,5%	81,4%
166,00	5,51	0,32	8,18	132,9%	20,45	12,11	104,1	29,1	97,2%	83,7%	81,3%
167,00	5,47	0,29	8,35	129,1%	20,44	11,95	104,0	29,2	97,5%	83,8%	81,7%
168,00	5,42	0,27	8,51	125,5%	20,44	11,79	103,9	29,0	97,8%	83,9%	82,0%
169,00	5,42	0,25	8,61	123,4%	20,43	11,69	103,8	29,2	97,9%	84,0%	82,3%
170,00	5,38	0,25	8,70	121,2%	20,43	11,60	103,7	29,1	97,9%	84,0%	82,3%
171,00	5,34	0,23	8,80	119,4%	20,42	11,51	103,9	29,2	98,2%	84,1%	82,6%
172,00	5,29	0,19	9,01	115,2%	20,41	11,30	104,0	29,2	98,5%	84,3%	83,0%
173,00	5,24	0,19	8,94	116,8%	20,42	11,38	103,7	28,9	98,5%	84,2%	83,0%
174,00	5,24	0,23	8,91	116,7%	20,42	11,39	103,3	29,0	98,2%	84,2%	82,7%
175,00	5,20	0,24	8,89	116,7%	20,41	11,40	102,7	28,7	98,1%	84,2%	82,6%
176,00	5,15	0,26	8,71	120,7%	20,42	11,58	102,0	28,8	97,9%	84,2%	82,4%
177,00	5,15	0,32	8,45	125,9%	20,44	11,83	100,8	28,9	97,3%	84,1%	81,8%
178,00	5,11	0,41	8,03	134,5%	20,45	12,21	99,8	28,8	96,2%	83,8%	80,7%
179,00	5,06	0,51	7,54	146,1%	20,48	12,68	98,7	28,8	95,0%	83,5%	79,4%
180,00	5,02	0,57	7,15	156,7%	20,50	13,07	97,6	28,9	94,2%	83,3%	78,4%
181,00	5,02	0,59	6,88	165,0%	20,51	13,33	96,6	29,1	93,7%	83,1%	77,9%
182,00	4,97	0,59	6,70	171,6%	20,52	13,53	95,6	28,7	93,6%	83,0%	77,7%
183,00	4,98	0,59	6,59	176,0%	20,53	13,65	94,6	29,0	93,5%	83,1%	77,7%
184,00	4,97	0,59	6,43	181,7%	20,54	13,81	93,7	29,1	93,3%	83,0%	77,5%
185,00	4,92	0,68	6,20	187,9%	20,54	14,01	93,1	29,1	92,1%	82,8%	76,2%
186,00	4,92	0,74	6,12	188,8%	20,55	14,06	92,3	29,1	91,4%	82,7%	75,6%
187,00	4,92	0,78	6,10	187,8%	20,54	14,05	91,3	29,2	90,9%	82,8%	75,3%
188,00	4,88	0,82	6,05	188,3%	20,55	14,09	91,1	29,2	90,4%	82,7%	74,8%
189,00	4,88	0,77	6,20	183,8%	20,54	13,95	90,1	29,1	91,1%	83,0%	75,6%
190,00	4,88	0,90	5,46	211,4%	20,57	14,67	88,9	29,0	88,6%	82,2%	72,9%
191,00	4,88	0,20	4,91	287,5%	20,65	15,64	88,1	29,1	97,4%	82,1%	80,0%
192,00	4,83	0,21	4,72	301,7%	20,66	15,83	87,3	28,8	97,4%	81,9%	79,7%
193,00	4,83	0,20	4,62	310,8%	20,66	15,94	86,4	29,1	97,5%	81,9%	79,8%
194,00	4,79	0,19	4,67	307,3%	20,66	15,89	85,4	29,0	97,6%	82,1%	80,2%
195,00	4,79	0,18	4,66	309,2%	20,66	15,91	84,5	29,1	97,8%	82,2%	80,4%
196,00	4,79	0,18	4,69	306,6%	20,66	15,88	83,8	29,0	97,8%	82,4%	80,6%
197,00	4,79	0,18	4,74	302,5%	20,66	15,83	83,1	29,2	97,8%	82,6%	80,8%
198,00	4,79	0,90	4,77	249,2%	20,61	15,39	82,3	29,1	87,3%	82,1%	71,7%
199,00	4,79	0,90	4,77	249,2%	20,61	15,40	81,8	29,2	87,3%	82,2%	71,7%
200,00	4,74	0,92	4,83	244,5%	20,61	15,32	81,0	28,9	87,2%	82,3%	71,8%
201,00	4,74	0,92	4,87	241,9%	20,61	15,28	80,3	28,9	87,2%	82,5%	72,0%
202,00	4,71	0,92	4,93	238,2%	20,60	15,21	79,7	29,1	87,4%	82,7%	72,2%
203,00	4,70	0,92	4,97	236,4%	20,60	15,17	79,0	29,0	87,5%	82,8%	72,5%
204,00	4,70	0,93	4,99	234,9%	20,60	15,15	78,2	29,2	87,4%	82,9%	72,5%
205,00	4,70	0,93	5,02	233,3%	20,60	15,12	77,7	29,3	87,5%	83,0%	72,7%
206,00	4,70	0,93	5,03	232,1%	20,60	15,10	77,2	29,3	87,5%	83,1%	72,7%
207,00	4,70	0,94	5,09	228,3%	20,59	15,03	76,6	29,3	87,5%	83,3%	72,9%
208,00	4,66	0,94	5,13	226,5%	20,59	14,99	76,1	29,2	87,6%	83,4%	73,0%
209,00	4,65	0,94	5,13	226,5%	20,59	15,00	75,5	29,3	87,6%	83,4%	73,1%
210,00	4,66	0,95	5,11	226,8%	20,59	15,01	75,1	29,4	87,4%	83,5%	73,0%
211,00	4,61	0,96	5,06	228,7%	20,59	15,05	74,5	29,3	87,1%	83,5%	72,7%
212,00	4,61	0,97	5,04	229,3%	20,59	15,07	74,1	29,3	87,1%	83,5%	72,7%
213,00	4,61	0,96	5,01	231,4%	20,60	15,10	73,5	29,2	87,0%	83,5%	72,7%
214,00	4,61	0,96	5,01	231,8%	20,60	15,11	73,0	29,3	87,1%	83,6%	72,9%
215,00	4,61	0,97	5,00	232,1%	20,60	15,12	72,6	29,3	87,0%	83,6%	72,7%
216,00	4,61	0,99	4,98	232,1%	20,60	15,13	72,1	29,4	86,7%	83,7%	72,5%
217,00	4,56	0,99	4,94	234,0%	20,60	15,16	71,7	29,6	86,6%	83,7%	72,5%
218,00	4,56	0,99	4,97	231,9%	20,60	15,13	71,1	29,4	86,6%	83,8%	72,6%
219,00	4,56	1,00	5,03	228,8%	20,59	15,07	70,7	29,5	86,7%	83,9%	72,7%
220,00	4,56	0,99	5,05	227,9%	20,59	15,05	70,2	29,5	86,8%	84,0%	72,9%
221,00	4,56	1,00	5,05	227,7%	20,59	15,05	69,9	29,3	86,7%	84,0%	72,8%
222,00	4,51	1,00	5,01	229,4%	20,59	15,08	69,4	29,2	86,6%	84,0%	72,8%

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223,00	4,51	1,00	4,97	232,1%	20,60	15,13	69,1	29,3	86,6%	84,0%	72,7%
224,00	4,51	0,99	4,95	233,5%	20,60	15,15	68,7	29,4	86,6%	84,1%	72,8%
225,00	4,51	0,99	4,97	232,4%	20,60	15,13	68,3	29,4	86,7%	84,1%	72,9%
226,00	4,47	0,99	4,97	232,5%	20,60	15,14	68,0	29,4	86,7%	84,2%	73,0%
227,00	4,47	0,97	4,96	233,9%	20,60	15,16	67,6	29,4	86,8%	84,2%	73,1%
228,00	4,47	0,97	4,99	232,4%	20,60	15,13	67,2	29,6	86,9%	84,3%	73,3%
229,00	4,45	0,97	5,02	230,6%	20,60	15,09	66,9	29,6	86,9%	84,4%	73,4%
230,00	4,47	0,99	5,05	227,9%	20,59	15,05	66,5	29,6	86,8%	84,5%	73,3%
231,00	4,47	0,98	5,05	228,4%	20,59	15,05	66,1	29,6	86,9%	84,5%	73,5%
232,00	4,43	0,98	5,05	228,6%	20,59	15,06	65,9	29,6	87,0%	84,6%	73,5%
233,00	4,43	0,97	5,03	229,6%	20,59	15,07	65,6	29,5	87,0%	84,6%	73,5%
234,00	4,43	0,97	5,05	228,8%	20,59	15,06	65,3	29,5	87,0%	84,6%	73,6%
235,00	4,43	0,97	5,07	227,9%	20,59	15,04	65,1	29,7	87,0%	84,7%	73,7%
236,00	4,43	0,98	5,10	226,0%	20,59	15,00	64,7	29,4	87,1%	84,7%	73,8%
237,00	4,38	0,98	5,07	227,7%	20,59	15,04	64,5	29,3	87,0%	84,7%	73,7%
238,00	4,38	0,97	5,02	230,5%	20,60	15,09	64,3	29,3	86,9%	84,7%	73,6%
239,00	4,38	0,97	4,99	232,4%	20,60	15,13	63,9	29,5	86,9%	84,7%	73,6%
240,00	4,38	0,97	4,97	233,6%	20,60	15,15	63,7	29,5	86,9%	84,8%	73,7%
241,00	4,38	0,97	4,98	232,5%	20,60	15,13	63,5	29,4	86,9%	84,8%	73,7%
242,00	4,34	0,97	4,99	232,3%	20,60	15,13	63,1	29,3	86,9%	84,8%	#DIV/0!
243,00	4,38	0,97	4,98	232,8%	20,60	15,13	62,9	29,5	86,9%	84,9%	73,8%
244,00	4,34	0,97	5,00	231,5%	20,60	15,11	62,7	29,4	86,9%	84,9%	73,8%
245,00	4,34	1,00	5,02	229,0%	20,59	15,08	62,5	29,3	86,6%	84,9%	73,5%
246,00	4,34	1,09	5,09	220,7%	20,59	14,95	62,2	29,4	85,7%	84,9%	72,8%
247,00	4,32	1,03	5,08	224,0%	20,59	14,99	62,1	29,6	86,4%	85,0%	73,4%
248,00	4,29	1,01	5,07	225,8%	20,59	15,02	61,9	29,4	86,6%	85,0%	73,6%
249,00	4,29	1,01	5,07	225,9%	20,59	15,02	61,8	29,5	86,6%	85,0%	73,7%
250,00	4,29	1,02	5,02	227,9%	20,59	15,06	61,4	29,8	86,4%	85,1%	73,5%
251,00	4,29	1,02	4,95	231,7%	20,60	15,14	61,2	29,7	86,3%	85,0%	73,4%
252,00	4,29	1,02	4,95	231,3%	20,60	15,13	60,9	29,4	86,2%	85,0%	73,3%
253,00	4,25	1,02	4,92	233,4%	20,60	15,17	60,8	29,6	86,2%	85,0%	73,3%
254,00	4,26	1,02	4,92	233,3%	20,60	15,17	60,6	29,5	86,1%	85,0%	73,3%
255,00	4,25	1,03	4,95	230,8%	20,60	15,13	60,5	29,6	86,1%	85,1%	73,3%
256,00	4,25	1,03	4,95	230,8%	20,60	15,13	60,4	29,6	86,1%	85,1%	73,3%
257,00	4,25	1,03	4,95	231,1%	20,60	15,13	60,2	29,8	86,1%	85,2%	73,3%
258,00	4,20	1,03	4,94	231,8%	20,60	15,14	59,9	29,8	86,1%	85,2%	73,3%
259,00	4,21	1,03	4,95	231,0%	20,60	15,13	59,8	29,7	86,1%	85,2%	73,4%
260,00	4,25	1,03	4,95	230,8%	20,60	15,13	59,7	29,8	86,1%	85,2%	73,4%
261,00	4,20	1,03	4,95	230,8%	20,60	15,13	59,5	29,7	86,1%	85,2%	73,4%
262,00	4,20	1,04	4,97	229,7%	20,59	15,11	59,3	29,6	86,1%	85,3%	73,4%
263,00	4,20	1,04	4,95	230,7%	20,60	15,13	59,1	29,7	86,1%	85,3%	73,4%
264,00	4,20	1,03	4,90	233,8%	20,60	15,18	58,9	29,7	86,0%	85,3%	73,4%
265,00	4,20	1,02	4,74	243,8%	20,61	15,36	58,8	29,7	85,8%	85,1%	73,0%
266,00	4,17	1,00	4,58	254,9%	20,62	15,54	58,6	29,9	85,6%	85,1%	72,8%
267,00	4,20	0,99	4,54	258,1%	20,62	15,59	58,5	30,0	85,7%	85,1%	72,9%
268,00	4,15	0,98	4,53	259,8%	20,62	15,61	58,3	29,7	85,8%	85,0%	72,9%
269,00	4,11	0,96	4,49	262,8%	20,63	15,65	58,2	29,7	85,9%	85,0%	73,0%
270,00	4,15	0,95	4,52	261,7%	20,63	15,63	58,1	29,8	86,1%	85,1%	73,2%
271,00	4,15	0,95	4,51	262,8%	20,63	15,64	57,9	29,5	86,1%	85,1%	73,2%
272,00	4,11	0,95	4,53	261,3%	20,63	15,62	57,7	29,7	86,2%	85,2%	73,4%
273,00	4,11	0,94	4,54	260,8%	20,62	15,61	57,4	29,4	86,2%	85,2%	73,5%
274,00	4,11	0,93	4,51	263,5%	20,63	15,65	57,2	29,4	86,3%	85,2%	73,5%
275,00	4,11	0,93	4,55	260,9%	20,62	15,60	57,1	29,6	86,4%	85,3%	73,7%
276,00	4,11	0,93	4,56	260,4%	20,62	15,60	56,9	29,9	86,4%	85,3%	73,8%
277,00	4,11	0,92	4,53	262,8%	20,63	15,63	56,7	29,8	86,5%	85,3%	73,8%
278,00	4,06	0,92	4,52	264,1%	20,63	15,65	56,5	29,9	86,5%	85,4%	73,9%
279,00	4,09	0,92	4,55	261,7%	20,63	15,61	56,3	29,7	86,6%	85,4%	73,9%
280,00	4,07	0,93	4,56	260,6%	20,62	15,60	56,2	29,9	86,5%	85,5%	73,9%
281,00	4,07	0,94	4,57	259,4%	20,62	15,58	56,1	29,9	86,3%	85,5%	73,7%
282,00	4,06	0,95	4,56	259,1%	20,62	15,58	55,9	29,9	86,2%	85,5%	73,7%
283,00	4,06	0,94	4,57	258,9%	20,62	15,58	55,8	29,9	86,3%	85,5%	73,8%

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284,00	4,07	0,93	4,53	263,0%	20,63	15,63	55,7	29,7	86,4%	85,5%	73,8%
285,00	4,02	0,93	4,58	259,7%	20,62	15,58	55,6	29,8	86,5%	85,5%	74,0%
286,00	4,02	0,92	4,57	261,1%	20,62	15,60	55,5	29,9	86,6%	85,6%	74,1%
287,00	4,06	0,92	4,59	259,8%	20,62	15,58	55,4	30,1	86,7%	85,6%	74,2%
288,00	4,02	0,90	4,56	262,4%	20,63	15,61	55,4	29,7	86,8%	85,6%	74,2%
289,00	4,02	0,90	4,56	262,5%	20,63	15,61	55,2	29,9	86,9%	85,6%	74,4%
290,00	4,02	0,89	4,58	261,8%	20,63	15,60	55,2	30,0	87,0%	85,6%	74,5%
291,00	4,02	0,89	4,56	262,9%	20,63	15,62	55,1	29,9	86,9%	85,6%	74,4%
292,00	3,98	0,89	4,61	259,7%	20,62	15,56	55,0	29,9	87,0%	85,7%	74,6%
293,00	3,98	0,89	4,59	261,4%	20,63	15,59	55,0	29,8	87,1%	85,7%	74,6%
294,00	3,98	0,88	4,59	262,1%	20,63	15,60	54,9	29,7	87,1%	85,7%	74,6%
295,00	3,98	0,88	4,59	261,8%	20,63	15,59	54,8	29,6	87,1%	85,7%	74,6%
296,00	3,98	0,89	4,63	258,5%	20,62	15,54	54,7	29,8	87,1%	85,7%	74,7%
297,00	3,98	0,88	4,61	260,5%	20,62	15,57	54,6	30,1	87,2%	85,8%	74,8%
298,00	3,93	0,89	4,65	257,4%	20,62	15,53	54,5	30,1	87,2%	85,8%	74,8%
299,00	3,93	0,89	4,64	258,3%	20,62	15,54	54,4	29,9	87,1%	85,8%	74,7%
300,00	3,93	0,90	4,66	256,6%	20,62	15,52	54,3	29,8	87,1%	85,8%	74,7%
301,00	3,93	0,89	4,63	258,5%	20,62	15,54	54,2	30,0	87,1%	85,8%	74,8%
302,00	3,93	0,89	4,65	257,2%	20,62	15,52	54,1	29,9	87,2%	85,8%	74,8%
303,00	3,93	0,89	4,67	256,1%	20,62	15,50	54,0	29,8	87,2%	85,9%	74,9%
304,00	3,93	0,89	4,67	256,6%	20,62	15,51	53,8	29,8	87,2%	85,9%	74,9%
305,00	3,93	0,89	4,69	255,2%	20,62	15,49	53,8	30,1	87,3%	85,9%	75,0%
306,00	3,93	0,89	4,68	256,1%	20,62	15,50	53,7	30,2	87,3%	86,0%	75,0%
307,00	3,93	0,89	4,69	255,2%	20,62	15,49	53,7	30,0	87,3%	85,9%	75,0%
308,00	3,93	0,89	4,71	253,8%	20,62	15,46	53,6	30,1	87,3%	86,0%	75,1%
309,00	3,90	0,89	4,73	252,4%	20,62	15,44	53,5	30,1	87,3%	86,0%	75,1%
310,00	3,89	0,90	4,74	250,8%	20,62	15,42	53,4	30,0	87,2%	86,0%	75,0%
311,00	3,89	0,91	4,71	252,7%	20,62	15,46	53,0	30,0	87,1%	86,0%	74,9%
312,00	3,89	0,92	4,75	249,3%	20,61	15,41	52,7	29,7	87,0%	86,1%	74,9%
313,00	3,89	0,93	4,80	245,5%	20,61	15,35	52,4	29,8	86,9%	86,1%	74,9%
314,00	3,89	0,94	4,83	243,3%	20,61	15,31	52,2	29,9	86,9%	86,2%	74,9%
315,00	3,89	0,95	4,83	242,7%	20,61	15,30	52,1	29,8	86,8%	86,2%	74,8%
316,00	3,84	0,95	4,82	243,2%	20,61	15,31	51,9	29,7	86,8%	86,2%	74,8%
317,00	3,84	0,95	4,80	244,1%	20,61	15,33	51,7	30,0	86,7%	86,2%	74,8%
318,00	3,84	0,97	4,72	247,6%	20,61	15,40	51,7	30,0	86,3%	86,1%	74,3%
319,00	3,84	0,96	4,66	252,1%	20,62	15,47	51,5	30,0	86,3%	86,1%	74,3%
320,00	3,79	0,95	4,65	254,1%	20,62	15,50	51,5	30,2	86,5%	86,2%	74,5%
321,00	3,79	0,93	4,64	255,6%	20,62	15,52	51,3	29,9	86,6%	86,2%	74,6%
322,00	3,83	0,92	4,62	256,9%	20,62	15,54	51,1	29,6	86,7%	86,1%	74,7%
323,00	3,84	0,93	4,65	255,2%	20,62	15,51	51,1	29,4	86,7%	86,1%	74,7%
324,00	3,79	0,93	4,64	255,9%	20,62	15,52	51,0	29,1	86,7%	86,1%	74,6%
325,00	3,79	0,92	4,63	256,9%	20,62	15,53	50,9	28,7	86,7%	86,1%	74,6%
326,00	3,79	0,92	4,63	256,4%	20,62	15,53	50,9	28,7	86,7%	86,1%	74,6%
327,00	3,79	0,92	4,63	256,7%	20,62	15,53	50,8	28,6	86,7%	86,1%	74,6%
328,00	3,79	0,93	4,64	255,8%	20,62	15,52	50,6	28,4	86,7%	86,1%	74,6%
329,00	3,75	0,93	4,64	255,6%	20,62	15,52	50,5	28,4	86,7%	86,1%	74,6%
330,00	3,75	0,93	4,61	257,4%	20,62	15,55	50,4	28,4	86,6%	86,1%	74,5%
331,00	3,75	0,93	4,63	255,5%	20,62	15,52	50,4	28,3	86,6%	86,1%	74,5%
332,00	3,75	0,94	4,65	254,3%	20,62	15,50	50,2	28,3	86,6%	86,1%	74,6%
333,00	3,75	0,93	4,66	254,4%	20,62	15,50	50,2	28,3	86,7%	86,1%	74,6%
334,00	3,75	0,93	4,67	253,8%	20,62	15,49	50,0	28,2	86,7%	86,1%	74,7%
335,00	3,75	0,93	4,68	253,1%	20,62	15,47	49,9	28,2	86,8%	86,2%	74,7%
336,00	3,70	0,93	4,67	253,8%	20,62	15,48	49,9	28,3	86,7%	86,2%	74,7%
337,00	3,70	0,93	4,67	253,8%	20,62	15,48	49,9	28,2	86,7%	86,2%	74,7%
338,00	3,70	0,93	4,67	253,9%	20,62	15,49	49,8	28,2	86,7%	86,2%	74,7%
339,00	3,70	0,93	4,66	254,1%	20,62	15,49	49,7	28,2	86,7%	86,2%	74,7%
340,00	3,66	0,94	4,63	255,7%	20,62	15,52	49,7	28,2	86,5%	86,1%	74,5%
341,00	3,70	0,96	4,62	255,4%	20,62	15,53	49,7	28,1	86,3%	86,1%	74,3%
342,00	3,66	0,97	4,62	254,3%	20,62	15,51	49,6	28,2	86,1%	86,1%	74,1%
343,00	3,70	0,98	4,62	254,1%	20,62	15,51	49,6	28,2	86,0%	86,1%	74,1%
344,00	3,66	0,98	4,65	251,7%	20,62	15,48	49,5	28,2	86,0%	86,1%	74,1%



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345,00	3,66	0,99	4,63	252,9%	20,62	15,50	49,5	28,2	85,9%	86,1%	74,0%
346,00	3,66	0,99	4,57	256,3%	20,62	15,56	49,5	28,2	85,7%	86,1%	73,8%
347,00	3,66	0,99	4,56	256,3%	20,62	15,56	49,4	28,2	85,7%	86,1%	73,7%
348,00	3,62	1,00	4,56	256,1%	20,62	15,56	49,3	28,1	85,6%	86,1%	73,7%
349,00	3,62	1,05	4,82	237,3%	20,60	15,26	49,2	28,1	85,6%	86,2%	73,8%
350,00	3,62	1,09	4,97	226,5%	20,59	15,07	49,5	28,2	85,4%	86,3%	73,7%
351,00	3,57	1,09	4,93	228,9%	20,59	15,12	50,0	28,2	85,4%	86,2%	73,6%
352,00	3,57	1,09	4,89	231,4%	20,60	15,17	50,5	28,1	85,3%	86,1%	73,4%
353,00	3,60	1,08	4,84	234,8%	20,60	15,22	51,1	28,1	85,4%	86,0%	73,4%
354,00	3,57	1,06	4,81	237,4%	20,60	15,26	51,6	28,1	85,4%	85,9%	73,4%
355,00	3,57	1,06	4,79	238,5%	20,60	15,28	52,1	28,0	85,5%	85,8%	73,3%
356,00	3,57	1,06	4,78	239,3%	20,60	15,30	52,9	28,0	85,4%	85,7%	73,2%
357,00	3,57	1,00	4,48	261,2%	20,62	15,64	53,6	28,1	85,4%	85,4%	72,9%
358,00	3,53	0,99	4,42	266,0%	20,63	15,71	53,6	28,1	85,4%	85,4%	72,9%
359,00	3,57	0,95	4,45	266,5%	20,63	15,70	53,4	28,0	85,9%	85,4%	73,4%
360,00	3,53	0,91	4,50	265,8%	20,63	15,67	53,1	28,0	86,6%	85,6%	74,1%
361,00	3,57	0,89	4,55	263,7%	20,63	15,63	52,8	28,0	86,9%	85,7%	74,4%
362,00	3,53	0,89	4,58	261,9%	20,63	15,60	52,6	28,0	86,9%	85,7%	74,5%
363,00	3,53	0,89	4,58	262,0%	20,63	15,60	52,3	28,0	87,0%	85,8%	74,6%
364,00	3,53	0,90	4,64	257,8%	20,62	15,54	52,1	28,0	87,1%	85,8%	74,7%
365,00	3,53	0,89	4,63	258,2%	20,62	15,54	52,0	28,0	87,1%	85,9%	74,8%
366,00	3,53	0,90	4,65	256,9%	20,62	15,52	51,8	28,0	87,1%	85,9%	74,8%
367,00	3,53	0,90	4,67	256,1%	20,62	15,51	51,6	28,0	87,1%	85,9%	74,9%
368,00	3,47	0,91	4,72	252,0%	20,62	15,44	51,2	28,1	87,1%	86,0%	74,9%
369,00	3,43	0,97	5,01	231,4%	20,60	15,11	51,2	28,1	87,0%	86,2%	75,0%
370,00	3,43	0,97	5,06	228,2%	20,59	15,05	51,4	28,0	87,0%	86,2%	75,0%
371,00	3,43	0,97	5,17	222,4%	20,59	14,93	51,8	28,0	87,3%	86,2%	75,3%
372,00	3,43	0,96	5,16	223,8%	20,59	14,95	52,2	28,1	87,4%	86,2%	75,3%
373,00	3,39	0,95	5,14	225,1%	20,59	14,97	52,8	28,0	87,5%	86,1%	75,3%
374,00	3,39	0,95	5,14	224,9%	20,59	14,97	53,3	28,0	87,4%	86,0%	75,2%
375,00	3,43	0,95	5,14	225,1%	20,59	14,97	54,2	28,0	87,4%	85,9%	75,1%
376,00	3,43	0,89	4,79	248,6%	20,61	15,38	54,9	28,1	87,4%	85,6%	74,8%
377,00	3,39	0,88	4,74	252,5%	20,62	15,44	54,8	28,0	87,5%	85,6%	74,9%
378,00	3,39	0,89	4,74	252,3%	20,62	15,44	54,4	28,0	87,4%	85,6%	74,8%
379,00	3,39	0,89	4,75	250,8%	20,62	15,42	54,1	28,0	87,4%	85,7%	74,9%
380,00	3,34	0,89	4,77	249,8%	20,61	15,40	53,6	28,1	87,4%	85,8%	74,9%
381,00	3,34	0,95	5,13	225,7%	20,59	14,99	53,3	28,0	87,4%	86,0%	75,2%
382,00	3,34	0,96	5,14	224,3%	20,59	14,96	53,5	28,0	87,3%	86,0%	75,1%
383,00	3,34	0,96	5,13	225,5%	20,59	14,98	53,8	28,1	87,3%	86,0%	75,1%
384,00	3,30	0,96	5,11	226,2%	20,59	15,00	54,2	28,1	87,3%	85,9%	75,0%
385,00	3,39	0,96	5,08	228,2%	20,59	15,04	54,7	28,0	87,3%	85,8%	74,9%
386,00	3,34	0,94	4,95	236,4%	20,60	15,19	55,7	28,1	87,2%	85,6%	74,6%
387,00	3,34	0,89	4,70	254,0%	20,62	15,47	55,9	28,1	87,3%	85,4%	74,5%
388,00	3,30	0,89	4,69	255,2%	20,62	15,49	55,7	28,1	87,3%	85,4%	74,5%
389,00	3,34	0,89	4,70	254,1%	20,62	15,47	55,4	28,0	87,3%	85,5%	74,6%
390,00	3,30	0,90	4,72	252,6%	20,62	15,45	54,7	28,1	87,2%	85,6%	74,6%
391,00	3,30	0,95	5,06	229,3%	20,59	15,06	54,5	28,0	87,3%	85,8%	74,9%
392,00	3,25	0,97	5,11	225,6%	20,59	14,99	54,6	28,0	87,2%	85,8%	74,8%
393,00	3,25	0,97	5,09	226,8%	20,59	15,01	54,9	28,1	87,2%	85,8%	74,8%
394,00	3,25	0,96	5,04	229,9%	20,60	15,07	55,2	28,0	87,2%	85,7%	74,7%
395,00	3,30	0,96	5,05	229,8%	20,59	15,07	55,7	28,0	87,2%	85,6%	74,7%
396,00	3,25	0,93	4,85	242,6%	20,61	15,29	56,6	28,0	87,1%	85,4%	74,3%
397,00	3,25	0,89	4,67	255,9%	20,62	15,50	56,8	28,0	87,2%	85,3%	74,3%
398,00	3,25	0,90	4,57	261,6%	20,63	15,60	56,5	28,0	86,8%	85,2%	74,0%
399,00	3,25	0,94	4,56	260,4%	20,62	15,60	56,0	28,0	86,4%	85,2%	73,6%
400,00	3,25	0,94	4,57	259,0%	20,62	15,58	55,7	28,0	86,3%	85,3%	73,6%
401,00	3,25	0,94	4,60	257,3%	20,62	15,55	55,3	28,0	86,5%	85,3%	73,8%
402,00	3,21	0,93	4,67	253,4%	20,62	15,48	54,7	28,0	86,7%	85,5%	74,1%
403,00	3,21	0,97	4,98	232,9%	20,60	15,13	54,3	28,1	86,9%	85,8%	74,5%
404,00	3,16	0,98	5,10	225,7%	20,59	15,00	54,3	28,0	87,0%	85,8%	74,7%
405,00	3,16	0,98	5,06	227,9%	20,59	15,04	54,6	28,0	87,0%	85,8%	74,6%

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406,00	3,16	0,97	5,04	229,3%	20,59	15,07	54,9	28,0	87,0%	85,7%	74,6%
407,00	3,16	0,96	5,04	230,0%	20,60	15,07	55,3	28,1	87,2%	85,7%	74,7%
408,00	3,16	0,95	5,01	232,2%	20,60	15,11	56,1	28,1	87,2%	85,6%	74,7%
409,00	3,16	0,88	4,69	255,5%	20,62	15,49	56,6	28,0	87,3%	85,3%	74,5%
410,00	3,16	0,87	4,64	259,6%	20,62	15,55	56,4	28,1	87,4%	85,3%	74,5%
411,00	3,16	0,87	4,67	257,3%	20,62	15,52	56,0	28,0	87,4%	85,4%	74,6%
412,00	3,11	0,88	4,70	255,0%	20,62	15,48	55,6	28,0	87,5%	85,4%	74,7%
413,00	3,12	0,88	4,75	252,0%	20,62	15,43	64,8	28,0	87,5%	84,3%	73,8%
414,00	3,07	0,85	3,86	320,6%	20,67	16,39	97,6	28,1	85,7%	77,9%	66,8%
415,00	3,03	0,61	3,84	345,0%	20,68	16,54	110,5	28,1	89,5%	75,9%	67,9%
416,00	3,01	0,37	3,88	366,0%	20,70	16,63	117,9	28,2	93,7%	75,0%	70,3%
417,00	2,98	0,33	3,95	363,3%	20,69	16,58	123,5	28,1	94,5%	74,3%	70,3%
418,00	2,93	0,35	3,95	360,2%	20,69	16,57	128,2	28,1	94,1%	73,6%	69,2%
419,00	2,89	0,38	3,89	364,0%	20,69	16,62	131,7	28,2	93,5%	72,8%	68,0%
420,00	2,85	0,44	3,83	363,4%	20,69	16,64	135,3	28,4	92,3%	71,9%	66,4%
421,00	2,79	0,34	3,69	390,8%	20,71	16,84	137,9	28,6	93,9%	70,9%	66,6%
422,00	2,79	0,33	3,65	397,6%	20,71	16,90	140,4	28,8	94,0%	70,3%	66,1%
423,00	2,75	0,40	3,59	396,0%	20,71	16,92	142,1	28,9	92,7%	69,7%	64,6%
424,00	2,71	0,46	3,49	400,8%	20,71	16,99	143,3	29,0	91,2%	69,0%	62,9%
425,00	2,71	0,54	3,43	398,6%	20,71	17,01	144,6	29,1	89,6%	68,4%	61,3%
426,00	2,71	0,59	3,35	403,3%	20,71	17,07	145,5	29,2	88,5%	67,8%	60,0%
427,00	2,66	0,59	3,32	406,2%	20,72	17,10	146,4	29,3	88,3%	67,4%	59,6%
428,00	2,66	0,63	3,32	401,1%	20,71	17,08	147,7	29,3	87,6%	67,2%	58,9%
429,00	2,62	0,65	3,31	400,4%	20,71	17,08	148,3	29,3	87,2%	67,0%	58,4%
430,00	2,57	0,69	3,29	397,6%	20,71	17,08	148,9	29,3	86,5%	66,8%	57,8%
431,00	2,57	0,71	3,27	397,6%	20,71	17,09	149,5	29,3	86,1%	66,5%	57,3%
432,00	2,53	0,70	3,26	400,2%	20,71	17,10	150,5	29,4	86,3%	66,3%	57,3%
433,00	2,52	0,68	3,28	400,4%	20,71	17,10	150,3	29,4	86,6%	66,4%	57,6%
434,00	2,49	0,66	3,29	401,5%	20,71	17,10	151,4	29,4	87,0%	66,3%	57,7%
435,00	2,43	0,60	3,30	407,4%	20,72	17,11	151,9	29,4	88,2%	66,3%	58,5%
436,00	2,43	0,57	3,29	412,9%	20,72	17,14	152,2	29,4	88,6%	66,1%	58,6%
437,00	2,39	0,55	3,20	427,8%	20,72	17,25	152,5	29,5	88,8%	65,5%	58,2%
438,00	2,39	0,56	3,09	442,3%	20,73	17,36	152,8	29,5	88,4%	64,7%	57,2%
439,00	2,34	0,56	3,04	450,5%	20,73	17,41	152,6	29,5	88,2%	64,3%	56,8%
440,00	2,34	0,57	2,98	457,6%	20,74	17,47	152,8	29,5	87,7%	63,8%	56,0%
441,00	2,30	0,59	2,96	458,3%	20,74	17,48	152,5	29,5	87,3%	63,7%	55,6%
442,00	2,30	0,59	2,94	461,8%	20,74	17,51	152,2	29,5	87,2%	63,6%	55,5%
443,00	2,26	0,58	2,91	467,4%	20,74	17,54	151,8	29,5	87,4%	63,5%	55,5%
444,00	2,25	0,56	2,91	470,6%	20,74	17,55	151,5	29,5	87,6%	63,5%	55,7%
445,00	2,21	0,55	2,90	474,1%	20,74	17,57	151,4	29,5	87,8%	63,5%	55,8%
446,00	2,21	0,53	2,91	475,6%	20,74	17,57	151,0	29,5	88,3%	63,6%	56,2%
447,00	2,17	0,52	2,91	476,9%	20,74	17,57	150,5	29,5	88,5%	63,8%	56,4%
448,00	2,17	0,51	2,89	482,0%	20,74	17,60	150,2	29,6	88,7%	63,7%	56,5%
449,00	2,17	0,50	2,87	487,0%	20,75	17,62	150,2	29,5	88,9%	63,5%	56,5%
450,00	2,12	0,48	2,84	495,2%	20,75	17,66	149,8	29,5	89,1%	63,3%	56,5%
451,00	2,12	0,49	2,85	492,9%	20,75	17,65	149,7	29,5	89,1%	63,5%	56,5%
452,00	2,07	0,49	2,88	488,5%	20,75	17,63	149,7	29,6	89,1%	63,7%	56,7%
453,00	2,07	0,47	2,88	491,1%	20,75	17,63	150,0	29,5	89,5%	63,6%	56,9%
454,00	2,03	0,44	2,89	494,8%	20,75	17,64	150,1	29,5	90,2%	63,6%	57,4%
455,00	2,03	0,42	2,89	497,6%	20,75	17,65	150,2	29,5	90,6%	63,7%	57,7%
456,00	1,98	0,43	2,88	499,2%	20,75	17,66	150,1	29,5	90,5%	63,6%	57,5%
457,00	1,94	0,42	2,87	500,9%	20,75	17,67	150,0	29,5	90,5%	63,5%	57,5%
458,00	1,94	0,42	2,86	504,3%	20,75	17,68	150,1	29,5	90,7%	63,4%	57,5%
459,00	1,94	0,41	2,85	506,8%	20,75	17,70	150,3	29,5	90,8%	63,3%	57,5%
460,00	1,89	0,41	2,84	509,9%	20,75	17,71	149,9	29,5	90,9%	63,3%	57,5%
461,00	1,89	0,40	2,84	510,3%	20,75	17,71	150,0	29,5	90,9%	63,3%	57,5%
462,00	1,89	0,40	2,85	509,3%	20,75	17,70	149,9	29,5	91,0%	63,3%	57,6%
463,00	1,88	0,40	2,85	508,9%	20,75	17,70	150,0	29,5	91,0%	63,4%	57,7%
464,00	1,85	0,39	2,84	513,4%	20,75	17,72	149,8	29,5	91,2%	63,3%	57,7%
465,00	1,85	0,39	2,84	512,9%	20,75	17,72	149,0	29,5	91,3%	63,5%	57,9%
466,00	1,81	0,36	2,72	543,1%	20,76	17,86	149,0	29,5	91,7%	62,4%	57,2%

CSA B415.1 OE Calculations

467,00	1,79	0,36	2,70	547,6%	20,76	17,89	148,6	29,5	91,6%	62,3%	57,1%
468,00	1,76	0,38	2,69	544,9%	20,76	17,88	148,7	29,5	91,2%	62,2%	56,8%
469,00	1,76	0,40	2,68	544,2%	20,76	17,89	148,3	29,4	90,7%	62,1%	56,3%
470,00	1,76	0,42	2,67	540,9%	20,76	17,88	148,2	29,4	90,1%	62,1%	56,0%
471,00	1,71	0,42	2,65	544,3%	20,76	17,90	147,5	29,4	89,9%	62,1%	55,8%
472,00	1,71	0,43	2,64	546,0%	20,76	17,91	147,4	29,4	89,7%	62,0%	55,6%
473,00	1,66	0,44	2,62	547,1%	20,76	17,92	146,8	29,4	89,5%	62,0%	55,5%
474,00	1,66	0,43	2,60	554,1%	20,77	17,95	146,4	29,4	89,6%	61,9%	55,4%
475,00	1,64	0,43	2,57	559,3%	20,77	17,98	145,7	29,4	89,5%	61,7%	55,2%
476,00	1,62	0,45	2,48	577,2%	20,77	18,07	144,9	29,4	88,8%	61,0%	54,1%
477,00	1,62	0,45	2,43	585,5%	20,77	18,11	144,3	29,4	88,4%	60,7%	53,6%
478,00	1,62	0,48	2,40	588,3%	20,77	18,14	143,3	29,3	87,7%	60,5%	53,1%
479,00	1,58	0,46	2,40	590,5%	20,78	18,14	142,9	29,4	88,0%	60,7%	53,4%
480,00	1,58	0,44	2,41	592,8%	20,78	18,14	142,3	29,4	88,6%	60,9%	54,0%
481,00	1,53	0,43	2,39	601,0%	20,78	18,17	141,9	29,4	88,9%	60,8%	54,0%
482,00	1,53	0,42	2,38	605,5%	20,78	18,18	140,9	29,3	89,0%	60,9%	54,2%
483,00	1,49	0,42	2,38	607,2%	20,78	18,19	140,7	29,3	88,9%	60,9%	54,1%
484,00	1,49	0,42	2,36	611,6%	20,78	18,21	139,7	29,3	89,0%	61,0%	54,3%
485,00	1,49	0,42	2,34	618,1%	20,78	18,23	139,0	29,3	89,1%	60,9%	54,3%
486,00	1,44	0,41	2,32	625,8%	20,78	18,26	139,0	29,3	89,2%	60,7%	54,2%
487,00	1,44	0,39	2,29	638,7%	20,79	18,30	138,1	29,3	89,5%	60,6%	54,2%
488,00	1,44	0,38	2,28	642,9%	20,79	18,31	137,4	29,3	89,7%	60,7%	54,4%
489,00	1,44	0,37	2,29	644,7%	20,79	18,31	137,1	29,3	90,0%	60,8%	54,7%
490,00	1,39	0,37	2,28	649,3%	20,79	18,33	136,5	29,3	90,2%	60,8%	54,8%
491,00	1,39	0,36	2,29	648,5%	20,79	18,32	135,8	29,3	90,4%	61,1%	55,2%
492,00	1,35	0,36	2,28	649,2%	20,79	18,33	135,2	29,2	90,3%	61,2%	55,2%
493,00	1,35	0,35	2,26	658,7%	20,79	18,35	134,7	29,2	90,6%	61,1%	55,3%
494,00	1,35	0,35	2,25	661,7%	20,79	18,37	134,3	29,2	90,5%	61,1%	55,3%
495,00	1,35	0,35	2,25	661,1%	20,79	18,37	133,9	29,2	90,4%	61,1%	55,3%
496,00	1,30	0,36	2,23	662,1%	20,79	18,37	133,4	29,2	90,0%	61,1%	55,1%
497,00	1,30	0,36	2,22	668,4%	20,79	18,39	132,6	29,2	90,1%	61,1%	55,1%
498,00	1,30	0,36	2,20	673,4%	20,79	18,41	132,1	29,2	90,2%	61,1%	55,1%
499,00	1,26	0,35	2,21	671,0%	20,79	18,40	131,7	29,2	90,3%	61,4%	55,4%
500,00	1,26	0,35	2,20	678,0%	20,79	18,42	131,3	29,2	90,4%	61,2%	55,3%
501,00	1,26	0,35	2,20	677,2%	20,79	18,42	131,1	29,1	90,4%	61,3%	55,5%
502,00	1,21	0,35	2,18	683,5%	20,79	18,44	130,8	29,1	90,4%	61,2%	55,3%
503,00	1,21	0,35	2,20	676,4%	20,79	18,42	130,4	29,1	90,5%	61,6%	55,7%
504,00	1,21	0,33	2,21	679,3%	20,79	18,42	130,1	29,1	91,0%	61,7%	56,1%
505,00	1,17	0,32	2,21	684,4%	20,79	18,43	129,7	29,1	91,4%	61,8%	56,4%
506,00	1,17	0,32	2,21	682,9%	20,79	18,42	129,1	29,1	91,4%	62,0%	56,7%
507,00	1,17	0,31	2,17	697,9%	20,80	18,47	129,0	29,1	91,4%	61,5%	56,2%
508,00	1,13	0,30	2,15	706,2%	20,80	18,50	128,6	29,1	91,5%	61,4%	56,2%
509,00	1,13	0,29	2,14	713,6%	20,80	18,51	128,2	29,1	91,9%	61,4%	56,4%
510,00	1,08	0,29	2,15	709,4%	20,80	18,50	127,9	29,1	91,9%	61,6%	56,6%
511,00	1,08	0,29	2,14	714,3%	20,80	18,51	127,6	29,1	92,0%	61,5%	56,6%
512,00	1,08	0,29	2,11	725,5%	20,80	18,55	127,4	29,0	91,9%	61,2%	56,2%
513,00	1,08	0,30	2,07	733,8%	20,80	18,58	127,3	29,0	91,3%	60,8%	55,5%
514,00	1,05	0,31	2,07	733,8%	20,80	18,58	126,9	29,0	91,2%	60,8%	55,5%
515,00	1,03	0,31	2,08	729,4%	20,80	18,57	126,6	29,0	91,2%	61,1%	55,7%
516,00	1,03	0,31	2,08	728,3%	20,80	18,57	126,3	29,0	91,2%	61,2%	55,8%
517,00	0,98	0,31	2,11	718,0%	20,80	18,53	126,1	29,0	91,3%	61,6%	56,2%
518,00	0,98	0,30	2,10	723,8%	20,80	18,55	126,1	29,0	91,5%	61,5%	56,2%
519,00	0,98	0,30	2,09	731,4%	20,80	18,57	125,7	29,0	91,6%	61,4%	56,2%
520,00	0,98	0,29	2,08	733,4%	20,80	18,57	125,5	28,9	91,7%	61,4%	56,3%
521,00	0,94	0,29	2,07	738,8%	20,80	18,59	125,1	29,0	91,8%	61,4%	56,3%
522,00	0,94	0,28	2,08	737,0%	20,80	18,58	124,6	28,9	92,0%	61,6%	56,7%
523,00	0,94	0,29	2,10	730,8%	20,80	18,56	124,8	28,9	91,9%	61,7%	56,7%
524,00	0,90	0,30	2,08	733,1%	20,80	18,57	124,7	28,9	91,6%	61,6%	56,5%
525,00	0,90	0,30	2,09	731,7%	20,80	18,57	124,5	28,9	91,6%	61,7%	56,5%
526,00	0,90	0,30	2,10	726,7%	20,80	18,56	124,2	28,9	91,5%	61,9%	56,7%
527,00	0,90	0,31	2,11	718,4%	20,80	18,54	124,2	28,9	91,1%	62,1%	56,5%

CSA B415.1 OE Calculations

528,00	0,85	0,31	2,10	719,9%	20,80	18,54	124,3	28,9	91,1%	62,0%	56,5%
529,00	0,85	0,31	2,11	718,8%	20,80	18,54	124,1	28,9	91,2%	62,1%	56,7%
530,00	0,81	0,30	2,11	722,2%	20,80	18,54	123,9	28,9	91,4%	62,1%	56,8%
531,00	0,81	0,30	2,11	723,8%	20,80	18,55	123,5	28,9	91,6%	62,2%	57,0%
532,00	0,81	0,29	2,11	725,9%	20,80	18,55	123,6	28,9	91,8%	62,2%	57,1%
533,00	0,76	0,29	2,10	729,6%	20,80	18,56	123,5	28,8	92,0%	62,2%	57,2%
534,00	0,76	0,28	2,10	733,3%	20,80	18,57	123,5	28,8	92,1%	62,1%	57,2%
535,00	0,76	0,30	2,13	714,6%	20,80	18,52	123,6	28,8	91,6%	62,5%	57,3%
536,00	0,76	0,30	2,15	708,3%	20,80	18,50	123,4	28,8	91,6%	62,8%	57,5%
537,00	0,72	0,30	2,17	702,9%	20,80	18,48	123,4	28,8	91,8%	63,0%	57,8%
538,00	0,72	0,29	2,15	709,5%	20,80	18,50	123,5	28,8	91,9%	62,8%	57,7%
539,00	0,67	0,29	2,16	708,4%	20,80	18,50	123,4	28,8	92,0%	62,9%	57,8%
540,00	0,71	0,29	2,16	708,0%	20,80	18,49	123,6	28,8	92,1%	62,8%	57,9%
541,00	0,67	0,29	2,17	706,7%	20,80	18,49	123,5	28,7	92,2%	62,9%	58,0%
542,00	0,67	0,28	2,16	708,4%	20,80	18,49	123,6	28,7	92,2%	62,9%	58,0%
543,00	0,63	0,29	2,17	704,7%	20,80	18,48	123,6	28,7	92,1%	63,0%	58,0%
544,00	0,62	0,29	2,18	702,4%	20,80	18,47	123,6	28,7	92,2%	63,1%	58,1%
545,00	0,62	0,28	2,19	700,9%	20,80	18,46	123,8	28,7	92,5%	63,1%	58,4%
546,00	0,58	0,28	2,21	697,5%	20,80	18,45	123,8	28,7	92,6%	63,3%	58,6%
547,00	0,58	0,27	2,20	700,9%	20,80	18,46	124,0	28,7	92,9%	63,2%	58,7%
548,00	0,58	0,26	2,23	693,2%	20,80	18,43	124,0	28,7	93,1%	63,5%	59,2%
549,00	0,58	0,25	2,26	687,4%	20,80	18,41	124,4	28,7	93,4%	63,7%	59,5%
550,00	0,55	0,25	2,24	693,9%	20,80	18,43	124,6	28,7	93,5%	63,5%	59,4%
551,00	0,53	0,25	2,22	699,4%	20,80	18,45	124,6	28,7	93,4%	63,2%	59,1%
552,00	0,53	0,25	2,22	700,5%	20,80	18,45	124,6	28,7	93,4%	63,2%	59,0%
553,00	0,49	0,25	2,22	702,6%	20,80	18,46	124,7	28,7	93,5%	63,1%	59,0%
554,00	0,49	0,25	2,20	709,3%	20,80	18,48	124,6	28,7	93,6%	63,0%	58,9%
555,00	0,45	0,25	2,18	712,4%	20,80	18,49	124,7	28,6	93,3%	62,7%	58,5%
556,00	0,45	0,25	2,16	720,6%	20,80	18,51	124,8	28,6	93,3%	62,4%	58,2%
557,00	0,45	0,25	2,15	724,6%	20,80	18,53	124,8	28,6	93,2%	62,3%	58,0%
558,00	0,45	0,25	2,13	730,3%	20,80	18,54	124,8	28,6	93,2%	62,1%	57,8%
559,00	0,40	0,26	2,13	730,8%	20,80	18,55	124,5	28,6	93,1%	62,1%	57,8%
560,00	0,40	0,26	2,12	732,9%	20,80	18,55	124,6	28,6	93,0%	62,0%	57,7%
561,00	0,40	0,25	2,12	737,6%	20,80	18,56	124,6	28,6	93,2%	61,9%	57,7%
562,00	0,40	0,25	2,11	741,5%	20,80	18,58	124,7	28,6	93,2%	61,8%	57,6%
563,00	0,40	0,25	2,11	741,6%	20,80	18,58	124,4	28,6	93,2%	61,9%	57,7%
564,00	0,36	0,25	2,11	740,8%	20,80	18,57	124,3	28,6	93,3%	61,9%	57,8%
565,00	0,36	0,25	2,11	739,7%	20,80	18,57	124,4	28,6	93,3%	61,9%	57,8%
566,00	0,32	0,24	2,13	735,4%	20,80	18,55	124,4	28,6	93,5%	62,1%	58,1%
567,00	0,30	0,24	2,14	734,0%	20,80	18,55	124,1	28,6	93,7%	62,3%	58,4%
568,00	0,30	0,23	2,15	728,9%	20,80	18,53	124,3	28,5	93,8%	62,5%	58,6%
569,00	0,30	0,23	2,16	728,0%	20,80	18,53	124,2	28,5	93,9%	62,6%	58,7%
570,00	0,26	0,24	2,20	712,6%	20,80	18,48	124,1	28,5	93,9%	63,1%	59,2%
571,00	0,26	0,25	2,21	706,1%	20,80	18,47	124,3	28,5	93,6%	63,1%	59,1%
572,00	0,26	0,25	2,21	704,5%	20,80	18,46	124,3	28,5	93,4%	63,1%	59,0%
573,00	0,22	0,25	2,26	689,1%	20,80	18,41	124,6	28,5	93,5%	63,6%	59,4%
574,00	0,22	0,26	2,24	692,7%	20,80	18,43	124,6	28,5	93,3%	63,4%	59,1%
575,00	0,22	0,26	2,22	696,1%	20,80	18,44	124,4	28,5	93,1%	63,3%	58,9%
576,00	0,17	0,27	2,19	705,2%	20,80	18,47	124,6	28,5	92,8%	62,8%	58,3%
577,00	0,13	0,28	2,21	695,0%	20,80	18,45	124,6	28,5	92,4%	63,0%	58,2%
578,00	0,17	0,28	2,19	701,9%	20,80	18,47	124,6	28,5	92,5%	62,8%	58,1%
579,00	0,13	0,29	2,17	704,6%	20,80	18,48	124,6	28,5	92,2%	62,6%	57,8%
580,00	0,13	0,29	2,16	707,8%	20,80	18,49	124,5	28,5	92,2%	62,6%	57,7%
581,00	0,13	0,29	2,15	713,3%	20,80	18,51	124,2	28,5	92,1%	62,4%	57,5%
582,00	0,08	0,29	2,14	714,2%	20,80	18,51	124,0	28,4	92,1%	62,4%	57,5%
583,00	0,08	0,29	2,13	718,5%	20,80	18,53	124,0	28,5	92,0%	62,3%	57,3%
584,00	0,04	0,28	2,13	722,6%	20,80	18,54	123,8	28,5	92,2%	62,3%	57,4%
585,00	0,04	0,28	2,10	732,5%	20,80	18,56	123,6	28,4	92,3%	62,0%	57,3%
586,00	0,04	0,27	2,09	736,9%	20,80	18,57	123,5	28,4	92,3%	61,9%	57,2%
587,00	0,04	0,27	2,05	754,3%	20,81	18,62	123,1	28,4	92,5%	61,6%	56,9%
588,00	0,04	0,26	2,03	761,8%	20,81	18,64	123,1	28,4	92,5%	61,3%	56,7%

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589,00	0,04	0,26	2,02	768,8%	20,81	18,66	122,7	28,4	92,5%	61,2%	56,6%
590,00	0,00	0,26	2,00	776,5%	20,81	18,68	122,3	28,4	92,7%	61,1%	56,6%

DATA 2022-08-17 EPA PI 20275 RUN 4 CAT 2  
preburn

Temps  
acquisition  
minutes

Flue	Room	Tunnel	scale	Tunnel Velocity	Flue draft	duct	duct	
temp	temp	dry bulb		Pressure	Pressure	in	out	
°F	°F	°F	lbs	in. Wc	in. Wc	°F	°F	
1	74,22	71,59	75,13	11,95	0,0729	0,0029	72,71	73,31
2	86,41	71,71	76,15	11,95	0,0704	0,0084	72,71	73,33
3	101,56	71,63	77,62	11,66	0,0707	0,0148	72,76	73,48
4	123,51	71,61	80,39	12,24	0,0690	0,0177	73,05	74,12
5	172,19	71,66	88,04	11,85	0,0675	0,0357	72,89	75,45
6	248,68	71,64	100,78	11,34	0,0688	0,0495	72,84	78,44
7	316,82	71,62	113,01	10,64	0,0677	0,0591	72,61	83,66
8	394,59	71,59	126,92	9,85	0,0649	0,0691	72,69	91,93
9	458,12	71,65	140,43	8,95	0,0639	0,0766	72,39	103,69
10	516,58	71,78	157,24	20,43	0,0629	0,0828	72,27	118,54
11	576,10	71,75	173,31	21,52	0,0607	0,0859	71,48	112,53
12	609,04	71,69	183,60	23,82	0,0605	0,0886	71,78	115,55
13	533,66	71,90	154,10	23,33	0,0631	0,0779	71,49	117,26
14	524,85	71,74	152,79	22,83	0,0633	0,0823	71,04	116,36
15	525,37	71,56	152,19	22,31	0,0644	0,0788	71,60	115,99
16	560,21	71,61	159,20	21,72	0,0631	0,0837	71,84	118,23
17	576,10	71,54	161,99	21,04	0,0617	0,0877	71,43	120,73
18	585,59	71,62	163,47	20,43	0,0637	0,0853	71,59	124,47
19	593,58	71,88	164,85	19,82	0,0617	0,0828	72,19	127,45
20	598,53	72,30	165,59	19,22	0,0626	0,0797	72,79	130,72
21	606,19	72,36	166,92	18,62	0,0610	0,0843	72,67	133,07
22	621,04	72,36	170,35	18,04	0,0621	0,0868	72,26	135,72
23	634,56	72,30	173,24	17,44	0,0629	0,0881	72,19	139,42
24	642,95	72,30	174,26	16,93	0,0612	0,0848	72,49	142,55
25	649,17	72,25	175,08	16,34	0,0612	0,0892	72,78	145,69
26	648,69	72,26	174,56	15,74	0,0622	0,0828	72,30	147,83
27	645,37	72,31	174,20	15,24	0,0642	0,0884	72,44	149,68
28	647,98	72,33	173,75	14,73	0,0629	0,0850	72,78	151,29
29	649,68	72,39	174,42	14,24	0,0631	0,0961	73,04	152,91
30	650,74	72,54	174,69	13,83	0,0621	0,0811	72,78	154,38
31	648,26	72,52	173,24	13,35	0,0624	0,0842	73,10	155,43
32	640,97	72,55	172,27	12,85	0,0629	0,0870	72,75	155,38
33	630,75	72,48	169,90	12,56	0,0633	0,0829	72,51	155,00
34	620,52	72,40	167,55	12,24	0,0629	0,0864	72,69	153,90
35	610,87	72,38	165,90	11,86	0,0631	0,0851	72,82	152,92
36	603,15	72,38	164,45	11,54	0,0643	0,0932	72,94	151,22
37	597,32	72,40	163,63	11,25	0,0631	0,0757	73,31	149,76
38	593,26	72,37	163,19	10,84	0,0649	0,0789	72,13	148,95
39	590,51	72,39	162,62	10,55	0,0631	0,0781	73,66	148,28
40	586,21	72,32	161,92	10,26	0,0642	0,0775	72,45	147,45
41	580,76	72,37	159,81	9,95	0,0642	0,0799	72,26	146,63
42	575,55	72,42	158,97	9,66	0,0628	0,0774	72,59	145,88
43	569,69	72,44	157,93	9,37	0,0642	0,0843	72,40	145,38
44	564,44	72,45	156,75	9,15	0,0644	0,0804	72,49	144,52
45	556,86	72,50	155,32	8,86	0,0649	0,0793	72,65	143,57
46	550,23	72,59	153,91	8,66	0,0649	0,0815	72,77	142,50
47	544,72	72,69	152,84	8,45	0,0658	0,0783	73,34	141,41
48	539,21	72,84	151,68	8,26	0,0655	0,0766	73,18	140,69
49	534,07	72,83	150,67	8,06	0,0646	0,0750	72,77	139,43
50	553,78	72,94	164,83	17,36	0,0642	0,0828	72,72	138,62
51	567,65	73,18	172,90	49,18	0,0646	0,0858	72,80	138,74
52	597,25	73,15	174,38	48,47	0,0623	0,0901	72,79	141,03
53	621,45	73,13	178,14	47,77	0,0626	0,0935	72,61	144,90
54	640,73	73,11	180,70	47,17	0,0633	0,0895	72,85	149,17
55	655,87	73,11	183,10	46,47	0,0626	0,0947	73,38	153,08
56	668,41	73,16	184,53	45,89	0,0619	0,0884	73,13	156,62
57	678,53	73,20	186,01	45,18	0,0617	0,0928	72,98	160,18
58	686,04	73,15	187,15	44,58	0,0629	0,0916	73,67	163,31
59	690,50	73,17	187,53	43,98	0,0624	0,0909	73,29	165,69
60	691,48	73,33	187,66	43,37	0,0614	0,0965	73,04	167,80
61	692,56	73,43	187,78	42,88	0,0617	0,0945	73,16	169,43
62	692,35	73,39	187,71	42,18	0,0617	0,0937	73,47	170,83
63	691,90	73,44	187,08	41,67	0,0621	0,0963	73,32	171,45
64	692,59	73,41	187,74	41,20	0,0617	0,0891	72,86	172,45
65	694,69	73,53	187,90	40,59	0,0631	0,0950	74,38	173,09

## preburn

66	695,61	73,42	187,91	40,08	0,0619	0,0943	73,71	174,13
67	696,24	73,54	188,12	39,49	0,0617	0,0960	73,57	174,87
68	696,86	73,56	188,27	39,01	0,0624	0,0904	73,18	175,18
69	697,81	73,53	188,33	38,50	0,0612	0,0932	73,69	175,60
70	698,84	73,61	188,48	37,99	0,0619	0,0899	73,16	176,23
71	700,89	73,75	189,42	37,51	0,0610	0,0937	73,83	177,02
72	700,05	73,84	189,26	36,90	0,0619	0,0908	73,29	177,50
73	700,51	73,80	188,91	36,38	0,0633	0,0928	73,83	178,06
74	701,11	73,73	188,51	35,91	0,0626	0,0939	73,64	178,36
75	701,40	73,70	189,18	35,40	0,0621	0,0966	73,25	178,99
76	702,14	73,95	188,96	34,90	0,0631	0,0954	73,56	179,52
77	703,00	74,04	188,96	34,41	0,0617	0,0914	73,62	179,75
78	706,55	74,00	189,51	33,89	0,0624	0,0913	73,80	180,72
79	708,08	74,02	190,03	33,30	0,0621	0,0974	74,00	181,07
80	711,41	74,13	190,67	32,81	0,0617	0,0945	73,95	181,50
81	713,70	74,25	191,47	32,30	0,0626	0,0929	73,66	182,60
82	715,57	74,30	191,62	31,80	0,0619	0,0952	73,63	183,32
83	717,85	74,34	191,92	31,21	0,0624	0,0914	74,48	183,98
84	718,72	74,37	192,66	30,71	0,0631	0,0928	73,67	185,13
85	718,68	74,40	192,50	30,20	0,0620	0,0918	74,32	185,13
86	719,04	74,45	192,16	29,72	0,0614	0,0943	74,14	186,45
87	717,87	74,52	191,93	29,11	0,0621	0,0935	74,50	186,69
88	718,23	74,42	191,51	28,71	0,0631	0,0935	74,71	186,94
89	715,54	74,60	191,61	28,22	0,0602	0,0935	74,07	187,44
90	712,32	74,79	190,41	27,81	0,0624	0,0972	74,31	187,70
91	712,32	74,64	190,08	27,33	0,0623	0,0946	73,78	187,44
92	710,98	74,86	189,45	26,83	0,0621	0,0952	74,23	187,80
93	708,86	74,87	189,18	26,43	0,0614	0,0909	74,93	187,83
94	706,89	75,02	188,60	25,92	0,0606	0,0899	74,38	188,20
95	705,03	75,02	187,56	25,42	0,0621	0,0910	74,05	187,91
96	704,20	75,07	187,31	25,03	0,0631	0,0923	74,62	188,32
97	704,47	75,08	187,04	24,62	0,0631	0,0929	74,60	188,35
98	701,92	75,09	187,26	24,13	0,0626	0,0919	75,61	188,82
99	701,02	75,14	186,62	23,73	0,0621	0,0957	75,36	188,35
100	699,73	75,05	186,20	23,34	0,0631	0,0917	74,32	188,22
101	697,38	75,17	185,90	22,84	0,0629	0,0950	74,90	188,47
102	695,42	75,13	185,22	22,42	0,0639	0,0924	75,49	188,62
103	694,94	75,08	184,69	22,03	0,0634	0,0921	75,02	188,04
104	695,51	75,06	184,23	21,67	0,0631	0,0947	74,78	188,38
105	692,65	75,22	184,00	21,23	0,0619	0,0899	75,51	188,11
106	691,47	75,13	183,03	20,93	0,0644	0,0917	74,28	187,81
107	688,91	75,08	181,86	20,53	0,0649	0,0901	74,62	187,54
108	687,15	75,33	181,76	20,13	0,0644	0,0906	75,48	188,21
109	684,18	75,51	180,94	19,73	0,0649	0,0867	74,77	187,37
110	681,34	75,56	180,29	19,45	0,0631	0,0899	75,50	187,22
111	677,94	75,48	179,43	19,13	0,0631	0,0852	75,17	186,95
112	673,39	75,48	177,76	18,84	0,0651	0,0883	74,94	186,09
113	669,47	75,49	176,41	18,44	0,0639	0,0917	78,24	185,13
114	663,33	75,38	176,10	18,24	0,0624	0,0835	74,71	184,49
115	658,35	75,56	174,20	17,95	0,0647	0,0850	74,65	183,18
116	650,23	75,58	172,72	17,64	0,0624	0,0901	74,91	181,81
117	640,96	75,54	170,48	17,44	0,0641	0,0808	74,83	179,99
118	632,22	75,72	169,34	17,15	0,0644	0,0875	74,95	177,55
119	622,87	75,55	167,34	16,94	0,0656	0,0821	75,75	175,44
120	613,78	75,46	165,82	16,75	0,0649	0,0908	75,28	173,01
121	604,70	75,48	164,50	16,55	0,0655	0,0823	75,46	171,15
122	597,29	75,63	162,86	16,35	0,0651	0,0831	75,17	168,77
123	590,76	75,77	161,65	16,24	0,0653	0,0774	75,81	167,50
124	584,03	75,91	160,45	16,04	0,0651	0,0859	75,64	165,54
125	579,22	75,88	159,34	15,84	0,0650	0,0777	75,32	164,25
126	574,10	75,99	158,90	15,65	0,0656	0,0781	75,84	162,48
127	569,68	76,24	157,80	15,44	0,0649	0,0815	75,98	161,29
128	565,20	76,15	156,81	15,34	0,0649	0,0798	75,74	160,33
129	562,09	76,13	156,78	15,15	0,0651	0,0777	75,72	159,21
130	558,24	76,06	156,00	14,95	0,0649	0,0822	76,43	158,27
131	556,66	76,06	155,58	14,86	0,0661	0,0789	75,35	157,39
132	553,81	76,14	154,43	14,64	0,0653	0,0785	76,15	156,81
133	550,07	76,36	153,44	14,45	0,0690	0,0802	76,27	156,44

## preburn

134	547,65	76,39	148,07	14,35	0,0836	0,0762	76,14	155,72
135	544,00	76,29	146,62	14,25	0,0839	0,0766	75,86	155,11
136	540,80	76,41	145,63	14,06	0,0839	0,0701	75,68	154,55
137	536,79	76,37	144,54	13,94	0,0837	0,0787	76,37	153,93
138	532,91	76,34	143,74	13,84	0,0856	0,0764	76,13	152,99
139	529,48	76,30	143,22	13,65	0,0846	0,0789	76,19	152,06
140	526,81	76,39	142,11	13,55	0,0849	0,0760	75,91	151,20
141	525,06	76,20	142,26	13,46	0,0837	0,0760	76,06	150,91
142	523,78	76,04	142,28	13,36	0,0863	0,0718	76,18	150,26
143	521,50	76,21	141,51	13,26	0,0849	0,0735	76,02	149,84
144	519,65	76,28	141,43	12,95	0,0846	0,0796	75,95	149,24
145	518,20	76,40	141,46	12,95	0,0846	0,0744	76,22	148,85
146	515,66	76,52	140,90	12,75	0,0851	0,0730	76,33	148,64
147	513,34	76,53	140,43	12,65	0,0863	0,0707	76,12	148,24
148	512,29	76,59	140,53	12,51	0,0842	0,0758	76,23	147,60
149	510,08	76,62	140,16	12,46	0,0839	0,0691	75,89	147,47
150	508,56	76,59	139,73	12,25	0,0862	0,0777	76,25	146,77
151	505,69	76,67	139,26	12,15	0,0849	0,0750	76,25	146,83
152	502,32	76,67	138,99	12,94	0,0869	0,0722	76,40	146,15
153	424,52	76,78	117,57	12,05	0,0890	0,0586	76,67	145,17
154	362,04	76,80	108,26	11,95	0,0875	0,0555	76,64	144,00
155	333,00	76,88	104,03	11,96	0,0883	0,0543	76,71	142,44
156	314,81	76,88	101,43	11,96	0,0895	0,0518	76,64	141,04
157	301,07	76,89	99,90	11,86	0,0883	0,0503	76,90	139,84
158	289,36	76,99	98,58	11,76	0,0886	0,0496	76,93	138,43
159	279,81	76,98	97,50	11,76	0,0886	0,0479	76,83	137,26
160	271,60	76,93	96,24	11,66	0,0888	0,0471	76,81	136,17
161	264,18	76,92	95,75	11,66	0,0893	0,0461	77,56	135,31
162	258,25	76,88	95,01	11,66	0,0903	0,0447	76,72	133,91
163	252,69	76,87	94,40	11,66	0,0898	0,0437	76,32	132,62
164	247,62	76,92	93,90	11,66	0,0906	0,0428	76,71	131,69
165	243,19	76,84	93,38	11,66	0,0883	0,0421	76,88	130,69
166	239,02	76,94	93,12	11,56	0,0895	0,0416	76,64	129,84
167	235,59	76,92	92,53	11,54	0,0874	0,0410	76,72	129,07
168	232,01	76,78	92,12	11,55	0,0886	0,0399	76,66	128,20
169	228,54	76,82	92,02	11,55	0,0901	0,0396	76,48	127,36
170	225,51	76,75	91,51	11,45	0,0913	0,0392	77,08	126,56
171	222,48	76,90	91,47	11,45	0,0888	0,0384	76,85	125,91
172	219,91	77,09	91,31	11,35	0,0920	0,0379	76,98	125,24
173	217,13	77,12	91,08	11,35	0,0897	0,0372	77,41	124,62
174	214,62	77,16	90,74	11,35	0,0901	0,0370	77,71	124,17
175	212,12	77,00	90,42	11,34	0,0895	0,0364	76,49	123,12
176	210,00	76,96	90,22	11,26	0,0886	0,0359	76,98	122,49
177	207,85	76,78	89,99	11,25	0,0890	0,0357	76,64	121,68
178	205,52	76,77	89,73	11,25	0,0901	0,0352	76,26	120,97
179	203,53	76,92	89,87	11,16	0,0890	0,0349	77,03	120,53
180	201,74	76,88	89,56	11,15	0,0910	0,0345	76,77	120,00
181	200,00	76,88	89,60	11,16	0,0886	0,0344	76,97	119,48
182	197,89	76,94	89,40	11,06	0,0895	0,0335	77,13	119,19
183	196,21	77,02	89,23	11,06	0,0901	0,0333	77,16	118,63
184	194,34	77,07	89,14	11,06	0,0920	0,0328	77,17	118,05
185	192,72	77,08	89,01	11,06	0,0893	0,0328	76,90	117,56
186	190,98	77,17	88,86	11,06	0,0903	0,0323	77,77	117,56
187	189,38	76,98	88,70	10,96	0,0902	0,0323	77,06	117,08
188	187,74	76,85	88,61	10,96	0,0903	0,0315	76,68	116,23
189	186,19	76,80	88,60	10,96	0,0901	0,0311	76,79	115,76
190	184,59	76,93	88,49	10,85	0,0920	0,0304	77,14	115,30
191	182,98	76,82	88,24	10,96	0,0899	0,0306	76,68	114,94
192	181,30	76,96	88,03	10,84	0,0883	0,0299	76,91	114,51
193	179,73	76,96	88,00	10,84	0,0901	0,0294	77,09	114,16
194	178,32	77,01	87,92	10,84	0,0918	0,0291	77,11	113,72
195	177,05	77,07	87,86	10,85	0,0907	0,0284	77,26	113,43
196	175,44	77,13	87,76	10,75	0,0910	0,0282	76,75	113,13
197	173,98	77,21	87,63	10,75	0,0892	0,0279	77,11	112,86
198	172,87	77,21	87,57	10,75	0,0912	0,0277	77,11	112,46
199	171,53	77,28	87,66	10,75	0,0903	0,0273	77,67	112,28
200	170,35	77,40	87,50	10,65	0,0883	0,0272	77,80	111,86
201	169,08	77,48	87,52	10,75	0,0889	0,0272	77,89	111,76



DATA 2022-08-17 EPA PI 20275 RUN 4 CAT 2  
preburn

202	168,08	77,59	87,39	10,75	0,0913	0,0264	77,83	111,56
203	166,82	77,60	87,50	10,65	0,0895	0,0263	77,85	111,20
204	166,11	77,62	87,45	10,65	0,0890	0,0262	77,51	110,85
205	165,08	77,55	87,35	10,65	0,0901	0,0262	77,44	110,40
206	164,04	77,50	87,27	10,65	0,0888	0,0255	77,84	110,09
207	163,19	77,60	87,29	10,59	0,0878	0,0257	77,49	109,80
208	162,12	77,54	87,16	10,55	0,0903	0,0252	77,60	109,71
209	161,35	77,48	87,09	10,56	0,0879	0,0250	76,97	109,25
210	160,20	77,54	87,06	10,55	0,0901	0,0248	77,98	109,12
211	159,43	77,57	86,99	10,55	0,0898	0,0248	77,91	108,95
212	158,72	77,65	87,01	10,45	0,0906	0,0248	78,37	108,82
213	157,69	77,60	86,81	10,45	0,0903	0,0240	77,84	108,61
214	156,69	77,54	86,88	10,46	0,0918	0,0243	77,52	108,37
215	155,07	77,55	86,78	10,36	0,0895	0,0235	77,61	118,85
216	154,09	77,51	86,75	10,36	0,0920	0,0239	77,91	129,77

Date: 2022-08-17 Manufacturer: vs stove Model: HB/520  
 Project #: PT 20275 Run: 4 Tech: MP Reviewer: TP

- kindling 126 LBS start fire
- Door open, Fan on with restriction and Damper open
- At 900 LBS insert 1400 LBS kindling
- At 2300 LBS close Door Front Damper and Remove restriction on the Fan
- At 800 LBS insert preload
- close Door immediately
- At 121 LBS close Fan (air inlet)
- At 105 LBS insert load
- At 6 min close Door and Fan
- turn Fan on After 413 minutes  
(out put average 23k Btu/hr)

TEST LOAD CONFIGURATION

8 1/4

872	883	823
849	887	812
846	876	836

# PRE / POST CHECKS

Date: 2022-08-17 Manufacturer: US Stove Model: HB 1520  
 Project #: PI 20275 Run: 4 Tech: MM Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM 334	7:00	ok	ok

**Facility Conditions:**

Air Velocity from less than 2 feet .....  
 Smoke Capture Check (tunnel velocity).....  
 Picture.....

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

**Wood Heater Conditions:**

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

2022-08-09
2022-08-09
ok
ok

**Temperature System:**

Ambient (65°-90°F).....

ok	°F
----	----

**Proportional Checks:**

Thermocouple check.....  
 Pitot Clean.....  
 Pitot verification.....  
 Pictures for report.....

	ok
	ok
	ok
Side	ok
Coal bed	ok
Load	ok
Load in stove	ok
Fuel adjustment	ok
	ok

Load Length approximately 5/6 of firebox Length.....

Date: 2022-08-17 Manufacturer: US Stove Model: HB1520  
 Project #: PT 20275 Run: 4 Tech: Mr Reviewer: [Signature]

**Leakage Checks Tunnel Samplers**

Unplugged Flow Rate = .25cfm	System 1 <sup>st</sup> hour		System 1		System 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)
Vacuum (inches Hg.)	-10	-10	-10	-10	-10	-10
Final Imminute DGM (Liter)	677731 99	680983 86	677731 13	680984 06	425823 49	429038 28
Initial Imminute DGM (Liter)	677731 99	680983 83	677731 12	680984 03	425823 48	429038 26
Change (Liter)	Ø	003	001	003	001	002
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	0.20	0.20	0.20	0.20	0.20	0.20
Check OK	OK	OK	OK	OK	OK	OK



Date: 2022-08-17 Manufacturer: US STOVE Model: AB1520  
 Project #: PT 20275 Run: 4 Tech: MM Reviewer: DO

**Leakage Checks Flue Gas Sampler**

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

**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	.4
Check OK (no change after 15 sec.)	O/K	O/K	O/K	O/K

**Scales checks**

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Platform	EM-205	1000 lbs, Class F	1000 lbs
Wood	EM-090	440 lbs, Class F	440 lbs
Analytical	EM-335 128 mm	100 mg, Class S	100 mg
Analytical	EM-120	200 g, Class S	200 g

**LIMITS OF WEIGHT RANGES**

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

Date: 2022-08-17 Manufacturer: US STOVE Model: AB1520  
 Project #: PI 20275 Run: 4 Tech: MM Reviewer: JP

FOR TUNNELS &lt; 12 in

 Barometric pressure ( $P_{bar}$ ) 1014 (KPa.) Static pressure ( $P_q$ ) 029 (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	0.071	82.61
B - Centroid	3.00	3.50	4	0.070	82.54
A-1	0.40	0.50	0.50	0.057	82.61
A-2	1.50	1.75	2	0.068	82.81
A-3	4.50	5.25	6	0.060	82.56
A-4	5.60	6.5	7.5	0.058	82.56
B-1	0.40	0.50	0.50	0.057	82.58
B-2	1.50	1.75	2	0.078	82.51
B-3	4.50	5.25	6	0.059	82.48
B-4	5.60	6.5	7.5	0.056	82.48
				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.

Date: 2022-08-17      Manufacturer: US STOVE      Model: H31520  
 Project #: PI 20275      Run: 4      Tech: MR      Reviewer: DP

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

	ZERO		SPAN		CAL. (Record Only)	
	Actual	Should Be	Actual	Should Be	Actual	Should Be
CO	0	0	3018	3000	1027	1000
Tolerance CO	0	+/- 0.02	0018	+/- 0.15	0027	+/- 0.05
CO <sub>2</sub>	0	0	1795	1800	987	1000
Tolerance CO <sub>2</sub>	0	+/- 0.02	005	+/- 0.5	013	+/- 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	3008	1019 100 MR	0	0.02	6018	0.15	0008 MR	0.05	✓	
CO <sub>2</sub>	0	1789	990	0	0.02	606	0.5	003	0.5	✓	



Date: 2022-08-17 Manufacturer: US stove Model: HB 1520  
 Project #: PT 20275 Run: 4 Tech: MM Reviewer: JP

**RAW DRY GAS METER READINGS**

	System 1	System 2	Blank
Final (Liter)	680 983 48	429 037 12	401 996 80
Initial (Liter)	677 731 91	425 823 44	399 472 88

**AMBIENT CONDITIONS**

	Before	After
Barometer (kPa):	101.4	100.8
Dry Bulb (F):	74.9	82.3
Humidity (%):	<sup>MM</sup> 74 554	52.6

**Flow Meter**

	Start	End
Flow meter reading	N.A	N.A

**Flow Meter Verification**

	Before	After
Flow meter Check (liters)	N.A	N.A
Scale Weight ( Kg)	N.A	N.A



### FUEL DATA

Date: 2022-08-17 Manufacturer: VS Stove Model: HB1520  
 Project #: PI 20275 Run: 4 Tech: MM Reviewer: DP

**FUEL DESCRIPTION:**

Type of wood:

**PRE-TEST LOAD**

Piece Size	Weight	Meter Moisture Content (% dry)*			
525 x 4.00 x 20 in.	678 lbs.	196	196	196	196
375 x 4.00 x 20 in.	702 lbs.	196	196	193	196
500 x 4.00 x 20 in.	744 lbs.	243	211	211	193
400 x 5.00 x 20 in.	576 lbs.	274	203	203	196
450 x 4.50 x 20 in.	750 lbs.	274	196	196	243
450 x 4.00 x 20 in.	738 lbs.	211	198	198	201
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.				
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.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				

TEST LOAD WEIGHT: 4186 lbs

## FUEL DATA

Date: 2022-08-17      Manufacturer: US Stove      Model: 4B1520  
 Project #: PL 20275      Run: 4      Tech: MM      Reviewer: DL

### FUEL DESCRIPTION:

Type of wood :

### TEST LOAD

Piece Size		Weight	Meter Moisture Content (% dry)*				
3 3/4	x 3,00 x 20 in.	560 lbs.	191		194		193
3.00	x 3.25 x 20 in.	546 lbs.	193		194		196
4.50	x 4.25 x 20 in.	538 lbs.	201		204		206
4.25	x 5.00 x 20 in.	862 lbs.	211		213		196
5.50	x 4.25 x 20 in.	874 lbs.	204		193		194
5.00	x 5.00 x 20 in.	876 lbs.	271		223		194
	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.					
	x x in.	lbs.					
	x x in.	lbs.					
	x x in.	lbs.					
	x x in.	lbs.					
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	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.					

**TEST LOAD WEIGHT:** 4252 lbs    Min 20%: 425      Max 25%: 1063





# DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-08-16      Manufacturer: US stove      Model: HB/S20  
 Project #: PI 20275      Run: 4      Tech: MM      Reviewer: MP

		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1				
Pre-test Weight Record	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank	
		001	638	639	15	16	640	641	29	644	
2022-08-16	17:00	610941	01810		345855	1087515	01798		342798	00903	
2022-08-17	9:00	610942	01810		345854	1087516	01798		342799	00902	

		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1				
Post-test Weight Record	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank	
		001	638	639	15	16	640	641	29	644	
2022-08-17	21:00	610953	01876		345872	1087524	01825		342822	00905	
2022-08-23	9:00	610944	01862		345856	1087518	01818		342801	00903	
2022-08-24	9:00	610944	01862		345855	1087517	01818		342800	00903	



# DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-08-16      Project #: PI 20175 Run: 4      Manufacturer: US Stove      Model: HB1520  
 Tech: MM      Reviewer: PO

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	21	642	643	30
2022-08-16	17:00	108 7372	01807		34 6902
2022-08-17	9:00	108 7372	01807		34 6903

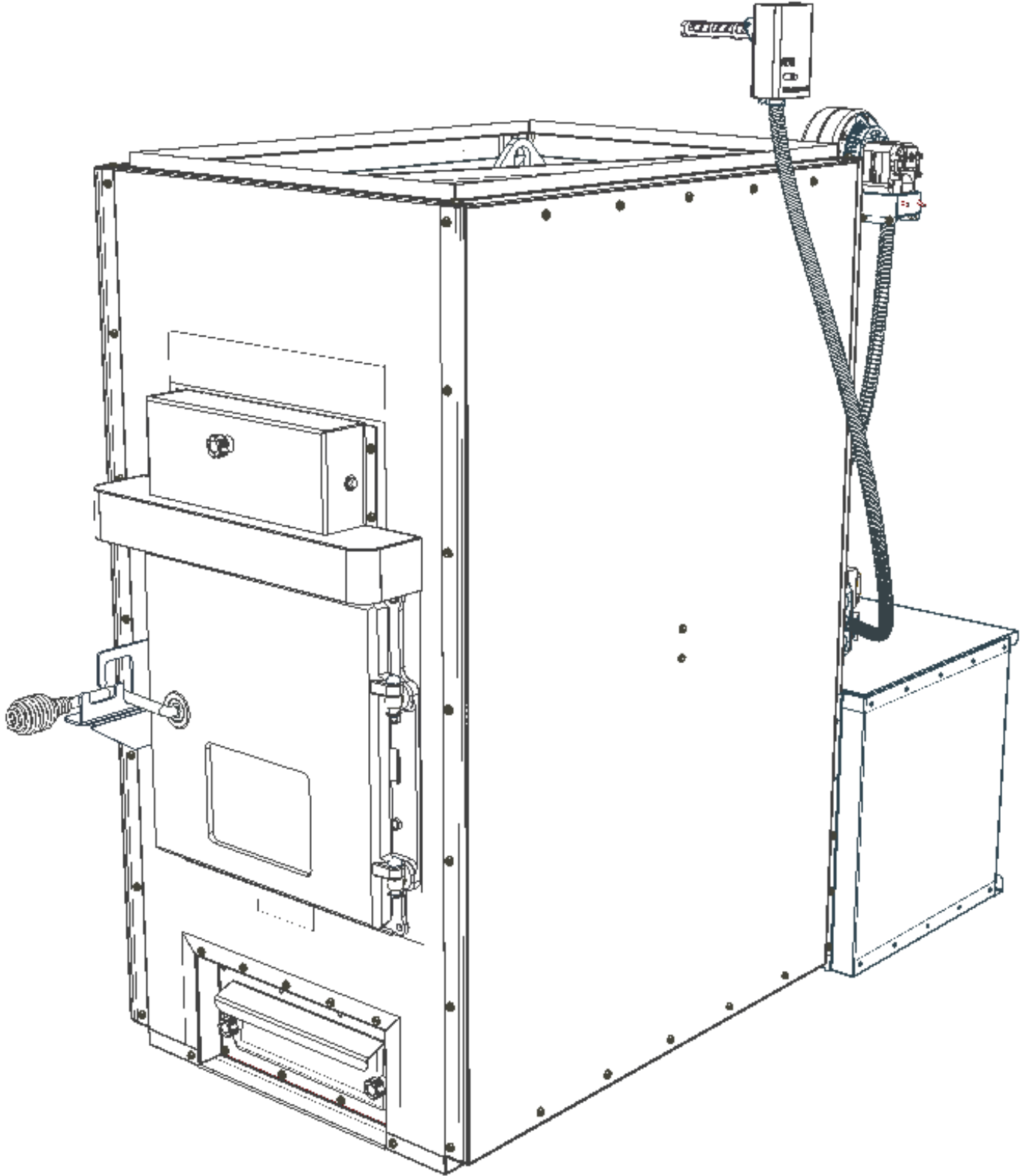
SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	21	642	643	30
2022-08-17	21:00	108 7386	01886		34 6917
2022-08-23	9:00	108 7374	01874		34 6905
2022-08-24	9:00	108 7373	01875		34 6905

## **Appendix 3    Drawing and specifications**

# UNITED STATES STOVE COMPANY

## MODEL 1520

EPA DOCUMENTATION



## **Appendix 4    Equipment list and calibration certificates**

## TEST DATA PACKAGE

CLIENT	USSC	PROJECT NUMBER	PI-20275
PRODUCT	Cord wood furnace	SAMPLE ID#	QI-20422
MODEL	HB-520		
STANDARDS	EPA ALT-134, CSAB415.1-10, ASTM E2515-11		

## TEST EQUIPMENT

ITEM	EQUIPMENT TYPE	MANUFACTURER	EQUIPMENT #	CALIBRATION DUE DATE	COMPLIES WITH STANDARD REQUIREMENTS
1	Digital Manometer	Dwyer	EM-006	2023 May	Y
2	Digital Manometer	Dwyer	EM-249	2023 May	Y
3	Data acquisition System	Keithley	EM-147	2023 May	Y
4	analytical scale 200gr.	Ohaus	EM-051	2022 September	Y
5	Weight 2kg	N/A	EM-090	2027 MARS	Y
6	Pitot tube	Dwyer	EM-296	Verification before use	Y
7	Scale 0-1000lbs Rough Deck	Rice lake	EM-114 / EM-137	2022 December	Y
8	Gas analyzer	Siemen's	EM-118	Verification before use	Y
9	Vacuum gauge	Dwyer	EM-126	2023 May	Y
10	Vacuum gauge	Dwyer	EM-127	2023 May	Y
11	Calibration weight 100mg	Troemer	EM-335	2027-MARS	y
12	Calibration weight 200g	Troemer	EM-129	2027 MARS	Y
13	Temp. humidity meter	Fluke	EM-136	2023 May	Y
14	Digital manometer	Dwyer	EM 313	2023 May	Y
15	Measuring tape	Stanley	EM-224	2023 May	Y
16	Chronometer	Extech	EM-175	2022 December	Y
17	Dry gas meter	Shinagawa	EM-178	2023 january	Y
18	Dry gas meter	Shinagawa	EM-179	2023 january	Y
19	Calibration gas	Praxair	EM-336	2030	Y
20	Calibration gas	Praxair	EM-338	2030	Y
21	Thermometer	Fluke	EM-001	2023MAY	Y
22	20 channel card & Thermocouple	Keithley	EM-015	2022 nov	Y
23	20 channel card & Thermocouple	Keithley	EM-154	2022 nov	Y
24	Dry gas meter	Shinagawa	EM-318	2023 January	Y
25	Barometer	Control company	EM 304	2022 December	Y
26	Hot wire	testo	EM 332	2022-September	Y
27	Weight 10kg	N/A	EM-205	2026 MARS	Y
28	Calibration block	Delmhorst	EM-334	2023 January	Y
29	Vane anemometer	Omega	EM-153	2023 January	y





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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>		<b>CE-EM-006 2022-05-10</b>	
<b>CLIENT</b>		<b>CALIBRATION SPECIFICATION</b>	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	4IN9106
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/-0.25"H2O
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	365
<b>INSTRUMENT SPECIFICATION</b>			
<b>Instrument Type:</b>	Indicator	<b>Input Type:</b>	Pression
<b>Manufacturer:</b>	Dwyer	<b>Output Type:</b>	Digitale
<b>Model #:</b>	MS-321-LCD	<b>Measurement Type:</b>	Pressure
<b>Serial #:</b>	E47U020014	<b>Range:</b>	0-0.5"H2O
<b>Location:</b>	N.A.	<b>Version:</b>	
<b>CALIBRATORS SPECIFICATION</b>			
<b>Calibrator:</b>	Fluke Pression	<b>Certification #:</b>	2021008414
<b>Serial #:</b>	3330050	<b>Certification Date:</b>	2021-11-22
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2022-11-22
<b>Comments:</b>			
<b>Calibrator:</b>	Fluke 744	<b>Certification #:</b>	2022001379
<b>Serial #:</b>	8223003	<b>Certification Date:</b>	2022-02-18
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2022-05-18
<b>Comments:</b>			





# CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-006 2022-05-10</b>
----------------------	-----------------------------

CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
<b>Conformity</b>	<b>Comment</b>					
0.0000 "H2O Compliant	0.000 "H2O	-0.012 "H2O	-0.012 "H2O	-0.012 "H2O	+/-0.25 "H2O	0.10 "H2O
Verification of the indicator						
0.2500 "H2O Compliant	0.250 "H2O	0.237 "H2O	-0.013 "H2O	0.237 "H2O	+/-0.25 "H2O	0.10 "H2O
Verification of the indicator						
0.5000 "H2O Compliant	0.500 "H2O	0.488 "H2O	-0.012 "H2O	0.488 "H2O	+/-0.25 "H2O	0.10 "H2O
Verification of the indicator						
0.7500 "H2O Compliant	0.750 "H2O	0.742 "H2O	-0.008 "H2O	0.742 "H2O	+/-0.25 "H2O	0.10 "H2O
Verification of the indicator						
1.0000 "H2O Compliant	1.000 "H2O	0.989 "H2O	-0.011 "H2O	0.989 "H2O	+/-0.25 "H2O	0.10 "H2O
Verification of the indicator						
0.0000 "H2O Compliant	0.0000 V.DC.	0.0004 V.DC.	+0.0004 V.DC.	0.0004 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Verification of the analogic output						
0.2500 "H2O Compliant	2.5000 V.DC.	2.3569 V.DC.	-0.1431 V.DC.	2.3569 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Verification of the analogic output						
0.5000 "H2O Compliant	5.0000 V.DC.	4.9466 V.DC.	-0.0534 V.DC.	4.9466 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Verification of the analogic output						
0.7500 "H2O Compliant	7.5000 V.DC.	7.4342 V.DC.	-0.0658 V.DC.	7.4342 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Verification of the analogic output						
1.0000 "H2O Compliant	10.0000 V.DC.	9.8526 V.DC.	-0.1474 V.DC.	9.8526 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Verification of the analogic output						

**Environmental Conditions:** Temperature: N.A. Humidity: N.A.

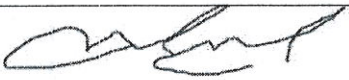
**Comments:**

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-10
<b>Next Calibration:</b>	2023-05-10
<b>Certificate Date:</b>	2022-05-10

CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

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

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). SCC accreditation number: # 669. ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.



Marco Miron - Technicien

*Handwritten signature and date: May 2022*





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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>		<b>CE-EM-001 2022-05-10</b>	
<b>CLIENT</b>		<b>CALIBRATION SPECIFICATION</b>	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	4IN9105
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/- 2.0°C
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	365
<b>INSTRUMENT SPECIFICATION</b>			
<b>Instrument Type:</b>	Indicator	<b>Input Type:</b>	Temp
<b>Manufacturer:</b>	Fluke	<b>Output Type:</b>	Digitale
<b>Model #:</b>	52-II	<b>Measurement Type:</b>	Temperature
<b>Serial #:</b>	90630037	<b>Range:</b>	Divers
<b>Location:</b>	N.A.	<b>Version:</b>	
<b>CALIBRATORS SPECIFICATION</b>			
<b>Calibrator:</b>	Fluke 744	<b>Certification #:</b>	2022003082
<b>Serial #:</b>	8180008	<b>Certification Date:</b>	2022-04-12
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2023-04-12
<b>Comments:</b>			



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# CALIBRATION CERTIFICATE

CERTIFICATE # CE-EM-001 2022-05-10

CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	Comment					
0.0 °C	0.0 °C	0.1 °C	+0.1 °C	0.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T1 typeJ					
125.0 °C	125.0 °C	125.1 °C	+0.1 °C	125.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T1 typeJ					
250.0 °C	250.0 °C	250.1 °C	+0.1 °C	250.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T1 typeJ					
375.0 °C	375.0 °C	375.1 °C	+0.1 °C	375.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T1 typeJ					
500.0 °C	500.0 °C	500.1 °C	+0.1 °C	500.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T1 typeJ					
0.0 °C	0.0 °C	0.2 °C	+0.2 °C	0.2 °C	+/- 2 °C	0.2 °C
Compliant	T2 typeJ					
125.0 °C	125.0 °C	125.1 °C	+0.1 °C	125.1 °C	+/- 2 °C	0.2 °C
Compliant	T2 typeJ					
250.0 °C	250.0 °C	250.1 °C	+0.1 °C	250.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T2 typeJ					
375.0 °C	375.0 °C	375.1 °C	+0.1 °C	375.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T2 typeJ					
500.0 °C	500.0 °C	500.1 °C	+0.1 °C	500.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T2 typeJ					
0.0 °C	0.0 °C	0.2 °C	+0.2 °C	0.2 °C	+/- 2.0 °C	0.3 °C
Compliant	T1 typeK					
125.0 °C	125.0 °C	125.2 °C	+0.2 °C	125.2 °C	+/- 2.0 °C	0.3 °C
Compliant	T1 typeK					
250.0 °C	250.0 °C	250.1 °C	+0.1 °C	250.1 °C	+/- 2.0 °C	0.3 °C
Compliant	T1 typeK					
375.0 °C	375.0 °C	375.1 °C	+0.1 °C	375.1 °C	+/- 2.0 °C	0.3 °C
Compliant	T1 typeK					
500.0 °C	500.0 °C	500.1 °C	+0.1 °C	500.1 °C	+/- 2.0 °C	0.3 °C
Compliant	T1 typeK					
0.0 °C	0.0 °C	0.3 °C	+0.3 °C	0.3 °C	+/- 2.0 °C	0.3 °C
Compliant	T2 typeK					
125.0 °C	125.0 °C	125.2 °C	+0.2 °C	125.2 °C	+/- 2.0 °C	0.3 °C
Compliant	T2 typeK					
250.0 °C	250.0 °C	250.2 °C	+0.2 °C	250.2 °C	+/- 2.0 °C	0.3 °C
Compliant	T2 typeK					
375.0 °C	375.0 °C	375.2 °C	+0.2 °C	375.2 °C	+/- 2.0 °C	0.3 °C
Compliant	T2 typeK					

Version 1





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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-001 2022-05-10</b>
----------------------	-----------------------------

CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
<b>Conformity</b>	<b>Comment</b>					
500.0 °C	500.0 °C	500.1 °C	+0.1 °C	500.1 °C	+/- 2.0 °C	1.0 °C
Compliant	T2 typeK					

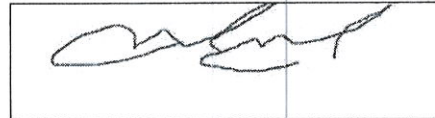
<b>Environmental Conditions:</b>	Temperature: 21 °C	Humidity: 41 %RH
<b>Comments:</b>		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-10
<b>Next Calibration:</b>	2023-05-10
<b>Certificate Date:</b>	2022-05-10

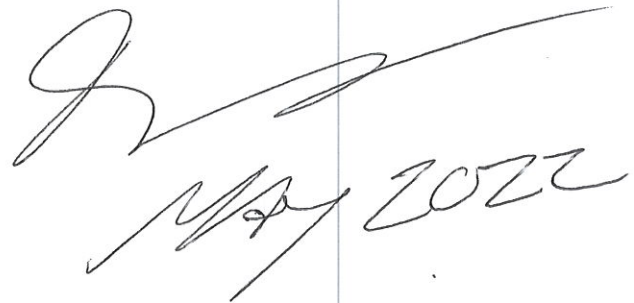
CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

- ▣ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- ▣ Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
- ▣ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
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Marco Miron - Technicien





**Instrumentation  
Saint-Laurent** inc.  
Certified ISO 17025



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(Québec), J0N 1M0  
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Email: inst.st-laurent@videotron.ca

## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-015/2 2022-05-11</b>
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CLIENT	
<b>Company:</b>	Services Polytests Inc
<b>Address:</b>	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

CALIBRATION SPECIFICATION	
<b>Service Procedure:</b>	4IN9101
<b>Required Accuracy:</b>	+/- 4.0°F
<b>Calibration Frequency:(days)</b>	181

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

CALIBRATORS SPECIFICATION			
<b>Calibrator:</b>	Fluke 744	<b>Certification #:</b>	2022003082
<b>Serial #:</b>	8180008	<b>Certification Date:</b>	2022-04-12
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2023-04-12
<b>Comments:</b>			





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# CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-015/2 2022-05-11</b>
----------------------	-------------------------------

CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	Comment					
662.0 °F Compliant	662.0 °F	661.4 °F	-0.6 °F	661.4 °F	+/- 4.0 °F	+/- 0.5 °F
ID. No. 201 (Flue) en type "K" En Loop avec EM-015						
482.0 °F Compliant	482.0 °F	481.4 °F	-0.6 °F	481.4 °F	+/- 4.0 °F	+/- 0.5 °F
ID. No. 202 (Right) en type "K" En Loop avec EM-015						
482.0 °F Compliant	482.0 °F	481.7 °F	-0.3 °F	481.7 °F	+/- 4.0 °F	+/- 0.5 °F
ID. No. 203 (Back) en type "K" En Loop avec EM-015						
482.0 °F Compliant	482.0 °F	481.7 °F	-0.3 °F	481.7 °F	+/- 4.0 °F	+/- 0.5 °F
ID. No. 204 (Bottom) en type "K" En Loop avec EM-015						
482.0 °F Compliant	482.0 °F	481.9 °F	-0.1 °F	481.9 °F	+/- 4.0 °F	+/- 0.5 °F
ID. No. 205 (Top) en type "K" En Loop avec EM-015						
482.0 °F Compliant	482.0 °F	481.8 °F	-0.2 °F	481.8 °F	+/- 4.0 °F	+/- 0.5 °F
ID. No. 206 (Left) en type "K" En Loop avec EM-015						
662.0 °F Compliant	662.0 °F	661.8 °F	-0.2 °F	661.8 °F	+/- 4.0 °F	+/- 0.5 °F
ID. No. 208 (Catalyst down) en type "K" En Loop avec EM-015						
77.0 °F Compliant	77.0 °F	76.7 °F	-0.3 °F	76.7 °F	+/- 4.0 °F	+/- 0.4 °F
ID. No. 215 (DGM 1 In) en type "J" En Loop avec EM-015						
77.0 °F Compliant	77.0 °F	76.7 °F	-0.3 °F	76.7 °F	+/- 4.0 °F	+/- 0.4 °F
ID. No. 216 (DGM 1 Out) en type "J" En Loop avec EM-015						
77.0 °F Compliant	77.0 °F	76.8 °F	-0.2 °F	76.8 °F	+/- 4.0 °F	+/- 0.4 °F
ID. No. 217 (DGM 2 In) en type "J" En Loop avec EM-015						
77.0 °F Compliant	77.0 °F	76.8 °F	-0.2 °F	76.8 °F	+/- 4.0 °F	+/- 0.4 °F
ID. No. 218 (DGM 2 Out) en type "J" En Loop avec EM-015						

<b>Environmental Conditions:</b>	Temperature: 21 °C	Humidity: 42 %RH
<b>Comments:</b>		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-11
<b>Next Calibration:</b>	2022-11-11
<b>Certificate Date:</b>	2022-05-11

CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

- ▣ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- ▣ Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
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- ▣ The date format used in this certificate is: YYYY-MM-DD.



Instrumentation  
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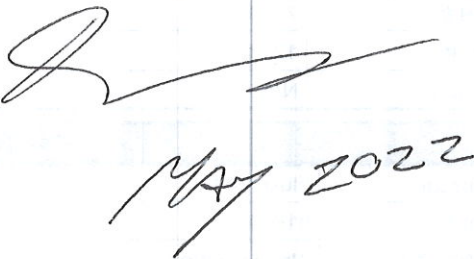
## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-015/2 2022-05-11</b>
----------------------	-------------------------------

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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-015 2022-05-11</b>
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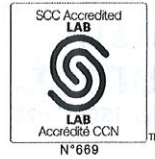
CLIENT		CALIBRATION SPECIFICATION	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	4IN9101
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/- 2°C
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	365

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

CALIBRATORS SPECIFICATION			
<b>Calibrator:</b>	Fluke 744	<b>Certification #:</b>	2022003082
<b>Serial #:</b>	8180008	<b>Certification Date:</b>	2022-04-12
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2023-04-12
<b>Comments:</b>			



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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-015 2022-05-11</b>
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CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
<b>Conformity</b>	<b>Comment</b>					
-190.0 °C	-190.0 °C	-190.0 °C	0.0 °C	190.0 °C	+/- 2.0 °C	+/- 0.4 °C
Compliant	Input#1TypeK					
0.0 °C	0.0 °C	0.0 °C	0.0 °C	0.0 °C	+/- 2.0 °C	+/- 0.3 °C
Compliant	Input#1TypeK					
750.0 °C	750.0 °C	750.0 °C	0.0 °C	750.0 °C	+/- 2.0 °C	+/- 0.3 °C
Compliant	Input#1TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+/- 2.0 °C	+/- 0.3 °C
Compliant	Input#2 TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+/- 2.0 °C	+/- 0.3 °C
Compliant	Input#3 TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+/- 2.0 °C	+/- 0.3 °C
Compliant	Input#4 TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+/- 2.0 °C	+/- 0.3 °C
Compliant	Input#5TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+/- 2.0 °C	+/- 0.3 °C
Compliant	Input#6TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+/- 2.0 °C	+/- 0.3 °C
Compliant	Input#7TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+/- 2.0 °C	+/- 0.3 °C
Compliant	Input#8TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+/- 2.0 °C	+/- 0.3 °C
Compliant	Input#9TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+/- 2.0 °C	+/- 0.2 °C
Compliant	Input#10TypeJ					
100.0 °C	100.0 °C	100.1 °C	+0.1 °C	100.1 °C	+/- 2.0 °C	+/- 0.2 °C
Compliant	Input#11TypeJ					
100.0 °C	100.0 °C	100.1 °C	+0.1 °C	100.1 °C	+/- 2.0 °C	+/- 0.2 °C
Compliant	Input#12TypeJ					
100.0 °C	100.0 °C	100.1 °C	+0.1 °C	100.1 °C	+/- 2.0 °C	+/- 0.2 °C
Compliant	Input#13 TypeJ					
100.0 °C	100.0 °C	100.2 °C	+0.2 °C	100.2 °C	+/- 2.0 °C	+/- 0.2 °C
Compliant	Input#14TypeJ					
100.0 °C	100.0 °C	100.1 °C	+0.1 °C	100.1 °C	+/- 2.0 °C	+/- 0.2 °C
Compliant	Input#15 TypeJ					
100.0 °C	100.0 °C	100.2 °C	+0.2 °C	100.2 °C	+/- 2.0 °C	+/- 0.2 °C
Compliant	Input#16TypeJ					
100.0 °C	100.0 °C	100.2 °C	+0.2 °C	100.2 °C	+/- 2.0 °C	+/- 0.2 °C
Compliant	Input#17TypeJ					
100.0 °C	100.0 °C	100.2 °C	+0.2 °C	100.2 °C	+/- 2.0 °C	+/- 0.2 °C
Compliant	Input#18TypeJ					

Version 1





## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-015 2022-05-11</b>
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CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
<b>Conformity</b>	<b>Comment</b>					
100.0 °C	100.0 °C	100.2 °C	+0.2 °C	100.2 °C	+/- 2.0 °C	+/- 0.2 °C
Compliant	Input#19TypeJ					
100.0 °C	100.0 °C	100.1 °C	+0.1 °C	100.1 °C	+/- 2.0 °C	+/- 0.2 °C
Compliant	Input#20TypeJ					
12.000 mA	12.000 mA	12.000 mA	0.000 mA	12.000 mA	+/- 0,100 mA	1.00 mA
Compliant	Input#21					
12.000 mA	12.000 mA	12.000 mA	0.000 mA	12.000 mA	+/- 0,100 mA	1.00 mA
Compliant	Input#22					


<b>Environmental Conditions:</b>	Temperature: 21 °C	Humidity: 42 %RH
<b>Comments:</b>	Test avec EM-147	

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-11
<b>Next Calibration:</b>	2023-05-11
<b>Certificate Date:</b>	2022-05-11

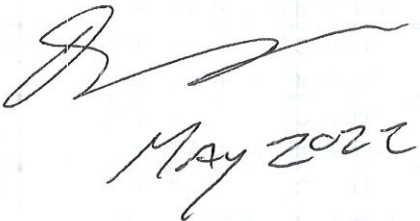
CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

- ▣ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
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Marco Miron - Technicien



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

## Accuracy Calibration Certificate

### Customer

Company: Services Polytests  
Address: 695-B Rue Gaudette  
City: Saint-Jean-Sur-Richelieu Contact: Danick Power  
Zip / Postal: J3B 7S7 Order Number: 0332427627  
State / Province: Quebec

### Weighing Device

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

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

### Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)  
METTLER TOLEDO Work Instruction: 30260953

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

The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight. As Left 350

As Found Calibration Date: 20-04-2022 Service Technician:   
As Left Calibration Date: 20-04-2022  
Issue Date: 20-04-2022  
Next Calibration Date: 31-10-2022 Kamel Mohand Kaci



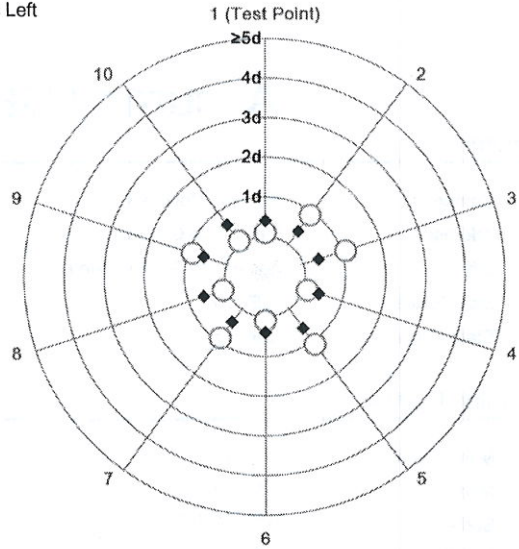
## Measurement Results

### Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0000 g	100.0000 g
2	99.9999 g	100.0000 g
3	100.0001 g	100.0000 g
4	100.0000 g	100.0000 g
5	100.0001 g	100.0001 g
6	100.0000 g	100.0000 g
7	99.9999 g	100.0000 g
8	100.0000 g	100.0001 g
9	99.9999 g	100.0001 g
10	100.0000 g	100.0001 g

○ As Found  
◆ As Left



Standard Deviation	0.00007 g	0.00005 g
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The "d" in the graph represents the readability of the range/interval in which the test was performed.

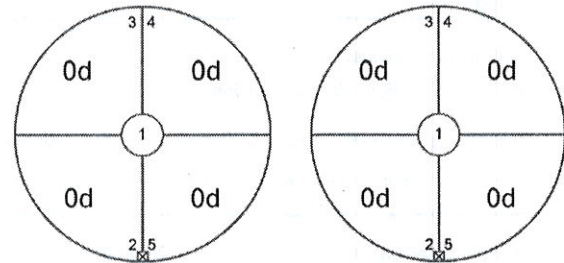
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 100 g

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

Maximum Deviation	0.0000 g	0.0000 g
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As Found

As Left

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

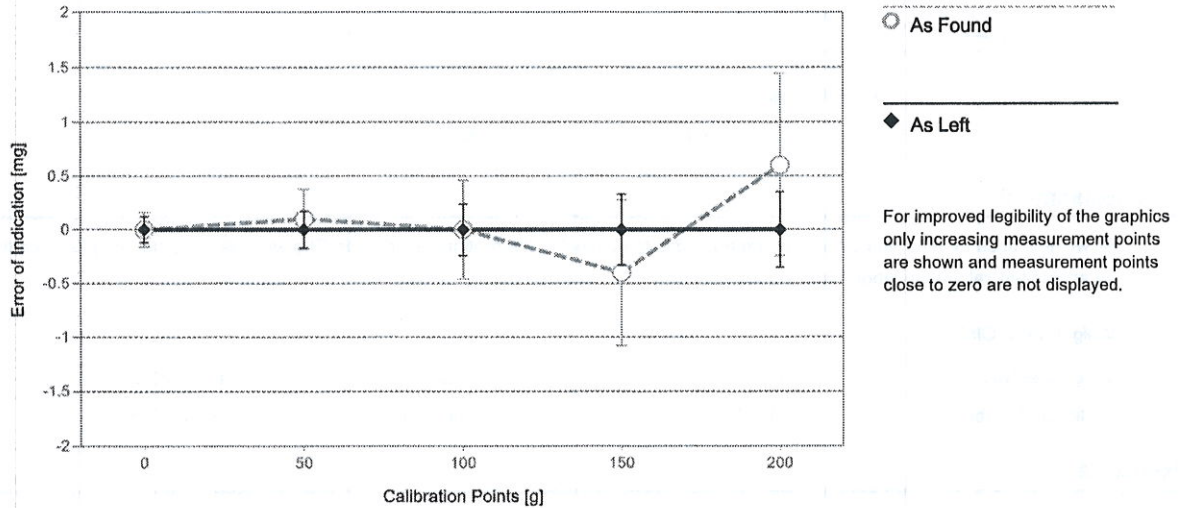
### Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.16 mg	2
2	50.0000 g	50.0001 g	0.0001 g	0.28 mg	2
3	100.0000 g	100.0000 g	0.0000 g	0.46 mg	2
4	150.0000 g	149.9996 g	-0.0004 g	0.68 mg	2
5	200.0001 g	200.0007 g	0.0006 g	0.84 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.12 mg	2
2	50.0000 g	50.0000 g	0.0000 g	0.17 mg	2
3	100.0000 g	100.0000 g	0.0000 g	0.24 mg	2
4	150.0000 g	150.0000 g	0.0000 g	0.33 mg	2
5	200.0001 g	200.0001 g	0.0000 g	0.35 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

**Measurement Uncertainty of the Weighing Instrument in Use**

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

Temperature coefficient for the evaluation of the measurement uncertainty in use: 3.0 · 10<sup>-6</sup> / K

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

Linearization of Uncertainty Equation

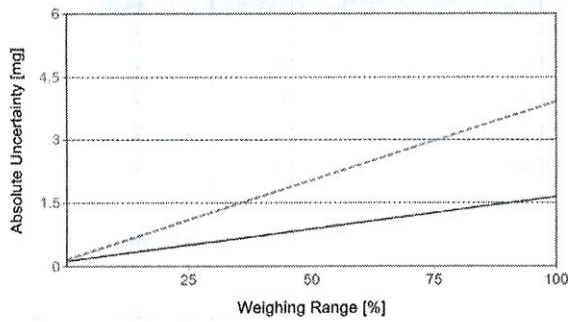
	Range		As Found	As Left
	d	Max		
1	0.0001 g	210 g	$U_1 = 0.17 \text{ mg} + 0.0178 \text{ mg/g} \cdot R$	$U_1 = 0.13 \text{ mg} + 0.00719 \text{ mg/g} \cdot R$

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

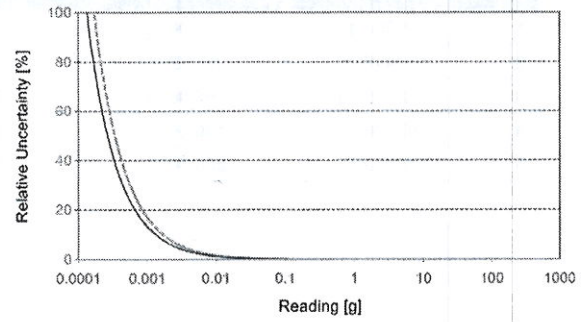
Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.0210 g	0.17 mg	0.81%	0.13 mg	0.62%
0.2100 g	0.17 mg	0.083%	0.13 mg	0.063%
2.1000 g	0.21 mg	0.0099%	0.15 mg	0.0069%
21.0000 g	0.54 mg	0.0026%	0.28 mg	0.0013%
210.0000 g	3.9 mg	0.0019%	1.6 mg	0.00078%





As Found



As Left

### Test Equipment

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

#### Weight Set 1: OIML E2

Weight Set No.:	350	Date of Issue:	15-02-2022
Certificate Number:	220554739-1	Calibration Due Date:	28-02-2023

### Remarks

This document is issued to record completion of the work performed by METTLER TOLEDO on the subject device in accordance with agreed standards. It does not guarantee the continued performance of the subject device. Any measurements recorded are based on the subject device's performance at a given time as tested by METTLER TOLEDO and, except where explicitly stated otherwise, do not express an opinion as to the sufficiency of any customer designed procedures used to test the device. This document is not a warranty, either implied or express. METTLER TOLEDO expressly disclaims any liability arising from the use of the information in this document for any purpose other than as specified herein.



# Custom Tolerance Assessment

Assessment done without considering measurement uncertainty.

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

	As Found	As Left
<b>Overall</b>	✓	✓
Repeatability	✓	✓
Eccentricity	✓	✓
Error of Indication	✓	✓

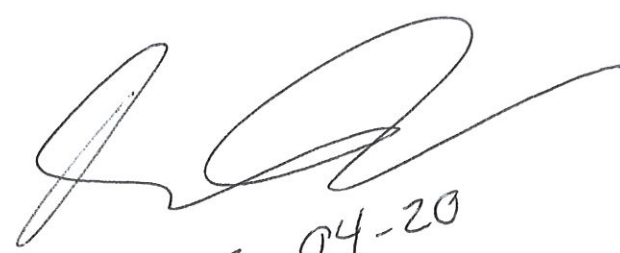
## Measurement Results

### Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0000 g	100.0000 g
2	99.9999 g	100.0000 g
3	100.0001 g	100.0000 g
4	100.0000 g	100.0000 g
5	100.0001 g	100.0001 g
6	100.0000 g	100.0000 g
7	99.9999 g	100.0000 g
8	100.0000 g	100.0001 g
9	99.9999 g	100.0001 g
10	100.0000 g	100.0001 g

Standard Deviation	0.00007 g	0.00005 g
Tolerance	0.00020 g ✓	0.00020 g ✓

  
2022-04-20

**Eccentricity**

Test Load: 100 g

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

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

**Error of Indication**

As Found

	Reference Value	Indication	Error of Indication	Tolerance	
1	0.0000 g	0.0000 g	0.0000 g	0.0002 g	✓
2	50.0000 g	50.0001 g	0.0001 g	0.0002 g	✓
3	100.0000 g	100.0000 g	0.0000 g	0.0004 g	✓
4	150.0000 g	149.9996 g	-0.0004 g	0.0006 g	✓
5	200.0001 g	200.0007 g	0.0006 g	0.0010 g	✓

As Left

	Reference Value	Indication	Error of Indication	Tolerance	
1	0.0000 g	0.0000 g	0.0000 g	0.0002 g	✓
2	50.0000 g	50.0000 g	0.0000 g	0.0002 g	✓
3	100.0000 g	100.0000 g	0.0000 g	0.0004 g	✓
4	150.0000 g	150.0000 g	0.0000 g	0.0006 g	✓
5	200.0001 g	200.0001 g	0.0000 g	0.0010 g	✓

**CALIBRATION CERTIFICATE**

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

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

**Technician:**  
 Coutu, Daniel

David Llorens, Quality Manager

**SERVICE DESCRIPTION:**

<b>Masses description :</b>	ASTM E617	<b>Date approved :</b>	04-03-2022
<b>Precision class :</b>	ASTM 6	<b>Next Calibration :</b>	04-03-2027
<b>Density :</b>	7.95g/cm <sup>3</sup>	<b>CCN accreditation # :</b>	668
<b>Identification (if unique) :</b>	EM-090	<b>CLAS Certification # :</b>	2010-01

<b>Test conditions :</b>	Temp °C:	21.05	kPa Pressure:	102.3	Humidity:	49.4
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**NOTES:**

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

**REMARKS:**









## CALIBRATION CERTIFICATE

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

### BALANCES

The following balances are used for calibration purposes :

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

We are also using these balances in our automated procedure :

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

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

### UNCERTAINTIES:

The following uncertainties exist :

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

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

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

### TRACEABILITY

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



## CALIBRATION CERTIFICATE

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

### USED REFERENCES

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

### ENVIRONMENTAL CONDITIONS

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



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



Accredited by the American Association  
for Laboratory Accreditation (A2LA)  
CALIBRATION CERT #1902.01

ISO 17025 Registered  
ANSI/NCSL Z540-1 Accredited

## Accuracy Calibration Certificate

### Customer

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

### Weighing Device

Manufacturer:	RICE LAKE	Instrument Type:	Weighing Instrument
Model:	4X4HP-10K	Asset Number:	EM-114 EM-137
Serial No.:	C18395	Terminal Model:	IQ+355
Building:	N/A	Terminal Serial No.:	164851
Floor:	N/A	Terminal Asset No.:	N/A
Room:	N/A		

Range	Max. Capacity	Readability (d)
1	400 kg	0.05 kg

### Procedure

Calibration Guideline:	ASTM E898 - 20
METTLER TOLEDO Work Instruction:	30260953

This calibration certificate including procedures and uncertainty estimation also complies with EURAMET cg-18 v 4.0.  
 This calibration certificate contains measurements for As Found and As Left calibrations.  
 The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight.  
 The calibration was agreed with the user below the maximum capacity of the balance.

	Temperature	
As Found	Start: 20.0 °C	End: 20.0 °C
As Left	Start: 20.0 °C	End: 20.0 °C

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

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

As Found Calibration Date:	20-12-2021	Authorized A2LA Signatory:	
As Left Calibration Date:	20-12-2021		
Issue Date:	20-12-2021		Marc-Andre Chouinard

  
 20 dec 2021

## Measurement Results

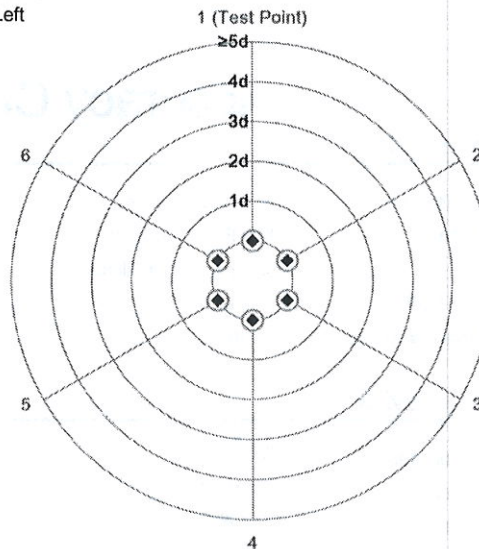
### Repeatability

Test Load: 70 kg

	As Found	As Left
1	70.10 kg	70.00 kg
2	70.10 kg	70.00 kg
3	70.10 kg	70.00 kg
4	70.10 kg	70.00 kg
5	70.10 kg	70.00 kg
6	70.10 kg	70.00 kg

○ As Found  
◆ As Left

Standard Deviation	0.000 kg	0.000 kg
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The "d" in the graph represents the readability of the range/interval in which the test was performed.

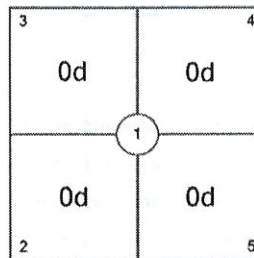
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

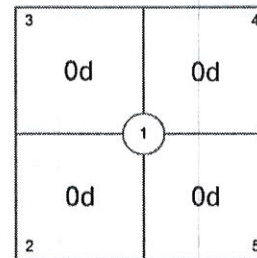
Test Load: 50 kg

Position	As Found	As Left
1	50.05 kg	50.00 kg
2	50.05 kg	50.00 kg
3	50.05 kg	50.00 kg
4	50.05 kg	50.00 kg
5	50.05 kg	50.00 kg

Maximum Deviation	0.00 kg	0.00 kg
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As Found



As Left

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



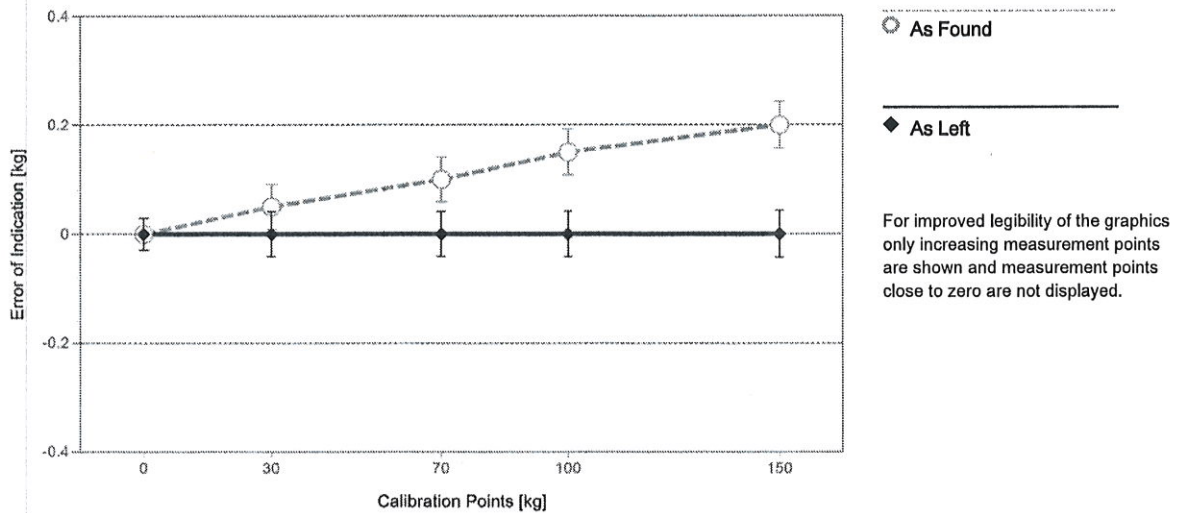
**Error of Indication**

**As Found**

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 kg	0.00 kg	0.00 kg	0.029 kg	2
2	30 kg	30.05 kg	0.05 kg	0.041 kg	2
3	70 kg	70.10 kg	0.10 kg	0.041 kg	2
4	100 kg	100.15 kg	0.15 kg	0.042 kg	2
5	150 kg	150.20 kg	0.20 kg	0.043 kg	2
6	100 kg	100.15 kg	0.15 kg	0.042 kg	2
7	70 kg	70.10 kg	0.10 kg	0.041 kg	2
8	30 kg	30.05 kg	0.05 kg	0.041 kg	2
9	0 kg	0.00 kg	0.00 kg	0.029 kg	2

**As Left**

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 kg	0.00 kg	0.00 kg	0.029 kg	2
2	30 kg	30.00 kg	0.00 kg	0.041 kg	2
3	70 kg	70.00 kg	0.00 kg	0.041 kg	2
4	100 kg	100.00 kg	0.00 kg	0.042 kg	2
5	150 kg	150.00 kg	0.00 kg	0.043 kg	2
6	100 kg	100.00 kg	0.00 kg	0.042 kg	2
7	70 kg	70.00 kg	0.00 kg	0.041 kg	2
8	30 kg	30.00 kg	0.00 kg	0.041 kg	2
9	0 kg	0.00 kg	0.00 kg	0.029 kg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor  $k$  - which can be larger than 2 according to ASTM E898 and EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

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**Test Equipment**

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

**Weight Set 1: OIML M1**

Weight Set No.:	<u>92294</u>	Date of Issue:	<u>23-09-2021</u>
Certificate Number:	<u>M21-0283</u>	Calibration Due Date:	<u>23-09-2022</u>

**Weight Set 2: OIML M1**

Weight Set No.:	<u>T-100</u>	Date of Issue:	<u>12-05-2021</u>
Certificate Number:	<u>1412861</u>	Calibration Due Date:	<u>12-05-2022</u>

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**Remarks**

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N/A

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**End of Accredited Section**

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

**Measurement Uncertainty of the Weighing Instrument in Use**

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

Temperature coefficient for the evaluation of the measurement uncertainty in use: 10.0 · 10<sup>-6</sup> / K

Temperature range on site for the evaluation of the measurement uncertainty in use: 20 K

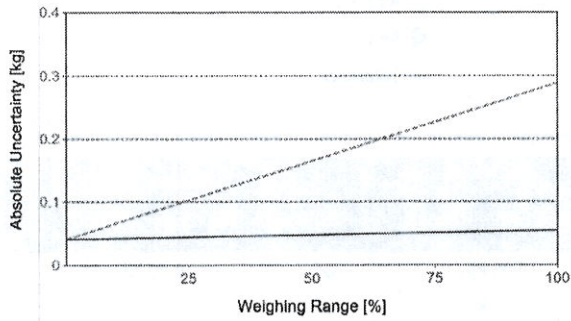
**Linearization of Uncertainty Equation**

	Range		As Found	As Left
	d	Max		
1	0.05 kg	150 kg	$U_1 = 41 \text{ g} + 1.66 \text{ g/kg} \cdot R$	$U_1 = 41 \text{ g} + 0.0938 \text{ g/kg} \cdot R$

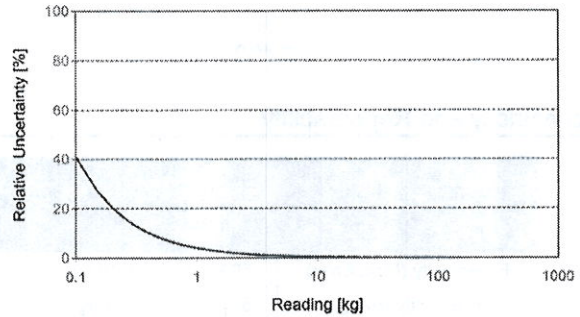
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
1.50 kg	0.043 kg	2.9%	0.041 kg	2.7%
15.00 kg	0.066 kg	0.44%	0.042 kg	0.28%
30.00 kg	0.091 kg	0.30%	0.044 kg	0.15%
75.00 kg	0.17 kg	0.22%	0.048 kg	0.064%
150.00 kg	0.29 kg	0.19%	0.055 kg	0.037%



**As Found**



**As Left**



# Handbook 44 Tolerance Assessment(Maintenance)

Assessment done without considering measurement uncertainty.

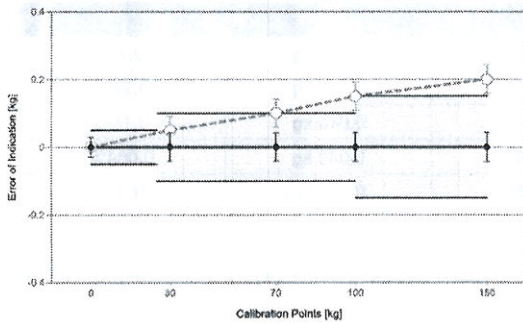
The measurements from the attached calibration certificate were assessed against the Tolerances defined by NIST Handbook 44.

The range of measurements for both Eccentricity and Repeatability (if performed) tests is assessed against Maintenance Tolerances.

Overall As Found **X** As Left **✓**  
 ✓ = Passed  
 X = Failed

## Weighing Device

Range	Max. Capacity	Readability (d)	Verification Scale Interval (e)	Class
1	400 kg	0.05 kg	0.05 kg	III



Tolerances according to NIST Handbook 44

Test Load		Tolerance
From	To	
0.00 kg	0.00 kg	0.0125 kg
0.05 kg	25.00 kg	0.05 kg
25.05 kg	100.00 kg	0.1 kg
100.05 kg	150.00 kg	0.15 kg

- As Found
- ◆ As Left
- Tolerance

## Eccentricity and Repeatability

Test	Test Load	Tolerance	As Found		As Left	
			Max. Error / Range	Result	Max. Error / Range	Result
Eccentricity (Max. Error)	50 kg	0.10 kg	0.05 kg	✓	0.00 kg	✓
Eccentricity (Range)	50 kg	0.1 kg	0.00 kg	✓	0.00 kg	✓
Repeatability (Max. Error)	70 kg	0.1 kg	0.10 kg	✓	0.00 kg	✓
Repeatability (Range)	70 kg	0.10 kg	0.00 kg	✓	0.00 kg	✓

Max. Error: Maximum of the absolute values of the individual errors.

Range: Difference between largest and smallest measurement value.

## Error of Indication

	Reference Value	Tolerance	As Found		As Left	
			Error of Indication	Result	Error of Indication	Result
1	0 kg	0.05 kg	0.00 kg	✓	0.00 kg	✓
2	30 kg	0.10 kg	0.05 kg	✓	0.00 kg	✓
3	70 kg	0.10 kg	0.10 kg	✓	0.00 kg	✓
4	100 kg	0.10 kg	0.15 kg	X	0.00 kg	✓
5	150 kg	0.15 kg	0.20 kg	X	0.00 kg	✓
6	100 kg	0.10 kg	0.15 kg	X	0.00 kg	✓
7	70 kg	0.10 kg	0.10 kg	✓	0.00 kg	✓
8	30 kg	0.10 kg	0.05 kg	✓	0.00 kg	✓
9	0 kg	0.05 kg	0.00 kg	✓	0.00 kg	✓





**Instrumentation  
Saint-Laurent** inc.  
Certified ISO 17025



80 rue de la montagne  
St-Joseph du lac  
(Québec), J0N 1M0  
Phone: (450) 473-6169  
Fax: (450) 473-5207  
Email: inst.st-laurent@videotron.ca

## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-126 2022-05-10</b>
----------------------	-----------------------------

CLIENT		CALIBRATION SPECIFICATION	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	4IN9106
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/- 1"Hg
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	365

INSTRUMENT SPECIFICATION			
<b>Instrument Type:</b>	Pressure Gauge	<b>Input Type:</b>	Pression
<b>Manufacturer:</b>	Dwyer	<b>Output Type:</b>	Digitale
<b>Model #:</b>	DPG200	<b>Measurement Type:</b>	Pressure
<b>Serial #:</b>	N.A.	<b>Range:</b>	0-28"Hg
<b>Location:</b>	N.A.	<b>Version:</b>	

CALIBRATORS SPECIFICATION			
<b>Calibrator:</b>	Crystal XP2i 300	<b>Certification #:</b>	2021008359
<b>Serial #:</b>	870437	<b>Certification Date:</b>	2021-11-15
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2022-11-15
<b>Comments:</b>			
<b>Calibrator:</b>	Fluke 744	<b>Certification #:</b>	2022003082
<b>Serial #:</b>	8180008	<b>Certification Date:</b>	2022-04-12
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2023-04-12
<b>Comments:</b>			





# CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-126 2022-05-10</b>
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CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
<b>Conformity</b>	<b>Comment</b>					
0.00 "Hg Compliant	0.00 "Hg Verification of the indicator	0.00 "Hg	0.00 "Hg	0.00 "Hg	+/- 1 "Hg	1 "Hg
-7.50 "Hg Compliant	-7.50 "Hg Verification of the indicator	-7.64 "Hg	-0.14 "Hg	-7.64 "Hg	+/- 1 "Hg	1 "Hg
-15.00 "Hg Compliant	-15.00 "Hg Verification of the indicator	-15.24 "Hg	-0.24 "Hg	-15.24 "Hg	+/- 1 "Hg	1 "Hg
-22.50 "Hg Compliant	-22.50 "Hg Verification of the indicator	-22.90 "Hg	-0.40 "Hg	-22.90 "Hg	+/- 1 "Hg	1 "Hg
-28.00 "Hg Compliant	-28.00 "Hg Verification of the indicator	-28.51 "Hg	-0.51 "Hg	-28.51 "Hg	+/- 1 "Hg	1 "Hg
0.00 "Hg Compliant	10.0000 V.DC. Verification of the analogic output	10.0778 V.DC.	+0.0778 V.DC.	10.0778 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
-7.50 "Hg Compliant	8.0000 V.DC. Verification of the analogic output	8.0447 V.DC.	+0.0447 V.DC.	8.0447 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
-15.00 "Hg Compliant	6.0000 V.DC. Verification of the analogic output	6.0069 V.DC.	+0.0069 V.DC.	6.0069 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
-22.50 "Hg Compliant	4.0000 V.DC. Verification of the analogic output	3.9596 V.DC.	-0.0404 V.DC.	3.9596 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
-28.00 "Hg Compliant	2.5333 V.DC. Verification of the analogic output	2.4444 V.DC.	-0.0889 V.DC.	2.4444 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.


<b>Environmental Conditions:</b>	Temperature: 21 °C	Humidity: 41 %RH
<b>Comments:</b>		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-10
<b>Next Calibration:</b>	2023-05-10
<b>Certificate Date:</b>	2022-05-10

CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

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

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). SCC accreditation number: # 669. ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.



Marco Miron - Technicien

*[Signature]* Version 1  
MAY 2022





**Instrumentation  
Saint-Laurent** inc.  
Certified ISO 17025



80 rue de la montagne  
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Email: inst.st-laurent@videotron.ca

## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-127 2022-05-10</b>
----------------------	-----------------------------

CLIENT		CALIBRATION SPECIFICATION	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	4IN9106
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/- 1"Hg
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	365

INSTRUMENT SPECIFICATION			
<b>Instrument Type:</b>	Pressure Gauge	<b>Input Type:</b>	Pression
<b>Manufacturer:</b>	Dwyer	<b>Output Type:</b>	Digitale
<b>Model #:</b>	DPG200	<b>Measurement Type:</b>	Pressure
<b>Serial #:</b>	N.A.	<b>Range:</b>	0-28"Hg
<b>Location:</b>	N.A.	<b>Version:</b>	

CALIBRATORS SPECIFICATION			
<b>Calibrator:</b>	Fluke 744	<b>Certification #:</b>	2022003082
<b>Serial #:</b>	8180008	<b>Certification Date:</b>	2022-04-12
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2023-04-12
<b>Comments:</b>			
<b>Calibrator:</b>	Crystal XP2i 300	<b>Certification #:</b>	2021008359
<b>Serial #:</b>	870437	<b>Certification Date:</b>	2021-11-15
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2022-11-15
<b>Comments:</b>			





**Instrumentation  
Saint-Laurent** inc.  
Certified ISO 17025



80 rue de la montagne  
St-Joseph du lac  
(Québec), J0N 1M0  
Phone: (450) 473-6169  
Fax: (450) 473-5207  
Email: inst.st-laurent@videotron.ca

# CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-127 2022-05-10</b>
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CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
<b>Conformity</b>	<b>Comment</b>					
0.00 "Hg Compliant	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	+/- 1 "Hg	1 "Hg
Verification of the indicator						
-7.50 "Hg Compliant	-7.50 "Hg	-7.52 "Hg	-0.02 "Hg	-7.52 "Hg	+/- 1 "Hg	1 "Hg
Verification of the indicator						
-15.00 "Hg Compliant	-15.00 "Hg	-15.03 "Hg	-0.03 "Hg	-15.03 "Hg	+/- 1 "Hg	1 "Hg
Verification of the indicator						
-22.50 "Hg Compliant	-22.50 "Hg	-22.56 "Hg	-0.06 "Hg	-22.56 "Hg	+/- 1 "Hg	1 "Hg
Verification of the indicator						
-28.00 "Hg Compliant	-28.00 "Hg	-28.11 "Hg	-0.11 "Hg	-28.11 "Hg	+/- 1 "Hg	1 "Hg
Verification of the indicator						
0.00 "Hg Compliant	10.0000 V.DC.	10.0236 V.DC.	+0.0236 V.DC.	10.0236 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
-7.50 "Hg Compliant	8.0000 V.DC.	8.0275 V.DC.	+0.0275 V.DC.	8.0275 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
-15.00 "Hg Compliant	6.0000 V.DC.	6.0185 V.DC.	+0.0185 V.DC.	6.0185 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
-22.50 "Hg Compliant	4.0000 V.DC.	4.0002 V.DC.	+0.0002 V.DC.	4.0002 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
-28.00 "Hg Compliant	2.5333 V.DC.	2.5160 V.DC.	-0.0173 V.DC.	2.5160 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						

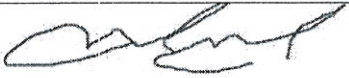
<b>Environmental Conditions:</b>	Temperature: 21 °C	Humidity: 41 %RH
<b>Comments:</b>		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-10
<b>Next Calibration:</b>	2023-05-10
<b>Certificate Date:</b>	2022-05-10

CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

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

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Marco Miron - Technicien

Version 1  
May 2022  
Page 2 of 2



# CALIBRATION CERTIFICATE

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

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

**Technician:**  
 Coutu, Daniel

David Llorens, Quality Manager

## SERVICE DESCRIPTION:

<b>Masses description :</b>	ASTM E617	<b>Date approved :</b>	04-03-2022
<b>Precision class :</b>	ASTM 1	<b>Next Calibration :</b>	04-03-2027
<b>Density :</b>	7.95g/cm <sup>3</sup>	<b>CCN accreditation # :</b>	668
<b>Identification (if unique) :</b>	1000026013	<b>CLAS Certification # :</b>	2010-01

<b>Test conditions :</b>	Temp °C:	21.05	kPa Pressure:	102.3	Humidity:	49.4
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## NOTES:

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

## REMARKS:

March 2022

**CALIBRATION CERTIFICATE**

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

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

**CALIBRATION RESULTS, CONVENTIONAL MASS:**

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

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





## CALIBRATION CERTIFICATE

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www.dispersion.ca 1.866.390.5066

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

### CALIBRATION RESULTS, CORRECTIONS:

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

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

## CALIBRATION CERTIFICATE

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www.dispersion.ca 1.866.390.5066

### BALANCES

The following balances are used for calibration purposes :

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

We are also using these balances in our automated procedure :

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

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

### UNCERTAINTIES:

The following uncertainties exist :

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

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

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

### TRACEABILITY

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



# CALIBRATION CERTIFICATE

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

## USED REFERENCES

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

## ENVIRONMENTAL CONDITIONS

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



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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>		<b>CE-EM-136 2022-05-25</b>	
<b>CLIENT</b>		<b>CALIBRATION SPECIFICATION</b>	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	ISL-004
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/-2°C +/-3%RH
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	365
<b>INSTRUMENT SPECIFICATION</b>			
<b>Instrument Type:</b>	Hygrometer	<b>Input Type:</b>	Temp/%RH
<b>Manufacturer:</b>	Fluke	<b>Output Type:</b>	Digitale
<b>Model #:</b>	971	<b>Measurement Type:</b>	Temp/Humidity
<b>Serial #:</b>	10610850	<b>Range:</b>	5-95%RH -20a60°C
<b>Location:</b>	N.A.	<b>Version:</b>	
<b>CALIBRATORS SPECIFICATION</b>			
<b>Calibrator:</b>	Hygrometre 485B-1/RPM	<b>Certification #:</b>	2022001936
<b>Serial #:</b>	035V4V	<b>Certification Date:</b>	2022-03-11
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2023-03-11
<b>Comments:</b>			





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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-136 2022-05-25</b>
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CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	Comment					
25.0 °C	25.0 °C	25.1 °C	+0.1 °C	25.1 °C	+/- 2.0 °C	1.0 °C
40.0 °C	40.0 °C	40.3 °C	+0.3 °C	40.3 °C	+/- 2.0 °C	1.0 °C
30.0 %RH	30.0 %RH	28.1 %RH	-1.9 %RH	28.1 %RH	+/- 3.0 %RH	-- %RH
55.0 %RH	55.0 %RH	52.8 %RH	-2.2 %RH	52.8 %RH	+/- 3.0 %RH	-- %RH
75.0 %RH	75.0 %RH	73.8 %RH	-1.2 %RH	73.8 %RH	+/- 3.0 %RH	-- %RH


<b>Environmental Conditions:</b>	Temperature: 22 °C	Humidity: 39 %RH
<b>Comments:</b>		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-25
<b>Next Calibration:</b>	2023-05-25
<b>Certificate Date:</b>	2022-05-25

CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

- ▣ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- ▣ Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
- ▣ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
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Martin Langlais - Technicien



Version 1



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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>		<b>CE-EM-147 2022-05-11</b>	
<b>CLIENT</b>		<b>CALIBRATION SPECIFICATION</b>	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	4IN9101
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/- 2.0C
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	365
<b>INSTRUMENT SPECIFICATION</b>			
<b>Instrument Type:</b>	Recorder	<b>Input Type:</b>	Divers
<b>Manufacturer:</b>	Keithley	<b>Output Type:</b>	Digital
<b>Model #:</b>	2700	<b>Measurement Type:</b>	Temperature
<b>Serial #:</b>	1349443	<b>Range:</b>	Divers
<b>Location:</b>	N.A.	<b>Version:</b>	
<b>CALIBRATORS SPECIFICATION</b>			
<b>Calibrator:</b>	Fluke 744	<b>Certification #:</b>	2022003082
<b>Serial #:</b>	8180008	<b>Certification Date:</b>	2022-04-12
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2023-04-12
<b>Comments:</b>			





**Instrumentation  
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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-147 2022-05-11</b>
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CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	Comment					
EntrySource	GivenValue	ActualValue	Deviation	Post Calib	Tolerance	Incertitude
Conformity	Voir Commentaire					


<b>Environmental Conditions:</b>	Temperature: 21 °C	Humidity: 42 %RH
<b>Comments:</b>	Data Acquisition system Conforme	
	Les 2 slot de l'enregistreur ont été vérifié.	

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-11
<b>Next Calibration:</b>	2023-05-11
<b>Certificate Date:</b>	2022-05-11

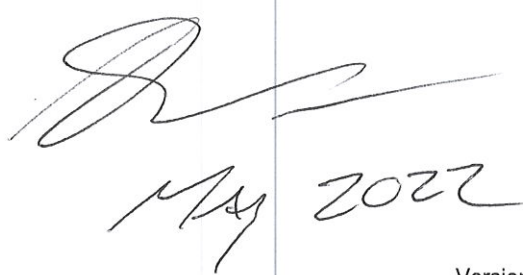
CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

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## CALIBRATION CERTIFICATE


CERTIFICATE #		CE-EM-154/2 2022-05-11				
CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	Comment					
77.0 °F	77.0 °F	76.4 °F	-0.6 °F	76.4 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 111 (Filtre 1) en type "T" En Loop avec EM-154					
77.0 °F	77.0 °F	76.3 °F	-0.7 °F	76.3 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 112 (Filtre 2) en type "T" En Loop avec EM-154					
140.0 °F	140.0 °F	139.7 °F	-0.3 °F	139.7 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 113 (Tunnel) en type "J" En Loop avec EM-154					
68.0 °F	68.0 °F	67.6 °F	-0.4 °F	67.6 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 114 (Room) en type "J" En Loop avec EM-154					
77.0 °F	77.0 °F	76.6 °F	-0.4 °F	76.6 °F	+/- 4.0 °F	+/- 0.4 °F
Non-Compliant	ID. No. 115 (Analyzer gaz) en type "J" En Loop avec EM-154					
<b>Environmental Conditions:</b> Temperature: 21 °C      Humidity: 42 %RH <b>Comments:</b>						

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-11
Next Calibration:	2022-11-11
Certificate Date:	2022-05-11

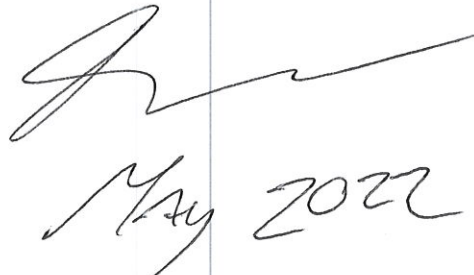
CALIBRATION CONFORMITY		
	Before	After
Compliant:	X	X
Non Compliant:		

- Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
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Marco Miron - Technicien



Version 1



**Instrumentation  
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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-154/2 2022-05-11</b>
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CLIENT		CALIBRATION SPECIFICATION	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	4IN9101
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/- 4.0°F
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	181

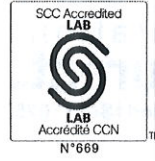
INSTRUMENT SPECIFICATION			
<b>Instrument Type:</b>	Recorder	<b>Input Type:</b>	Temp
<b>Manufacturer:</b>	Keithley	<b>Output Type:</b>	Digitale
<b>Model #:</b>	7700	<b>Measurement Type:</b>	Temperature
<b>Serial #:</b>	1306774	<b>Range:</b>	Divers
<b>Location:</b>	N/A	<b>Version:</b>	

CALIBRATORS SPECIFICATION			
<b>Calibrator:</b>	Fluke 744	<b>Certification #:</b>	2022003082
<b>Serial #:</b>	8180008	<b>Certification Date:</b>	2022-04-12
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2023-04-12
<b>Comments:</b>			





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Email: inst.st-laurent@videotron.ca

## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>		CE-EM-154 2022-05-11	
<b>CLIENT</b>		<b>CALIBRATION SPECIFICATION</b>	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	4IN9101
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/- 2°C
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	365
<b>INSTRUMENT SPECIFICATION</b>			
<b>Instrument Type:</b>	Recorder	<b>Input Type:</b>	Temp
<b>Manufacturer:</b>	Keithley	<b>Output Type:</b>	Digitale
<b>Model #:</b>	7700	<b>Measurement Type:</b>	Temperature
<b>Serial #:</b>	1306774	<b>Range:</b>	Divers
<b>Location:</b>	N/A	<b>Version:</b>	
<b>CALIBRATORS SPECIFICATION</b>			
<b>Calibrator:</b>	Fluke 744	<b>Certification #:</b>	2022003082
<b>Serial #:</b>	8180008	<b>Certification Date:</b>	2022-04-12
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2023-04-12
<b>Comments:</b>			





Instrumentation  
**Saint-Laurent** inc.  
Certified ISO 17025



80 rue de la montagne  
St-Joseph du lac  
(Québec), J0N 1M0  
Phone: (450) 473-6169  
Fax: (450) 473-5207  
Email: inst.st-laurent@videotron.ca

## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-154 2022-05-11</b>
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CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	Comment					
-17.000 mV Compliant	-17.000 mV Input#1	-17.106 mV	-0.106 mV	-17.106 mV	+/- 0.500 mV	0.1 mV
0.000 mV Compliant	0.000 mV Input#1	-0.105 mV	-0.105 mV	-0.105 mV	+/- 0.500 mV	0.1 mV
20.000 mV Compliant	20.000 mV Input#1	19.897 mV	-0.103 mV	19.897 mV	+/- 0.500 mV	0.1 mV
30.000 mV Compliant	30.000 mV Input#2	29.870 mV	-0.130 mV	29.870 mV	+/- 0.500 mV	0.1 mV
30.000 mV Compliant	30.000 mV Input#3 Non-Conforme	29.870 mV	-0.130 mV	29.870 mV	+/- 0.500 mV	0.1 mV
5.000 V.DC. Compliant	5.000 V.DC. Input#4	5.000 V.DC.	0.000 V.DC.	5.000 V.DC.	+/- 0.050 V.DC.	0.1 V.DC.
30.000 mV Compliant	30.000 mV Input#5	29.647 mV	-0.353 mV	29.647 mV	+/- 0.050 mV	0.1 mV
30.000 mV Compliant	30.000 mV Input#6	29.642 mV	-0.358 mV	29.642 mV	+/- 0.050 mV	0.1 mV
100.00 Ohms Non-Compliant	100.00 Ohms Input#7	101.02 Ohms	+1.02 Ohms	101.02 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
100.00 Ohms Non-Compliant	100.00 Ohms Input#8	101.00 Ohms	+1.00 Ohms	101.00 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
100.00 Ohms Non-Compliant	100.00 Ohms Input#9	101.00 Ohms	+1.00 Ohms	101.00 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
100.00 Ohms Non-Compliant	100.00 Ohms Input#10	100.90 Ohms	+0.90 Ohms	100.90 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
100.0 °C Compliant	100.0 °C Input#11 TypeT	99.6 °C	-0.4 °C	99.6 °C	+/- 2.0 °C	+/- 0.3 °C
100.0 °C Compliant	100.0 °C Input#12 TypeT	99.6 °C	-0.4 °C	99.6 °C	+/- 2.0 °C	+/- 0.3 °C
100.0 °C Compliant	100.0 °C Input#13 TypeJ	99.7 °C	+0.3 °C	99.7 °C	+/- 2.0 °C	+/- 0.2 °C
100.0 °C Compliant	100.0 °C Input#14 TypeJ	99.7 °C	-0.3 °C	99.7 °C	+/- 2.0 °C	+/- 0.2 °C
100.0 °C Compliant	100.0 °C Input#15 TypeJ	99.9 °C	-0.1 °C	99.9 °C	+/- 2.0 °C	+/- 0.2 °C
100.0 °C Compliant	100.0 °C Input#16 TypeJ	99.7 °C	-0.3 °C	99.7 °C	+/- 2.0 °C	+/- 0.2 °C
100.00 Ohms Non-Compliant	100.00 Ohms Input#17	101.08 Ohms	+1.08 Ohms	101.08 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
100.00 Ohms Non-Compliant	100.00 Ohms Input#18	101.04 Ohms	+1.04 Ohms	101.04 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms





**Instrumentation  
Saint-Laurent inc.**  
Certified ISO 17025



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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-154 2022-05-11</b>
----------------------	-----------------------------

CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
<b>Conformity</b>	<b>Comment</b>					
100.00 Ohms	100.00 Ohms	101.03 Ohms	+0.02 Ohms	101.03 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
Non-Compliant	Input#19					
100.00 Ohms	100.00 Ohms	100.99 Ohms	+0.99 Ohms	100.99 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
Non-Compliant	Input#20					
12.000 mA	12.000 mA	12.001 mA	+0.001 mA	12.001 mA	+/- 0.100 mA	1.00 mA
Compliant	Input#21					
12.000 mA	12.000 mA	----- mA	----- mA	----- mA	+/- 0.100 mA	1.00 mA
Non-Compliant	Input#22 Fonctionne pas					


<b>Environmental Conditions:</b>	Temperature: 21 °C	Humidity: 42 %RH
<b>Comments:</b>	Test avec EM-147	

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-11
<b>Next Calibration:</b>	2023-05-11
<b>Certificate Date:</b>	2022-05-11

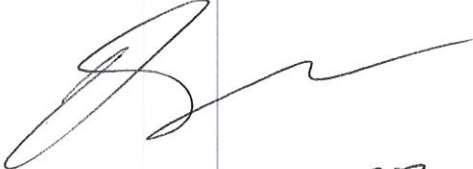
CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

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

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). SCC accreditation number: # 669. ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.



Marco Miron - Technicien



May 2022

  
2022-01-17

## Certificat d'Étalonnage / Certificate of Calibration

CLIENT :  
SERVICES POLYTESTS INC.  
695-B GAUDETTE  
ST-JEAN-SUR-RICHELIEU, QC J3B7S7

Description: STOPWATCH  
Fabricant/ Manufacturer: EXTECH  
Modèle/ Model : 365510  
No série / Serial no : 131636  
# Inventaire / Asset # : EM-175

CERTIFICAT No / Certificate No: **347561**

PROCÉDURE / Procedure :  
TRESCAL - EXTECH\_365510

Date étalonnage/ Calibration Performed :  
aaaa - mm - jj  
2021-12-24

Echéance/ Due Date : **2022-12-24**

Type de résultat / Results type :	As-Found = As-Left
Résultats d'essais / Test results :	Conforme / In Tolerance

Conditions de mesure / Measurement conditions

TEMPÉRATURE / Temp. : 23.0°C

Usage restreint/ Restricted use :

HUMIDITÉ / Humidity : 36% RH

Réparation effectuée / Repair performed :

Ajustement effectué / Adjustment performed :

ÉTALONS UTILISÉS/ Standards Used:

Identification	Manuf.	Model	Description	Ser. #	Étalonné/ Cal.	Échéance/ Due
PRO313	H-P	53132A	UNIVERSAL COUNTER	3546A03142	2021-08-25	2022-08-25
PRO392	AGILENT	33250A	FUNCTION/ARBITRARY WAVEFORM GENERATOR	MY40008014	2021-06-11	2023-06-11

Les spécifications mentionnées comme limites de tolérances d'essai sont celles établies par le fabricant, sauf indication contraire.  
Test tolerance limits are based on manufacturers specifications unless stated otherwise.

NOTES :

Technicien :  
Technician

  
M. BARAK

Le système qualité de la société est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour le processus d'étalonnage sont retraçables au SI par l'entremise du CNRC et/ou du NIST.  
Our quality system complies with the requirements of ISO 17025 and the standards used for the calibration are traceable to SI through NRC and/or NIST.

LE DROIT D'AUTEUR DE CE CERTIFICAT APPARTIENT À TRESCAL CANADA INC. CE CERTIFICAT NE PEUT ÊTRE REPRODUIT AUTREMENT QU'EN ENTIER ET AVEC LE CONSENTEMENT PRÉALABLE ÉCRIT DE TRESCAL CANADA INC.  
TRESCAL CANADA INC. OWN COPYRIGHT OF THIS CERTIFICATE. THE CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN CONSENT OF TRESCAL CANADA INC.



CLIENT / Customer :

DESCRIPTION / Description :

MANUFACTURIER / Manufacturer :

MODÈLE / Model :

347561

SERVICES POLYTESTS INC.

STOPWATCH

EXTECH

365510

DESCRIPTION Description	LIMITES Limits	LECTURES Readings	LIMITES Limits
----------------------------	-------------------	----------------------	-------------------

**Temps écoulé, chronomètre sous test / Elapsed time on test stopwatch**

Minutes	Seconds	1/100 sec
27	4	44

Total au compteur / Reference timer:  comptes/counts

( $\Delta t$ ) Deviation (1/100sec): -3,40

Deviation Par jour/ Per day (%): -0,0021 %

Deviation Par jour/ Per day (sec): -1,81 sec

\* Tolérances basées sur une déviation maximale de 3 sec/jour

\* Tolerances based on a 3 sec/day maximum deviation

Incertitude/ Uncertainty:  $\pm 37$  ms

Lorsque fournies dans le rapport, les incertitudes de mesure sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95% , obtenu en multipliant l'incertitude-type composée par un facteur de couverture de k=2.

When supplied in the report, the measurement uncertainties are expanded uncertainties representing a confidence level of approximately 95% , obtain by multiplying the combined standard uncertainty by a coverage factor of k=2.

Min	Comptes / Counts Chronomètre/timer 162444	Max
* Secondes -3,00	Deviation 24hrs -1,81	* Secondes 3,00

**CALIBRATION CERTIFICATE # 17213**

Calibration date : 2022-07-05  
Certificate issued : 2022-07-05

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

Calibration of  
Shinigawa DCDA-2c S/N : 23544

**QUALITY PROGRAM CONFORMANCE**

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

**TRACEABILITY**

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

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

**CALIBRATION AND MEASUREMENT CAPABILITY**

Calibration measurement capabilities have an uncertainty of  $\pm 0.2\%$  of reading for a flow range between 5 SCCM to 10 SLPM,  $\pm 0.3\%$  of reading for a flow range between 10 SLPM to 30 SLPM,  $\pm 0.2\%$  of reading for a flow range between 30 SLPM to 3000 SLPM,  $\pm 0.3\%$  of reading for a flow range above 3000 SLPM to 6000 SLPM and  $\pm 0.5\%$  of reading for a flow range under 5 SCCM down to 1 SCCM, air or nitrogen equivalent. The reported uncertainty is expanded using a coverage factor  $k=2$  for a level of confidence of approximately 95%, assuming a normal distribution including resolution of the instrument. The test uncertainty ratio (TUR) of this calibration is at least 4:1 unless otherwise stated.

**CONDITION SUMMARY OF THE DEVICE UNDER TEST**

Initial conditions	In good condition
Work done	Initial readings = Final readings, no adjustment. Calibration of the instrument
Results	Final readings in tolerance with K factor = 0.98. Final readings in tolerance
Remarks	Calibration frequency every 12 months



Louis-Philippe Tremblay  
Metrologist



Laboratory Manager



### Calibration certificate # 17213

Serial Number:	23544	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-178	Decision rule:	Method #3

### Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500331212	2023-05-03
Fluke molboxI+	MolboxI+	2089	1500317991	2022-10-05
RTD Mist	Mist	L00295	2022000011	2023-01-10
Module 44.5 PSI avec Baro 163671	Module 30	160659	2022003929	2023-05-13

### Final specifications of the device under test

### Calibration conditions

Gas	Air	Gas	Air
Operation temperature		Ambient temperature	22 °C
Inlet pressure		Ambient pressure	1012.35 mbar
Outlet pressure		Orientation	Horizontal
Reference temperature		Seals	Viton
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy	±2 %O.R.		

### Final readings

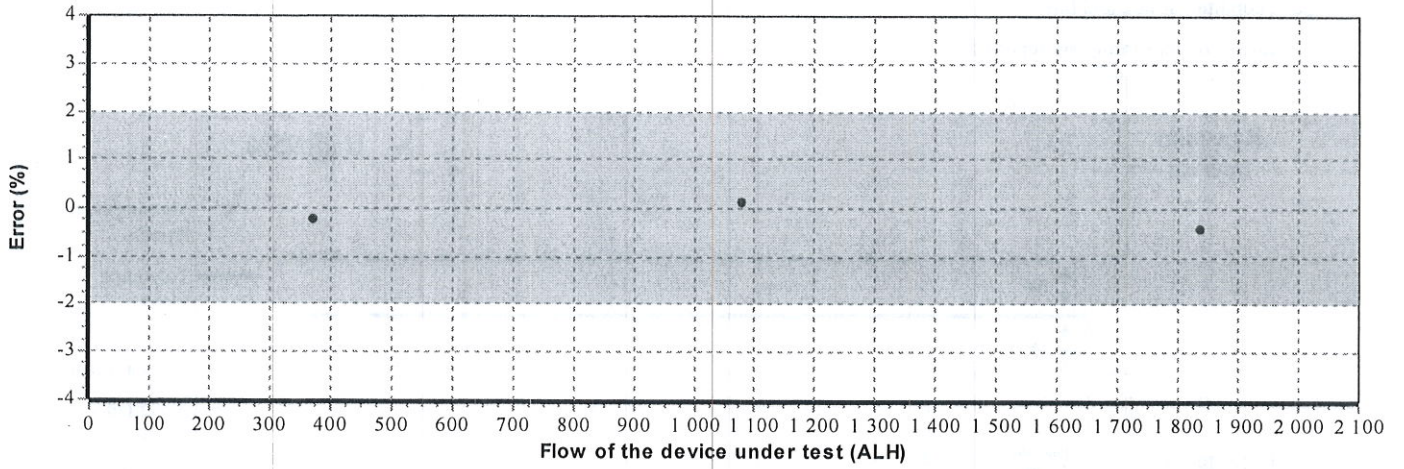
Test Flow ALH	Device under test m <sup>3</sup>	Measured values			Calculated Reference m <sup>3</sup>	Calculated Error m <sup>3</sup>	Acceptable Error m <sup>3</sup>	Uncertainty k = 2 m <sup>3</sup>	TUR
		Pressure PSIA	Temperature °C	Reference m <sup>3</sup>					
373.1579	61.9850	14.6731	22.39	57.3300	62.1414	-0.1564	1.2428	0.2141	>4
1078.5347	179.8300	14.6851	22.31	165.8700	179.5948	0.2352	3.5919	0.6186	>4
1838.4293	304.8241	14.7102	22.40	283.1400	306.1385	-1.3144	6.1228	1.0545	>4



### Calibration certificate # 17213

Serial Number:	23544	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-178	Decision rule:	Method #3

### Final results



See the appendix for the guideline of decision rule

*CAL Fact. 1.002523*

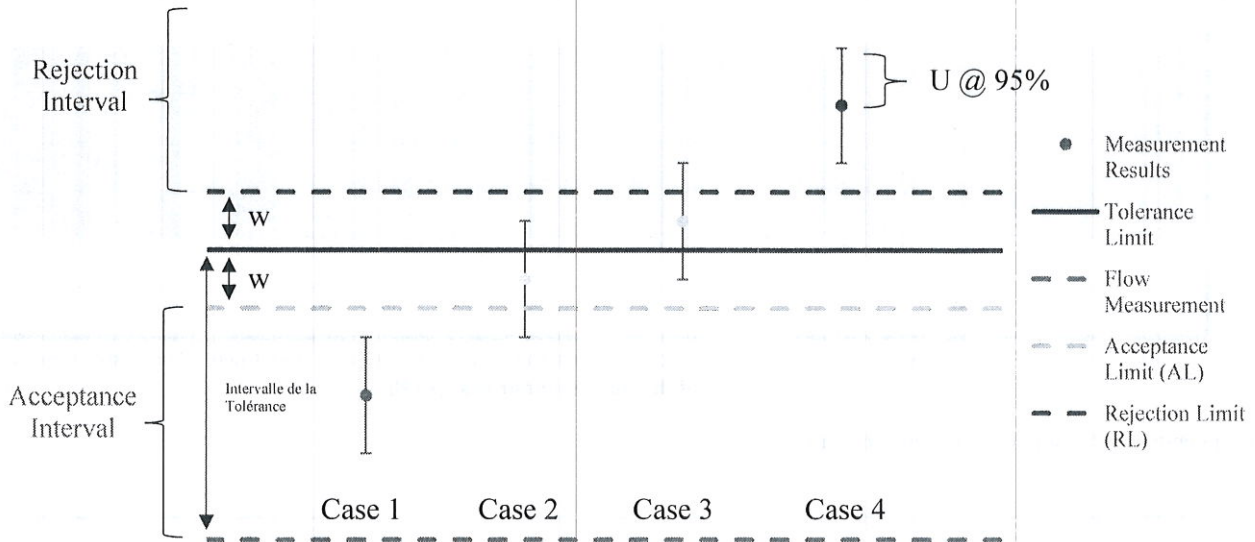
*July 26<sup>th</sup> 2022*

*Appendix for the decision rule*

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

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

Statements of conformity are reported as:



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

**Case 1 – Below acceptance limit AL**

**Status: In tolerance**

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

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

**Status: In tolerance-Conditional**

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

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

**Status: Out of tolerance-Conditional**

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

**Case 4 – Greater than rejection limit RL**

**Status: Out of tolerance**

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



**CALIBRATION CERTIFICATE # 17215**

**Calibration date : 2022-07-05**

**Certificate issued : 2022-07-05**

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

**Calibration of  
Shinigawa DCDA-2c S/N : 23543**

**QUALITY PROGRAM CONFORMANCE**

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

**TRACEABILITY**

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

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

**CALIBRATION AND MEASUREMENT CAPABILITY**

Calibration measurement capabilities have an uncertainty of  $\pm 0.2\%$  of reading for a flow range between 5 SCCM to 10 SLPM,  $\pm 0.3\%$  of reading for a flow range between 10 SLPM to 30 SLPM,  $\pm 0.2\%$  of reading for a flow range between 30 SLPM to 3000 SLPM,  $\pm 0.3\%$  of reading for a flow range above 3000 SLPM to 6000 SLPM and  $\pm 0.5\%$  of reading for a flow range under 5 SCCM down to 1 SCCM, air or nitrogen equivalent. The reported uncertainty is expanded using a coverage factor  $k=2$  for a level of confidence of approximately 95%, assuming a normal distribution including resolution of the instrument. The test uncertainty ratio (TUR) of this calibration is at least 4:1 unless otherwise stated.

**CONDITION SUMMARY OF THE DEVICE UNDER TEST**

Initial conditions	In good condition
Work done	Calibration of the instrument
Results	Initial readings in tolerance-conditional. Final readings in tolerance
Remarks	Calibration frequency every 12 months. Apply K factor 1.02 to display to meet accuracy.

*Louis-Philippe Tremblay*

Louis-Philippe Tremblay  
Metrologist

*OLL*

Laboratory Manager

### Calibration certificate # 17215

Serial Number:	23543	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

### Standard equipment used for initial calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500331212	2023-05-03
Fluke molbox I+	Molbox I+	2089	1500317991	2022-10-05
RTD Mist	Mist	L00295	2022000011	2023-01-10
Module 44.5 PSI avec Baro 163671	Module 30	160659	2022003929	2023-05-13

### Initial specifications of the device under test

### Calibration conditions

Gas	Air	Gas	Air
Operation temperature		Ambient temperature	22 °C
Inlet pressure		Ambient pressure	1010.63 mbar
Outlet pressure		Orientation	Horizontal
Reference temperature		Seals	Viton
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy	±2 %O.R.		

### Initial readings

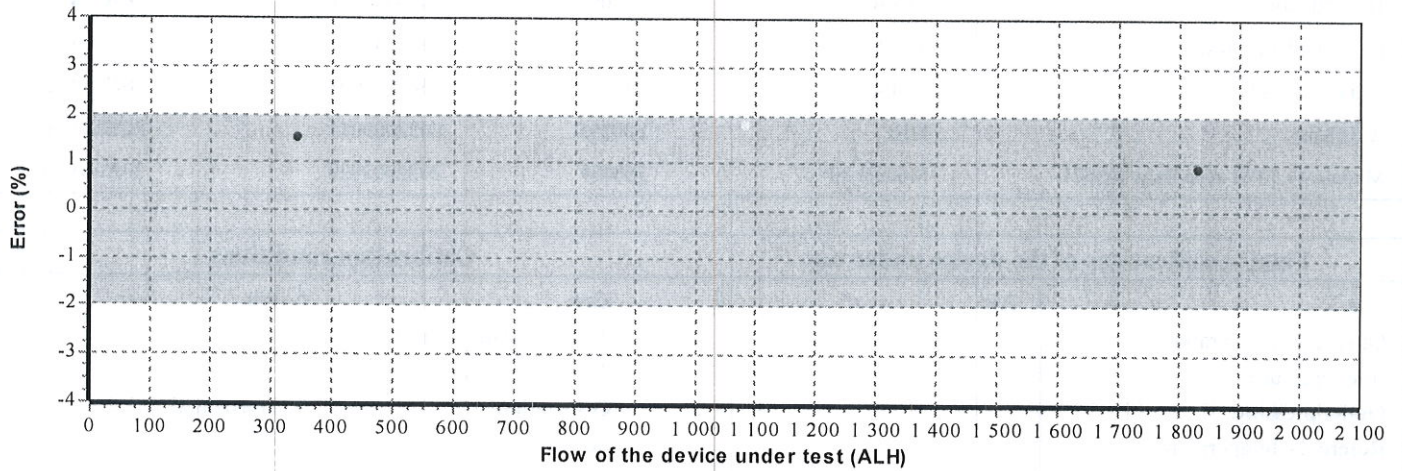
Test Flow ALH	Device under test m <sup>3</sup>	Measured values			Calculated Reference m <sup>3</sup>	Calculated Error m <sup>3</sup>	Acceptable Error m <sup>3</sup>	Uncertainty k = 2 m <sup>3</sup>	TUR
		Pressure PSIA	Temperature °C	Reference m <sup>3</sup>					
344.0786	58.1450	14.6588	22.38	52.8000	57.2843	0.8607	1.1457	0.1974	>4
1082.8864	183.5100	14.6686	22.37	166.3200	180.3206	3.1894	3.6064	0.6212	>4
1832.4116	307.8200	14.6893	22.56	281.6500	305.1232	2.6968	6.1025	1.0513	>4



## Calibration certificate # 17215

Serial Number:	23543	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

## Initial results



See the appendix for the guideline of decision rule



### Calibration certificate # 17215

Serial Number:	23543	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

### Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500331212	2023-05-03
Fluke molbox1+	Molbox1+	2089	1500317991	2022-10-05
RTD Mist	Mist	L00295	2022000011	2023-01-10
Module 44.5 PSI avec Baro 163671	Module 30	160659	2022003929	2023-05-13

### Final specifications of the device under test

### Calibration conditions

Gas	Air	Gas	Air
Operation temperature		Ambient temperature	
Inlet pressure		Ambient pressure	
Outlet pressure		Orientation	Horizontal
Reference temperature		Seals	Viton
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy	±2 %O.R.		

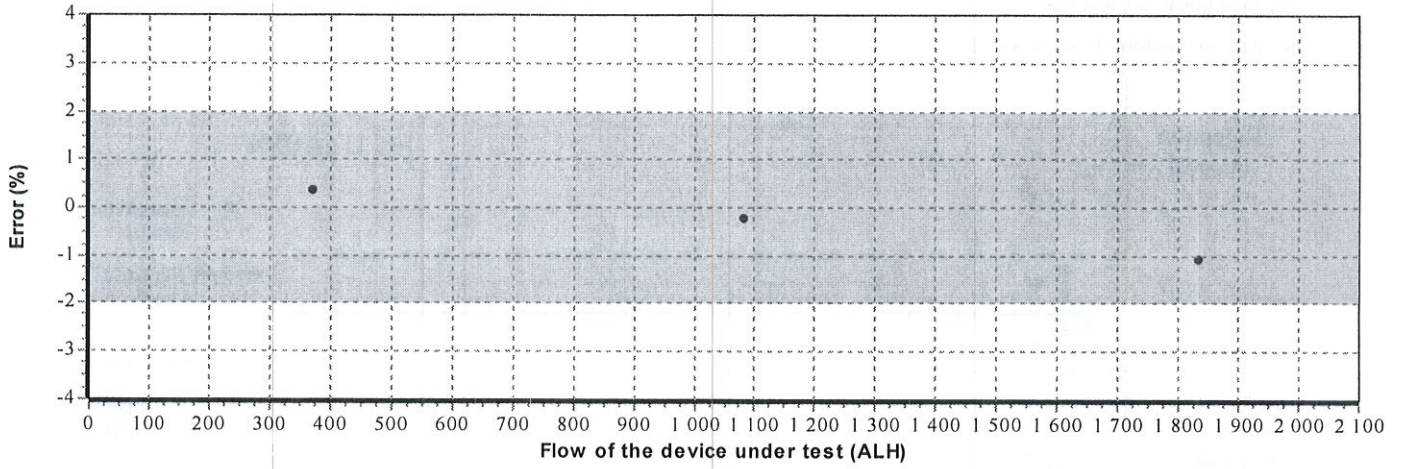
### Final readings

Test Flow ALH	Device under test m <sup>3</sup>	Measured values			Calculated Reference m <sup>3</sup>	Calculated Error m <sup>3</sup>	Acceptable Error m <sup>3</sup>	Uncertainty k = 2 m <sup>3</sup>	TUR
		Pressure PSIA	Temperature °C	Reference m <sup>3</sup>					
373.8365	57.0049	14.6589	22.80	52.2843	56.8061	0.1988	1.1361	0.1958	>4
1082.8910	179.9117	14.6686	22.37	166.3200	180.3214	-0.4097	3.6064	0.6212	>4
1832.4310	301.7843	14.6893	22.56	281.6500	305.1264	-3.3421	6.1025	1.0513	>4

**Calibration certificate # 17215**

Serial Number:	23543	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

**Final results**



See the appendix for the guideline of decision rule

Cal Factor : 0.996513

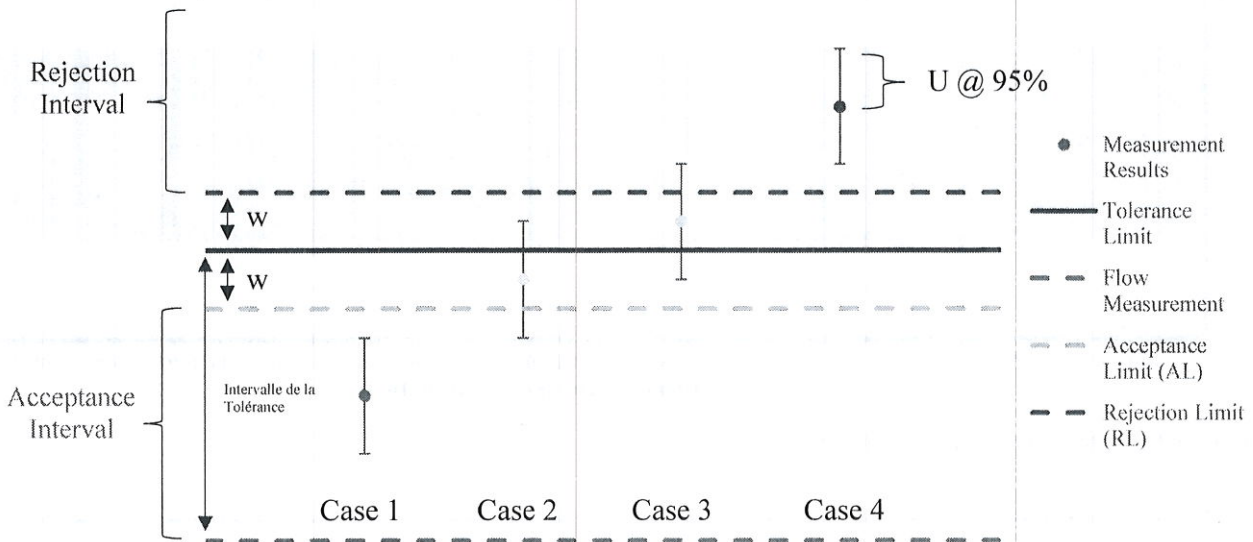
*[Signature]*  
 July 26<sup>th</sup>  
 2022

*Appendix for the decision rule*

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

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

Statements of conformity are reported as:



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

**Case 1 – Below acceptance limit AL**

**Status: In tolerance**

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

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

**Status: In tolerance-Conditional**

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

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

**Status: Out of tolerance-Conditional**

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

**Case 4 – Greater than rejection limit RL**

**Status: Out of tolerance**

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



# CALIBRATION CERTIFICATE

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

<b>Client :</b>	Polytests	<b>Certificate Number :</b>	157-77C603-222
<b>Address :</b>	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	<b>Calibration date :</b>	04-03-2022

**Technician:**  
Coutu, Daniel

David Llorens, Quality Manager

## SERVICE DESCRIPTION:

<b>Masses description :</b>	NIST F	<b>Date approved :</b>	14-03-2022
<b>Precision class :</b>	NIST F	<b>Next Calibration :</b>	04-03-2026
<b>Density :</b>	7.7g/cm <sup>3</sup>	<b>CCN accreditation # :</b>	668
<b>Identification (if unique) :</b>	DI000D532	<b>CLAS Certification # :</b>	2010-01

<b>Test conditions :</b>	Temp °C:	21.05	kPa Pressure:	102.3	Humidity:	49.4
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## NOTES:

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

## REMARKS:

March 2022



## CALIBRATION CERTIFICATE

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

<b>Client :</b>	Polytests	<b>Certificate Number :</b>	<b>157-77C603-222</b>
<b>Address :</b>	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	<b>CCN Accreditation # :</b>	668
<b>Mass :</b>	10 kg	<b>CLAS Certification # :</b>	2010-01
		<b>Precision class :</b>	NIST F
		<b>Calibration date :</b>	04-03-2022
		<b>Follow-up date :</b>	04-03-2026

### CALIBRATION RESULTS, CONVENTIONAL MASS:

Nominal Mass	Serial #	Inventory #	Conventional mass	Conventional mass after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
10 kg	DI000D532	EM 205	9.999938 kg		1 000 mg	10 mg

*Handwritten notes and signatures:*  
 157-77C603-222  
 695 B rue Gaudette  
 Saint-Jean-sur-Richelieu, QC  
 J3B7S7  
 Polytests





## CALIBRATION CERTIFICATE

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

### BALANCES

The following balances are used for calibration purposes :

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

We are also using these balances in our automated procedure :

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

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

### UNCERTAINTIES:

The following uncertainties exist :

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

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

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

### TRACEABILITY

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



## CALIBRATION CERTIFICATE

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

### USED REFERENCES

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

### ENVIRONMENTAL CONDITIONS

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



## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>		CE-EM-224 2022-05-25	
<b>CLIENT</b>		<b>CALIBRATION SPECIFICATION</b>	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	ISL-022
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/- 1/32"
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	365
<b>INSTRUMENT SPECIFICATION</b>			
<b>Instrument Type:</b>	Ruban à mesurer	<b>Input Type:</b>	Mesure
<b>Manufacturer:</b>	Stanley	<b>Output Type:</b>	N/A
<b>Model #:</b>	Leverlock 12&#39;	<b>Measurement Type:</b>	Inch
<b>Serial #:</b>	N/A	<b>Range:</b>	0 à 12'
<b>Location:</b>	Portable	<b>Version:</b>	
<b>CALIBRATORS SPECIFICATION</b>			
<b>Calibrator:</b>	tape a mesurer	<b>Certification #:</b>	VB-19652440
<b>Serial #:</b>	22091327	<b>Certification Date:</b>	2022-03-10
<b>Certified by:</b>	Starrett	<b>Next Certification:</b>	2023-03-10
<b>Comments:</b>			



## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-224 2022-05-25</b>
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CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	
<b>Comment</b>						
1.00 "	1.00 "	1.00 "	0.00 "	1.00 "	+/- 1/32 "	
36.00 "	36.00 "	36.00 "	0.00 "	36.00 "	+/- 1/32 "	
72.00 "	72.00 "	72.00 "	0.00 "	72.00 "	+/- 1/32 "	
108.00 "	108.00 "	108.00 "	0.00 "	108.00 "	+/- 1/32 "	
132.00 "	132.00 "	132.00 "	0.00 "	132.00 "	+/- 1/32 "	

<b>Environmental Conditions:</b>	Temperature: 22 °C	Humidity: 39 %RH
<b>Comments:</b>		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-25
<b>Next Calibration:</b>	2023-05-25
<b>Certificate Date:</b>	2022-05-25

CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

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



Martin Langlais - Technicien



MAY 2022





**Instrumentation  
Saint-Laurent** inc.  
Certified ISO 17025



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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-249 2022-05-10</b>
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CLIENT		CALIBRATION SPECIFICATION	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	4IN9106
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/- 0.25 "H2O
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	365

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

CALIBRATORS SPECIFICATION			
<b>Calibrator:</b>	Fluke Pression	<b>Certification #:</b>	2021008414
<b>Serial #:</b>	3330050	<b>Certification Date:</b>	2021-11-22
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2022-11-22
<b>Comments:</b>			
<b>Calibrator:</b>	Fluke 744	<b>Certification #:</b>	2022001379
<b>Serial #:</b>	8223003	<b>Certification Date:</b>	2022-02-18
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2022-05-18
<b>Comments:</b>			





**Instrumentation  
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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-249 2022-05-10</b>
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CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
<b>Conformity</b>	<b>Comment</b>					
0.0000 "H2O Compliant	0.0000 "H2O	0.0010 "H2O	0.0010 "H2O	0.0010 "H2O	+/- 0.25 "H2O	0.10 "H2O
Verification of the indicator						
0.0250 "H2O Compliant	0.0250 "H2O	0.0254 "H2O	+0.0004 "H2O	0.0254 "H2O	+/- 0.25 "H2O	0.10 "H2O
Verification of the indicator						
0.0500 "H2O Compliant	0.0500 "H2O	0.0496 "H2O	-0.0004 "H2O	0.0496 "H2O	+/- 0.25 "H2O	0.10 "H2O
Verification of the indicator						
0.0750 "H2O Compliant	0.0750 "H2O	0.0740 "H2O	-0.0010 "H2O	0.0740 "H2O	+/- 0.25 "H2O	0.10 "H2O
Verification of the indicator						
0.1000 "H2O Compliant	0.1000 "H2O	0.9963 "H2O	-0.0037 "H2O	0.9963 "H2O	+/- 0.25 "H2O	0.10 "H2O
Verification of the indicator						
0.0000 "H2O Compliant	0.0000 V.DC.	0.0715 V.DC.	+0.0715 V.DC.	0.0715 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
0.0250 "H2O Compliant	2.5000 V.DC.	2.4770 V.DC.	-0.023 V.DC.	2.4770 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
0.0500 "H2O Compliant	5.0000 V.DC.	4.9157 V.DC.	-0.0843 V.DC.	4.9157 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
0.0750 "H2O Compliant	7.5000 V.DC.	7.4215 V.DC.	-0.0785 V.DC.	7.4215 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
0.1000 "H2O Compliant	10.0000 V.DC.	9.9532 V.DC.	-0.0468 V.DC.	9.9532 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						

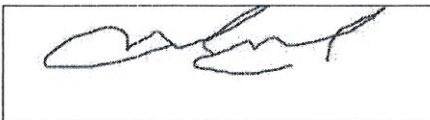
<b>Environmental Conditions:</b>	Temperature: 21 °C	Humidity: 41 %RH
<b>Comments:</b>		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-10
<b>Next Calibration:</b>	2023-05-10
<b>Certificate Date:</b>	2022-05-10

CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

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

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). SCC accreditation number: # 669. ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.



Marco Miron - Technicien

Version 1  
MAY 2022  
Page 2 of 2





# CERTIFICATE OF CALIBRATION



Certificate Number: 2022004548

Page 1 of 2

**Manufacturer:** Control Company  
**Model:** 4199  
**Description:** Barometer  
**Serial:** 192343395  
**ID:** EM 304  
**Customer:** SERVICES POLYTESTS  
 695-B GUADETTE  
 ST-JEAN-SUR-RICHELIEU QC  
 J3B 7S7

**RMA:** AC22051901  
**Workorder:** 2022004548  
**Barcode:** AL00040350-P  
**Received Conditions:** In Tolerance  
**Calibration Date:** 06-Jun-2022  
**Calibration Due:** 06-Jun-2023  
**Temperature:** 21.52°C  
**Humidity:** 44.1%RH

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

Any statement of compliance is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only. The customer must ensure equipment calibrated meets the intended use.

Tolerance is based on manufacturer specification if not stated otherwise. Calibration results relate to items calibrated only.

This certificate shall not be reproduced except in full without written approval of Alpha Controls and Instrumentation Inc.

## STANDARDS USED

Description	Model	ID	Cal Date	Due Date
Pressure Controller/Calibrator	Fluke Calibration 6270A	PRE-CAL-08	No Cal Required	
Pressure Measurement Module	Fluke Calibration PM600-A7M	PRE-MOD-01	25-Oct-2021	25-Oct-2022

**Notes:** Adjusted from adjustment screw on back of unit.

**Performed by:** Anthony Morra  
 Technician  
 (digitally signed on 06-Jun-2022 8:38 am)

**QA Reviewed by:** Slava Peciurov  
 Lab Manager  
 (digitally signed on 06-Jun-2022 9:37 am)

Quality Management System is assessed and registered by Intertek as conforming to the requirements of ISO9001

**Procedure: Pressure Gauge: CAL VER /6270A (1.1.A) FOUND (Pass)**

Test Description	True Value	Test Results	Tolerance	Lower Limit	Upper Limit	Status	Uncertainty
PRESSURE TEST							
993.05 mbar	993.05 mbar	998.0 mbar	±5.00 mbar	988.0 mbar	998.0 mbar	Pass	1.2e-001 mbar

**Procedure: Pressure Gauge: CAL VER /6270A (1.1.A) LEFT (Pass)**

Test Description	True Value	Test Results	Tolerance	Lower Limit	Upper Limit	Status	Uncertainty
PRESSURE TEST							
992.90 mbar	992.90 mbar	993.0 mbar	±5.00 mbar	987.9 mbar	997.9 mbar	Pass	1.1e-001 mbar

END OF CERTIFICATE



**Instrumentation  
Saint-Laurent** inc.  
Certified ISO 17025



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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-313 2022-05-10</b>
----------------------	-----------------------------

CLIENT		CALIBRATION SPECIFICATION	
<b>Company:</b>	Services Polytests Inc	<b>Service Procedure:</b>	4IN9106
<b>Address:</b>	695 B rue Gaudette	<b>Required Accuracy:</b>	+/- 0.25"H2O
	St-Jean-sur-Richelieu, Québec, J3B 7S7	<b>Calibration Frequency:(days)</b>	365

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

CALIBRATORS SPECIFICATION			
<b>Calibrator:</b>	Fluke Pression	<b>Certification #:</b>	2021008414
<b>Serial #:</b>	3330050	<b>Certification Date:</b>	2021-11-22
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2022-11-22
<b>Comments:</b>			
<b>Calibrator:</b>	Fluke 744	<b>Certification #:</b>	2022001379
<b>Serial #:</b>	8223003	<b>Certification Date:</b>	2022-02-18
<b>Certified by:</b>	Alpha Controls	<b>Next Certification:</b>	2022-05-18
<b>Comments:</b>			





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## CALIBRATION CERTIFICATE

<b>CERTIFICATE #</b>	<b>CE-EM-313 2022-05-10</b>
----------------------	-----------------------------

CALIBRATION RESULTS						
Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
<b>Conformity</b>	<b>Comment</b>					
0.0000 "H2O Compliant	0.0000 "H2O	+0.0015 "H2O	0.0015 "H2O	+0.0015 "H2O	+/- 0.25 "H2O	0.25 "H2O
Verification of the indicator						
0.0250 "H2O Compliant	0.0250 "H2O	0.0261 "H2O	+0.0011 "H2O	0.0261 "H2O	+/- 0.25 "H2O	0.25 "H2O
Verification of the indicator						
0.0500 "H2O Compliant	0.0500 "H2O	0.0510 "H2O	+0.0010 "H2O	0.0510 "H2O	+/- 0.25 "H2O	0.25 "H2O
Verification of the indicator						
0.0750 "H2O Compliant	0.0750 "H2O	0.0762 "H2O	+0.0012 "H2O	0.0762 "H2O	+/- 0.25 "H2O	0.25 "H2O
Verification of the indicator						
0.1000 "H2O Compliant	0.1000 "H2O	0.1011 "H2O	+0.0011 "H2O	0.1011 "H2O	+/- 0.25 "H2O	0.25 "H2O
Verification of the indicator						
0.0000 "H2O Compliant	0.0000 V.DC.	0.0420 V.DC.	+0.0420 V.DC.	0.0420 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
0.0250 "H2O Compliant	2.5000 V.DC.	2.5828 V.DC.	+0.0828 V.DC.	2.5828 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
0.0500 "H2O Compliant	5.0000 V.DC.	5.1261 V.DC.	+0.1261 V.DC.	5.1261 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
0.0750 "H2O Compliant	7.5000 V.DC.	7.6332 V.DC.	+0.1332 V.DC.	7.6332 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						
0.1000 "H2O Compliant	10.0000 V.DC.	10.1287 V.DC.	+0.1287 V.DC.	10.1287 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Verification of the analogic output						

<b>Environmental Conditions:</b>	Temperature: 21 °C	Humidity: 41 %RH
<b>Comments:</b>		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
<b>Calibration Date:</b>	2022-05-10
<b>Next Calibration:</b>	2023-05-10
<b>Certificate Date:</b>	2022-05-10

CALIBRATION CONFORMITY		
	Before	After
<b>Compliant:</b>	X	X
<b>Non Compliant:</b>		

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

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). SCC accreditation number: # 669. ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.

Marco Miron - Technicien

May 2022



**CALIBRATION CERTIFICATE # 17221**

**Calibration date : 2022-07-06**  
**Certificate issued : 2022-07-06**

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

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

**QUALITY PROGRAM CONFORMANCE**

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

**TRACEABILITY**

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

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

**CALIBRATION AND MEASUREMENT CAPABILITY**

Calibration measurement capabilities have an uncertainty of  $\pm 0.2\%$  of reading for a flow range between 5 SCCM to 10 SLPM,  $\pm 0.3\%$  of reading for a flow range between 10 SLPM to 30 SLPM,  $\pm 0.2\%$  of reading for a flow range between 30 SLPM to 3000 SLPM,  $\pm 0.3\%$  of reading for a flow range above 3000 SLPM to 6000 SLPM and  $\pm 0.5\%$  of reading for a flow range under 5 SCCM down to 1 SCCM, air or nitrogen equivalent. The reported uncertainty is expanded using a coverage factor  $k=2$  for a level of confidence of approximately 95%, assuming a normal distribution including resolution of the instrument. The test uncertainty ratio (TUR) of this calibration is at least 4:1 unless otherwise stated.

**CONDITION SUMMARY OF THE DEVICE UNDER TEST**

Initial conditions	In good condition
Work done	Initial readings = Final readings, no adjustment. Calibration of the instrument
Results	Final readings in tolerance
Remarks	Calibration frequency every 12 months

*Louis-Philippe Tremblay*

Louis-Philippe Tremblay  
Metrologist

*SCC*

Laboratory Manager

### Calibration certificate # 17221

Serial Number:	S8020	Test stand:	3
Calibration Date:	2022-07-06	Procedure:	POS-CAL-005
Instrument ID:	EM 318	Decision rule:	Method #3

### Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500331212	2023-05-03
Fluke molbox1+	Molbox1+	2089	1500317991	2022-10-05
RTD Mist	Mist	L00295	2022000011	2023-01-10
Module 44.5 PSI avec Baro 163671	Module 30	160659	2022003929	2023-05-13

### Final specifications of the device under test

### Calibration conditions

Gas	Air	Gas	Air
Operation temperature		Ambient temperature	22 °C
Inlet pressure		Ambient pressure	1013.54 mbar
Outlet pressure		Orientation	
Reference temperature		Seals	
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy	±2 %O.R.		

### Final readings

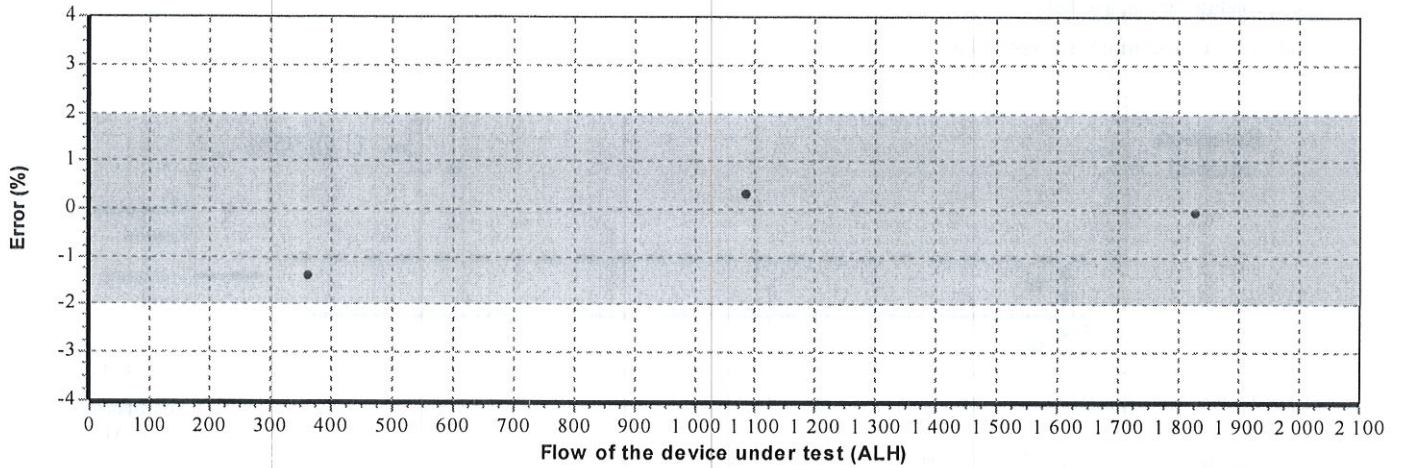
Test Flow ALH	Device under test m³	Measured values			Calculated Reference m³	Calculated Error m³	Acceptable Error m³	Uncertainty k = 2 m³	TUR
		Pressure PSIA	Temperature °C	Reference m³					
361.5227	59.3600	14.6578	22.32	55.4900	60.1955	-0.8355	1.2039	0.2074	>4
1085.7119	181.7350	14.6623	22.42	166.9800	181.1431	0.5919	3.6229	0.6241	>4
1826.9168	304.6100	14.6745	22.38	281.2500	304.8173	-0.2073	6.0963	1.0501	>4



### Calibration certificate # 17221

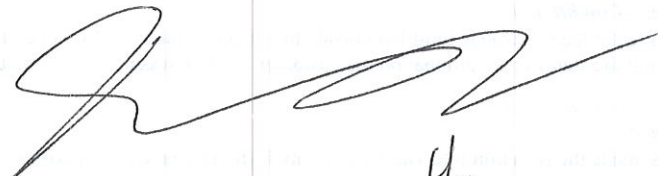
Serial Number:	S8020	Test stand:	3
Calibration Date:	2022-07-06	Procedure:	POS-CAL-005
Instrument ID:	EM 318	Decision rule:	Method #3

### Final results



See the appendix for the guideline of decision rule

attach: 1,014075

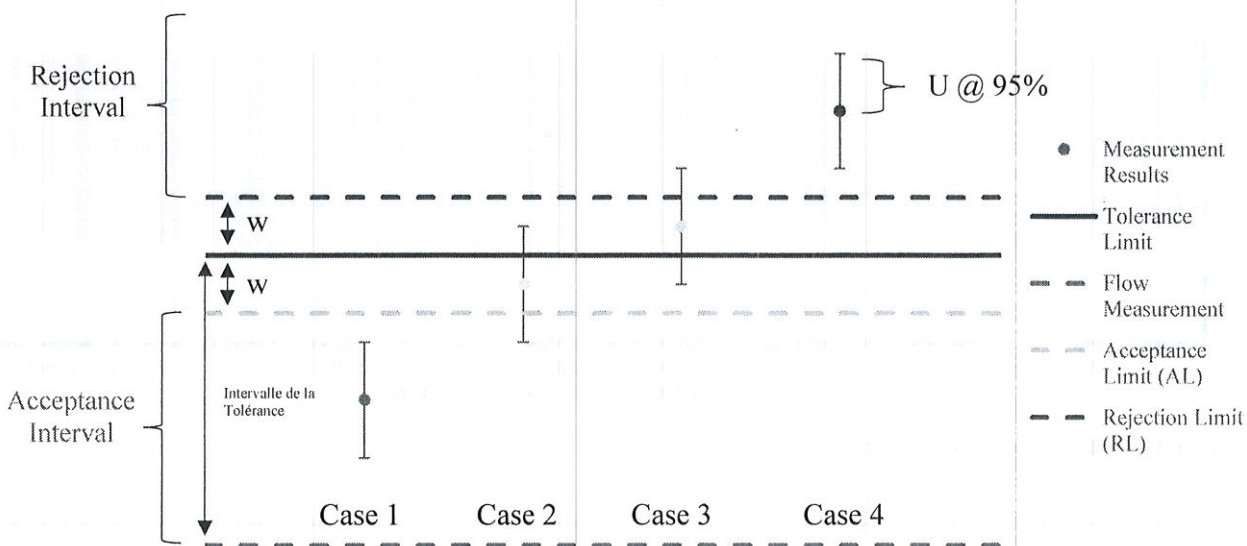
  
July 25<sup>th</sup>  
2022

*Appendix for the decision rule*

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

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

Statements of conformity are reported as:



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

**Case 1 – Below acceptance limit AL**

**Status: In tolerance**

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

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

**Status: In tolerance-Conditional**

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

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

**Status: Out of tolerance-Conditional**

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

**Case 4 – Greater than rejection limit RL**

**Status: Out of tolerance**

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



F.H. 332

Prüfer / Inspector /  
Responsable / Verificador

24.8 °C	±0.5 °C	24.7 °C
Temperature :		
8.0 m/s	±0.7 m/s	8.1 m/s
Velocity:		
Sollwert / Reference / Référence / Referencia:	Zulässige Toleranz / Permissible tolerance / Tolérance admise / Tolerancia permitida:	Istwert / Actual Value / Valeur réelle / Valor medido:
Messwerte / Measured values / Valeurs mesurées / Valores medidos:		

Serien-Nr. / Serial no. /  
N° de série / Número de serie:

46100640

Messbereich / Measuring range /  
Etendue de mesure / Rango de medición:  
Velocity: 0 ... 30 m/s  
Temperature: -20 ... +60 °C

Gerät / Module type /  
Modèle / Modelo:

testo 405i

Certificato di conformità • Protocole d'étalonnage  
Certificado de calibración

Kalibrier-Protokoll



**CALIBRATION CERTIFICATE**

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

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

**Technician:**  
Coutu, Daniel

David Llorens, Quality Manager

**SERVICE DESCRIPTION:**

<b>Masses description :</b>	ASTM E617	<b>Date approved :</b>	14-03-2022
<b>Precision class :</b>	ASTM 1	<b>Next Calibration :</b>	14-03-2027
<b>Density :</b>	7.96g/cm <sup>3</sup>	<b>CCN accreditation # :</b>	668
<b>Identification (if unique) :</b>	DI000J378	<b>CLAS Certification # :</b>	2010-01

<b>Test conditions :</b>	Temp °C: 21.16	kPa Pressure: 100.64	Humidity: 47.97
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**NOTES:**

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

**REMARKS:**

Mars 2022











## CALIBRATION CERTIFICATE

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

### BALANCES

The following balances are used for calibration purposes :

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

We are also using these balances in our automated procedure :

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

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

### UNCERTAINTIES:

The following uncertainties exist :

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

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

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

### TRACEABILITY

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

## CALIBRATION CERTIFICATE

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

### USED REFERENCES

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

### ENVIRONMENTAL CONDITIONS

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

## CERTIFICATE OF ANALYSIS

### Grade of Product: PRIMARY STANDARD

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

**Expiration Date: Mar 07, 2030**

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

### ANALYTICAL RESULTS


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

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



EM-336

  
 JUN 2022

  
 \_\_\_\_\_  
 Approved for Release





## CERTIFICATE OF ANALYSIS

**Customer:** SERVICES POLYTESTS INC., (S2232)  
695B, GAUDETTE  
ST-JEAN SUR RICHELIEU QC  
J3B 7S7

**Analysis Date:** 3/4/2022 9:44:18AM  
**Product code:** A1334811  
**Grade:** PRIMARY  
**Size:** 44  
**CGA #:** 590

**Servitrax barcode No:** T2H6H8N  
**Work order number:** 1607008  
**Pressure:** 1450 psig  
**Volume:** 4.7M3  
**Expiry date:** 03/04/2025

COMPONENTS	NOMINAL CONCENTRATION	ANALYSIS RESULTS
CARBON DIOXIDE	10.0000 % Molar	10.00 % Molar
CARBON MONOXIDE	1.0000 % Molar	1.002 % Molar
OXYGEN	10.0000 % Molar	10.00 % Molar
NITROGEN	BALANCE	BALANCE

Analysis performed by:

  
TOBIN ERINLE - LAB TECHNICIAN

Verified by:



This Air Liquide Canada mixture is traceable to NIST

### METHOD OF ANALYSIS:

Method of analysis is based on principles of gas chromatography and as documented in Air Liquide Canada operating procedure, where applicable, FID, TCD, PDHID, FT-IR, FPD, NO/NOx and SO2 chemiluminescence, hygrometer, and electrochemical cells and paramagnetic cell. Detectors were used in conjunction with packed or capillary columns calibrated flow meters and dilution calibrated system.

### ANALYTICAL ACCURACY:

Quality	Concentration	Blend Tolerance	AA
PRIMARY	5%-50%	+/-1%	+/-1%
	0.5%-5%	+/-2%	
	1ppm-0.5%	+/-5%	
CERTIFIED	5%-50%	+/-5%	+/-2%
	0.5%-5%	+/-10%	+/-2%
	1ppm-0.5%	+/-20%	+/-5%
UNANALYZE	5%-50%	+/-10%	
	<5%	+/-20%	

EM-338

  
June 2022

This mixture was certified by a combination of weight and analysis (depending on component) using scales certified against weights traceable to the Institute for National Measurement Standards (INMS) of the National Research Council of Canada (NRCC), Report # W-021221-13857 (MTL) and CA3033-022-050621-ACC (Calgary) or calibration standards prepared in that manner.

### How to contact us & order



E-mail within your region:

specgas.atlantic@airliquide.com  
specgas.qc@airliquide.com

specgas.on@airliquide.com  
specgas.ab@airliquide.com

specgas.midwest@airliquide.com  
specgas.pacific@airliquide.com



Customer Solution Center 1 800 217-2688



Online 24/7 through My.Airliquide.ca



Air Liquide Mobile App





# CERTIFICATE OF NIST TRACEABLE CALIBRATION

## Calibration Certificate No: 95240

### Customer Information

Customer: Services Polytests, Inc.  
Address : 695-B Gaudette  
St-Jean-sur-richelieu  
J3B 7S7



Customer PO #: 100544

### Calibration Procedure Information

Procedure ID: GTP AIRVEL

Revision #: 7

Revision Date: 10/17/2018

### Calibration Standards Information

<u>Graftel ID</u>	<u>Manufacturer</u>	<u>Model #</u>	<u>Description</u>	<u>CAL Due</u>
10086	Furness Controls	FC0332	DP Transmitter	5/7/2022
10100	Graftel	n/a	Temperature	10/18/2022
10171	Furness	FC0332-2W	0 - .4" H2O	5/7/2022
10187	Vaisala	PTB210	Barometric Pressure Gauge	5/7/2022
10017	Hart Scientific/Burns	1502A/12005	PRT, Temperature	10/29/2022
T1830459	Vaisala	HMW95D	RH/Temp. Logger	6/17/2022
1A01JMGKP36	Graftel	N/A	Digital Barometer	6/16/2022

### Sensor Information

Manufacturer: Omega

Description: Anemometer

Method Used: Pitot Tube

Model #: HHF143

Rated Accuracy: ± See Attachment

Accuracy Specified By: Omega

Instrument ID#: EM153

Range: 40 to 7800 fpm

Condition: Functional

Serial #: 1015949

Comments: Calibration Date: 01/19/2022 \*Limited calibration range: 40-5000 fpm  
Calibration Due: 01/19/2023

*The calibrations within the certificate/report are traceable through NIST or another National Metrology Institute to the International System of Units (SI). The reported calibration uncertainty has a confidence level of 95% (k=2). A calibration uncertainty ratio of 4:1 was maintained unless required uncertainty is supported by analysis. Graftel Quality Assurance System complies with applicable requirements of ISO/IEC-17025-2017, ANSI/NCSL Z540-1-1994 and ISO 9001. All results contained within this certificate relate only to item(s) calibrated. This certificate shall not be reproduced except in full and with the written consent of Graftel. Acceptance Criteria per Simple Acceptance Rule: Measurement Uncertainty is not applied to the measured value when in/out of tolerance statement is made.*

Performed By: Philip Davis  
Philip Davis  
Calibration Technician

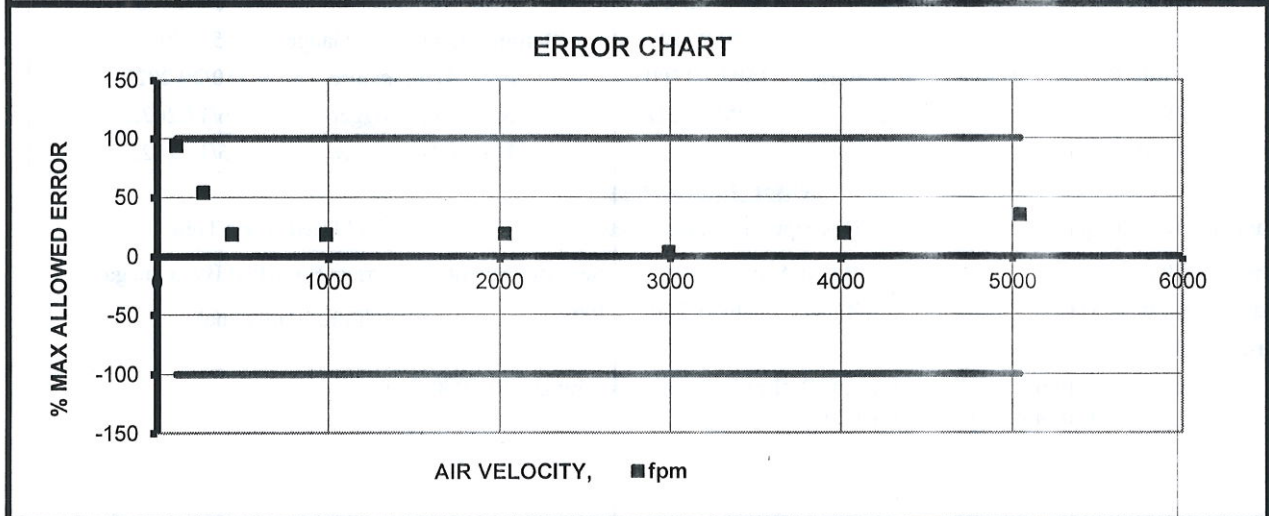
Date: 1/19/2022

Approved By: Scott Pickett  
Scott Pickett  
Vice President, Lab Services


Date: 1/19/2022


**ATTACHMENT TO CALIBRATION CERTIFICATE 95240**  
**AS FOUND / AS LEFT DATA**  
 Page 2 of 2

Reading From Standard,	Lower Limit of Meter Reading,	Measured Reading From Meter,	Upper Limit of Meter Reading,	Error,	Measurement Uncertainty (k=2)	CMC (k=2)	STATUS
<b>Actual Air Velocity</b>							
fpm	fpm	fpm	fpm	fpm	fpm	fpm	STATUS
113	111	115	115	2	3	3	Pass
271	267	273	275	2	6	5	Pass
436	431	437	441	1	8	8	Pass
987	976	989	998	2	15	15	Pass
2029	2008	2033	2050	4	28	28	Pass
2992	2961	2993	3023	1	41	41	Pass
4018	3977	4026	4059	8	54	54	Pass
5046	4995	5064	5097	18	68	68	Pass



Instrument Specifications		
Test Fluid:	Air	
Lower Velocity Range:	40	fpm
Upper Velocity Range:	7800	fpm
Velocity Resolution:	1	
Velocity Accuracy:	1 % Reading + 1 digit	
Laboratory Ambient Conditions		
Pressure:	14.29	psia
Humidity:	13.43	%RH
Temperature:	73.82	°F

 WWW.GRAFTEL.COM	FLOW - TEMPERATURE - HUMIDITY - PRESSURE - DESIGN - CONSULTING - ENGINEERING <b>NIST Traceable Calibration Data Sheet</b>		
	95 Chancellor Dr., Roselle, IL 60172	Phone: 847-364-2600	Fax: 847-364-3899

  
 2022-01-25



# CALIBRATION CERTIFICATE

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

<b>Client :</b>	Polytests	<b>Certificate Number :</b>	157-77C603-222
<b>Address :</b>	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	<b>Calibration date :</b>	04-03-2022

**Technician:**  
Coutu, Daniel

David Llorens, Quality Manager

## SERVICE DESCRIPTION:

<b>Masses description :</b>	NIST F	<b>Date approved :</b>	14-03-2022
<b>Precision class :</b>	NIST F	<b>Next Calibration :</b>	04-03-2026
<b>Density :</b>	7.7g/cm <sup>3</sup>	<b>CCN accreditation # :</b>	668
<b>Identification (if unique) :</b>	DI000D532	<b>CLAS Certification # :</b>	2010-01

<b>Test conditions :</b>	Temp °C:	21.05	kPa Pressure:	102.3	Humidity:	49.4
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## NOTES:

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

## REMARKS:

March 2022 page 1 of 5



## CALIBRATION CERTIFICATE

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

<b>Client :</b>	Polytests	<b>Certificate Number :</b>	157-77C603-222
<b>Address :</b>	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	<b>CCN Accreditation # :</b>	668
<b>Mass :</b>	10 kg	<b>CLAS Certification # :</b>	2010-01
		<b>Precision class :</b>	NIST F
		<b>Calibration date :</b>	04-03-2022
		<b>Follow-up date :</b>	04-03-2026

### CALIBRATION RESULTS, CONVENTIONAL MASS:

Nominal Mass	Serial #	Inventory #	Conventional mass	Conventional mass after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
10 kg	DI000D532	<i>EM205</i>	9.999938 kg		1 000 mg	10 mg
		<i>[Signature]</i>				

*[Faint handwritten notes and signatures at the bottom of the page]*



# CALIBRATION CERTIFICATE

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

<b>Client :</b>	Polytests	<b>Certificate Number :</b>	157-77C603-222
<b>Address :</b>	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	<b>CCN Accreditation # :</b>	668
<b>Mass :</b>	10 kg	<b>CLAS Certification # :</b>	2010-01
		<b>Precision class :</b>	NIST F
		<b>Calibration date :</b>	04-03-2022
		<b>Follow-up date :</b>	04-03-2026

## CALIBRATION RESULTS, CORRECTIONS:

Nominal Mass	Serial #	Inventory #	Conventional mass Corrections	Conventional mass Corrections after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
10 kg	DI000D532		-62 mg		1 000 mg	10 mg

## CALIBRATION CERTIFICATE

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

### BALANCES

The following balances are used for calibration purposes :

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

We are also using these balances in our automated procedure :

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

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

### UNCERTAINTIES:

The following uncertainties exist :

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

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

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

### TRACEABILITY

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



## CALIBRATION CERTIFICATE

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

### USED REFERENCES

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

### ENVIRONMENTAL CONDITIONS

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



# CERTIFICATE OF CALIBRATION



Certificate Number: 2022004548

Page 1 of 2

**Manufacturer:** Control Company  
**Model:** 4199  
**Description:** Barometer  
**Serial:** 192343395  
**ID:** EM 304  
**Customer:** SERVICES POLYTESTS  
 695-B GUADETTE  
 ST-JEAN-SUR-RICHELIEU QC  
 J3B 7S7

**RMA:** AC22051901  
**Workorder:** 2022004548  
**Barcode:** AL00040350-P  
**Received Conditions:** In Tolerance  
**Calibration Date:** 06-Jun-2022  
**Calibration Due:** 06-Jun-2023  
**Temperature:** 21.52°C  
**Humidity:** 44.1%RH

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

Any statement of compliance is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only. The customer must ensure equipment calibrated meets the intended use.

Tolerance is based on manufacturer specification if not stated otherwise. Calibration results relate to items calibrated only.

This certificate shall not be reproduced except in full without written approval of Alpha Controls and Instrumentation Inc.

## STANDARDS USED

Description	Model	ID	Cal Date	Due Date
Pressure Controller/Calibrator	Fluke Calibration 6270A	PRE-CAL-08	No Cal Required	
Pressure Measurement Module	Fluke Calibration PM600-A7M	PRE-MOD-01	25-Oct-2021	25-Oct-2022

**Notes:** Adjusted from adjustment screw on back of unit.

**Performed by:** Anthony Morra  
 Technician  
 (digitally signed on 06-Jun-2022 8:38 am)

**QA Reviewed by:** Slava Peciurov  
 Lab Manager  
 (digitally signed on 06-Jun-2022 9:37 am)

Quality Management System is assessed and registered by Intertek as conforming to the requirements of ISO9001



**Procedure: Pressure Gauge: CAL VER /6270A (1.1.A) FOUND (Pass)**

Test Description	True Value	Test Results	Tolerance	Lower Limit	Upper Limit	Status	Uncertainty
PRESSURE TEST							
993.05 mbar	993.05 mbar	998.0 mbar	±5.00 mbar	988.0 mbar	998.0 mbar	Pass	1.2e-001 mbar

**Procedure: Pressure Gauge: CAL VER /6270A (1.1.A) LEFT (Pass)**

Test Description	True Value	Test Results	Tolerance	Lower Limit	Upper Limit	Status	Uncertainty
PRESSURE TEST							
992.90 mbar	992.90 mbar	993.0 mbar	±5.00 mbar	987.9 mbar	997.9 mbar	Pass	1.1e-001 mbar

END OF CERTIFICATE

F.H. 332

Prüfer / Inspector /  
Responsable / Verificador

24.8 °C	±0.5 °C	24.7 °C
Temperature :		
8.0 m/s	±0.7 m/s	8.1 m/s
Velocity:		
Sollwert / Reference / Référence / Referencia:	Zulässige Toleranz / Permissible tolerance / Tolérance admise / Tolerancia permitida:	Istwert / Actual Value / Valeur réelle / Valor medido:
Messwerte / Measured values / Valeurs mesurées / Valores medidos:		

Serien-Nr. / Serial no. /  
N° de série / Número de serie:

46100640

Messbereich / Measuring range /  
Etendue de mesure / Rango de medición:  
Velocity: 0 ... 30 m/s  
Temperature: -20 ... +60 °C

Gerät / Module type /  
Modèle / Modelo:

testo 405i

Certificato di conformità • Protocole d'étalonnage  
Certificado de calibración

Kalibrier-Protokoll



## Certificat d'étalonnage / Calibration Certificate

**Client/Customer:** *Services Polytests*

**Certificat/Certificate:** C458078-00-01

### Identification de l'unité / Unit Identification

Fabricant/Manufacturer: **Delmhorst**  
Modèle/Model: **MCS-1**  
Description: **Wood Moisture Content Standard**

Série/Serial: **NA**  
ID de l'unité/Unit ID: **NA**

### Date d'étalonnage / Calibration Date

Date d'étalonnage/Cal Date: **17-Jan-2022**  
Échéance/Due Date: **17-Jan-2023**

### Conditions d'étalonnage / Calibration Conditions

Température/Temperature: **21.76°C**  
Humidité/Humidity: **15.39 %**  
Pression barométrique/Barometric Pressure: **N/A**

### Information générales / General Information

Commentaire/Remark: **N/A**

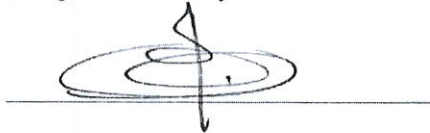
### Étalons utilisés / Standards Used

<u>ID de l'unité / Unit ID</u>	<u>Fabricant / Manufacturer</u>	<u>Modèle / Model</u>	<u>Date d'étalonnage / Cal Date</u>	<u>Date Due / Due Date</u>
INV022	Hewlett Packard	3458A	17-Dec-2021	17-Dec-2022

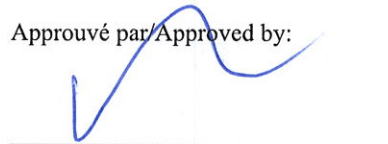
L'étalonnage a été effectué à l'aide d'étalons qui ont été vérifiés par rapport à ceux de l'Institut des Étalons Nationaux de Mesure (IÉNM) du Conseil National de Recherches du Canada (CNRC) ou à ceux du National Institute of Standards and Technology (NIST) des États-Unis, et/ou ont été dérivés de constantes physiques de base et/ou par technique d'autoétalonnage proportionnelle. L'incertitude d'étalonnage indiqué dans ce rapport est obtenue en utilisant un facteur de couverture de  $k=2$  selon un degré de confiance d'environ 95%.

The calibration was performed using measurement standards traceable to the National Measurement Institute Standards (NMIS) part of the National Research Council of Canada (NRC) or the National Institute of Standards and Technology (NIST), or to accepted intrinsic standards or measurement, or is derived by ratio type self-calibration techniques. Measurement uncertainties given in this report are based on a coverage factor of  $k=2$  corresponding to a confidence level of approximately 95%.

Étalonné par/Calibrated by: **B. Cardin**



Approuvé par/Approved by:



EM-334



Certificat/Certificate: C458078-00-01  
Asset: ITM0056802

Certificat d'étalonnage / Calibration Certificate

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**MONTREAL**  
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#D, 288 Hodsman Road  
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**CALGARY**  
#209, 4615 112 Ave SE  
Calgary, AB T2C 5J3

**VANCOUVER**  
1282 Cliveden Av  
Delta, BC V3M 6G4

www.itm.com  
information@itm.com  
1.800.561.8187

**Résultats du test / Test Results**

Procédure/Procedure: DELMHORST MCS-1 : 3458 Rev: 1

Type de donnée/Data Type: À la réception\As Found Résultats/Results: Passer\Pass

<u>Description du test</u> <u>Test Description</u>	<u>Valeur réelle</u> <u>True Value</u>	<u>Lecture</u> <u>Reading</u>	<u>Limite min.</u> <u>Lower Limit</u>	<u>Limite max.</u> <u>Upper Limit</u>	<u>Status de test</u> <u>Test Status</u>	<u>Ince Elarg</u> <u>Exp Uncert</u>
---- 12% MOISTURE ---- ---- 120MOHMS +/-10% ---- 120.00 MOhm		119.800 MOhm	108.000 MOhm	132.000 MOhm	Pass	4.1e+004 Ohm
---- 22% MOISTURE ---- ---- 1.1MOHMS +/-10% ---- 1.100 MOhm		1.0969 MOhm	0.9900 MOhm	1.2100 MOhm	Pass	5.8e+002 Ohm



## **Appendix 5    Unit pre-burn**

Temps acquisition minutes	Flue	Room	Tunnel	scale	duct	duct	wood moisture for each pieces 20 inches long each piece 26-19-20-26-19-19
	temp	temp	dry bulb		in	out	
	°F	°F	°F	lbs	°F	°F	
1	722,60	77,87	183,75	48,28	77,83	174,56	
2	712,32	77,91	179,95	47,59	78,34	175,72	
3	714,38	77,97	178,81	46,88	78,62	176,73	
4	718,50	77,96	178,01	46,17	78,94	178,33	
5	724,17	77,97	177,62	45,52	78,78	179,85	
6	730,59	77,96	176,78	44,88	78,68	180,89	
7	734,38	78,02	176,09	44,28	78,50	181,65	
8	731,83	78,00	176,99	43,68	78,47	182,99	
9	730,52	77,97	177,65	42,98	78,79	183,38	
10	731,74	77,97	177,90	42,39	78,66	184,33	
11	732,93	77,99	177,51	41,68	79,14	185,27	
12	736,58	78,03	177,05	41,08	78,83	186,37	
13	740,14	78,06	177,03	40,49	78,69	186,85	
14	742,73	78,09	177,46	39,89	79,12	187,79	
15	744,24	78,16	177,96	39,30	79,02	188,73	
16	744,05	78,19	178,08	38,69	79,36	189,15	
17	744,66	78,23	178,09	38,11	79,04	189,90	
18	745,01	78,36	178,02	37,50	79,24	190,23	
19	745,02	78,38	177,72	37,00	79,82	190,98	
20	744,81	78,41	177,82	36,40	78,94	191,07	
21	744,55	78,56	177,01	35,91	80,10	191,63	
22	743,34	78,66	176,16	35,31	79,87	191,72	
23	740,08	78,70	175,55	34,79	79,44	191,80	
24	736,44	78,72	174,71	34,32	79,76	191,23	
25	734,91	78,68	174,83	33,81	79,71	191,85	
26	731,93	78,68	174,09	33,20	79,31	191,36	
27	727,94	78,78	173,42	32,81	79,81	191,25	
28	725,22	78,72	172,44	32,32	79,75	190,94	
29	722,18	78,73	172,23	31,80	79,87	190,96	
30	721,10	78,69	171,06	31,32	80,05	190,71	
31	719,08	78,76	170,45	30,80	79,99	190,40	
32	716,47	78,76	170,23	30,33	80,05	190,40	
33	714,17	78,80	170,03	29,91	79,64	189,42	
34	712,43	78,77	169,46	29,32	79,70	189,49	
35	709,08	78,85	169,29	29,01	79,21	188,76	
36	708,69	78,83	168,61	28,51	79,93	188,74	
37	707,32	78,82	168,45	28,02	79,63	188,83	
38	705,81	78,92	168,52	27,52	80,23	188,57	
39	704,22	78,86	167,67	27,11	80,19	188,77	
40	703,67	78,89	167,75	26,63	80,50	188,92	
41	701,54	78,93	166,43	26,21	80,14	188,74	
42	700,48	79,01	166,37	25,83	80,18	189,19	
43	699,60	79,07	165,53	25,33	79,59	189,06	
44	698,22	79,08	164,88	24,93	80,37	189,06	
45	696,81	79,21	164,76	24,52	79,99	188,51	
46	694,99	79,21	163,73	24,14	79,56	188,34	
47	693,46	79,19	163,19	23,73	79,18	187,82	
48	689,82	79,26	163,10	23,34	80,90	188,13	
49	686,57	79,23	162,57	22,94	80,84	187,49	
50	683,12	79,27	162,22	22,64	80,62	186,70	
51	679,71	79,33	160,88	22,23	80,94	186,16	
52	677,06	79,34	160,62	21,93	80,43	185,46	
53	673,94	79,31	159,94	21,53	81,19	184,97	
54	671,48	79,32	159,95	21,23	80,75	184,45	
55	670,92	79,40	159,32	20,83	81,05	183,95	
56	670,45	79,45	158,90	20,54	81,50	183,67	
57	667,90	79,48	158,51	20,13	81,03	183,60	
58	664,69	79,42	158,45	19,84	80,78	183,14	
59	661,22	79,53	158,16	19,55	81,38	183,04	
60	657,62	79,72	157,76	19,23	81,60	182,28	
61	655,39	79,81	157,14	18,94	81,36	182,09	
62	652,96	79,85	157,27	18,63	81,63	181,64	
63	649,67	79,93	156,10	18,34	81,53	180,85	
64	647,53	79,96	154,77	18,05	81,73	180,48	
65	643,78	80,00	154,15	17,74	81,38	179,54	
66	640,35	79,99	153,47	17,45	81,80	179,03	
67	637,64	80,05	152,54	17,16	81,99	178,31	
68	634,57	80,12	151,85	16,94	81,53	177,55	
69	632,55	80,10	152,10	16,65	81,74	177,31	
70	630,33	80,06	151,35	16,36	81,86	176,46	
71	626,71	80,15	151,61	16,14	81,91	176,01	
72	623,63	80,26	150,47	15,95	81,96	175,66	
73	621,29	80,45	150,44	15,66	81,70	174,85	
74	619,14	80,43	150,23	15,34	82,06	174,15	
75	616,83	80,38	149,61	15,15	82,27	174,24	
76	613,90	80,49	148,96	14,95	82,07	173,12	
77	609,91	80,39	149,04	14,65	82,24	172,27	
78	605,97	80,35	148,09	14,55	82,18	171,46	
79	601,25	80,24	147,74	14,35	82,34	170,32	
80	596,19	80,10	147,36	14,16	82,31	169,30	
81	593,81	80,19	146,96	13,84	81,53	168,15	
82	590,70	80,32	146,04	13,75	82,20	167,78	
83	588,71	80,41	145,55	13,55	82,35	167,13	
84	585,54	80,40	145,25	13,36	82,74	166,63	
85	582,63	80,53	144,28	13,14	82,64	166,04	
86	578,94	80,61	143,78	13,04	82,10	165,16	
87	575,16	80,53	143,57	12,85	82,41	164,52	
88	570,59	80,46	142,91	12,76	82,57	163,36	
89	565,12	80,51	142,01	12,56	82,47	162,37	
90	559,76	80,50	140,84	12,35	82,05	161,73	

91	554,30	80,46	140,75	12,25	81,76	160,68
92	550,96	80,50	140,07	12,15	82,56	159,94
93	546,89	80,66	139,88	11,96	82,21	159,04
94	542,31	80,74	138,99	11,86	82,25	158,52
95	538,36	80,80	138,46	11,76	83,06	157,82
96	535,03	80,71	138,08	11,66	82,61	156,55
97	455,74	80,71	123,86	11,55	82,90	155,73
98	382,09	80,58	112,30	11,45	82,79	153,97
99	349,38	80,78	106,03	11,45	82,95	152,53
100	329,24	80,88	103,07	11,36	81,54	150,69
101	313,71	80,83	100,82	11,25	82,77	149,23
102	301,24	81,03	99,00	11,26	82,98	147,78
103	290,81	81,06	98,04	11,16	82,95	146,22
104	281,89	80,89	96,97	11,16	82,73	144,84
105	273,53	81,07	96,07	11,16	82,76	143,36
106	266,58	80,98	95,26	11,16	82,66	142,04
107	260,00	81,15	94,64	11,16	82,50	140,58
108	254,48	81,31	94,08	11,06	82,49	139,67
109	248,99	81,40	93,51	11,06	82,74	138,30
110	244,45	81,30	93,19	11,06	82,64	137,00
111	240,13	81,21	92,80	11,06	81,80	135,77
112	236,09	81,05	92,38	11,06	82,29	134,72
113	232,53	81,10	92,07	10,96	82,46	133,86
114	229,01	81,34	91,43	11,06	82,71	132,74
115	225,53	81,15	91,21	10,96	82,53	131,86
116	222,06	81,22	90,93	10,96	81,92	130,77
117	219,24	81,09	90,54	10,96	82,19	129,79
118	216,65	81,08	90,48	10,85	82,05	129,03
119	214,11	80,98	90,27	10,84	82,16	128,16
120	211,14	81,05	89,98	10,96	81,98	127,34
121	208,61	81,23	89,88	10,85	81,91	126,55
122	206,46	81,26	89,64	10,84	82,05	125,94
123	204,29	81,08	89,42	10,84	82,01	125,04
124	202,02	81,15	89,24	10,75	81,89	124,43
125	199,34	81,10	88,98	10,85	82,00	123,77
126	197,49	81,20	88,82	10,75	81,97	123,01
127	195,23	81,12	88,54	10,75	81,89	122,42
128	193,38	81,22	88,55	10,75	81,70	121,83
129	191,43	81,10	88,36	10,65	81,93	121,45
130	189,54	81,18	88,19	10,65	81,79	120,71
131	187,79	81,33	87,93	10,65	81,85	120,27
132	186,20	81,35	87,78	10,65	81,60	119,74
133	184,37	81,32	87,66	10,65	81,88	119,25
134	182,81	80,98	87,46	10,55	81,27	118,39
135	181,37	80,88	87,31	10,55	81,07	117,98
136	179,33	80,85	87,19	10,55	81,48	117,61
137	177,85	80,97	87,08	10,55	81,48	117,31
138	176,69	80,93	86,84	10,55	81,31	116,71
139	175,42	80,89	86,68	10,55	81,25	116,43
140	174,14	80,85	86,49	10,56	81,01	116,05
141	172,98	80,94	86,48	10,56	81,14	115,57
142	171,69	80,44	86,38	10,46	81,01	115,00
143	170,70	80,02	86,00	10,46	80,12	114,42
144	169,45	79,89	85,83	10,46	80,23	113,95
145	168,23	79,82	85,70	10,36	79,94	113,43
146	167,28	79,70	85,22	10,37	80,14	113,12
147	166,25	79,72	85,27	10,46	80,15	112,69
148	165,27	79,75	85,23	10,42	80,73	112,56
149	164,17	79,97	85,16	10,36	80,79	112,52
150	162,69	80,13	85,25	10,36	80,80	112,30
151	161,85	80,30	85,20	10,36	80,85	112,10
152	160,91	80,42	85,18	10,26	81,01	111,89
153	159,90	80,51	85,16	10,26	80,98	111,61
154	159,25	80,56	85,23	10,26	81,45	111,39
155	158,32	80,63	85,25	10,26	81,06	111,18
156	157,41	80,70	85,17	10,26	81,11	111,07
157	156,56	80,74	85,15	10,26	81,08	110,79
158	155,83	80,73	85,10	10,26	81,16	110,51
159	154,96	80,79	84,98	10,26	81,49	110,54
160	154,17	80,85	85,08	10,17	81,25	110,14
161	153,41	80,85	84,97	10,16	81,27	110,01
162	152,85	80,87	84,87	10,16	81,17	109,72
163	152,27	80,85	84,86	10,16	81,06	109,48
164	151,39	80,81	84,83	10,16	81,14	109,24
165	150,62	80,84	84,78	10,05	81,29	109,11
166	150,25	80,88	84,71	9,94	81,20	108,95
167	252,11	80,99	97,85	40,25	80,78	123,70
168	267,68	80,83	103,79	39,79	79,92	131,34
169	280,65	80,57	108,18	39,48	81,00	117,12
170	309,19	80,73	113,83	39,09	81,33	115,40
171	419,77	80,86	126,94	38,30	81,08	117,20
172	507,58	80,91	140,66	37,50	81,41	122,16
173	518,12	80,93	140,25	36,79	81,49	127,32
174	497,25	80,85	133,27	36,20	81,38	131,77
175	390,23	81,03	113,82	35,99	81,43	133,04
176	354,35	81,02	106,23	35,69	81,61	133,19
177	335,60	81,10	101,74	35,50	81,84	132,81
178	324,04	81,00	99,84	35,30	81,92	132,49
179	315,17	80,90	98,10	35,11	82,48	131,56
180	307,84	80,80	97,08	34,89	82,81	131,20
181	301,50	80,77	96,33	34,69	82,29	130,48
182	297,27	80,64	95,82	34,51	82,47	129,94
183	293,11	80,71	95,36	34,31	83,80	129,36

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184	290,28	80,76	95,26	34,09	83,30	129,07
185	288,77	80,90	95,04	33,80	82,09	128,87
186	287,03	81,08	94,81	33,61	82,48	128,86
187	285,35	81,03	94,62	33,39	82,30	128,79
188	285,81	81,19	94,53	33,10	82,56	128,90
189	285,17	81,15	94,50	33,01	82,10	128,79
190	285,91	81,06	94,38	32,71	82,07	129,01
191	286,73	81,17	94,36	32,50	82,07	129,16
192	288,45	81,22	94,54	32,20	83,78	129,59
193	289,37	81,22	94,41	32,02	83,38	129,95
194	291,22	81,15	94,73	31,70	82,90	130,21
195	292,27	81,13	94,75	31,50	82,43	130,41
196	293,64	81,18	94,78	31,22	82,53	130,92
197	295,89	81,21	94,97	31,00	83,16	131,18
198	297,27	81,31	95,02	30,70	83,26	131,77
199	299,36	81,32	95,26	30,51	82,66	132,03
200	300,26	81,35	95,13	30,31	83,65	132,30
201	301,83	81,34	95,13	30,00	82,80	132,45
202	302,54	81,38	95,25	29,81	82,99	132,75
203	303,39	81,27	95,49	29,51	83,45	133,18
204	304,40	81,20	95,51	29,21	82,54	133,20
205	305,98	81,16	95,38	29,02	83,29	133,66
206	306,46	81,23	95,37	28,70	83,45	133,85
207	307,26	81,25	95,70	28,51	82,63	133,81
208	307,38	81,25	95,70	28,22	82,98	134,33
209	308,10	81,30	95,71	28,02	84,61	134,61
210	308,08	81,32	95,79	27,72	83,86	134,81
211	307,20	81,48	95,78	27,52	83,29	135,01
212	307,92	81,45	95,88	27,32	84,48	135,10
213	307,92	81,40	95,87	27,10	82,68	135,18
214	308,13	81,42	95,76	26,82	82,64	135,35
215	308,17	81,37	96,05	26,62	84,37	135,44
216	307,78	81,36	95,87	26,31	83,29	135,74
217	307,52	81,54	95,89	26,11	83,62	135,71
218	307,19	81,57	95,65	25,92	84,13	136,01
219	307,80	81,46	95,63	25,61	83,66	136,08
220	307,16	81,48	95,55	25,41	83,56	136,10
221	305,81	81,56	95,59	25,23	83,11	135,86
222	305,09	81,58	95,31	25,03	84,21	136,02
223	304,30	81,47	95,45	24,81	85,23	136,02
224	303,86	81,48	95,25	24,52	83,07	135,99
225	303,51	81,46	95,19	24,33	84,53	136,14
226	302,90	81,42	95,43	24,13	83,75	136,06
227	302,74	81,31	95,27	23,92	84,99	135,96
228	302,75	81,30	95,20	23,73	83,75	135,98
229	302,00	81,24	95,19	23,53	84,41	135,79
230	302,30	81,25	95,14	23,33	83,35	136,00
231	301,79	81,24	95,23	23,12	83,83	136,02
232	301,95	81,27	95,30	22,92	85,07	136,01
233	302,09	81,32	95,27	22,73	83,74	135,81
234	301,68	81,44	95,17	22,42	84,63	136,15
235	301,17	81,38	95,20	22,23	83,73	135,95
236	301,11	81,29	95,31	22,03	82,52	135,76
237	301,01	81,27	95,27	21,83	84,99	135,58
238	300,95	81,30	95,24	21,53	85,06	135,81
239	300,87	81,41	95,20	21,43	85,14	135,86
240	300,84	81,51	95,11	21,24	85,91	135,80
241	300,69	81,60	95,03	20,96	85,16	135,84
242	299,70	81,68	95,13	20,82	84,27	135,64
243	298,53	81,56	94,95	20,53	85,16	135,67
244	298,85	81,70	94,84	20,33	85,36	135,57
245	297,70	81,78	94,80	20,12	85,01	135,57
246	297,72	81,73	95,00	19,93	84,55	135,66
247	297,17	81,72	94,78	19,73	85,35	135,49
248	297,63	81,68	94,92	19,54	84,75	135,70
249	296,73	81,58	94,97	19,33	84,86	135,41
250	296,01	81,59	94,72	19,13	84,30	135,43
251	295,91	81,72	94,67	18,94	84,53	135,53
252	295,89	81,73	94,79	18,75	84,28	135,49
253	295,85	81,61	94,77	18,53	85,29	135,63
254	295,13	81,75	94,62	18,34	84,89	135,77
255	293,29	81,73	94,53	18,14	84,96	135,53
256	291,86	81,83	94,38	17,95	85,98	135,70
257	290,91	81,76	94,34	17,72	84,93	135,42
258	289,99	81,86	94,31	17,54	83,71	135,52
259	288,82	81,86	94,31	17,34	85,55	135,88
260	288,44	81,97	94,17	17,15	85,37	135,46
261	286,97	82,08	93,97	17,04	84,97	135,38
262	285,68	82,15	94,03	16,84	85,46	135,12
263	284,82	82,16	93,94	16,74	85,18	135,32
264	283,64	82,15	93,90	16,54	84,54	134,99
265	283,07	82,01	93,83	16,35	85,12	135,02
266	282,92	81,91	93,64	16,13	85,49	134,80
267	281,65	81,92	93,56	16,04	85,00	134,73
268	280,38	82,03	93,57	15,85	85,40	134,89
269	279,49	82,08	93,54	15,75	86,14	134,67
270	278,06	82,14	93,47	15,55	86,17	134,64
271	276,67	82,19	93,46	15,34	86,01	134,41
272	275,26	82,30	93,40	15,24	86,10	134,41
273	274,90	82,30	93,19	15,05	86,19	134,31
274	274,91	82,29	93,07	14,95	86,21	134,12
275	274,79	82,34	92,99	14,73	86,05	134,12
276	273,98	82,28	93,12	14,64	86,11	134,16



277	273,77	82,31	93,30	14,44	84,73	134,18
278	272,41	82,32	93,44	14,35	84,69	134,33
279	271,55	82,35	93,26	14,15	85,51	134,42
280	270,20	82,33	93,22	14,05	85,96	134,28
281	269,21	82,27	93,19	13,94	86,48	134,35
282	267,63	82,32	92,96	13,84	86,04	134,32
283	266,85	82,47	92,81	13,65	86,22	134,41
284	267,34	82,58	92,65	13,45	85,62	134,16
285	266,68	82,63	92,74	13,36	85,92	134,23
286	265,65	82,59	92,49	13,26	86,21	133,97
287	264,70	82,52	92,36	13,14	84,27	133,95
288	264,16	82,54	92,32	12,94	85,92	133,92
289	263,23	82,46	92,19	12,85	85,70	133,92
290	261,21	82,38	92,17	12,75	86,29	133,67
291	258,59	82,37	91,84	12,66	85,90	133,29
292	256,85	82,26	91,73	12,55	85,42	132,92
293	255,02	82,34	91,60	12,46	84,38	132,73
294	253,24	82,36	91,57	12,35	85,85	132,19
295	251,78	82,25	91,53	12,25	85,18	132,01
296	250,73	82,34	91,38	12,15	85,68	131,70
297	249,05	82,40	91,20	12,05	84,93	131,22
298	246,05	82,39	91,03	12,05	86,03	130,81
299	243,00	82,31	90,92	11,86	84,25	130,41
300	240,08	82,09	90,69	11,86	85,64	129,88
301	236,51	82,28	90,51	11,76	85,65	129,32
302	233,97	82,27	90,36	11,76	85,48	128,70
303	231,82	82,26	90,21	11,66	85,75	128,21
304	229,94	82,30	90,11	11,66	84,69	127,53
305	228,01	82,43	90,02	11,55	84,26	127,01
306	225,29	82,36	89,86	11,55	84,36	126,14
307	224,22	82,48	89,80	11,45	84,10	125,69
308	222,55	82,58	89,81	11,45	86,27	124,97
309	219,84	82,53	89,64	11,44	84,83	124,29
310	216,05	82,41	89,54	11,35	84,67	123,79
311	213,85	82,29	89,46	11,25	86,29	123,07
312	212,43	82,43	89,44	11,25	84,97	122,66
313	209,92	82,38	89,34	11,16	83,33	121,89
314	208,47	82,47	89,20	11,15	85,23	121,26
315	206,37	82,52	89,19	11,06	84,81	120,84
316	204,61	82,50	89,13	11,06	84,57	120,24
317	204,08	82,51	89,06	10,96	84,65	119,73
318	203,32	82,58	88,98	10,96	84,86	119,36
319	202,60	82,53	88,84	10,85	85,14	118,90
320	201,49	82,60	88,87	10,75	84,68	118,59
321	200,57	82,56	88,87	10,75	83,56	118,25
322	199,38	82,60	88,82	10,75	84,42	117,97
323	197,85	82,59	88,71	10,65	84,78	117,74
324	196,40	82,55	88,59	10,56	84,23	117,40
325	196,13	82,55	88,59	10,55	85,17	117,12
326	195,58	82,54	88,57	10,46	85,02	117,02
327	195,53	82,51	88,56	10,46	84,14	116,85
328	194,89	82,48	88,44	10,36	83,67	116,64
329	194,47	82,53	88,41	10,33	84,65	116,52
330	193,93	82,56	88,37	10,26	84,28	116,37
331	193,83	82,55	88,34	10,26	85,70	116,28
332	193,10	82,53	88,15	10,17	83,68	116,14
333	192,29	82,55	88,20	10,16	83,78	116,10
334	191,81	82,51	88,01	10,05	84,40	116,07
335	191,25	82,46	87,92	9,95	84,61	115,70
336	190,60	82,49	87,97	9,95	84,88	115,61
337	189,63	82,48	87,85	9,85	84,11	115,56
338	189,18	82,45	87,75	9,85	83,09	115,50
339	188,39	82,32	87,79	9,85	84,30	114,96
340	187,64	82,01	87,29	9,85	84,88	114,84
341	186,82	81,74	87,02	9,76	82,38	114,57
342	186,23	81,67	86,79	9,66	84,50	114,19
343	185,27	81,49	86,52	9,66	83,16	114,05
344	184,73	81,43	86,34	9,56	84,49	113,83
345	184,24	81,14	86,07	9,56	81,32	113,22
346	183,16	80,94	85,60	9,56	81,69	112,93
347	182,42	80,88	85,52	9,46	83,39	112,79
348	181,08	80,87	85,29	9,46	81,62	112,65
349	180,19	80,86	85,48	9,37	82,31	112,43
350	178,53	80,92	85,40	9,37	83,61	112,21
351	177,23	80,91	85,27	9,37	81,02	111,88
352	175,66	80,87	85,29	9,37	81,83	111,50
353	174,49	80,97	85,30	9,25	84,57	111,50
354	173,57	80,99	85,21	9,37	81,46	111,14
355	172,28	81,04	85,35	9,25	82,19	110,91
356	171,21	81,08	85,35	9,25	81,79	110,69
357	170,04	81,10	85,18	9,25	81,73	110,37
358	168,78	81,08	85,10	9,15	84,78	110,22
359	167,87	81,08	85,12	9,15	84,93	110,05
360	166,97	81,08	84,99	9,15	83,65	109,71
361	165,72	81,06	84,89	9,15	81,21	109,33
362	164,64	81,02	84,79	9,15	82,98	109,21
363	163,82	80,96	84,85	9,15	82,41	109,05
364	162,89	80,86	84,58	9,06	82,03	108,66
365	161,94	80,83	84,44	9,06	82,69	108,46
366	161,02	80,84	84,52	9,05	82,36	108,28
367	160,15	80,87	84,48	9,05	81,56	108,04
368	159,29	80,87	84,48	9,05	83,07	107,90
369	158,63	80,89	84,33	8,96	82,04	107,58

370	157,58	80,88	84,25	8,95	82,66	107,44
371	156,60	80,87	84,27	8,96	82,71	107,45
372	155,69	80,90	84,25	8,96	82,48	107,27
373	155,02	80,92	84,55	8,96	81,82	107,16
374	154,53	81,00	84,52	8,96	82,74	107,05
375	154,03	81,02	84,46	8,86	81,93	106,88
376	153,17	81,06	84,56	8,86	82,11	106,83
377	152,63	81,10	84,57	8,86	82,30	106,73
378	151,65	81,15	84,56	8,86	82,16	112,56
379	149,58	81,19	84,35	8,76	81,62	123,42
380	149,78	81,13	84,10	8,67	81,51	128,98
381	150,72	81,06	83,90	8,76	82,91	118,10
382	153,19	80,98	84,01	8,76	82,19	113,13
383	153,70	80,92	83,91	8,76	82,76	111,16
384	152,93	80,92	84,06	8,67	81,56	109,74
385	152,21	80,96	84,15	8,66	81,55	108,61
386	151,05	81,00	84,19	8,67	84,26	108,09
387	150,33	80,97	84,11	8,66	82,71	107,40
388	148,33	80,94	83,97	8,57	81,88	118,22
389	147,05	80,89	83,68	8,57	81,48	126,32
390	147,37	80,84	83,55	8,57	81,31	130,61
391	149,60	80,78	83,41	8,57	81,14	114,36
392	151,13	80,77	83,58	8,57	81,51	111,69
393	150,72	80,75	83,63	8,57	81,70	109,80
394	150,02	80,72	83,67	8,57	83,04	108,60
395	148,93	80,78	83,83	8,45	83,58	107,77
396	147,94	80,85	83,82	8,54	81,47	106,93
397	146,65	80,90	83,89	8,57	83,71	106,50
398	145,86	80,97	83,93	8,45	81,84	105,97
399	145,26	80,98	83,99	8,45	82,84	105,59
400	144,51	81,00	84,01	8,45	82,76	105,28
401	143,51	81,05	83,98	8,41	81,71	104,93
402	142,78	81,05	83,92	8,35	82,54	104,68
403	141,34	81,04	83,73	8,36	81,79	112,88
404	140,48	80,91	83,51	8,26	81,53	121,23
405	140,73	80,87	83,31	8,26	81,33	125,38
406	141,61	80,80	83,24	8,26	81,22	129,04
407	143,82	80,68	83,17	8,35	80,97	112,10
408	144,73	80,72	83,41	8,25	81,50	109,63
409	144,50	80,73	83,47	8,26	82,66	108,01
410	143,80	80,72	83,51	8,25	81,12	106,67
411	142,92	80,71	83,43	8,26	82,77	105,88
412	142,26	80,70	83,47	8,26	83,37	105,22
413	141,07	80,73	83,60	8,25	83,11	104,56
414	140,16	80,77	83,69	8,26	81,40	104,28
415	139,46	80,81	83,65	8,26	81,62	103,85
416	138,58	80,86	83,71	8,16	82,15	104,77
417	136,88	80,88	83,66	8,16	81,61	116,74
418	136,62	80,89	83,57	8,16	81,49	121,55
419	137,31	80,95	83,50	8,06	81,40	125,20
420	138,25	80,96	83,41	8,06	81,42	128,31
421	140,39	80,99	83,67	8,06	81,98	112,25
422	141,21	81,02	83,81	8,06	81,87	109,52
423	141,11	81,06	83,84	8,06	81,47	107,73
424	140,31	81,10	83,89	8,06	81,39	106,46
425	139,70	81,13	84,07	8,06	82,49	105,51
426	139,03	81,15	83,99	8,06	82,45	104,83
427	137,85	81,15	83,94	7,97	81,77	111,43
428	136,55	81,10	83,51	7,87	81,57	119,87
429	136,43	81,00	83,44	7,87	81,42	124,09
430	137,06	80,99	83,41	7,96	81,39	127,03
431	138,14	80,93	83,23	7,97	81,52	116,55
432	140,28	80,88	83,31	7,87	81,23	110,87
433	140,25	80,84	83,45	7,96	81,02	108,35
434	139,93	80,86	83,50	7,87	81,25	106,74
435	139,44	80,92	83,60	7,96	83,03	105,74
436	138,62	80,93	83,64	7,87	81,52	104,80
437	136,84	80,97	83,46	7,87	81,49	116,64
438	136,36	80,89	83,20	7,77	81,43	122,24
439	136,81	80,88	83,10	7,77	81,39	125,78
440	137,36	80,82	82,93	7,77	81,11	128,43
441	139,29	80,73	82,91	7,77	81,51	111,68
442	140,18	80,69	83,18	7,85	81,65	108,92
443	139,91	80,70	83,29	7,77	81,77	106,98
444	139,14	80,75	83,43	7,77	82,75	105,74
445	138,38	80,79	83,59	7,77	82,20	104,75
446	137,45	80,89	83,59	7,77	81,52	103,97
447	136,71	80,94	83,60	7,77	81,43	103,36
448	136,00	80,87	83,47	7,77	81,19	102,90
449	135,37	80,89	83,47	7,77	81,40	102,51
450	134,66	80,87	83,60	7,65	82,35	102,17
451	133,90	80,87	83,78	7,66	82,08	101,94
452	133,28	80,95	83,86	7,65	83,02	101,88
453	132,77	81,01	83,93	7,65	82,34	101,71
454	132,25	81,09	84,02	7,65	83,32	101,59
455	131,69	81,16	84,07	7,65	81,84	101,46
456	131,38	81,24	84,12	7,66	82,70	101,45
457	130,82	81,26	84,21	7,65	83,16	101,32
458	130,45	81,30	84,30	7,56	84,10	101,22
459	130,09	81,36	84,25	7,55	83,56	101,19
460	129,74	81,37	84,24	7,56	82,46	101,09
461	129,27	81,38	84,24	7,56	84,97	101,06
462	129,14	81,41	84,28	7,56	83,29	101,05

463	128,97	81,41	84,28	7,46	82,76	100,88
464	128,52	81,46	84,35	7,46	81,91	100,82
465	128,26	81,47	84,39	7,46	83,03	100,70
466	127,96	81,48	84,47	7,46	82,58	100,72
467	127,81	81,48	84,45	7,46	83,80	100,68
468	127,63	81,48	84,38	7,46	82,64	100,54
469	127,53	81,50	84,35	7,46	82,19	100,41
470	127,16	81,48	84,40	7,46	82,42	100,40
471	126,78	81,49	84,40	7,36	84,25	100,35
472	126,63	81,50	84,37	7,36	83,26	100,37
473	126,42	81,55	84,31	7,36	84,21	100,20
474	126,27	81,55	84,31	7,36	83,32	100,22
475	125,99	81,50	84,29	7,36	82,30	100,05
476	125,71	81,49	84,29	7,36	81,92	99,90
477	125,52	81,48	84,35	7,36	83,92	99,92
478	125,23	81,47	84,34	7,36	82,55	99,77
479	125,06	81,49	84,31	7,36	82,31	99,82
480	124,77	81,50	84,43	7,26	82,38	99,73
481	124,58	81,45	84,37	7,26	82,30	99,64
482	124,35	81,48	84,30	7,36	83,10	99,61
483	124,19	81,47	84,28	7,26	83,84	99,67
484	123,97	81,48	84,34	7,27	83,81	99,52
485	123,82	81,52	84,29	7,27	82,46	99,42
486	123,67	81,52	84,30	7,27	82,27	99,37
487	123,43	81,51	84,31	7,27	82,39	99,34
488	123,36	81,48	84,20	7,17	82,99	99,23
489	123,20	81,46	84,28	7,24	82,07	99,22
490	123,07	81,49	84,29	7,17	84,19	99,21
491	122,85	81,49	84,30	7,17	83,85	99,16
492	122,69	81,51	84,35	7,17	83,31	99,19
493	122,63	81,48	84,26	7,17	82,08	99,01
494	122,41	81,49	84,23	7,17	83,14	98,99
495	121,89	81,46	84,23	7,07	82,25	104,00
496	121,43	81,42	83,90	7,07	81,97	109,75
497	121,76	81,39	83,83	7,07	81,78	113,03
498	122,40	81,31	83,72	6,95	81,76	115,74
499	123,37	81,29	83,56	6,95	81,64	117,93
500	124,29	81,27	83,51	6,95	81,75	120,24
501	125,53	81,22	83,52	6,95	81,68	122,47
502	126,65	81,17	83,52	6,86	81,62	124,37
503	128,42	81,17	83,67	6,95	83,16	109,67
504	129,32	81,21	83,84	6,95	81,85	106,76
505	129,44	81,19	83,94	6,95	82,09	104,76
506	129,16	81,24	84,01	6,95	82,84	103,40
507	128,58	81,28	84,00	6,95	81,92	102,30
508	127,31	81,31	83,97	6,86	81,99	111,87
509	126,80	81,29	83,76	6,85	81,81	116,81
510	127,01	81,26	83,69	6,76	81,69	119,69
511	127,58	81,25	83,69	6,76	81,71	122,09
512	128,35	81,22	83,60	6,76	81,71	124,22
513	129,23	81,20	83,60	6,76	81,63	126,14
514	131,24	81,18	83,73	6,76	82,45	110,50
515	132,08	81,23	83,94	6,76	82,61	107,39
516	131,83	81,26	83,98	6,76	81,97	105,31
517	131,14	81,29	84,12	6,76	81,94	103,85
518	130,62	81,33	84,15	6,76	83,48	102,81
519	129,31	81,36	84,14	6,76	82,11	109,25
520	128,15	81,34	83,94	6,66	81,80	115,83
521	128,26	81,28	83,93	6,66	81,79	119,21
522	128,61	81,30	83,76	6,56	81,72	121,81
523	129,23	81,24	83,64	6,66	81,66	123,84
524	130,13	81,21	83,67	6,57	81,64	125,80
525	131,44	81,14	83,69	6,66	82,17	112,34
526	132,89	81,19	84,03	6,66	81,71	108,29
527	132,98	81,23	83,97	6,56	81,97	105,87
528	132,43	81,22	84,11	6,66	83,79	104,30
529	131,56	81,25	84,22	6,66	82,22	103,14
530	130,45	81,30	84,18	6,56	81,88	107,79
531	128,96	81,27	83,95	6,56	81,81	115,60
532	128,67	81,27	83,86	6,47	81,79	119,14
533	128,99	81,21	83,73	6,47	81,71	121,60
534	129,71	81,20	83,67	6,47	81,66	123,80
535	130,57	81,17	83,59	6,47	81,55	125,67
536	131,70	81,12	83,52	6,47	83,13	112,68
537	133,26	81,16	83,94	6,47	83,42	108,47
538	133,19	81,18	83,97	6,47	82,81	106,04
539	132,50	81,19	84,07	6,47	82,42	104,31
540	131,69	81,22	84,25	6,47	83,00	103,12
541	130,77	81,26	84,22	6,47	82,21	102,13
542	130,01	81,24	84,26	6,47	83,45	101,33
543	128,40	81,26	84,08	6,37	82,11	111,42
544	127,76	81,21	83,86	6,27	81,84	115,86
545	128,08	81,19	83,87	6,37	81,67	118,62
546	128,61	81,15	83,62	6,37	81,71	121,08
547	129,19	81,15	83,58	6,27	81,51	123,18
548	129,94	81,09	83,55	6,27	81,55	125,38
549	131,24	81,04	83,63	6,27	82,28	111,26
550	132,63	81,07	83,89	6,37	84,26	107,61
551	132,38	81,08	83,90	6,27	82,36	105,33
552	131,85	81,10	84,02	6,27	82,04	103,65
553	131,30	81,14	84,01	6,27	83,06	102,49
554	130,41	81,14	83,99	6,27	83,58	101,68
555	128,63	81,18	83,89	6,27	81,80	111,02

556	127,87	81,13	83,66	6,16	81,66	115,96
557	127,88	81,10	83,62	6,16	81,67	118,79
558	128,40	81,06	83,56	6,15	81,40	121,31
559	129,02	80,99	83,46	6,16	81,51	123,23
560	129,71	80,95	83,44	6,16	81,45	124,99
561	130,39	80,95	83,35	6,16	82,57	113,69
562	132,43	80,97	83,70	6,15	82,67	108,37
563	132,83	80,97	83,70	6,16	82,09	105,68
564	132,18	81,05	83,86	6,16	81,51	103,90
565	130,33	81,04	83,81	6,08	81,53	114,35
566	129,57	81,03	83,69	6,06	81,41	119,40
567	129,66	81,04	83,57	6,06	81,43	121,95
568	130,11	81,01	83,49	5,96	81,46	124,22
569	130,69	80,92	83,43	5,96	81,34	126,33
570	131,48	80,89	83,36	6,06	81,91	119,21
571	133,25	80,92	83,67	6,06	82,19	109,11
572	133,46	80,96	83,81	6,06	82,03	106,21
573	132,88	80,99	83,85	6,06	81,40	104,28
574	131,89	81,01	83,85	5,96	81,99	106,69
575	130,00	81,03	83,69	5,96	81,74	116,12
576	129,57	80,99	83,59	5,87	81,49	119,71
577	129,94	80,95	83,45	5,86	81,37	122,20
578	130,34	80,92	83,41	5,86	81,43	124,28
579	130,92	80,91	83,37	5,86	81,34	125,97
580	132,34	80,84	83,39	5,94	82,33	111,16
581	133,35	80,85	83,73	5,96	81,83	107,41
582	133,17	80,87	83,71	5,96	83,12	105,03
583	132,33	80,91	83,78	5,96	82,33	103,35
584	131,40	80,95	83,83	5,86	81,85	102,04
585	130,38	80,93	83,76	5,96	81,59	101,14
586	129,46	80,95	83,74	5,86	81,90	100,55
587	128,66	80,96	83,79	5,86	82,79	100,02
588	127,91	80,97	83,77	5,86	82,06	99,59
589	127,04	80,99	83,80	5,77	82,12	99,26
590	126,28	81,02	83,78	5,86	82,29	98,96
591	125,67	81,01	83,77	5,86	83,38	98,70
592	125,07	81,01	83,75	5,77	82,18	98,47
593	124,68	81,02	83,68	5,77	81,93	98,29
594	124,24	81,00	83,78	5,77	82,16	98,21
595	123,97	81,00	83,68	5,77	81,97	98,00
596	123,47	81,02	83,71	5,77	82,37	97,87
597	122,90	80,99	83,69	5,77	83,47	97,79
598	122,56	80,98	83,59	5,77	82,87	97,69
599	122,28	80,96	83,54	5,67	81,91	97,53
600	121,96	80,95	83,46	5,77	82,20	97,56
601	121,53	80,92	83,52	5,77	83,24	97,46
602	121,38	80,91	83,57	5,67	82,10	97,32
603	121,02	80,92	83,51	5,67	82,65	97,29
604	120,88	80,91	83,46	5,67	81,66	97,20
605	120,71	80,93	83,40	5,67	81,84	97,09
606	120,38	80,93	83,33	5,67	82,74	97,07
607	120,18	80,86	83,38	5,67	82,19	96,91
608	119,95	80,83	83,37	5,67	83,38	96,99
609	119,76	80,86	83,31	5,67	83,04	96,91
610	119,62	80,83	83,24	5,57	83,81	96,89
611	119,48	80,81	83,25	5,57	82,38	96,81
612	119,20	80,80	83,22	5,57	81,76	96,77
613	119,03	80,80	83,16	5,57	81,43	96,66
614	118,87	80,76	83,20	5,57	82,08	96,59
615	118,74	80,74	83,12	5,57	81,70	96,58
616	118,68	80,74	83,19	5,57	81,50	96,53
617	118,60	80,76	83,21	5,48	81,01	96,46
618	118,45	80,73	83,25	5,48	81,10	96,39
619	118,44	80,73	83,12	5,47	81,32	96,43
620	118,39	80,69	83,15	5,48	81,43	96,35
621	118,19	80,67	83,04	5,47	81,97	96,31
622	118,05	80,65	83,09	5,47	82,08	96,27
623	117,94	80,64	83,06	5,48	82,72	96,30
624	117,86	80,61	82,99	5,47	82,95	96,25
625	117,67	80,60	82,88	5,46	81,91	96,23
626	117,68	80,61	82,89	5,36	81,19	96,17
627	117,60	80,58	82,84	5,36	82,00	96,20
628	117,63	80,53	82,91	5,36	81,69	96,19
629	117,55	80,55	82,90	5,35	81,25	96,06
630	117,48	80,52	82,94	5,36	80,96	95,93
631	117,43	80,49	82,85	5,26	80,90	96,05
632	117,32	80,49	82,84	5,26	81,08	95,98
633	117,32	80,48	82,85	5,26	81,55	95,95
634	117,36	80,46	82,85	5,26	82,83	95,96
635	117,33	80,44	82,77	5,26	81,21	95,90
636	116,70	80,43	82,69	5,16	81,04	100,50
637	116,21	80,41	82,40	5,16	80,94	105,31
638	116,49	80,36	82,37	5,16	80,82	108,10
639	117,21	80,30	82,30	5,11	80,63	110,57
640	117,82	80,24	82,18	5,16	80,61	112,85
641	118,82	80,20	82,16	5,16	80,57	114,74
642	119,54	80,12	82,11	5,07	80,52	116,83
643	120,32	80,12	82,03	5,06	80,54	118,59
644	121,42	80,05	82,02	5,07	80,46	120,26
645	122,39	80,04	82,03	4,97	80,54	121,91
646	123,36	79,96	82,03	4,97	80,40	123,63
647	125,37	79,94	82,28	5,07	82,11	108,32
648	126,60	79,99	82,51	5,06	80,29	104,91



649	126,54	80,04	82,46	5,07	81,23	102,76
650	125,44	80,10	82,54	4,97	80,48	109,29
651	124,18	80,09	82,37	4,97	80,48	115,85
652	124,51	80,07	82,33	4,97	80,39	118,66
653	124,93	80,04	82,23	4,87	80,45	120,73
654	125,65	80,01	82,15	4,87	80,36	122,48
655	126,38	79,97	82,09	4,87	80,34	124,02
656	127,24	79,94	82,08	4,97	80,19	126,09
657	129,37	79,93	82,41	4,92	81,34	107,64
658	129,87	79,94	82,48	4,87	80,68	104,66
659	129,20	79,99	82,51	4,97	81,35	102,69
660	127,76	80,01	82,39	4,77	80,45	114,26
661	127,25	79,93	82,27	4,77	80,45	118,47
662	127,40	79,96	82,26	4,77	80,34	120,89
663	127,94	79,94	82,18	4,77	80,41	123,05
664	128,52	79,89	82,10	4,77	80,33	124,96
665	129,45	79,84	82,11	4,68	80,30	126,38
666	131,31	79,77	82,30	4,77	80,51	109,12
667	132,19	79,86	82,54	4,77	80,33	105,79
668	131,81	79,88	82,58	4,69	80,34	105,52
669	130,00	79,89	82,38	4,68	80,35	116,60
670	129,45	79,87	82,23	4,68	80,35	120,78
671	129,66	79,86	82,25	4,68	80,30	123,07
672	130,30	79,80	82,16	4,56	80,23	124,92
673	131,03	79,75	82,12	4,56	80,17	126,72
674	132,86	79,75	82,25	4,56	80,41	108,49
675	133,52	79,81	82,49	4,68	80,06	105,38
676	132,92	79,85	82,60	4,68	80,93	103,28
677	131,57	79,86	82,55	4,56	80,36	109,78
678	130,22	79,85	82,27	4,46	80,30	117,17
679	130,19	79,81	82,29	4,46	80,16	120,28
680	130,53	79,78	82,22	4,46	80,18	122,46
681	131,07	79,75	82,12	4,46	80,08	124,42
682	131,71	79,71	82,12	4,46	80,05	126,56
683	133,62	79,67	82,32	4,56	81,14	108,50
684	134,29	79,68	82,45	4,46	80,47	105,34
685	133,93	79,68	82,43	4,46	80,67	103,34
686	133,12	79,74	82,50	4,46	82,27	101,98
687	131,33	79,77	82,38	4,37	80,29	112,06
688	130,22	79,76	82,16	4,37	80,26	117,27
689	130,27	79,72	82,12	4,37	80,14	120,08
690	130,96	79,66	82,07	4,36	80,11	122,48
691	131,80	79,60	82,00	4,27	80,02	124,30
692	132,68	79,57	81,99	4,27	80,07	126,24
693	134,38	79,51	82,20	4,37	80,18	108,92
694	135,15	79,56	82,39	4,35	80,88	105,76
695	134,71	79,57	82,35	4,36	80,09	103,53
696	132,89	79,61	82,34	4,27	80,05	114,05
697	131,85	79,60	82,11	4,17	80,06	119,11
698	131,84	79,60	82,06	4,17	79,91	122,25
699	132,38	79,56	81,97	4,17	79,98	124,58
700	133,45	79,50	81,92	4,17	79,82	126,71
701	134,27	79,45	81,95	4,27	80,76	112,70
702	136,09	79,48	82,33	4,17	80,20	107,66
703	136,15	79,50	82,29	4,17	80,11	105,00
704	135,27	79,52	82,33	4,17	79,95	105,15
705	133,22	79,51	82,12	4,07	80,06	116,97
706	132,91	79,50	82,06	4,07	79,92	121,12
707	133,07	79,52	81,96	4,07	79,85	123,43
708	133,92	79,46	82,01	4,07	79,83	125,53
709	134,71	79,40	81,89	4,07	79,60	122,31
710	136,97	79,35	82,21	4,07	80,32	108,22
711	136,91	79,39	82,26	4,07	80,67	105,35
712	136,24	79,41	82,32	4,07	79,69	103,34
713	135,19	79,45	82,30	4,07	80,83	102,00
714	134,20	79,46	82,26	4,07	80,30	100,91
715	133,21	79,53	82,34	4,07	79,80	100,19
716	132,33	79,56	82,34	4,07	81,43	99,62
717	131,51	79,54	82,32	4,07	80,40	99,07
718	130,71	79,53	82,35	3,98	80,04	98,65
719	130,08	79,53	82,32	3,98	79,91	98,31
720	129,32	79,52	82,33	4,07	79,75	98,12
721	128,60	79,49	82,34	3,98	79,91	97,81
722	128,07	79,47	82,25	3,98	79,80	97,62
723	127,52	79,47	82,22	3,98	81,14	97,47
724	126,96	79,48	82,18	3,98	80,13	97,42
725	126,66	79,45	82,16	3,88	80,54	97,21
726	126,17	79,44	82,07	3,98	80,12	97,05
727	125,55	79,43	81,99	3,88	79,83	101,95
728	124,30	79,37	81,75	3,80	79,77	107,95
729	124,43	79,33	81,68	3,76	79,75	111,35
730	125,11	79,34	81,59	3,76	79,83	113,91
731	125,92	79,28	81,47	3,76	79,73	116,51
732	126,79	79,24	81,45	3,67	79,66	118,71
733	127,61	79,16	81,39	3,66	79,73	120,63
734	128,42	79,10	81,36	3,66	79,55	122,80
735	129,54	79,07	81,37	3,67	79,94	111,89
736	131,73	79,07	81,67	3,66	79,55	106,67
737	132,21	79,14	81,74	3,66	79,54	104,05
738	131,49	79,13	81,81	3,66	79,57	107,56
739	129,79	79,14	81,58	3,57	79,59	116,50
740	129,64	79,13	81,54	3,57	79,59	119,93
741	130,07	79,12	81,46	3,57	79,50	122,37

742	130,75	79,09	81,49	3,57	79,45	124,51
743	131,76	79,02	81,45	3,57	79,48	126,26
744	133,39	78,98	81,64	3,57	79,62	109,34
745	134,40	79,04	81,84	3,66	81,29	105,89
746	133,98	79,05	81,79	3,57	81,93	103,71
747	132,52	79,06	81,71	3,47	79,61	112,57
748	131,42	79,04	81,53	3,47	79,53	118,99
749	131,47	79,04	81,48	3,47	79,45	121,88
750	132,08	79,00	81,46	3,47	79,45	124,34
751	132,65	78,93	81,35	3,47	79,47	125,94
752	133,48	78,92	81,37	3,47	79,98	115,92
753	135,57	78,91	81,70	3,47	79,42	107,94
754	135,73	78,88	81,72	3,47	79,82	104,90
755	134,88	78,93	81,81	3,37	79,32	108,28
756	132,85	78,93	81,57	3,37	79,34	118,12
757	132,58	78,93	81,46	3,37	79,45	121,66
758	133,07	78,92	81,41	3,28	79,30	124,27
759	133,70	78,90	81,35	3,37	79,28	126,38
760	134,81	78,85	81,36	3,37	79,35	111,76
761	136,44	78,89	81,70	3,37	79,28	106,94
762	136,22	78,87	81,76	3,37	79,32	104,33
763	135,42	78,93	81,79	3,37	81,05	102,57
764	134,36	78,95	81,83	3,28	79,43	101,14
765	133,32	78,99	81,88	3,28	79,33	105,16
766	131,51	78,99	81,61	3,18	79,39	113,96
767	131,11	78,93	81,46	3,27	79,25	117,63
768	131,42	78,90	81,43	3,18	79,28	120,26
769	132,16	78,89	81,35	3,18	79,21	122,33
770	132,83	78,80	81,29	3,18	79,18	124,63
771	133,62	78,77	81,23	3,06	79,23	126,52
772	135,49	78,73	81,38	3,18	79,16	108,25
773	136,10	78,76	81,58	3,27	80,23	105,21
774	135,64	78,79	81,66	3,18	80,28	103,05
775	133,76	78,81	81,50	3,06	79,41	114,78
776	132,86	78,80	81,31	3,06	79,23	119,79
777	133,05	78,78	81,39	3,06	79,20	122,64
778	133,49	78,72	81,33	2,96	79,26	124,74
779	134,24	78,70	81,19	2,96	79,10	126,86
780	135,32	78,62	81,20	3,06	79,15	111,94
781	137,28	78,66	81,63	3,06	79,36	107,15
782	137,13	78,68	81,62	3,06	80,29	104,45
783	135,69	78,70	81,51	2,96	79,09	112,41
784	134,13	78,65	81,35	2,96	79,10	119,60
785	133,92	78,63	81,26	2,87	79,12	122,80
786	134,16	78,59	81,23	2,87	79,06	125,20
787	134,83	78,56	81,20	2,87	79,01	126,90
788	136,45	78,50	81,26	2,96	78,83	110,65
789	137,76	78,56	81,60	2,96	79,04	106,56
790	137,54	78,59	81,55	2,96	79,24	104,01
791	136,58	78,60	81,62	2,87	79,06	102,16
792	135,05	78,67	81,65	2,87	79,18	107,81
793	133,12	78,62	81,37	2,87	79,12	115,83
794	132,79	78,58	81,23	2,77	78,94	119,54
795	133,10	78,58	81,16	2,77	78,98	121,93
796	133,75	78,52	81,06	2,77	78,94	124,09
797	134,59	78,49	81,06	2,77	78,95	126,16
798	135,96	78,40	81,06	2,77	78,85	110,87
799	137,36	78,46	81,39	2,87	78,67	106,56
800	136,98	78,47	81,41	2,77	78,88	103,87
801	136,14	78,52	81,48	2,77	80,43	102,19
802	134,06	78,56	81,33	2,77	79,00	113,01
803	133,21	78,53	81,11	2,67	79,01	118,41
804	133,18	78,52	81,04	2,58	78,94	121,38
805	133,77	78,46	81,01	2,60	78,90	123,59
806	134,33	78,42	80,95	2,58	78,94	125,62
807	134,95	78,33	80,90	2,67	79,32	115,25
808	137,07	78,36	81,29	2,67	79,68	107,37
809	137,25	78,37	81,29	2,67	78,63	104,50
810	136,29	78,40	81,29	2,58	78,81	108,03
811	134,22	78,41	81,07	2,58	78,79	117,89
812	133,71	78,43	80,99	2,57	78,86	121,62
813	134,18	78,39	80,91	2,49	78,79	123,97
814	134,69	78,36	80,87	2,57	78,82	125,94
815	135,53	78,30	80,92	2,48	78,84	127,99
816	137,54	78,28	81,04	2,58	79,42	108,96
817	137,87	78,32	81,24	2,58	78,60	105,48
818	137,24	78,34	81,22	2,57	78,67	103,19
819	135,22	78,41	81,15	2,48	78,86	112,53
820	134,03	78,36	80,97	2,48	78,78	118,92
821	133,96	78,36	80,98	2,38	78,77	122,04
822	134,37	78,29	80,88	2,47	78,71	124,29
823	134,93	78,25	80,82	2,38	78,72	126,46
824	135,66	78,22	80,73	2,48	78,95	114,28
825	137,54	78,22	81,16	2,38	78,95	107,42
826	137,52	78,28	81,18	2,48	79,18	104,49
827	136,80	78,30	81,13	2,48	78,66	102,36
828	135,71	78,34	81,13	2,38	78,81	101,07
829	133,91	78,38	81,10	2,38	78,63	108,51
830	132,29	78,30	80,93	2,26	78,70	115,79
831	132,34	78,25	80,82	2,26	78,61	119,05
832	132,90	78,21	80,79	2,26	78,62	121,54
833	133,49	78,16	80,70	2,17	78,57	123,76
834	134,10	78,10	80,62	2,17	78,60	125,85

835	135,11	78,02	80,65	2,26	78,27	113,79
836	136,89	78,10	80,98	2,26	79,29	107,21
837	136,77	78,08	81,03	2,26	78,80	104,25
838	135,53	78,17	81,01	2,17	78,96	110,29
839	134,03	78,16	80,77	2,17	78,78	118,56
840	133,75	78,14	80,75	2,17	78,71	122,09
841	134,02	78,09	80,67	2,07	78,57	124,03
842	134,65	78,05	80,62	2,07	78,45	126,58
843	135,39	78,02	80,57	2,07	78,62	128,45
844	137,28	78,01	80,85	2,17	78,23	107,96
845	137,38	78,04	81,03	2,17	78,63	104,84
846	136,58	78,09	80,98	2,07	78,41	106,57
847	134,64	78,07	80,74	1,97	78,42	117,77
848	134,09	78,00	80,62	1,97	78,45	121,67
849	134,57	77,94	80,64	1,97	78,46	124,11
850	135,16	77,92	80,55	1,97	78,47	126,19
851	135,88	77,90	80,51	1,97	78,37	127,94
852	137,53	77,87	80,67	1,97	78,38	107,70
853	137,61	77,93	80,87	1,97	78,29	104,58
854	136,83	77,98	80,82	1,97	79,07	102,52
855	135,68	78,01	80,88	1,97	78,36	105,69
856	133,87	78,00	80,68	1,87	78,37	115,71
857	133,40	77,98	80,58	1,87	78,46	119,40
858	133,63	77,91	80,52	1,87	78,24	121,89
859	134,21	77,88	80,41	1,87	78,35	124,18
860	75,05	73,03	75,41	12,81	74,74	75,14
861	82,45	72,92	75,51	12,61	74,57	75,21
862	85,83	73,11	75,89	16,94	74,57	75,29
863	92,65	73,26	76,48	13,78	74,75	75,44
864	96,73	73,40	76,75	12,25	74,89	75,74
865	115,05	73,18	79,00	12,06	74,65	76,20
866	155,89	73,23	84,97	11,86	74,85	77,33
867	194,03	73,45	90,60	11,55	74,77	79,40
868	242,38	73,40	98,22	11,16	74,95	82,18
869	285,05	73,69	105,27	10,75	74,88	86,20
870	328,98	73,62	112,72	10,36	74,68	91,91
871	367,67	73,82	120,51	12,23	74,86	98,88
872	377,68	73,74	125,33	22,04	74,73	105,57
873	412,79	73,71	132,86	21,63	74,74	113,00
874	451,34	73,67	141,11	21,24	74,89	121,46
875	462,97	73,74	137,26	20,83	74,36	109,25
876	444,51	73,89	130,74	20,54	75,42	106,21
877	441,13	73,80	129,49	20,13	74,27	105,91
878	450,84	73,96	130,81	19,74	74,50	106,29
879	463,26	73,74	132,87	19,23	73,98	107,32
880	483,22	73,97	136,23	18,75	74,43	109,55
881	507,96	74,18	140,70	18,24	74,88	112,47
882	533,52	74,01	145,22	17,74	74,58	115,84
883	551,16	73,91	147,85	17,25	75,56	119,68
884	560,21	74,08	149,57	16,75	74,52	122,94
885	568,04	74,39	151,33	16,24	75,16	126,16
886	573,04	74,58	151,34	15,75	75,80	128,90
887	575,45	74,47	151,77	15,35	74,87	130,93
888	578,02	74,75	152,27	14,89	75,42	133,05
889	580,59	74,71	152,87	14,45	74,81	134,37
890	581,78	75,00	153,20	14,06	75,64	135,92
891	580,04	74,96	153,07	13,65	75,51	137,05
892	576,55	74,93	151,91	13,36	76,78	137,88
893	571,33	74,79	150,81	13,04	75,24	138,07
894	566,41	75,21	150,48	12,75	76,32	138,21
895	561,84	75,25	149,80	12,47	75,16	138,09
896	557,44	75,20	148,02	12,15	75,59	137,76
897	552,14	75,11	147,88	11,86	75,52	137,49
898	546,00	75,01	146,30	11,67	74,83	136,76
899	539,25	74,69	145,35	11,35	74,74	135,83
900	532,67	74,74	144,74	11,26	75,61	134,77
901	525,46	75,11	143,45	10,96	75,46	134,29
902	519,53	74,95	142,38	10,75	75,11	133,11
903	514,09	74,91	141,89	10,63	75,68	132,14
904	509,67	75,14	141,23	10,46	75,48	131,62
905	505,13	75,35	140,62	10,26	75,84	130,84
906	499,42	75,52	138,87	10,05	76,00	130,41
907	492,92	75,40	138,22	9,86	76,39	129,46
908	486,34	75,35	137,04	9,76	75,81	128,64
909	480,53	75,48	136,37	9,57	76,76	128,00
910	474,71	75,79	135,43	9,37	76,27	127,05
911	468,42	75,75	133,43	9,25	76,36	126,34
912	462,98	75,82	132,71	9,06	76,30	125,38
913	458,11	75,48	131,51	8,96	75,82	124,30
914	454,01	75,60	131,50	8,87	76,56	123,84
915	451,21	75,76	131,67	8,77	76,03	123,38
916	448,00	75,74	131,03	8,55	76,76	122,77
917	445,65	75,73	130,79	8,45	75,91	122,26
918	443,21	75,61	130,09	8,26	75,81	121,82
919	441,15	75,57	129,29	8,07	75,19	121,57
920	439,69	75,76	129,00	7,97	76,27	121,39
921	470,91	75,87	148,44	49,25	75,90	121,70
922	448,76	75,83	145,82	47,08	76,97	121,25
923	471,17	75,65	152,58	46,57	76,64	121,40
924	520,37	75,83	162,63	45,97	76,74	123,72
925	536,10	75,88	159,30	45,37	77,25	127,03
926	543,54	76,13	157,02	44,78	77,34	130,09
927	564,08	75,84	158,65	44,17	77,30	133,81

20-19-18-19

18-19-19

23-22-21-19-19-20

928	584,42	76,39	160,52	43,60	77,02	137,92
929	603,83	75,79	163,31	42,99	76,49	141,79
930	622,64	76,15	166,66	42,47	77,06	146,37
931	639,20	76,24	168,37	41,88	76,74	149,86
932	654,27	76,15	171,63	41,40	76,39	153,92
933	668,23	75,89	173,50	40,79	76,33	157,30
934	678,80	75,99	175,33	40,18	76,28	160,98
935	686,98	76,06	176,94	39,69	77,48	164,26
936	694,62	76,48	178,51	39,20	77,25	167,11
937	701,88	76,10	179,62	38,59	75,66	169,73
938	706,89	76,20	180,60	37,99	76,78	171,82
939	710,76	75,99	181,79	37,49	78,04	173,94
940	715,33	76,27	182,40	36,91	76,62	175,81
941	719,49	76,39	182,73	36,39	76,77	177,61
942	721,96	76,40	183,32	35,90	76,88	179,32
943	723,04	76,11	183,42	35,30	76,86	180,70
944	723,79	76,04	182,03	34,80	76,73	181,67
945	726,34	76,66	183,55	34,32	77,21	182,88
946	727,98	76,72	184,38	33,80	76,92	184,36
947	729,16	77,08	184,10	33,29	76,68	184,57
948	730,21	76,92	182,86	32,81	77,10	185,54
949	731,94	76,33	183,24	32,30	75,97	186,13
950	733,05	75,92	182,96	31,80	75,66	186,65
951	734,21	76,33	183,54	31,32	78,09	187,57
952	734,77	76,65	185,34	30,81	76,77	188,09
953	735,82	76,66	186,07	30,33	76,69	188,58
954	736,76	76,92	186,46	29,81	76,89	189,12
955	738,55	76,74	187,09	29,32	77,33	190,08
956	739,36	76,85	187,22	28,83	77,10	190,70
957	740,14	76,99	185,47	28,32	77,89	191,50
958	740,76	76,72	186,72	27,81	77,32	192,02
959	741,07	76,39	187,86	27,43	77,26	192,48
960	741,31	77,04	188,09	26,91	77,35	192,72
961	740,05	77,78	187,46	26,44	77,81	193,56
962	738,70	77,64	185,34	25,97	77,64	193,24
963	737,02	77,46	185,67	25,52	77,63	193,47
964	734,85	77,87	186,26	25,03	78,01	193,76
965	732,09	77,06	185,44	24,52	77,46	193,15
966	728,21	77,17	184,17	24,14	77,66	193,40
967	721,11	77,48	182,98	23,63	77,28	192,96
968	713,68	77,45	182,13	23,22	77,94	191,97
969	706,56	77,38	180,94	22,84	77,62	191,41
970	702,09	77,21	178,77	22,53	77,08	190,21
971	697,19	77,41	177,43	22,13	77,61	189,04
972	694,39	77,39	177,06	21,73	76,96	188,45
973	691,17	77,40	176,81	21,34	77,52	187,88
974	688,37	77,52	173,91	20,93	77,68	187,00
975	686,11	78,01	172,66	20,54	78,12	186,77
976	682,61	77,61	173,41	20,25	78,60	186,12
977	680,59	77,80	174,02	19,83	77,70	185,72
978	677,24	77,27	172,01	19,45	80,52	185,16
979	673,03	77,17	172,13	19,14	77,43	184,06
980	668,07	77,79	170,95	18,74	78,77	183,83
981	664,43	77,78	170,21	18,43	78,07	182,91
982	660,19	77,52	169,00	18,15	77,13	181,96
983	655,75	77,99	167,92	17,83	77,98	180,78
984	651,41	78,07	167,52	17,54	77,52	179,95
985	647,00	78,28	165,93	17,35	78,34	179,22
986	642,82	77,60	164,99	17,03	78,61	177,89
987	639,16	77,88	164,90	16,74	77,72	177,02
988	635,12	77,65	163,75	16,45	79,64	176,32
989	630,44	78,03	162,61	16,14	78,19	175,02
990	627,50	78,17	162,85	15,95	78,24	174,30
991	625,17	78,15	162,36	15,65	78,33	173,79
992	621,99	78,44	160,98	15,34	78,87	173,34
993	617,01	78,28	159,64	15,15	78,49	171,89
994	612,70	78,35	159,32	14,95	78,07	171,39
995	607,24	78,21	158,34	14,74	80,68	170,51
996	601,78	78,63	157,72	14,45	78,65	169,25
997	596,20	78,21	155,21	14,25	77,91	167,84
998	591,97	78,36	154,12	14,06	78,60	166,70
999	586,72	77,59	153,13	13,75	77,22	165,33
1000	582,63	77,97	150,96	13,65	78,27	164,50
1001	577,96	78,04	150,52	13,45	78,53	163,35
1002	574,06	77,62	150,20	13,26	78,19	162,40
1003	570,90	78,31	150,06	13,05	78,56	161,47
1004	567,01	78,03	148,44	12,85	78,30	160,95
1005	563,41	78,57	148,74	12,66	79,24	160,46
1006	558,57	78,52	148,29	12,56	78,88	159,78
1007	554,38	78,47	147,28	12,35	78,20	158,63
1008	550,59	78,25	146,46	12,15	77,29	157,55
1009	546,07	78,06	145,21	11,95	78,40	156,86
1010	542,16	78,38	144,95	11,86	78,43	155,67
1011	537,57	78,02	144,00	11,76	78,52	154,58
1012	533,49	78,53	143,73	11,55	78,54	154,13
1013	529,77	78,02	142,55	11,45	78,12	153,22
1014	525,92	77,95	141,73	11,26	78,24	152,48
1015	522,79	78,27	141,10	11,16	78,28	151,63
1016	519,65	78,44	141,80	11,06	78,46	151,06
1017	517,13	78,10	141,74	10,97	78,37	150,33
1018	515,22	78,65	140,80	10,75	78,75	149,80
1019	512,86	78,77	142,04	10,56	79,12	149,18
1020	511,01	79,02	142,60	10,46	79,48	149,20



1021	508,78	79,30	143,09	10,36	79,66	148,88
1022	506,75	79,56	143,45	10,26	80,00	148,45
1023	504,81	79,79	143,24	10,05	79,91	148,21
1024	502,82	80,04	143,17	9,95	80,45	147,94
1025	501,16	80,24	142,97	9,76	80,42	147,54
1026	499,24	80,44	142,98	9,66	80,56	147,20
1027	497,18	80,66	142,93	9,56	80,49	147,03
1028	495,49	80,74	142,48	9,47	80,51	146,68
1029	494,04	80,89	142,06	9,25	81,11	146,43
1030	426,70	81,15	122,24	9,15	80,87	145,88
1031	366,95	81,17	111,41	9,16	81,47	145,08
1032	337,34	80,27	106,51	9,06	79,50	143,31
1033	317,11	79,27	101,99	9,06	80,45	142,06
1034	302,65	79,26	99,80	8,96	78,50	140,45
1035	290,56	78,89	97,80	8,96	78,77	139,15
1036	280,63	78,81	96,52	8,86	79,00	137,97
1037	272,03	78,93	95,12	8,86	78,91	137,10
1038	264,62	79,06	94,41	8,76	79,12	136,25
1039	258,15	78,28	93,45	8,76	78,34	134,88
1040	252,55	78,57	93,02	8,76	78,54	133,87
1041	247,13	78,72	93,06	8,67	78,39	132,90
1042	241,95	78,59	92,22	8,67	79,10	132,12
1043	237,23	78,40	91,75	8,67	78,47	131,08
1044	233,01	78,25	91,51	8,67	78,77	130,26
1045	229,20	78,49	91,17	8,67	78,63	129,28
1046	225,66	78,76	90,90	8,57	78,66	128,57
1047	222,27	78,55	90,23	8,57	78,79	127,84
1048	218,71	78,71	89,82	8,57	78,90	127,03
1049	215,35	78,52	89,47	8,45	78,84	126,11
1050	212,24	78,87	88,98	8,45	79,11	125,55
1051	209,44	78,50	88,61	8,45	78,71	124,75
1052	206,65	78,36	88,61	8,45	78,71	123,85
1053	204,05	78,15	88,30	8,45	78,25	123,20
1054	201,70	78,48	88,37	8,35	78,95	122,60
1055	198,93	78,76	88,06	8,36	79,17	122,00
1056	197,06	78,39	87,67	8,36	78,42	121,36
1057	194,72	78,32	87,81	8,36	78,44	120,84
1058	192,28	78,52	87,40	8,26	79,34	120,36
1059	190,36	78,37	87,06	8,26	78,45	119,73
1060	188,70	78,47	86,88	8,36	78,84	118,96
1061	186,88	78,68	86,85	8,26	78,98	118,64
1062	185,16	77,94	86,89	8,16	78,22	118,00
1063	183,46	78,57	86,87	8,22	78,84	117,65
1064	181,71	78,29	86,64	8,16	78,43	117,07
1065	180,16	78,54	86,68	8,16	78,70	116,71
1066	178,55	78,63	86,53	8,16	78,77	116,37
1067	176,91	78,62	86,49	8,06	78,81	116,02
1068	175,61	78,67	86,55	8,06	78,85	115,69
1069	174,03	78,62	86,32	8,06	78,97	115,36
1070	172,58	78,78	86,32	8,06	78,86	114,86
1071	171,37	78,73	86,17	8,06	79,11	114,54
1072	170,43	78,81	85,86	8,06	78,81	114,29
1073	169,30	78,52	85,39	8,06	79,01	113,83
1074	168,14	78,74	85,41	7,97	79,00	113,74
1075	166,95	78,63	85,26	7,97	78,70	113,25
1076	165,92	78,75	85,63	7,97	78,92	112,97
1077	164,87	79,08	85,54	7,96	79,03	112,76
1078	163,89	78,87	85,60	7,97	79,01	112,38
1079	162,77	78,84	85,39	7,87	78,95	112,16
1080	161,86	78,62	85,36	7,87	78,72	111,64
1081	159,88	78,41	85,19	7,77	78,62	128,70
1082	159,58	78,56	85,08	7,77	78,77	136,64
1083	161,15	78,51	84,61	7,87	78,11	117,45
1084	161,24	78,46	84,68	7,77	78,65	115,40
1085	160,52	78,74	84,65	7,77	79,13	114,26
1086	159,80	78,76	84,31	7,77	79,31	113,24
1087	158,89	78,77	84,66	7,67	79,11	112,31
1088	158,04	78,77	84,75	7,77	79,07	111,72
1089	156,95	78,39	84,69	7,77	78,84	111,03
1090	156,09	78,62	84,95	7,77	78,81	110,56
1091	216,07	78,71	97,53	40,85	79,07	120,72
1092	263,04	78,48	107,72	40,58	78,84	132,34
1093	294,61	79,02	114,71	40,27	79,65	118,88
1094	343,24	78,80	124,48	39,79	79,05	117,23
1095	415,68	78,93	136,66	39,18	79,48	118,89
1096	491,19	79,21	151,25	38,29	79,71	122,94
1097	529,08	79,15	154,41	37,50	79,42	128,61
1098	548,15	79,32	155,99	36,80	79,81	133,98
1099	452,03	79,47	124,02	36,29	79,81	136,90
1100	407,93	79,36	112,58	36,09	79,40	137,75
1101	385,86	79,57	107,16	35,80	79,68	138,05
1102	370,81	79,14	103,95	35,59	79,75	137,96
1103	359,31	79,31	102,32	35,39	80,85	137,53
1104	350,80	79,38	101,00	35,10	79,95	137,06
1105	344,01	79,40	100,73	34,89	79,24	136,45
1106	338,90	79,30	99,70	34,69	79,57	135,97
1107	334,87	78,75	98,67	34,50	79,42	135,55
1108	331,72	78,82	98,81	34,31	80,29	135,19
1109	328,85	79,17	98,58	34,09	80,51	134,99
1110	326,67	79,30	99,03	33,89	80,41	134,77
1111	324,73	79,27	98,82	33,61	79,81	134,64
1112	323,08	79,51	98,89	33,40	79,87	134,73
1113	322,07	79,21	98,77	33,11	79,93	134,65

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1114	321,20	79,43	98,44	33,00	80,41	134,56
1115	320,40	79,61	98,80	32,72	82,00	134,72
1116	319,57	79,89	97,86	32,50	81,13	134,99
1117	319,27	79,70	98,20	32,21	80,00	134,80
1118	319,30	79,83	97,75	32,02	81,55	134,99
1119	318,85	79,48	97,89	31,70	79,95	135,06
1120	318,40	79,92	98,20	31,50	81,30	135,20
1121	318,29	79,55	98,27	31,30	79,79	135,25
1122	318,14	79,83	97,85	31,00	81,08	135,16
1123	317,97	79,64	97,16	30,81	81,40	135,05
1124	317,88	79,93	97,46	30,61	81,03	135,40
1125	317,51	79,97	97,38	30,42	80,52	135,51
1126	317,50	79,89	97,39	30,11	81,36	135,88
1127	317,12	79,80	96,88	29,91	80,91	135,48
1128	316,97	79,68	96,97	29,71	80,62	135,84
1129	316,66	79,95	97,38	29,51	81,22	135,84
1130	317,01	79,77	98,08	29,21	80,64	135,64
1131	317,33	79,67	97,56	29,02	79,92	135,55
1132	317,08	79,91	98,04	28,71	82,06	135,88
1133	317,27	79,73	97,52	28,51	82,07	135,91
1134	316,92	79,80	97,58	28,32	81,60	135,91
1135	316,95	79,82	97,80	28,02	81,36	136,14
1136	316,26	79,79	97,62	27,81	81,20	136,11
1137	316,12	79,84	97,83	27,62	80,69	136,09
1138	315,96	79,90	97,87	27,33	80,84	135,73
1139	315,50	79,86	97,41	27,11	81,58	136,22
1140	315,09	79,91	97,57	26,92	81,28	136,20
1141	314,85	80,29	97,90	26,62	81,82	136,24
1142	314,91	80,05	97,58	26,43	80,20	136,18
1143	314,43	79,84	97,56	26,22	81,31	136,07
1144	313,87	80,03	96,97	26,02	81,51	136,29
1145	314,14	79,98	97,40	25,72	82,90	136,29
1146	313,33	80,01	96,64	25,51	81,44	136,14
1147	313,46	80,16	96,52	25,32	81,89	136,41
1148	313,01	79,94	96,08	25,03	81,89	136,47
1149	312,36	80,02	96,55	24,81	82,10	136,39
1150	311,58	80,27	96,91	24,62	81,84	136,53
1151	310,73	80,29	96,85	24,42	82,51	136,35
1152	310,15	80,04	96,63	24,23	80,26	136,19
1153	309,24	80,28	96,93	24,01	81,45	136,38
1154	308,89	80,21	96,42	23,73	81,51	136,33
1155	308,16	80,44	96,57	23,53	80,95	136,44
1156	307,60	80,20	96,74	23,33	81,45	136,17
1157	307,12	80,45	96,96	23,22	81,66	136,22
1158	307,08	80,35	96,68	22,92	81,98	136,60
1159	306,46	80,61	97,50	22,73	81,74	136,40
1160	306,79	80,52	96,74	22,53	83,38	136,53
1161	306,15	80,46	96,57	22,32	81,88	136,42
1162	305,59	80,65	96,54	22,13	81,65	136,23
1163	304,58	80,79	96,63	21,94	81,97	136,47
1164	303,30	80,48	95,97	21,72	81,88	136,22
1165	302,08	80,34	96,18	21,53	81,17	136,02
1166	300,38	80,50	96,16	21,43	82,02	135,87
1167	298,81	80,59	96,48	21,23	82,76	135,78
1168	297,48	80,38	96,37	21,04	80,89	135,68
1169	295,97	80,53	96,13	20,83	81,34	135,72
1170	294,71	80,42	96,20	20,73	81,89	135,39
1171	293,60	80,47	95,87	20,54	81,56	135,06
1172	292,40	80,45	95,51	20,34	82,26	135,03
1173	292,02	80,26	95,59	20,20	81,49	135,12
1174	291,67	80,41	95,90	20,02	82,17	134,96
1175	292,38	80,54	96,25	19,83	81,31	135,06
1176	292,00	80,54	95,92	19,64	81,78	135,39
1177	291,42	80,69	95,89	19,50	82,97	135,11
1178	290,11	80,65	95,62	19,32	81,88	135,25
1179	289,60	80,79	95,43	19,23	81,86	135,46
1180	288,26	80,79	95,64	19,04	82,40	135,53
1181	286,88	80,87	95,56	18,94	81,40	135,32
1182	285,22	80,90	95,25	18,75	82,78	135,39
1183	283,63	80,88	94,98	18,63	81,62	135,38
1184	282,14	80,89	94,99	18,43	81,53	134,88
1185	280,45	80,95	94,56	18,34	81,89	134,90
1186	277,41	80,80	94,59	18,22	80,74	134,50
1187	275,31	80,91	94,51	18,13	82,74	134,04
1188	273,24	80,96	94,51	17,95	82,20	133,77
1189	271,11	80,97	94,01	17,83	82,65	133,40
1190	268,59	80,81	93,81	17,73	81,32	133,00
1191	266,39	80,77	93,51	17,64	81,94	132,57
1192	264,16	80,75	93,28	17,54	81,89	132,07
1193	261,92	80,75	93,00	17,44	83,13	131,41
1194	259,62	80,64	92,93	17,35	81,12	130,83
1195	257,32	80,95	92,92	17,15	81,21	130,51
1196	255,33	80,69	92,35	17,03	82,36	130,07
1197	253,06	80,80	92,57	16,95	81,73	129,63
1198	251,39	80,61	92,34	16,84	82,04	129,03
1199	249,01	80,76	92,34	16,84	81,78	128,63
1200	246,76	80,79	92,37	16,64	81,85	128,29
1201	244,78	80,85	92,44	16,64	82,70	127,66
1202	242,58	80,99	92,42	16,45	82,20	127,52
1203	240,94	80,97	92,30	16,45	81,41	126,99
1204	239,03	80,69	92,21	16,35	81,58	126,29
1205	237,46	80,81	91,80	16,31	82,02	126,14
1206	235,76	81,05	91,82	16,23	82,72	125,76

1207	234,59	80,64	91,58	16,14	81,19	125,01
1208	233,27	81,07	91,54	16,04	81,56	124,82
1209	231,93	80,96	91,20	15,95	81,56	124,36
1210	230,41	80,69	90,94	15,85	82,28	123,97
1211	228,75	80,61	90,84	15,75	82,16	123,54
1212	226,72	80,67	90,83	15,75	82,29	123,43
1213	224,74	80,31	90,74	15,65	81,18	122,89
1214	222,73	80,77	90,34	15,56	82,18	122,69
1215	220,32	80,78	90,14	15,44	82,48	122,33
1216	217,77	80,61	90,21	15,43	81,75	121,65
1217	215,37	80,65	90,12	15,34	81,40	121,39
1218	213,37	80,39	89,85	15,34	80,29	120,55
1219	210,48	80,75	89,86	15,24	81,58	120,46
1220	208,08	80,67	89,63	15,24	82,57	119,91
1221	205,72	80,74	89,46	15,24	81,99	119,44
1222	203,70	81,07	89,26	15,14	82,29	119,15
1223	201,83	80,84	89,19	15,05	81,97	118,34
1224	200,15	80,67	88,54	15,05	81,99	117,83
1225	198,52	80,85	88,65	15,05	82,53	117,51
1226	196,80	80,78	88,47	14,95	83,23	116,98
1227	194,74	80,84	88,67	14,85	82,17	116,49
1228	193,20	80,64	88,61	14,85	83,66	115,84
1229	191,44	80,68	88,61	14,86	81,60	115,43
1230	189,93	80,82	88,53	14,74	82,32	115,22
1231	188,58	80,51	88,47	14,74	80,94	114,55
1232	187,03	80,36	88,34	14,63	81,98	114,10
1233	185,22	80,53	88,42	14,64	80,58	113,62
1234	183,68	80,58	88,49	14,54	81,70	113,43
1235	182,17	80,58	88,13	14,45	82,49	113,14
1236	181,01	80,78	88,21	14,45	82,43	112,65
1237	179,53	80,64	87,87	14,44	81,73	112,28
1238	178,15	80,58	87,60	14,35	81,98	112,07
1239	176,83	80,45	87,50	14,35	82,33	111,46
1240	175,58	80,52	87,23	14,35	82,14	111,20
1241	174,46	80,50	87,16	14,25	82,44	110,81
1242	173,23	80,57	87,05	14,15	82,19	110,69
1243	171,94	80,36	86,89	14,15	80,68	110,21
1244	171,01	80,62	87,11	14,05	81,47	109,97
1245	169,82	80,34	87,02	14,05	81,47	109,67
1246	168,86	80,44	86,91	13,94	82,05	109,49
1247	167,95	80,40	86,90	13,94	82,45	109,35
1248	167,27	80,27	86,78	13,84	82,01	108,95
1249	166,39	80,49	86,70	13,84	82,10	108,75
1250	165,62	80,66	86,63	13,74	81,68	108,74
1251	164,92	80,25	86,56	13,64	80,96	108,31
1252	164,27	80,23	86,61	13,64	82,55	107,96
1253	163,53	80,33	86,48	13,55	82,03	107,92
1254	162,86	80,20	86,42	13,452	81,39	107,61
1255	162,31	80,06	86,23	13,454	80,97	107,39
1256	162,01	80,24	86,15	13,357	82,00	107,26
1257	160,90	80,11	86,14	13,255	81,73	115,19
1258	160,17	80,19	86,14	13,043	80,84	125,81
1259	160,83	80,06	86,02	13,131	80,53	131,18
1260	162,63	80,00	86,05	13,041	80,87	115,83
1261	163,77	79,82	86,18	13,042	80,93	112,81
1262	163,61	80,10	86,12	12,947	82,40	111,09
1263	162,92	79,87	86,10	12,850	81,52	109,68
1264	162,34	79,90	86,38	12,851	80,54	108,91
1265	161,53	79,95	86,30	12,655	80,77	108,54
1266	159,56	80,05	86,14	12,553	80,96	124,77
1267	159,35	80,14	86,13	12,458	80,49	131,23
1268	160,06	79,98	86,00	12,555	80,32	118,92
1269	162,12	80,34	86,40	12,458	81,57	113,96
1270	162,16	80,25	86,35	12,341	81,80	111,65
1271	161,49	80,26	86,48	12,245	81,96	110,13
1272	160,71	80,03	86,32	12,246	80,47	108,84
1273	158,95	79,92	86,10	12,053	80,43	125,29
1274	158,97	80,01	86,24	11,960	80,54	131,76
1275	160,15	79,96	86,04	11,952	80,46	116,96
1276	161,64	79,86	86,24	11,948	80,25	113,03
1277	161,50	79,67	86,24	11,854	80,62	110,93
1278	160,90	79,82	86,20	11,857	81,57	109,51
1279	160,23	79,99	86,10	11,660	80,97	108,78
1280	158,48	80,13	85,91	11,543	80,79	125,17
1281	158,37	80,16	85,81	11,446	80,29	131,13
1282	159,39	80,05	85,86	11,447	81,42	118,17
1283	161,15	79,93	86,03	11,450	81,30	113,07
1284	161,28	80,25	86,09	11,349	81,13	110,97
1285	160,84	80,16	85,88	11,252	82,33	109,38
1286	160,11	80,04	86,05	11,254	80,63	108,19
1287	158,45	80,14	85,80	11,061	80,71	120,31
1288	157,91	79,95	85,96	10,963	80,38	128,46
1289	158,63	80,08	85,92	10,846	80,19	132,42
1290	160,84	80,13	86,00	10,847	81,37	114,39
1291	161,62	80,29	86,11	10,750	81,92	111,65
1292	161,57	80,33	85,84	10,649	80,67	109,73
1293	160,81	79,84	85,83	10,553	81,69	108,38
1294	159,36	79,89	85,74	10,454	80,77	116,32
1295	158,06	80,24	85,72	10,358	80,74	126,98
1296	157,94	79,93	85,55	10,260	80,59	131,59
1297	158,64	79,88	85,57	10,263	80,63	116,87
1298	159,81	79,66	85,49	10,261	80,42	112,22
1299	159,25	79,73	85,52	10,163	81,00	110,27

1300	158,09	79,90	85,48	10,066	80,98	108,59
1301	155,98	79,77	85,17	10,010	80,45	118,80
1302	154,59	79,43	84,93	9,949	80,37	127,64
1303	154,41	79,25	84,94	9,852	80,24	132,01
1304	155,50	79,95	85,06	9,948	81,28	114,63
1305	156,04	79,88	85,16	9,852	81,75	111,34
1306	155,27	79,87	85,07	9,852	81,88	109,21
1307	154,11	79,73	85,11	9,756	82,07	107,72
1308	152,35	79,80	85,15	9,752	80,69	115,28
1309	150,67	79,78	84,99	9,656	80,29	125,20
1310	150,39	79,63	84,79	9,651	80,28	129,52
1311	150,86	79,88	84,81	9,658	81,45	119,32
1312	152,20	79,80	84,85	9,657	80,95	111,92
1313	151,92	79,65	84,69	9,657	80,05	109,18
1314	150,84	79,95	84,85	9,562	80,50	107,66
1315	148,93	79,68	84,66	9,562	80,52	121,11
1316	147,94	79,62	84,44	9,464	80,23	127,86
1317	147,97	79,96	84,53	9,464	80,32	131,39
1318	148,98	79,78	84,27	9,464	81,27	114,72
1319	149,80	79,76	84,72	9,462	81,61	110,93
1320	149,47	79,66	84,55	9,461	81,59	108,60
1321	147,94	79,54	84,50	9,463	79,98	119,56
1322	146,90	79,68	84,34	9,366	80,28	127,45
1323	146,99	79,71	84,67	9,367	80,25	131,13
1324	147,87	79,86	84,72	9,367	81,12	114,81
1325	148,84	79,93	84,86	9,368	81,89	111,28
1326	148,52	80,31	85,19	9,368	80,70	108,77
1327	147,63	80,46	85,51	9,366	82,31	107,51
1328	146,64	80,62	85,78	9,250	82,04	106,49
1329	144,71	80,86	85,72	9,152	81,35	119,80
1330	143,99	81,34	85,96	9,153	81,06	125,50
1331	143,99	81,52	86,01	9,150	80,95	129,03
1332	144,64	81,17	86,06	9,151	81,71	117,79
1333	146,29	81,23	86,40	9,150	82,67	111,90
1334	146,46	81,25	86,47	9,152	83,01	109,48
1335	145,76	81,21	86,64	9,153	82,56	107,80
1336	144,41	81,28	86,67	9,057	82,02	115,93
1337	143,04	81,43	86,64	9,056	81,64	124,51
1338	143,01	81,45	86,64	8,959	81,18	128,26
1339	143,43	81,51	86,58	8,957	81,22	131,32
1340	145,04	81,48	86,72	8,963	82,77	113,40
1341	145,66	81,42	86,86	8,957	82,38	110,43
1342	145,20	81,39	86,93	8,957	83,06	108,47
1343	144,15	81,47	87,01	8,960	82,29	112,78
1344	142,50	81,66	86,78	8,959	82,10	123,16
1345	142,25	81,69	86,87	8,859	81,46	127,63
1346	142,59	81,83	86,74	8,859	81,17	130,93
1347	144,10	81,65	86,86	8,860	82,53	113,36
1348	144,89	81,62	86,97	8,861	82,76	110,31
1349	144,56	81,55	86,96	8,862	82,77	108,42
1350	143,71	81,64	87,06	8,861	83,03	107,05
1351	142,58	81,65	86,98	8,764	82,64	112,63
1352	141,07	81,90	86,83	8,762	81,87	122,22
1353	140,79	81,80	86,85	8,666	81,56	126,33
1354	140,97	81,95	86,76	8,664	81,28	129,57
1355	142,03	81,77	86,79	8,667	82,67	114,82
1356	143,44	81,78	86,96	8,667	82,82	111,08
1357	143,57	81,71	87,06	8,665	83,65	108,86
1358	143,10	81,69	87,06	8,665	83,30	107,43
1359	141,85	81,75	87,02	8,571	82,20	116,63
1360	140,61	81,79	86,89	8,572	81,90	124,02
1361	140,52	82,10	86,92	8,571	81,59	127,90
1362	141,07	82,12	86,76	8,451	81,32	130,67
1363	142,61	81,85	86,83	8,567	83,05	113,85
1364	143,29	81,83	86,92	8,568	82,42	110,60
1365	143,13	81,75	87,01	8,568	82,86	108,50
1366	142,59	81,79	87,07	8,453	83,30	107,19
1367	140,83	81,89	86,91	8,451	82,36	120,93
1368	140,22	81,89	86,91	8,356	81,76	126,06
1369	140,33	82,04	86,86	8,354	81,55	129,32
1370	141,22	81,94	86,78	8,451	82,59	115,66
1371	142,67	81,90	87,01	8,358	84,00	111,35
1372	142,64	81,81	86,88	8,356	83,91	109,06
1373	142,10	81,84	87,01	8,354	83,14	107,45
1374	141,40	81,84	87,09	8,354	83,33	106,27
1375	140,48	81,88	87,05	8,356	83,27	105,40
1376	139,36	81,86	87,00	8,254	82,74	109,97
1377	137,81	82,05	86,81	8,258	82,30	119,16
1378	137,53	82,02	86,80	8,259	82,01	123,54
1379	137,90	82,05	86,71	8,159	81,88	126,65
1380	138,44	82,34	86,67	8,161	81,48	129,07
1381	139,96	81,97	86,75	8,259	82,72	113,23
1382	140,84	81,93	86,83	8,159	82,97	110,13
1383	140,64	81,88	86,89	8,158	83,57	108,10
1384	139,91	81,87	86,96	8,159	83,36	106,68
1385	138,52	82,01	86,84	8,149	82,41	117,98
1386	137,81	81,92	86,74	8,063	81,59	124,09
1387	137,86	81,96	86,77	7,964	81,86	127,39
1388	138,33	82,14	86,66	7,966	81,54	130,11
1389	139,78	82,04	86,73	8,064	82,92	114,15
1390	140,59	81,99	86,87	8,062	83,01	110,60
1391	140,46	81,87	86,87	8,062	82,95	108,44
1392	139,95	81,90	86,93	7,966	83,60	106,93



1393	139,19	82,01	86,92	8,062	84,01	105,84
1394	137,68	81,96	86,84	7,870	82,56	114,45
1395	136,69	82,08	86,67	7,869	82,22	121,64
1396	136,51	81,83	86,73	7,869	81,74	125,11
1397	136,90	82,22	86,59	7,868	81,54	127,63
1398	137,63	82,16	86,61	7,965	82,44	116,65
1399	139,19	82,04	86,81	7,870	83,44	111,23
1400	139,35	82,04	86,79	7,867	83,64	108,70
1401	138,80	81,92	86,86	7,868	82,94	106,97
1402	137,84	82,01	86,89	7,867	83,83	105,70
1403	136,44	82,20	86,81	7,770	82,69	114,60
1404	135,32	82,02	86,66	7,770	81,99	121,40
1405	135,21	81,93	86,68	7,772	81,52	124,76
1406	135,47	82,12	86,58	7,770	81,38	127,26
1407	136,14	82,17	86,55	7,769	82,25	116,95
1408	137,78	82,03	86,74	7,771	83,37	110,99
1409	137,84	81,99	86,73	7,769	83,78	108,53
1410	137,24	81,97	86,78	7,657	83,22	106,78
1411	136,00	81,99	86,78	7,654	82,64	115,51
1412	134,83	82,20	86,62	7,563	81,96	122,18
1413	134,66	81,92	86,61	7,557	81,68	125,73
1414	135,01	82,30	86,56	7,558	81,49	128,04
1415	135,76	82,12	86,55	7,655	82,50	115,62
1416	137,31	82,05	86,79	7,653	83,55	110,86
1417	137,34	82,07	86,74	7,556	83,22	108,38
1418	136,78	81,97	86,82	7,558	83,67	106,54
1419	135,39	82,07	86,86	7,556	82,72	114,75
1420	134,35	82,28	86,63	7,486	82,42	121,93
1421	134,24	82,12	86,69	7,459	81,78	125,20
1422	134,45	82,34	86,57	7,461	81,48	127,78
1423	135,13	82,23	86,57	7,459	82,76	115,03
1424	136,65	82,10	86,78	7,458	84,01	110,46
1425	136,83	82,08	86,80	7,458	83,69	108,04
1426	136,36	82,09	86,92	7,460	83,33	106,35
1427	135,68	82,15	86,98	7,459	83,11	105,14
1428	134,09	82,26	86,79	7,361	82,81	115,92
1429	133,32	82,11	86,73	7,363	82,40	121,13
1430	133,35	81,98	86,74	7,363	81,91	124,39
1431	133,69	82,17	86,69	7,266	81,74	126,70
1432	134,36	82,19	86,64	7,361	81,91	117,38
1433	136,10	82,08	86,81	7,362	83,84	110,83
1434	136,39	82,12	86,84	7,362	83,89	108,20
1435	136,09	82,12	86,89	7,308	83,48	106,51
1436	135,13	82,15	86,90	7,168	83,09	110,21
1437	133,59	82,19	86,71	7,256	82,77	119,24
1438	133,26	82,07	86,72	7,168	82,17	123,01
1439	133,55	82,15	86,71	7,168	81,79	125,97
1440	133,92	82,37	86,59	7,168	81,60	128,14
1441	135,41	82,17	86,68	7,167	83,52	112,70
1442	136,22	82,14	86,89	7,167	84,23	109,33
1443	136,12	82,08	86,88	7,168	83,30	107,29
1444	135,61	82,15	86,93	7,168	82,91	108,85
1445	133,98	82,15	86,76	7,070	82,31	119,49
1446	133,61	82,43	86,72	7,070	82,28	123,49
1447	133,85	82,36	86,71	7,069	81,85	126,36
1448	134,35	82,31	86,60	7,070	81,53	128,53
1449	135,70	82,18	86,71	7,069	82,70	113,03
1450	136,56	82,17	86,86	7,072	83,57	109,58
1451	136,57	82,20	86,87	7,069	84,12	107,45
1452	135,93	82,21	86,93	7,070	84,12	105,96
1453	135,28	82,23	86,96	7,069	83,53	104,81
1454	133,69	82,10	86,85	6,855	82,87	115,70
1455	132,94	82,22	86,74	6,948	82,28	120,55
1456	132,91	82,25	86,75	6,854	81,85	123,96
1457	133,42	82,26	86,63	6,857	81,38	126,27
1458	134,14	82,38	86,60	6,857	82,24	117,19
1459	135,70	82,24	86,88	6,856	84,47	110,62
1460	136,17	82,20	86,85	6,855	84,00	108,06
1461	135,86	82,22	86,91	6,856	84,31	106,38
1462	135,28	82,17	86,94	6,759	83,93	105,12
1463	134,65	82,16	86,93	6,757	83,32	104,99
1464	133,01	82,21	86,75	6,661	82,61	116,00
1465	132,52	82,16	86,69	6,663	82,37	120,64
1466	132,57	82,48	86,64	6,660	81,94	123,39
1467	133,04	82,47	86,57	6,660	81,68	126,15
1468	133,66	82,33	86,54	6,659	81,42	128,24
1469	135,44	82,25	86,73	6,661	84,04	111,19
1470	136,06	82,20	86,77	6,663	83,98	108,48
1471	135,89	82,18	86,78	6,661	83,76	106,74
1472	135,00	82,20	86,80	6,654	83,09	111,68
1473	133,59	82,25	86,65	6,561	82,29	119,90
1474	133,35	82,06	86,65	6,564	82,19	123,62
1475	133,59	82,08	86,60	6,468	81,68	126,48
1476	134,31	82,20	86,55	6,467	81,81	128,73
1477	135,83	82,12	86,64	6,563	83,17	112,95
1478	136,71	82,17	86,78	6,468	83,74	109,64
1479	136,66	82,11	86,84	6,494	83,84	107,63
1480	135,71	82,21	86,78	6,465	83,20	114,53
1481	134,62	82,30	86,60	6,368	82,53	122,16
1482	134,62	82,22	86,57	6,370	81,88	125,48
1483	134,89	82,34	86,60	6,370	81,62	128,27
1484	135,96	82,13	86,57	6,369	83,01	114,10
1485	137,30	82,18	86,80	6,367	84,22	110,31

1486	137,29	82,16	86,79	6,371	83,83	108,05
1487	136,85	82,20	86,80	6,369	84,02	106,37
1488	136,23	82,29	86,88	6,370	83,85	105,17
1489	135,67	82,25	86,86	6,369	84,08	104,37
1490	135,00	82,26	86,84	6,275	84,31	103,78
1491	134,30	82,27	86,85	6,271	83,81	103,15
1492	133,74	82,32	86,81	6,272	84,24	102,82
1493	133,15	82,34	86,78	6,273	83,87	102,46
1494	132,78	82,34	86,74	6,272	83,53	102,27
1495	132,20	82,36	86,70	6,271	83,77	102,01
1496	131,71	82,33	86,65	6,158	84,15	101,81
1497	131,27	82,30	86,60	6,273	84,05	101,64
1498	130,87	82,30	86,62	6,153	83,91	101,60
1499	130,57	82,31	86,56	6,156	83,87	101,44
1500	130,20	82,26	86,53	6,155	84,00	101,27
1501	129,92	82,27	86,54	6,157	83,67	101,26
1502	129,61	82,28	86,49	6,154	84,21	101,15
1503	129,31	82,26	86,48	6,154	84,26	101,13
1504	129,14	82,28	86,46	6,058	83,66	101,08
1505	128,91	82,30	86,42	6,059	83,78	101,04
1506	128,52	82,30	86,39	6,057	84,56	100,99
1507	128,52	82,26	86,36	6,058	84,10	101,00
1508	128,23	82,30	86,39	6,056	84,22	100,88
1509	127,95	82,29	86,37	6,057	84,15	100,82
1510	127,85	82,25	86,35	5,977	84,32	100,80
1511	127,68	82,26	86,32	5,961	84,08	100,76
1512	127,41	82,25	86,29	5,960	84,19	100,76
1513	127,25	82,20	86,28	5,960	83,96	100,69
1514	127,17	82,23	86,31	5,962	83,70	100,73
1515	126,92	82,20	86,27	5,960	83,79	100,62
1516	126,75	82,19	86,21	5,963	84,35	100,63
1517	126,55	82,19	86,26	5,864	84,14	100,63
1518	126,59	82,13	86,18	5,862	83,90	100,60
1519	126,47	82,18	86,17	5,863	84,10	100,56
1520	126,20	82,12	86,18	5,864	84,10	100,53
1521	126,13	82,16	86,19	5,765	84,25	100,53
1522	126,14	82,14	86,16	5,768	84,05	100,46
1523	125,94	82,18	86,15	5,767	84,20	100,51
1524	125,85	82,17	86,14	5,765	84,07	100,54
1525	125,74	82,13	86,11	5,766	84,11	100,51
1526	125,70	82,18	86,11	5,766	83,59	100,49
1527	125,62	82,14	86,07	5,668	83,95	100,45
1528	125,48	82,15	86,10	5,766	84,16	100,48
1529	125,46	82,16	86,04	5,766	83,97	100,47
1530	125,43	82,17	86,06	5,668	84,09	100,40
1531	125,25	82,15	86,03	5,669	83,91	100,40
1532	125,23	82,16	86,02	5,670	83,86	100,44
1533	125,11	82,17	85,97	5,668	83,85	100,43
1534	125,13	82,15	85,97	5,572	83,51	100,45
1535	125,12	82,13	85,98	5,572	84,04	100,40
1536	125,13	82,17	85,98	5,572	83,75	100,38
1537	125,14	82,12	86,00	5,572	83,62	100,40
1538	125,19	82,09	85,99	5,572	83,50	100,37
1539	125,10	82,13	85,95	5,473	83,21	100,39
1540	125,07	82,11	85,88	5,475	83,81	100,38
1541	125,03	82,08	85,92	5,475	83,57	100,39
1542	125,02	82,09	85,89	5,474	83,96	100,44
1543	124,89	82,08	85,91	5,358	84,02	100,36
1544	124,89	82,10	85,93	5,359	83,65	100,46
1545	124,92	82,11	85,90	5,359	83,43	100,38
1546	125,05	82,08	85,85	5,359	83,69	100,36
1547	124,90	82,09	85,86	5,358	83,75	100,41
1548	124,94	82,13	85,90	5,359	83,69	100,36
1549	124,82	82,09	85,83	5,358	83,65	100,42
1550	124,82	82,08	85,80	5,358	83,22	100,38
1551	124,88	82,13	85,85	5,357	83,06	100,42
1552	124,85	82,10	85,83	5,357	83,84	100,38
1553	124,90	82,09	85,81	5,261	83,64	100,37
1554	124,93	82,08	85,73	5,259	83,52	100,39
1555	124,80	82,07	85,77	5,260	83,64	100,37
1556	124,64	82,07	85,76	5,261	83,04	100,33
1557	124,61	82,08	85,76	5,162	83,45	100,34
1558	124,52	82,10	85,71	5,163	83,68	100,33
1559	124,57	82,09	85,75	5,163	83,30	100,29
1560	124,58	82,10	85,74	5,162	83,25	100,30
1561	124,41	82,09	85,70	5,163	83,31	100,32
1562	124,29	82,08	85,69	5,164	83,07	100,28
1563	124,25	82,05	85,68	5,163	83,40	100,34
1564	124,21	82,06	85,65	5,065	83,46	100,31
1565	124,24	82,08	85,65	5,163	83,42	100,26
1566	124,26	82,02	85,65	5,067	83,34	100,20
1567	124,36	82,04	85,61	5,065	83,44	100,20
1568	124,45	82,03	85,62	5,065	83,58	100,19
1569	124,34	82,04	85,61	5,065	83,39	100,24
1570	124,33	82,02	85,61	5,062	83,88	100,18
1571	124,46	82,01	85,56	4,967	83,55	100,14
1572	124,32	81,96	85,59	4,967	83,88	100,15
1573	124,27	81,95	85,61	4,968	83,81	100,16
1574	124,14	81,96	85,52	4,968	83,47	100,14
1575	124,18	81,92	85,55	4,968	83,63	100,12
1576	124,26	81,94	85,55	4,967	83,70	100,15
1577	124,13	81,91	85,51	4,969	83,60	100,12
1578	124,27	81,90	85,56	4,968	83,84	100,14

1579	124,14	81,95	85,53	4,870	83,63	100,11
1580	124,27	81,94	85,53	4,969	83,47	100,04
1581	124,30	81,95	85,53	4,870	83,40	100,09
1582	124,48	81,93	85,52	4,871	83,54	100,09
1583	124,56	81,90	85,51	4,871	83,49	100,08
1584	124,56	81,91	85,51	4,821	83,67	100,06
1585	124,55	81,91	85,44	4,773	83,18	99,97
1586	124,47	81,91	85,41	4,773	83,67	100,00
1587	124,44	81,88	85,45	4,775	83,16	99,98
1588	124,42	81,88	85,47	4,775	83,12	99,96
1589	124,36	81,88	85,45	4,773	83,13	99,91
1590	124,41	81,89	85,44	4,773	83,49	99,96
1591	124,26	81,90	85,41	4,773	83,31	99,93
1592	124,16	81,91	85,41	4,677	83,52	99,86
1593	124,23	81,90	85,36	4,676	83,47	99,88
1594	124,17	81,90	85,35	4,560	83,66	99,88
1595	124,09	81,88	85,34	4,676	83,13	99,85
1596	123,90	81,86	85,33	4,677	83,18	99,77
1597	124,06	81,87	85,36	4,677	83,30	99,77
1598	123,97	81,85	85,31	4,676	83,41	99,76
1599	123,93	81,81	85,31	4,559	83,60	99,73
1600	123,77	81,83	85,28	4,560	83,26	99,67
1601	123,68	81,86	85,26	4,675	83,60	99,67
1602	123,55	81,84	85,25	4,559	83,67	99,60
1603	123,56	81,80	85,25	4,560	83,45	99,64
1604	123,42	81,79	85,24	4,558	83,89	99,53
1605	123,44	81,79	85,27	4,559	83,27	99,55
1606	123,31	81,83	85,22	4,462	83,73	99,57
1607	123,36	81,80	85,21	4,463	83,55	99,53
1608	123,32	81,78	85,23	4,461	83,70	99,46
1609	123,28	81,79	85,21	4,462	83,44	99,47
1610	122,99	81,78	85,15	4,463	83,42	99,48
1611	122,89	81,75	85,15	4,365	82,94	99,42
1612	122,76	81,79	85,11	4,365	82,98	99,36
1613	122,69	81,77	85,08	4,463	83,34	99,34
1614	122,62	81,81	85,06	4,365	83,31	99,33
1615	122,52	81,75	85,13	4,365	83,74	99,30
1616	122,37	81,73	85,12	4,269	83,14	99,24
1617	121,70	81,72	84,93	4,267	82,47	105,53
1618	121,28	81,73	84,77	4,268	82,21	110,66
1619	121,59	81,59	84,78	4,268	81,36	113,50
1620	122,07	81,60	84,72	4,170	81,44	116,25
1621	122,76	81,55	84,67	4,170	81,62	118,75
1622	123,42	81,56	84,70	4,172	81,38	120,69
1623	124,42	81,51	84,67	4,148	81,39	122,94
1624	125,34	81,50	84,65	4,074	81,26	125,13
1625	127,03	81,43	84,88	4,170	83,00	110,51
1626	128,06	81,48	85,07	4,171	83,63	107,43
1627	128,24	81,49	84,96	4,074	83,15	105,52
1628	128,09	81,53	85,07	4,072	83,47	104,14
1629	126,92	81,48	84,94	3,977	82,24	114,29
1630	126,42	81,58	84,77	3,989	81,90	119,10
1631	126,59	81,45	84,79	3,976	81,70	122,05
1632	127,01	81,56	84,81	3,976	81,30	124,06
1633	127,70	81,49	84,72	3,976	81,41	126,19
1634	128,65	81,45	84,77	3,977	82,15	113,62
1635	130,17	81,46	85,12	3,976	83,21	109,43
1636	130,62	81,50	85,17	3,975	83,11	106,89
1637	130,33	81,48	85,17	3,976	84,13	105,17
1638	129,11	81,57	85,06	3,879	82,53	114,09
1639	128,35	81,51	84,85	3,878	82,18	119,95
1640	128,38	81,44	84,83	3,879	81,21	123,02
1641	128,90	81,39	84,89	3,878	81,53	125,36
1642	129,41	81,52	84,76	3,762	81,38	127,39
1643	130,55	81,40	84,81	3,880	83,09	113,63
1644	131,88	81,43	85,10	3,879	83,40	109,65
1645	132,10	81,37	85,20	3,878	83,20	107,02
1646	131,68	81,46	85,18	3,879	83,32	105,44
1647	130,63	81,47	85,06	3,763	82,41	114,07
1648	129,57	81,64	84,85	3,762	82,20	120,33
1649	129,43	81,33	84,76	3,664	81,19	123,27
1650	129,84	81,43	84,81	3,666	81,49	125,78
1651	130,26	81,36	84,75	3,665	81,52	127,64
1652	132,05	81,32	85,05	3,664	82,29	110,52
1653	132,42	81,40	85,09	3,666	83,47	107,67
1654	132,07	81,44	85,16	3,708	83,22	105,87
1655	131,54	81,44	85,17	3,664	82,88	104,45
1656	130,60	81,38	85,20	3,664	82,20	108,88
1657	129,25	81,35	84,90	3,569	81,50	117,11
1658	128,94	81,37	84,76	3,568	81,71	120,66
1659	129,30	81,32	84,78	3,567	81,30	123,41
1660	129,67	81,30	84,76	3,470	81,40	125,63
1661	130,28	81,26	84,70	3,568	82,29	115,36
1662	131,82	81,26	85,03	3,568	82,31	109,86
1663	132,19	81,34	85,10	3,568	83,03	107,30
1664	132,03	81,34	85,11	3,569	84,02	105,56
1665	131,45	81,36	85,14	3,567	83,51	104,34
1666	130,59	81,36	85,11	3,470	82,03	107,68
1667	129,17	81,39	84,82	3,470	82,11	116,46
1668	128,99	81,45	84,71	3,470	81,51	120,34
1669	129,21	81,30	84,68	3,373	81,31	122,85
1670	129,78	81,36	84,69	3,372	81,46	125,15
1671	130,45	81,30	84,58	3,372	81,01	127,37

1672	131,93	81,21	84,90	3,373	81,89	110,73
1673	132,41	81,27	85,05	3,442	83,03	107,85
1674	132,16	81,29	85,07	3,469	83,47	105,94
1675	131,60	81,27	85,03	3,372	83,22	105,05
1676	130,18	81,24	84,81	3,373	82,08	116,71
1677	129,71	81,21	84,59	3,275	81,63	121,11
1678	129,97	81,08	84,59	3,277	81,43	123,61
1679	130,55	81,12	84,62	3,275	81,24	126,31
1680	131,09	81,12	84,59	3,242	81,19	129,25
1681	132,70	81,06	84,89	3,277	82,11	110,91
1682	133,23	81,19	84,91	3,276	82,70	107,92
1683	132,83	81,16	84,87	3,275	82,95	106,05
1684	132,18	81,24	84,90	3,276	82,81	104,76
1685	131,62	81,22	85,01	3,275	83,50	103,73
1686	130,54	81,19	84,88	3,276	82,18	110,10
1687	129,41	81,19	84,69	3,179	81,50	117,35
1688	129,26	81,26	84,56	3,178	81,04	120,67
1689	129,61	81,22	84,55	3,176	81,29	123,35
1690	130,12	81,12	84,49	3,062	81,32	125,67
1691	131,17	81,14	84,45	3,178	82,12	113,32
1692	132,62	81,13	84,82	3,178	82,91	109,35
1693	132,72	81,13	84,90	3,062	83,42	106,86
1694	132,36	81,13	84,93	3,178	82,91	105,30
1695	131,78	81,16	84,88	3,061	83,10	104,08
1696	131,03	81,16	84,88	3,062	83,36	103,20
1697	129,76	81,12	84,73	2,964	82,13	111,25
1698	128,98	81,18	84,54	2,964	81,74	117,26
1699	128,99	81,07	84,45	2,965	80,94	120,49
1700	129,43	81,10	84,46	2,964	81,13	123,28
1701	130,03	80,92	84,40	2,965	81,28	125,58
1702	130,91	81,03	84,37	2,965	82,17	114,40
1703	132,38	80,97	84,79	2,964	82,33	109,72
1704	132,74	81,05	84,74	2,965	82,94	107,20
1705	132,27	81,08	84,76	2,868	83,74	105,49
1706	131,69	81,10	84,75	2,868	82,71	105,63
1707	130,28	81,09	84,53	2,866	81,59	116,51
1708	129,92	81,09	84,40	2,867	81,50	121,04
1709	130,10	81,03	84,37	2,770	81,33	123,52
1710	130,69	81,02	84,35	2,771	80,67	126,00
1711	131,26	80,95	84,31	2,770	81,19	128,35
1712	132,74	80,93	84,65	2,867	82,08	111,13
1713	133,30	81,00	84,74	2,770	82,92	108,16
1714	133,24	80,95	84,76	2,868	83,13	106,17
1715	132,84	81,00	84,72	2,770	82,47	104,76
1716	132,22	81,01	84,81	2,770	83,20	103,98
1717	130,76	81,00	84,50	2,674	82,02	115,51
1718	130,26	81,22	84,38	2,673	81,66	119,91
1719	130,39	80,96	84,33	2,672	81,07	122,93
1720	130,86	80,93	84,29	2,672	81,09	125,20
1721	131,50	80,89	84,22	2,685	80,95	129,34
1722	133,26	80,85	84,54	2,672	82,06	110,45
1723	133,82	80,97	84,71	2,593	83,30	107,76
1724	133,76	80,91	84,63	2,673	83,35	105,90
1725	133,33	80,95	84,71	2,575	83,09	104,60
1726	132,68	80,97	84,66	2,672	83,46	103,56
1727	132,02	81,00	84,67	2,673	82,91	102,90
1728	130,77	80,97	84,45	2,576	82,15	109,82
1729	129,79	80,95	84,29	2,576	81,58	116,49
1730	129,68	80,98	84,20	2,573	81,11	119,95
1731	130,06	80,93	84,19	2,478	81,25	122,59
1732	130,62	80,93	84,16	2,380	81,06	124,88
1733	131,36	80,80	84,11	2,479	81,01	127,31
1734	133,15	80,76	84,42	2,479	82,98	111,10
1735	133,74	80,88	84,51	2,477	83,10	108,09
1736	133,49	80,81	84,58	2,477	83,13	106,08
1737	133,01	80,89	84,59	2,478	82,67	104,63
1738	132,14	80,81	84,51	2,381	81,79	109,20
1739	130,83	80,77	84,29	2,380	81,48	117,63
1740	130,72	80,86	84,17	2,357	81,12	121,23
1741	131,01	80,78	84,13	2,263	80,76	124,02
1742	131,55	80,77	84,10	2,381	80,97	126,31
1743	132,18	80,70	84,06	2,264	80,98	128,44
1744	133,86	80,69	84,36	2,381	81,94	111,30
1745	134,55	80,76	84,59	2,380	83,05	108,27
1746	134,39	80,79	84,52	2,263	83,11	106,17
1747	133,83	80,81	84,57	2,367	83,44	104,69
1748	132,60	80,83	84,42	2,263	81,52	112,40
1749	131,46	80,82	84,17	2,174	81,37	119,38
1750	131,29	80,81	84,09	2,264	81,21	122,56
1751	131,62	80,67	84,07	2,166	80,97	125,22
1752	132,21	80,71	84,02	2,167	81,09	127,34
1753	133,66	80,62	84,27	2,255	82,01	111,90
1754	134,45	80,73	84,52	2,166	83,06	108,59
1755	134,27	80,68	84,45	2,167	82,59	106,39
1756	133,80	80,76	84,50	2,167	83,07	104,81
1757	132,49	80,79	84,31	2,166	81,84	112,12
1758	131,37	80,75	84,13	2,167	81,56	119,20
1759	131,15	80,71	84,04	2,070	81,04	122,64
1760	131,49	80,66	83,99	2,069	81,26	125,11
1761	132,11	80,66	83,98	2,069	81,02	127,48
1762	133,35	80,63	84,05	2,069	81,89	113,24
1763	134,51	80,65	84,40	2,070	82,71	109,26
1764	134,68	80,69	84,46	2,069	83,02	106,89



1765	134,09	80,69	84,40	2,070	83,71	105,18
1766	133,50	80,72	84,28	1,972	82,11	106,37
1767	131,75	80,67	84,11	1,972	81,54	116,98
1768	131,26	80,66	83,98	1,970	81,24	121,15
1769	131,38	80,60	83,93	1,876	80,97	123,96
1770	131,91	80,63	83,93	1,875	81,20	126,20
1771	132,50	80,57	83,87	1,875	80,88	128,51
1772	134,09	80,50	84,29	1,874	82,37	111,08
1773	134,75	80,58	84,31	1,972	83,26	108,09
1774	134,43	80,55	84,31	1,875	82,76	106,03
1775	133,88	80,61	84,36	1,875	82,31	104,78
1776	132,13	80,62	84,05	1,875	81,31	116,96
1777	131,61	80,67	83,88	1,777	80,77	121,47
1778	131,78	80,61	83,85	1,778	80,99	124,19
1779	132,09	80,53	83,81	1,777	80,81	126,57
1780	132,60	80,55	83,81	1,680	80,75	128,71
1781	134,13	80,49	84,23	1,777	82,23	111,98
1782	134,88	80,60	84,32	1,777	82,74	108,69
1783	134,90	80,55	84,11	1,778	83,06	106,40
1784	134,39	80,59	84,24	1,778	83,25	104,81
1785	133,69	80,65	84,25	1,777	82,70	103,75
1786	132,10	80,58	84,06	1,680	81,66	114,28
1787	131,36	80,64	83,87	1,680	81,09	119,47
1788	131,36	80,61	83,81	1,648	81,05	122,55
1789	131,74	80,52	83,82	1,680	81,10	124,95
1790	132,31	80,50	83,79	1,589	80,59	126,98
1791	133,80	80,40	84,04	1,680	82,09	112,07
1792	134,77	80,49	84,34	1,681	82,74	108,65
1793	134,70	80,46	84,14	1,680	83,00	106,28
1794	134,20	80,54	84,28	1,681	82,89	104,74
1795	133,40	80,57	84,22	1,583	82,32	107,59
1796	131,75	80,50	83,90	1,584	81,51	117,22
1797	131,43	80,53	83,76	1,466	80,93	120,93
1798	131,42	80,44	83,69	1,466	80,83	123,58
1799	132,01	80,49	83,73	1,466	80,91	126,11
1800	132,66	80,42	83,67	1,466	80,70	128,25
1801	134,10	80,37	84,12	1,466	82,27	111,59
1802	134,87	80,44	84,22	1,468	82,54	108,34
1803	134,70	80,39	84,10	1,465	82,20	106,04
1804	133,93	80,46	84,17	1,466	82,24	104,53
1805	132,38	80,45	83,96	1,466	81,39	114,93
1806	131,60	80,46	83,75	1,369	80,97	120,46
1807	131,64	80,46	83,67	1,369	81,21	123,38
1808	131,95	80,40	83,68	1,272	81,05	125,65
1809	132,63	80,38	83,59	1,369	80,79	128,05
1810	133,98	80,34	83,86	1,369	82,08	112,30
1811	134,95	80,41	84,05	1,369	82,57	108,72
1812	134,98	80,29	84,00	1,314	82,83	106,30
1813	134,38	80,44	83,97	1,369	82,71	104,73
1814	133,23	80,44	83,86	1,272	81,66	110,37
1815	131,82	80,32	83,69	1,271	80,81	118,19
1816	131,48	80,37	83,63	1,271	80,90	121,86
1817	131,66	80,34	83,61	1,174	80,83	124,28
1818	132,21	80,33	83,57	1,175	80,56	126,63
1819	132,88	80,32	83,54	1,271	81,19	120,31
1820	134,59	80,26	84,08	1,272	82,63	110,30
1821	134,95	80,39	83,99	1,272	82,32	107,35
1822	134,50	80,33	84,00	1,174	82,85	105,40
1823	133,79	80,35	83,95	1,174	82,99	103,97
1824	133,00	80,36	83,96	1,174	82,10	106,16
1825	131,35	80,30	83,65	1,077	80,93	116,14
1826	130,86	80,26	83,52	1,076	81,00	120,05
1827	131,02	80,29	83,53	1,077	80,75	122,80
1828	131,47	80,28	83,44	1,077	80,68	125,14
1829	132,00	80,29	83,44	1,077	80,65	127,23
1830	133,17	80,21	83,48	1,077	81,74	112,94
1831	134,42	80,28	83,98	1,078	82,22	108,99
1832	134,50	80,28	83,78	1,077	82,23	106,43
1833	133,80	80,32	83,95	1,077	82,75	104,70
1834	133,04	80,38	83,89	1,077	82,67	103,44
1835	76,40	74,20	76,59	12,456	75,57	76,13
1836	89,98	74,51	77,67	12,243	75,60	76,15
1837	95,21	74,44	77,94	12,148	75,59	76,30
1838	101,38	74,50	78,73	12,553	75,45	76,72
1839	133,60	74,41	82,95	11,854	75,53	77,23
1840	179,92	74,52	89,24	11,660	75,46	78,53
1841	240,23	74,46	98,26	11,250	75,57	81,09
1842	270,48	74,32	103,32	10,958	75,48	84,95
1843	318,40	74,55	111,89	10,551	75,21	89,97
1844	367,03	74,61	121,68	10,043	75,42	96,55
1845	414,71	74,68	131,64	9,655	75,35	105,40
1846	447,44	74,59	139,72	9,151	75,21	115,38
1847	475,41	74,50	147,40	8,679	75,22	126,07
1848	495,91	74,78	154,16	8,354	75,09	110,52
1849	517,35	74,81	159,10	7,963	75,04	111,86
1850	539,81	74,97	164,60	7,459	75,29	114,29
1851	558,98	75,01	170,02	6,952	75,40	117,14
1852	572,77	75,17	176,94	20,533	75,33	120,21
1853	555,51	74,87	175,02	25,022	75,45	120,82
1854	560,97	74,54	176,85	24,523	74,93	121,33
1855	576,50	74,65	180,01	24,015	75,12	122,72
1856	591,83	75,07	183,52	23,529	75,61	124,57
1857	605,07	74,66	186,74	23,026	75,34	126,85

20-22-21-24

21-19-19

1858	615,63	75,07	189,98	22,532	75,57	129,33
1859	626,34	74,80	192,67	22,033	75,33	131,47
1860	641,97	74,95	196,59	21,431	75,51	134,30
1861	651,82	74,87	199,10	20,925	75,24	136,55
1862	658,68	75,25	201,93	20,336	75,48	139,38
1863	668,41	74,93	203,76	19,830	75,29	141,93
1864	675,81	75,08	206,67	19,328	75,37	144,31
1865	629,32	75,47	181,05	18,771	75,84	146,07
1866	643,11	75,39	177,40	18,313	75,54	148,14
1867	662,91	74,84	178,97	17,728	75,27	151,61
1868	675,34	75,20	179,86	17,149	75,51	155,16
1869	685,30	74,59	180,87	16,545	75,23	158,23
1870	690,75	74,83	181,46	16,042	75,29	161,14
1871	694,81	74,98	181,62	15,554	75,06	163,81
1872	689,95	74,99	179,99	15,141	75,39	165,72
1873	679,62	75,04	177,58	14,640	75,22	166,53
1874	671,55	75,20	175,61	14,250	75,43	166,46
1875	663,75	75,25	173,86	13,840	75,95	166,07
1876	656,20	74,97	172,01	13,550	75,58	165,09
1877	646,18	75,43	169,56	13,255	76,00	164,27
1878	635,43	75,50	167,67	12,849	75,70	162,74
1879	625,95	75,87	165,23	12,655	75,87	160,85
1880	615,60	75,84	163,34	12,341	75,88	159,03
1881	606,27	75,80	161,23	12,051	75,76	157,39
1882	596,38	75,63	159,46	11,853	75,70	155,50
1883	586,77	75,43	157,54	11,632	75,62	153,98
1884	577,36	75,63	155,76	11,446	75,93	151,96
1885	568,90	75,58	153,84	11,253	75,82	150,06
1886	560,38	75,79	152,65	11,056	75,80	148,38
1887	553,35	75,45	151,15	10,846	75,49	146,65
1888	546,28	75,42	149,74	10,648	75,68	145,09
1889	539,43	75,31	148,69	10,550	75,73	143,24
1890	532,99	75,48	147,83	10,357	75,89	141,78
1891	528,09	75,76	147,03	10,210	76,40	141,17
1892	524,61	75,70	146,60	9,950	75,90	140,12
1893	523,61	75,48	146,81	9,752	75,48	139,20
1894	523,14	75,25	146,42	9,559	75,29	138,79
1895	521,41	75,67	146,43	9,247	75,99	138,65
1896	519,16	75,86	145,43	9,152	76,13	138,39
1897	515,81	76,07	144,59	8,873	76,05	138,26
1898	511,91	75,90	143,91	8,693	75,92	137,53
1899	506,45	75,81	143,21	8,566	75,78	136,92
1900	501,38	76,22	142,19	8,452	76,11	136,37
1901	496,02	76,21	140,94	8,255	76,24	135,69
1902	491,32	75,98	140,11	8,158	76,21	134,80
1903	486,66	75,99	139,47	7,965	76,05	134,01
1904	524,46	76,14	166,33	45,312	76,11	133,95
1905	563,72	76,03	179,88	44,388	76,05	134,94
1906	636,72	76,16	195,87	43,464	76,40	140,25
1907	686,19	76,08	207,81	42,681	75,87	147,16
1908	727,18	76,26	218,63	41,869	76,45	154,87
1909	758,67	76,05	227,42	40,992	76,75	162,87
1910	722,96	76,40	205,13	40,372	76,71	168,85
1911	719,67	76,57	198,74	39,798	76,54	172,71
1912	722,50	76,10	196,97	39,149	75,97	175,71
1913	725,57	76,15	195,87	38,496	76,35	178,61
1914	729,46	76,16	195,96	37,880	76,12	181,23
1915	732,10	76,16	196,04	37,286	76,48	183,20
1916	734,08	75,71	196,33	36,706	76,27	184,86
1917	737,54	76,11	196,52	36,093	76,31	187,22
1918	735,38	76,38	195,62	35,501	76,50	189,12
1919	731,69	76,85	195,04	35,012	77,14	190,49
1920	730,25	76,78	193,88	34,506	76,28	190,33
1921	729,89	76,94	193,75	33,892	76,51	191,64
1922	730,14	76,79	193,23	33,391	76,82	192,52
1923	729,94	76,52	193,08	32,913	76,43	192,71
1924	730,68	76,87	193,06	32,306	76,93	193,67
1925	731,05	76,74	193,48	31,794	76,82	194,62
1926	731,57	76,98	193,00	31,313	76,72	194,55
1927	733,82	77,21	193,64	30,802	76,67	195,80
1928	734,93	77,37	193,66	30,201	76,66	196,06
1929	735,69	77,37	193,87	29,819	76,66	196,09
1930	734,44	77,35	197,94	29,305	76,57	196,35
1931	730,74	76,81	196,73	28,821	76,34	195,94
1932	727,77	76,76	193,75	28,319	76,60	196,23
1933	725,64	76,96	192,51	27,812	76,48	195,34
1934	723,05	76,50	188,41	27,416	76,42	195,19
1935	720,67	76,98	187,40	26,917	76,31	194,81
1936	717,90	77,03	186,79	26,530	77,04	195,01
1937	715,89	77,12	185,33	26,021	76,83	194,39
1938	714,84	76,45	185,41	25,607	76,39	193,22
1939	711,85	76,78	184,96	25,127	76,30	193,05
1940	709,94	76,74	184,58	24,718	76,49	193,04
1941	709,35	76,48	183,68	24,324	76,36	192,30
1942	707,35	76,85	183,41	23,920	76,50	192,16
1943	705,37	76,42	183,01	23,533	76,45	191,72
1944	704,41	76,69	182,81	23,023	76,27	191,13
1945	702,07	75,96	181,90	22,629	76,57	190,70
1946	700,23	76,65	181,62	22,229	76,23	190,31
1947	696,16	76,51	180,77	21,936	76,25	189,78
1948	692,33	76,47	179,61	21,522	76,10	189,02
1949	689,11	76,57	178,95	21,137	76,26	188,50
1950	685,70	76,29	178,29	20,773	76,25	187,76

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1951	682,46	76,45	177,13	20,434	76,43	186,90
1952	678,29	77,16	176,28	20,128	76,50	186,19
1953	673,56	77,01	175,14	19,733	76,63	185,74
1954	669,92	76,61	174,11	19,447	76,72	184,46
1955	666,82	76,47	173,41	19,128	76,28	183,88
1956	664,25	76,39	172,85	18,837	76,31	182,66
1957	659,47	76,63	171,88	18,531	76,59	181,73
1958	656,34	76,80	171,29	18,242	76,44	181,05
1959	654,09	76,67	170,15	17,948	76,78	180,18
1960	651,03	76,85	169,74	17,638	76,42	179,43
1961	647,25	76,40	168,86	17,339	76,47	178,32
1962	644,06	76,70	168,59	17,144	76,27	177,35
1963	640,58	76,86	167,34	16,840	76,39	176,84
1964	635,60	76,88	166,71	16,543	76,65	175,70
1965	631,80	77,07	165,36	16,351	77,02	174,83
1966	627,92	76,87	164,66	16,043	76,79	173,78
1967	623,32	76,92	163,96	15,890	76,73	172,82
1968	619,54	77,00	163,16	15,647	76,77	172,03
1969	615,96	77,15	162,65	15,438	76,67	170,90
1970	613,63	77,39	162,22	15,245	77,18	170,23
1971	610,84	76,99	161,48	14,947	77,16	169,43
1972	606,91	77,25	160,25	14,795	77,00	168,40
1973	603,35	76,71	160,17	14,640	76,62	167,41
1974	599,88	76,95	159,16	14,445	76,67	166,68
1975	595,83	76,30	158,14	14,247	76,78	165,87
1976	589,97	76,67	157,07	14,056	76,57	165,13
1977	580,65	76,71	155,83	13,937	76,88	163,42
1978	572,91	77,09	154,56	13,742	77,01	161,93
1979	565,83	77,08	153,48	13,648	77,18	160,83
1980	558,86	77,06	151,93	13,454	77,19	159,11
1981	552,42	77,17	151,19	13,354	76,81	157,64
1982	546,05	76,69	150,07	13,138	76,78	155,98
1983	539,83	77,05	149,04	13,141	76,71	154,49
1984	533,97	76,95	147,72	12,948	76,43	152,81
1985	529,42	77,18	146,91	12,944	76,86	151,92
1986	524,02	76,86	145,55	12,751	76,50	150,33
1987	517,53	77,10	144,75	12,754	76,55	148,97
1988	511,06	76,74	143,72	12,654	76,64	147,83
1989	504,29	76,61	142,65	12,554	76,41	146,61
1990	497,80	76,83	141,35	12,461	76,68	145,44
1991	490,94	77,04	140,14	12,342	76,59	144,23
1992	483,96	76,51	139,40	12,249	76,27	142,67
1993	477,49	76,89	138,67	12,246	76,59	141,50
1994	470,89	76,65	137,91	12,150	76,43	140,07
1995	464,86	76,85	136,77	12,051	76,63	138,95
1996	458,70	77,01	136,14	12,048	76,48	137,80
1997	454,28	76,97	135,54	11,953	76,28	136,77
1998	449,39	76,82	134,91	11,857	76,50	135,76
1999	444,47	76,99	133,96	11,855	76,38	134,83
2000	440,32	76,74	133,38	11,756	76,47	134,03
2001	436,11	76,57	132,87	11,760	76,10	132,99
2002	432,63	76,80	132,12	11,544	76,29	132,41
2003	429,77	76,45	131,52	11,544	76,31	131,64
2004	427,34	76,71	131,14	11,449	76,34	131,07
2005	425,62	76,61	130,77	11,449	76,49	130,42
2006	424,16	76,59	130,34	11,255	76,23	129,88
2007	423,35	76,59	130,03	11,243	76,28	129,60
2008	422,93	76,29	129,90	11,057	76,32	129,27
2009	423,06	76,47	129,60	11,060	76,18	129,08
2010	423,48	76,67	129,94	10,958	76,30	128,74
2011	423,89	76,74	129,82	10,846	76,24	128,68
2012	425,15	76,36	129,98	10,845	76,34	128,56
2013	425,75	76,41	130,12	10,648	76,38	128,64
2014	426,44	76,86	130,25	10,651	76,54	128,70
2015	408,17	76,29	122,26	10,551	76,60	128,71
2016	332,65	76,64	105,08	10,550	76,48	128,02
2017	298,93	76,84	100,20	10,456	76,53	127,35
2018	279,22	76,90	97,48	10,452	76,51	126,56
2019	265,30	76,61	95,58	10,359	76,41	125,86
2020	254,53	76,73	94,50	10,360	76,56	125,33
2021	245,96	77,02	93,39	10,358	76,75	124,84
2022	238,64	76,58	92,72	10,260	76,75	124,11
2023	232,37	76,67	91,90	10,257	76,68	123,55
2024	226,88	77,02	91,47	10,262	76,68	123,02
2025	222,28	76,81	90,91	10,262	76,83	122,32
2026	217,62	76,91	90,42	10,260	76,84	121,85
2027	213,67	76,96	89,90	10,163	76,68	121,18
2028	210,16	77,16	89,46	10,163	76,76	120,63
2029	206,48	77,10	89,07	10,161	76,46	119,93
2030	203,22	76,91	88,78	10,045	76,61	119,47
2031	200,43	76,40	88,54	10,047	76,47	118,81
2032	197,62	77,01	88,47	10,048	76,40	118,37
2033	194,99	76,62	88,10	10,045	76,52	117,90
2034	192,84	76,89	87,91	9,982	76,79	117,54
2035	190,63	77,00	87,75	9,951	76,61	117,04
2036	188,48	76,78	87,66	9,951	76,96	116,58
2037	186,43	76,85	87,42	9,947	76,64	115,85
2038	184,40	76,29	87,13	9,950	76,51	115,40
2039	182,49	76,71	86,85	9,949	76,48	114,90
2040	180,78	76,54	86,68	9,947	76,51	114,54
2041	179,16	76,75	86,52	9,949	76,65	114,11
2042	177,64	76,48	86,38	9,911	76,83	113,73
2043	175,84	76,46	86,32	9,850	76,71	113,41

2044	174,35	76,73	86,06	9,851	76,83	113,01
2045	172,91	76,66	86,01	9,850	76,69	112,52
2046	171,59	76,71	85,89	9,853	76,62	112,12
2047	170,10	76,65	85,71	9,756	76,68	111,90
2048	168,18	76,59	85,48	9,655	76,63	125,62
2049	167,26	77,06	85,53	9,655	76,78	137,03
2050	168,31	77,11	85,42	9,756	77,04	118,32
2051	168,42	76,74	85,34	9,754	76,62	115,93
2052	167,61	76,66	85,22	9,673	76,67	114,19
2053	166,32	76,78	85,17	9,753	76,77	112,84
2054	165,16	76,87	85,14	9,754	76,68	111,92
2055	163,80	77,21	85,16	9,658	76,60	111,13
2056	162,26	77,29	85,42	9,654	77,22	110,77
2057	161,08	77,49	85,51	9,657	78,04	110,36
2058	159,83	77,67	85,52	9,658	78,16	110,02
2059	158,82	77,84	85,68	9,657	78,22	109,68
2060	157,66	78,02	85,64	9,655	78,80	109,46
2061	156,76	78,16	85,70	9,562	79,05	109,17
2062	155,98	78,30	85,70	9,559	79,05	108,93
2063	155,11	78,45	85,73	9,558	78,95	108,71
2064	154,07	78,58	85,68	9,562	79,04	108,46
2065	153,31	78,60	85,69	9,560	78,80	108,20
2066	152,49	78,52	85,71	9,462	78,67	107,89
2067	151,83	78,98	85,70	9,461	79,23	108,00
2068	151,10	78,94	85,67	9,462	79,41	107,66
2069	150,33	78,91	85,62	9,464	79,26	107,44
2070	149,51	78,98	85,57	9,464	79,74	107,23
2071	148,72	79,05	85,66	9,367	79,72	107,12
2072	147,70	79,28	85,54	9,247	78,80	113,86
2073	146,49	79,27	85,38	9,248	79,13	125,17
2074	146,78	79,14	85,37	9,250	78,75	130,59
2075	148,35	79,18	85,45	9,364	79,13	114,99
2076	149,00	79,33	85,52	9,365	79,49	112,24
2077	222,35	79,49	100,40	38,780	79,49	110,72
2078	252,18	79,59	107,24	38,688	80,18	109,92
2079	267,16	79,45	111,85	38,305	79,71	109,33
2080	298,34	79,57	118,67	37,700	79,57	109,34
2081	351,25	79,70	125,34	37,196	80,57	111,00
2082	422,00	79,77	136,46	36,403	80,07	113,97
2083	467,03	79,94	141,45	35,803	80,22	118,72
2084	495,11	80,11	143,36	35,103	79,96	123,21
2085	390,56	79,92	115,05	34,793	80,61	125,42
2086	352,58	79,98	107,56	34,502	80,21	126,10
2087	335,58	80,15	104,45	34,312	80,21	126,30
2088	325,14	80,22	102,74	34,001	79,97	126,27
2089	318,41	80,15	101,42	33,809	80,20	126,31
2090	313,88	80,27	100,51	33,605	80,43	126,28
2091	311,19	79,45	99,93	33,400	78,84	126,17
2092	310,70	78,68	99,38	33,105	79,26	125,95
2093	308,26	79,25	98,72	32,903	77,91	125,80
2094	306,48	79,14	98,26	32,708	78,62	125,53
2095	305,25	78,42	98,13	32,398	78,92	125,50
2096	304,54	78,53	97,85	32,184	77,59	125,43
2097	303,88	78,28	97,59	31,910	78,24	125,39
2098	303,46	78,50	97,60	31,697	77,45	125,36
2099	303,86	78,25	97,42	31,409	77,87	125,40
2100	304,04	77,58	97,45	31,115	78,49	125,33
2101	304,71	77,95	97,27	30,906	78,12	125,49
2102	305,23	78,18	97,34	30,612	77,83	125,46
2103	306,10	77,95	97,36	30,419	78,02	125,66
2104	307,22	77,74	97,49	30,108	77,80	125,90
2105	308,24	77,70	97,60	29,807	78,04	126,16
2106	309,31	77,78	97,83	29,508	77,91	126,28
2107	310,56	77,79	97,88	29,215	77,68	126,46
2108	311,14	77,75	97,92	29,015	78,31	126,84
2109	311,80	77,88	97,96	28,605	78,16	127,06
2110	312,32	77,45	97,88	28,310	78,14	127,25
2111	312,94	77,66	98,01	28,118	78,58	127,52
2112	313,56	77,50	97,95	27,805	78,38	127,82
2113	313,46	77,27	98,00	27,513	78,40	128,04
2114	313,50	77,64	97,88	27,229	78,25	128,27
2115	314,14	77,79	98,08	27,006	77,87	128,34
2116	314,68	77,34	97,84	26,715	77,18	128,47
2117	314,54	77,73	97,80	26,421	77,84	128,55
2118	315,49	77,71	97,89	26,111	77,86	129,12
2119	315,85	77,71	97,72	25,917	78,04	129,28
2120	316,43	77,18	97,80	25,607	78,26	129,54
2121	316,82	77,21	97,82	25,392	78,18	129,58
2122	316,68	77,20	97,73	25,120	78,42	129,73
2123	316,97	77,51	97,60	24,926	77,71	130,06
2124	317,11	77,23	97,55	24,617	77,68	130,26
2125	317,31	77,57	97,39	24,330	77,06	130,31
2126	317,72	77,74	97,50	24,130	77,86	130,84
2127	318,51	78,03	97,55	23,821	78,62	131,27
2128	318,95	78,04	97,65	23,527	77,73	131,29
2129	318,64	78,25	98,05	23,337	78,25	131,66
2130	318,84	78,51	98,57	23,048	78,60	131,74
2131	318,00	78,77	98,89	22,831	80,30	132,32
2132	317,69	79,05	98,99	22,537	80,31	132,90
2133	316,79	79,27	99,09	22,323	80,81	133,09
2134	316,18	79,52	99,07	22,126	81,13	133,35
2135	315,72	79,73	99,09	21,832	80,95	133,75
2136	314,90	79,89	99,29	21,622	81,21	133,93

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2137	314,47	80,05	99,29	21,424	80,90	133,92
2138	314,00	80,18	99,10	21,196	81,17	134,13
2139	313,72	80,24	99,26	21,039	81,30	134,43
2140	313,39	80,41	99,46	20,723	81,31	134,55
2141	312,94	80,47	99,46	20,535	81,36	134,61
2142	312,50	80,58	99,52	20,341	81,15	134,90
2143	312,40	80,66	99,46	20,127	81,61	134,81
2144	311,56	80,75	99,29	19,933	81,39	134,88
2145	311,21	80,84	99,45	19,735	81,97	134,98
2146	310,65	80,85	99,33	19,449	81,73	134,91
2147	309,95	80,99	99,42	19,324	81,69	135,03
2148	309,68	81,05	99,34	19,038	81,76	135,11
2149	308,90	80,42	99,17	18,836	80,68	134,80
2150	308,79	80,45	99,05	18,625	79,46	134,60
2151	307,99	80,32	99,03	18,529	79,50	134,17
2152	307,51	80,47	99,32	18,240	80,78	134,47
2153	307,12	80,50	99,32	18,039	81,06	134,59
2154	307,35	80,61	99,22	17,829	81,55	134,90
2155	307,45	80,75	99,29	17,633	82,02	135,06
2156	307,30	80,89	99,37	17,438	82,03	135,17
2157	306,77	81,05	99,60	17,245	81,79	135,14
2158	306,16	81,11	99,31	17,031	81,99	135,20
2159	305,31	81,23	99,46	16,836	82,11	135,15
2160	303,52	81,33	99,25	16,642	82,28	134,99
2161	302,63	81,36	99,07	16,446	81,92	134,95
2162	301,68	81,35	98,86	16,236	81,76	134,86
2163	300,59	81,43	98,93	16,038	82,42	134,86
2164	299,46	81,42	98,96	15,842	81,86	134,89
2165	298,82	81,51	98,57	15,648	82,00	134,71
2166	297,76	81,52	98,57	15,435	82,16	134,74
2167	297,12	81,53	98,58	15,339	82,26	134,86
2168	296,78	81,56	98,47	15,145	82,24	134,94
2169	296,23	81,62	98,33	14,951	82,09	134,92
2170	296,18	81,62	98,34	14,853	82,31	135,06
2171	296,48	81,64	98,45	14,640	82,69	135,20
2172	295,90	81,70	98,22	14,446	82,45	135,28
2173	294,40	81,74	98,05	14,252	82,38	135,23
2174	292,18	81,78	97,71	14,152	82,55	135,20
2175	289,19	81,78	97,53	14,054	82,41	134,89
2176	286,88	81,80	97,26	13,940	82,65	134,68
2177	284,73	81,83	97,04	13,837	82,59	134,42
2178	282,21	81,85	97,00	13,645	82,69	133,96
2179	279,48	81,87	96,69	13,547	82,67	133,62
2180	277,14	81,88	96,63	13,452	82,83	133,43
2181	275,41	81,81	96,48	13,358	83,15	133,08
2182	273,14	81,87	96,21	13,143	82,84	132,46
2183	271,34	81,87	96,24	13,042	82,57	132,19
2184	269,59	81,87	96,32	12,945	81,95	131,79
2185	268,13	81,81	96,18	12,848	82,31	131,40
2186	266,83	81,48	95,96	12,752	80,57	130,67
2187	265,72	80,56	95,65	12,657	80,97	130,45
2188	264,12	80,59	95,13	12,560	80,99	129,67
2189	262,70	80,54	94,94	12,461	80,15	129,26
2190	260,71	80,45	94,62	12,344	80,13	128,90
2191	258,44	80,37	94,40	12,247	78,89	128,27
2192	256,32	80,21	93,97	12,151	78,85	128,01
2193	254,28	80,00	93,75	12,049	79,89	127,68
2194	251,87	80,36	93,51	11,854	78,92	127,41
2195	249,57	80,35	93,31	11,855	79,01	127,03
2196	247,27	80,39	93,35	11,760	79,31	126,86
2197	245,74	80,43	93,00	11,664	80,27	126,39
2198	243,70	80,45	92,93	11,547	80,16	126,05
2199	242,17	80,43	92,71	11,546	79,94	125,74
2200	240,32	80,53	92,68	11,448	79,39	125,38
2201	238,25	80,30	92,41	11,349	79,83	124,95
2202	236,09	80,38	92,33	11,255	79,80	124,37
2203	233,90	80,27	92,25	11,162	80,45	124,31
2204	231,81	80,44	92,14	11,156	80,27	123,94
2205	229,66	80,34	91,91	11,157	79,88	123,45
2206	227,49	80,14	91,83	11,006	79,43	122,98
2207	225,20	80,18	91,59	10,959	80,20	122,40
2208	223,22	80,34	91,46	10,842	79,28	121,81
2209	220,77	80,10	91,30	10,846	79,92	121,46
2210	217,57	80,17	91,12	10,746	79,51	120,85
2211	214,90	80,12	90,80	10,749	80,00	120,52
2212	212,90	80,12	90,74	10,649	79,95	120,00
2213	211,07	80,03	90,54	10,553	80,10	119,34
2214	208,40	80,10	90,15	10,553	80,16	118,95
2215	206,18	80,21	90,05	10,452	78,88	118,11
2216	204,52	79,76	89,90	10,453	79,15	117,68
2217	201,84	79,98	89,68	10,360	80,08	117,23
2218	200,19	80,11	89,67	10,261	78,51	116,42
2219	198,72	79,97	89,28	10,258	79,56	116,37
2220	196,60	79,97	88,76	10,258	79,06	115,83
2221	195,00	80,07	88,77	10,161	78,32	114,90
2222	192,64	79,90	88,67	10,165	78,31	114,46
2223	190,61	79,91	88,52	10,047	79,09	114,34
2224	188,97	79,91	88,42	10,045	78,69	113,82
2225	187,01	79,84	88,20	9,947	78,63	113,12
2226	185,42	79,81	88,14	9,950	78,30	112,70
2227	183,65	79,71	87,99	9,950	78,77	112,38
2228	182,07	79,78	87,85	9,854	78,66	112,09
2229	180,67	79,80	87,73	9,852	77,98	111,47

2230	179,33	79,76	87,76	9,754	78,07	111,01
2231	178,07	80,02	87,42	9,753	78,42	110,73
2232	177,72	79,88	87,45	9,656	78,41	110,55
2233	176,64	79,69	87,44	9,561	77,97	110,23
2234	176,22	79,72	87,56	9,560	77,95	109,89
2235	174,89	79,75	87,43	9,462	78,50	109,69
2236	174,33	79,69	87,33	9,462	78,41	109,57
2237	173,23	79,62	87,30	9,363	78,14	109,25
2238	172,07	79,74	87,17	9,363	78,24	108,98
2239	171,41	79,49	87,16	9,248	77,89	108,75
2240	169,37	79,35	86,75	9,149	78,08	123,09
2241	168,37	78,56	86,86	9,054	78,03	133,04
2242	169,27	79,74	86,83	9,153	77,89	117,63
2243	170,00	79,58	86,68	9,055	77,90	114,15
2244	169,27	79,46	86,59	9,054	77,91	112,25
2245	168,01	79,55	86,58	9,054	77,52	110,76
2246	166,13	79,22	86,41	8,955	77,88	122,29
2247	164,91	78,32	86,36	8,955	77,93	134,04
2248	165,38	79,32	86,42	8,957	77,53	118,52
2249	166,10	79,64	86,18	8,955	77,56	113,99
2250	165,40	79,38	86,10	8,955	77,72	111,91
2251	164,27	79,30	85,99	8,954	77,98	110,36
2252	162,72	79,29	86,05	8,955	77,61	109,12
2253	160,77	78,83	85,93	8,859	77,71	123,27
2254	159,79	78,41	85,97	8,761	77,81	132,33
2255	160,22	79,17	86,00	8,860	77,93	117,31
2256	161,09	79,20	85,87	8,859	77,37	112,98
2257	160,43	79,27	85,76	8,858	77,54	110,66
2258	159,24	79,05	85,80	8,860	77,45	109,18
2259	157,93	79,03	85,79	8,762	77,77	108,16
2260	156,70	78,87	85,76	8,763	77,36	106,99
2261	155,63	79,03	85,63	8,763	77,66	106,24
2262	154,41	79,08	85,68	8,763	77,15	105,59
2263	153,36	79,18	85,64	8,763	77,27	105,01
2264	152,22	79,46	85,60	8,762	77,02	104,33
2265	151,02	79,33	85,50	8,667	77,81	104,40
2266	149,98	79,09	85,58	8,662	77,41	103,92
2267	149,21	79,36	85,59	8,663	77,29	105,94
2268	147,39	79,94	85,43	8,566	77,72	119,80
2269	147,18	79,66	85,39	8,566	77,76	125,41
2270	147,56	79,70	85,40	8,566	77,92	129,37
2271	148,74	79,78	85,39	8,568	77,83	113,20
2272	149,80	79,36	85,20	8,568	77,84	110,05
2273	149,22	79,42	85,15	8,568	77,47	107,94
2274	147,87	79,88	85,22	8,450	77,81	124,24
2275	147,39	79,81	85,31	8,451	77,85	130,49
2276	147,79	79,56	85,24	8,449	77,39	118,21
2277	149,03	79,64	85,30	8,449	77,58	111,55
2278	148,87	79,57	85,15	8,450	77,18	108,86
2279	147,42	79,59	85,04	8,351	77,43	123,13
2280	146,73	78,63	85,06	8,352	77,57	130,13
2281	146,99	79,51	85,03	8,286	77,69	134,20
2282	148,48	79,49	84,91	8,351	77,27	112,30
2283	148,50	79,40	84,87	8,353	77,14	109,31
2284	147,11	79,50	84,77	8,256	77,39	122,00
2285	146,39	78,59	85,01	8,255	77,54	129,88
2286	146,52	79,03	84,78	8,160	77,55	133,90
2287	147,85	79,67	84,75	8,256	77,27	111,90
2288	147,70	79,54	84,66	8,257	77,53	109,11
2289	146,83	79,39	84,83	8,256	77,45	106,96
2290	145,52	79,41	84,72	8,159	77,58	113,54
2291	144,19	78,98	84,99	8,160	77,61	124,77
2292	143,95	79,07	85,02	8,158	77,75	129,40
2293	144,35	78,85	85,01	8,160	77,56	118,51
2294	145,89	79,09	85,03	8,160	77,29	110,61
2295	145,60	79,37	84,85	8,159	77,51	107,96
2296	144,18	79,51	84,97	8,062	77,65	123,97
2297	143,87	79,40	85,05	8,061	77,81	129,85
2298	144,25	78,49	84,91	8,061	77,90	133,06
2299	145,42	79,04	84,89	8,064	77,37	111,53
2300	145,58	79,34	84,65	8,061	77,88	108,71
2301	144,30	79,53	84,84	7,964	78,14	118,51
2302	143,21	78,85	84,95	7,963	78,27	127,80
2303	143,20	79,04	84,86	7,867	78,18	131,52
2304	144,22	79,03	84,60	7,965	77,91	114,35
2305	145,19	79,39	84,71	7,964	78,22	110,24
2306	144,41	79,57	84,66	7,964	78,05	118,52
2307	143,33	79,36	84,78	7,964	78,08	128,40
2308	143,42	79,44	84,72	7,555	77,97	132,44
2309	144,60	79,33	84,86	7,868	77,75	112,64
2310	144,88	79,47	84,80	7,965	78,13	109,20
2311	144,35	79,45	84,85	7,892	77,56	106,83
2312	143,05	79,64	84,76	7,867	78,02	113,16
2313	141,35	78,93	84,88	7,771	78,01	123,88
2314	141,19	79,06	84,81	7,769	78,06	128,10
2315	141,46	79,76	84,83	7,770	77,96	131,01
2316	142,85	79,57	84,74	7,866	77,86	110,91
2317	143,15	79,47	84,70	7,868	78,14	108,16
2318	142,26	79,37	84,75	7,769	78,10	108,32
2319	140,57	79,45	84,72	7,653	78,03	122,35
2320	140,01	79,22	84,79	7,556	77,98	127,30
2321	140,35	79,50	84,83	7,554	77,98	130,42
2322	141,78	79,28	84,84	7,650	77,69	112,20

2323	142,28	79,36	84,67	7,652	78,85	108,79
2324	141,47	79,45	84,62	7,579	77,69	115,02
2325	140,06	79,36	84,70	7,555	77,93	125,23
2326	139,92	79,54	84,73	7,556	78,04	128,85
2327	140,31	79,54	84,57	7,556	77,92	132,07
2328	141,70	79,50	84,62	7,556	77,75	111,31
2329	141,73	79,56	84,47	7,555	78,00	108,09
2330	140,36	79,16	84,50	7,457	78,09	122,46
2331	139,74	79,21	84,73	7,456	78,09	128,29
2332	139,93	79,10	84,69	7,456	78,15	131,32
2333	141,22	79,30	84,43	7,557	77,71	111,36
2334	141,36	79,44	84,47	7,557	77,65	107,94
2335	140,72	79,41	84,53	7,556	77,44	105,53
2336	139,16	79,12	84,32	7,459	77,76	115,66
2337	138,07	78,72	84,49	7,459	78,02	123,61
2338	137,96	79,32	84,38	7,362	77,82	127,28
2339	138,36	79,06	84,34	7,362	77,98	130,10
2340	139,69	79,42	84,14	7,427	77,41	110,64
2341	140,07	79,20	84,07	7,458	77,36	107,21
2342	138,96	78,99	83,99	7,359	77,24	114,47
2343	137,64	78,72	84,25	7,359	77,49	123,83
2344	137,37	78,82	84,36	7,264	77,56	127,32
2345	137,70	78,74	84,25	7,359	77,47	130,29
2346	139,03	79,10	84,26	7,359	77,16	110,94
2347	139,31	78,94	84,10	7,359	78,00	107,67
2348	138,22	78,84	84,12	7,263	77,61	121,70
2349	137,42	78,79	84,23	7,265	77,73	127,39
2350	137,73	78,39	84,35	7,262	77,86	130,16
2351	138,47	78,63	84,22	7,263	77,52	114,19
2352	139,75	78,96	84,15	7,263	77,53	109,13
2353	139,33	79,39	84,13	7,164	77,40	114,15
2354	138,08	78,66	84,24	7,165	77,59	124,62
2355	137,67	78,53	84,23	7,165	77,55	128,37
2356	137,89	78,15	84,15	7,069	77,61	131,29
2357	139,23	78,86	84,28	7,164	77,63	110,42
2358	139,22	78,97	84,36	7,164	78,08	107,23
2359	138,32	79,21	84,53	7,166	78,51	110,27
2360	136,57	79,90	84,45	7,070	78,38	122,00
2361	136,00	80,32	84,58	7,068	78,45	126,24
2362	136,37	80,51	84,55	7,069	78,48	129,00
2363	137,26	80,30	84,70	7,068	79,46	112,61
2364	137,98	80,25	84,99	7,165	79,85	108,71
2365	137,77	80,27	85,01	7,166	80,10	106,43
2366	136,63	80,41	85,08	7,019	79,86	113,42
2367	135,39	80,48	84,87	6,951	79,62	122,18
2368	135,22	80,44	84,92	6,954	79,63	125,74
2369	135,42	80,28	84,89	6,857	79,52	128,50
2370	136,04	80,48	84,92	6,953	80,37	114,00
2371	137,39	80,52	85,16	6,952	80,36	109,29
2372	137,37	80,55	85,19	6,951	80,42	106,86
2373	136,00	81,09	85,07	6,855	80,03	120,00
2374	135,43	80,61	85,01	6,757	79,86	125,31
2375	135,61	80,35	85,03	6,759	79,71	128,36
2376	135,96	80,45	85,01	6,760	79,69	130,60
2377	137,39	80,62	85,25	6,854	80,22	110,73
2378	137,48	80,68	85,39	6,757	80,53	107,68
2379	136,90	80,68	85,38	6,757	80,36	110,59
2380	135,19	80,70	85,11	6,757	80,13	121,30
2381	134,91	80,73	85,11	6,660	79,95	125,41
2382	135,32	80,62	85,09	6,659	79,83	128,23
2383	135,75	80,67	85,06	6,757	80,56	115,03
2384	137,18	80,84	85,38	6,757	80,46	109,60
2385	137,14	80,84	85,34	6,659	80,84	106,96
2386	136,39	80,83	85,41	6,660	81,02	105,10
2387	135,04	81,01	85,44	6,661	80,60	110,82
2388	133,68	80,91	85,14	6,564	80,38	119,44
2389	133,23	80,71	85,17	6,564	80,24	123,26
2390	133,55	80,85	85,09	6,565	79,99	125,76
2391	133,98	80,78	85,08	6,563	80,00	128,37
2392	135,48	81,02	85,29	6,564	80,44	110,42
2393	135,91	80,97	85,39	6,564	80,59	107,40
2394	135,45	80,97	85,40	6,566	80,76	105,33
2395	133,91	80,98	85,21	6,468	80,39	118,37
2396	133,38	80,98	85,13	6,468	80,28	123,09
2397	133,46	80,84	85,10	6,466	80,16	126,19
2398	133,71	80,81	85,06	6,369	79,90	128,25
2399	134,96	80,95	85,25	6,466	80,71	112,02
2400	135,72	81,02	85,44	6,466	80,86	108,29
2401	135,31	81,08	85,38	6,369	80,86	106,12
2402	133,79	81,65	85,23	6,369	80,45	119,42
2403	133,20	80,96	85,11	6,370	80,31	124,14
2404	133,39	81,08	85,12	6,369	80,18	126,82
2405	133,89	80,71	85,06	6,274	80,12	129,08
2406	135,11	81,15	85,24	6,370	80,60	111,89
2407	135,79	81,15	85,45	6,369	80,64	108,30
2408	135,42	81,08	85,43	6,368	81,11	106,15
2409	134,09	81,34	85,24	6,273	80,69	118,46
2410	133,26	81,04	85,13	6,272	80,50	123,67
2411	133,36	80,60	85,14	6,272	80,41	126,54
2412	133,64	80,63	85,08	6,157	80,31	128,82
2413	135,11	81,11	85,38	6,272	80,69	110,62
2414	135,26	81,11	85,44	6,271	80,74	107,47
2415	134,99	81,18	85,38	6,271	81,15	105,50

2416	134,27	81,16	85,44	6,272	81,05	104,01
2417	133,34	81,22	85,44	6,157	81,28	102,94
2418	132,47	81,22	85,46	6,272	81,00	102,00
2419	131,75	81,30	85,41	6,273	81,17	101,44
2420	130,93	81,35	85,39	6,155	81,35	100,96
2421	130,12	81,30	85,38	6,155	81,20	100,59
2422	129,47	81,27	85,40	6,161	81,20	100,25
2423	128,92	81,32	85,34	6,155	81,30	99,99
2424	128,27	81,33	85,35	6,155	81,38	99,80
2425	127,52	81,53	85,26	6,060	81,25	103,92
2426	126,45	81,65	84,99	6,058	80,89	110,89
2427	126,21	81,07	85,02	6,058	80,64	114,73
2428	126,49	80,98	84,97	5,960	80,57	117,46
2429	127,18	81,12	84,96	5,960	80,42	120,14
2430	127,95	81,09	84,93	5,960	80,42	122,49
2431	128,54	81,10	84,91	5,962	80,35	124,69
2432	129,84	81,33	84,94	5,963	80,79	112,29
2433	131,22	81,33	85,29	5,961	81,00	108,13
2434	131,50	81,36	85,29	5,960	81,19	105,65
2435	131,01	81,35	85,38	5,962	81,31	104,06
2436	129,88	81,43	85,30	5,962	81,01	110,81
2437	128,92	81,85	85,03	5,864	80,81	117,94
2438	128,85	81,72	85,05	5,863	80,61	121,37
2439	129,26	81,07	85,06	5,765	80,54	123,91
2440	130,01	81,22	85,04	5,766	80,49	126,11
2441	130,79	81,68	85,07	5,865	80,78	114,17
2442	132,27	81,49	85,37	5,865	81,16	108,85
2443	132,48	81,52	85,43	5,862	81,37	106,35
2444	131,72	81,56	85,34	5,767	81,01	113,00
2445	130,75	81,78	85,15	5,766	80,92	120,68
2446	130,71	82,13	85,19	5,767	80,84	124,15
2447	131,06	81,99	85,14	5,669	80,67	126,48
2448	131,47	81,56	85,17	5,668	80,59	128,71
2449	132,94	81,74	85,34	5,765	81,09	110,98
2450	133,65	81,73	85,65	5,767	81,24	107,76
2451	133,47	81,67	85,58	5,767	81,48	105,61
2452	132,22	81,83	85,35	5,668	80,97	116,92
2453	131,62	82,02	85,27	5,571	80,90	122,25
2454	131,64	82,05	85,28	5,572	80,76	125,02
2455	132,10	81,42	85,21	5,573	80,70	127,45
2456	132,55	81,81	85,20	5,669	80,58	132,30
2457	134,17	81,76	85,48	5,572	81,19	110,34
2458	134,34	81,67	85,64	5,573	81,08	107,34
2459	133,99	81,60	85,66	5,570	81,43	105,23
2460	132,48	81,91	85,44	5,573	81,03	117,03
2461	131,86	82,09	85,29	5,475	80,89	122,21
2462	131,86	81,94	85,29	5,473	80,84	125,17
2463	132,27	82,02	85,27	5,474	80,61	127,24
2464	132,81	81,91	85,24	5,476	80,81	117,73
2465	134,27	81,79	85,58	5,476	81,20	109,79
2466	134,59	81,77	85,61	5,474	81,55	107,01
2467	134,04	81,69	85,62	5,474	81,43	105,14
2468	132,96	81,81	85,58	5,357	81,24	110,85
2469	131,76	82,37	85,37	5,357	81,04	118,94
2470	131,35	82,25	85,29	5,359	80,89	122,50
2471	131,69	81,49	85,30	5,358	80,75	125,09
2472	132,26	81,63	85,22	5,260	80,73	127,31
2473	133,23	81,93	85,36	5,358	81,11	112,48
2474	134,25	81,86	85,63	5,357	81,11	108,48
2475	134,08	81,79	85,71	5,357	81,58	106,20
2476	133,03	81,89	85,57	5,260	81,13	112,87
2477	132,10	82,05	85,36	5,262	81,05	120,57
2478	131,94	81,80	85,31	5,261	80,85	124,04
2479	132,16	81,75	85,25	5,161	80,65	126,46
2480	132,85	81,98	85,24	5,163	80,62	128,66
2481	134,38	81,89	85,44	5,261	81,24	111,44
2482	134,84	81,77	85,69	5,260	81,29	108,10
2483	134,62	81,74	85,71	5,259	81,47	105,92
2484	133,06	82,01	85,49	5,163	81,14	117,95
2485	132,66	82,22	85,39	5,164	80,92	122,98
2486	132,79	82,02	85,39	5,066	80,88	125,86
2487	133,15	81,58	85,31	5,065	80,72	128,04
2488	133,77	81,98	85,33	5,160	81,02	114,92
2489	135,30	81,92	85,67	5,163	81,49	109,70
2490	135,18	81,84	85,74	5,164	81,58	106,93
2491	134,40	81,93	85,63	5,066	81,19	111,12
2492	132,94	81,96	85,40	5,065	81,13	120,61
2493	132,58	81,61	85,36	4,968	81,02	124,08
2494	132,73	82,18	85,34	4,969	80,89	126,63
2495	133,06	81,70	85,27	4,968	80,82	128,99
2496	134,44	81,85	85,50	5,066	81,46	111,24
2497	134,97	81,77	85,64	4,968	81,09	107,92
2498	134,48	81,69	85,65	4,967	81,59	105,75
2499	133,81	81,72	85,57	4,967	81,39	104,17
2500	132,88	81,72	85,60	4,969	81,79	103,05
2501	131,89	81,77	85,66	4,967	81,40	103,94
2502	130,23	82,00	85,37	4,872	81,26	114,30
2503	129,77	81,58	85,29	4,872	81,08	118,55
2504	129,87	81,59	85,20	4,871	80,94	121,37
2505	130,24	81,53	85,15	4,871	80,84	123,70
2506	130,64	81,60	85,12	4,870	80,93	126,08
2507	131,69	81,77	85,15	4,870	81,16	112,66
2508	132,81	81,75	85,39	4,872	81,34	108,39

2509	132,90	81,71	85,50	4,871	81,27	105,96
2510	132,27	81,61	85,46	4,872	81,63	104,32
2511	130,85	81,91	85,32	4,774	81,26	114,91
2512	130,07	82,09	85,18	4,773	80,98	120,05
2513	130,22	81,78	85,11	4,773	80,94	122,89
2514	130,65	81,53	85,07	4,677	80,90	125,37
2515	131,09	81,72	85,10	4,678	80,90	127,53
2516	132,48	81,65	85,16	4,773	81,25	111,81
2517	133,39	81,65	85,54	4,774	81,18	108,07
2518	133,12	81,69	85,49	4,775	81,30	105,75
2519	132,10	81,75	85,35	4,677	81,22	112,26
2520	130,86	82,04	85,17	4,676	81,12	119,83
2521	130,68	82,11	85,09	4,560	80,95	123,21
2522	131,02	82,09	85,06	4,561	80,83	125,57
2523	131,61	81,36	85,02	4,560	80,85	127,64
2524	132,59	81,57	85,02	4,560	81,43	113,55
2525	133,72	81,65	85,43	4,559	81,28	109,02
2526	133,78	81,64	85,48	4,559	81,20	106,41
2527	132,81	81,88	85,31	4,558	81,23	112,48
2528	131,54	81,97	85,11	4,462	81,07	120,51
2529	131,37	81,52	85,11	4,461	80,88	123,93
2530	131,71	81,50	85,06	4,462	80,85	126,32
2531	132,07	81,38	85,03	4,463	80,75	128,34
2532	133,41	81,80	85,23	4,463	81,24	111,14
2533	134,10	81,75	85,40	4,463	81,25	107,77
2534	133,93	81,67	85,45	4,461	81,71	105,63
2535	133,05	81,66	85,39	4,462	81,33	104,00
2536	132,20	81,67	85,37	4,463	81,72	103,05
2537	130,66	82,14	85,12	4,366	81,19	114,67
2538	130,07	82,11	85,01	4,365	80,97	119,15
2539	130,12	81,57	84,99	4,364	80,90	121,99
2540	130,48	81,36	84,96	4,366	80,77	124,57
2541	131,00	81,50	84,91	4,365	80,81	126,61
2542	132,03	81,56	84,99	4,366	81,18	112,66
2543	133,29	81,61	85,29	4,366	81,38	108,47
2544	133,24	81,60	85,38	4,352	81,38	106,02
2545	132,75	81,59	85,29	4,364	81,52	104,38
2546	131,50	81,86	85,19	4,356	81,24	110,75
2547	130,35	81,87	85,03	4,268	81,09	118,21
2548	130,16	81,84	84,92	4,259	80,97	121,57
2549	130,40	81,71	84,90	4,172	80,86	123,95
2550	130,82	81,81	84,85	4,170	80,86	126,40
2551	131,35	81,37	84,81	4,315	80,92	130,95
2552	132,93	81,73	85,07	4,268	81,29	109,96
2553	133,21	81,62	85,21	4,171	81,32	106,97
2554	132,98	81,53	85,19	4,170	81,31	105,01
2555	131,79	81,82	85,04	4,170	81,11	113,61
2556	130,76	82,03	84,91	4,091	81,05	120,05
2557	130,69	81,92	84,91	4,073	80,99	123,16
2558	131,03	81,25	84,85	4,073	80,88	125,44
2559	131,63	81,28	84,83	4,073	80,77	127,76
2560	132,35	81,52	84,89	4,074	81,46	113,30
2561	133,71	81,58	85,23	4,074	81,26	108,90
2562	133,68	81,54	85,21	4,072	81,53	106,23
2563	133,02	81,60	85,17	4,072	81,11	108,44
2564	131,40	81,87	84,94	3,976	81,12	118,78
2565	130,98	81,43	84,86	3,975	80,87	122,68
2566	131,27	81,13	84,81	3,976	80,91	125,40
2567	131,70	81,18	84,78	3,880	80,84	127,35
2568	132,54	81,46	84,81	3,976	81,53	113,22
2569	133,72	81,53	85,10	3,976	81,30	108,73
2570	133,82	81,49	85,16	3,976	81,37	106,25
2571	133,20	81,51	85,17	3,975	81,21	104,42
2572	132,40	81,53	85,17	3,903	81,34	103,14
2573	131,60	81,54	85,13	3,975	81,76	102,21
2574	130,73	81,57	85,14	3,975	81,49	101,46
2575	129,86	81,56	85,13	3,976	81,55	100,94
2576	129,04	81,59	85,02	3,879	81,76	100,50
2577	127,77	82,01	84,89	3,879	81,36	107,88
2578	126,81	82,03	84,71	3,763	81,19	113,66
2579	126,83	81,53	84,66	3,761	81,01	116,88
2580	127,34	81,43	84,61	3,762	80,90	119,46
2581	127,81	81,58	84,57	3,762	80,72	121,69
2582	128,45	81,45	84,53	3,763	80,71	124,13
2583	129,05	81,34	84,52	3,761	80,76	126,02
2584	130,26	81,51	84,72	3,762	81,26	111,84
2585	131,36	81,48	84,90	3,762	81,26	107,91
2586	131,39	81,47	84,97	3,664	81,25	105,53
2587	130,33	81,76	84,74	3,665	81,06	113,02
2588	129,47	81,64	84,58	3,665	80,95	119,93
2589	129,47	81,44	84,62	3,665	80,80	122,90
2590	129,66	81,23	84,56	3,664	80,84	125,39
2591	130,09	81,22	84,54	3,566	80,77	127,15
2592	130,95	81,43	84,52	3,665	81,16	114,13
2593	132,32	81,44	84,88	3,665	81,11	108,90
2594	132,29	81,48	85,01	3,579	81,00	106,24
2595	131,83	81,48	85,00	3,664	81,30	104,36
2596	130,39	81,91	84,69	3,567	81,02	116,29
2597	129,88	81,38	84,54	3,469	80,94	120,97
2598	129,85	81,06	84,49	3,471	80,80	123,62
2599	130,18	81,11	84,46	3,470	80,76	125,87
2600	130,73	81,30	84,46	3,469	80,65	127,70
2601	132,28	81,47	84,69	3,496	81,09	109,68



2602	132,49	81,47	84,93	3,567	81,18	106,67
2603	132,18	81,44	84,85	3,469	81,41	104,73
2604	131,33	81,45	84,85	3,567	81,42	103,25
2605	130,55	81,45	84,83	3,471	81,27	102,17
2606	129,87	81,48	84,79	3,471	81,91	101,41
2607	129,05	81,53	84,83	3,470	81,56	100,74
2608	128,18	81,52	84,83	3,470	81,47	100,22
2609	127,47	81,62	84,69	3,471	81,48	99,88
2610	126,76	81,55	84,72	3,470	81,62	99,48
2611	125,49	82,11	84,54	3,372	81,24	107,62
2612	124,98	81,38	84,33	3,373	80,98	112,55
2613	125,11	81,35	84,31	3,373	80,92	115,59
2614	125,43	81,37	84,26	3,275	80,76	118,10
2615	125,98	81,32	84,22	3,276	80,74	120,48
2616	126,69	81,28	84,22	3,179	80,71	122,68
2617	127,34	80,94	84,18	3,178	80,78	124,52
2618	128,56	81,36	84,31	3,275	81,10	111,88
2619	129,83	81,36	84,66	3,275	81,03	107,59
2620	130,03	81,38	84,69	3,276	81,32	105,24
2621	129,03	81,60	84,57	3,179	81,01	111,16
2622	128,01	81,28	84,31	3,177	80,80	118,35
2623	127,89	81,35	84,24	3,178	80,74	121,61
2624	128,30	81,12	84,27	3,149	80,71	124,07
2625	128,77	81,31	84,22	3,060	80,63	126,00
2626	129,45	81,23	84,18	3,062	81,02	122,65
2627	130,97	81,35	84,54	3,179	81,02	109,35
2628	131,39	81,37	84,65	3,178	81,17	106,42
2629	130,68	81,50	84,64	3,170	80,88	111,03
2630	129,46	81,44	84,35	3,062	80,85	119,49
2631	129,30	81,32	84,27	3,062	80,66	122,81
2632	129,50	81,23	84,28	3,061	80,67	125,23
2633	130,13	81,05	84,23	2,964	80,66	127,15
2634	130,61	81,04	84,22	3,062	80,90	117,49
2635	132,14	81,30	84,54	3,060	80,86	109,42
2636	132,30	81,30	84,64	3,061	81,19	106,48
2637	131,38	81,44	84,57	2,964	81,00	112,37
2638	130,15	81,38	84,35	2,963	80,78	120,31
2639	129,92	81,46	84,25	2,867	80,68	123,53
2640	130,09	81,08	84,28	2,867	80,55	125,79
2641	130,67	81,15	84,27	2,866	80,62	127,82
2642	131,71	81,20	84,38	2,964	80,99	111,94
2643	132,70	81,30	84,60	2,894	80,95	107,85
2644	132,40	81,29	84,66	2,964	81,26	105,55
2645	131,97	81,31	84,70	2,963	81,22	103,77
2646	130,87	81,62	84,65	2,867	80,91	106,44
2647	129,22	81,86	84,40	2,867	80,81	115,90
2648	128,80	81,65	84,21	2,867	80,65	119,49
2649	128,82	81,43	84,20	2,769	80,46	122,08
2650	129,27	81,42	84,12	2,770	80,29	124,27
2651	129,64	81,33	84,13	2,770	80,41	126,45
2652	130,68	81,31	84,26	2,867	80,85	112,10
2653	131,84	81,29	84,50	2,867	80,88	107,83
2654	131,78	81,33	84,62	2,850	81,01	105,33
2655	131,18	81,25	84,50	2,770	81,27	103,70
2656	130,15	81,66	84,51	2,769	80,93	107,82
2657	128,68	81,97	84,27	2,672	80,81	116,15
2658	128,25	81,92	84,19	2,672	80,72	119,58
2659	128,34	81,30	84,11	2,671	80,64	121,99
2660	128,97	81,35	84,09	2,576	80,58	124,28
2661	129,52	81,29	84,06	2,575	80,39	126,22
2662	130,28	81,19	84,06	2,672	81,17	113,41
2663	131,44	81,29	84,40	2,672	80,86	108,34
2664	131,59	81,30	84,52	2,672	81,10	105,73
2665	130,96	81,55	84,46	2,673	80,88	108,56
2666	129,52	81,70	84,15	2,574	80,72	117,92
2667	129,22	81,52	84,03	2,574	80,70	121,64
2668	129,29	81,09	84,06	2,478	80,65	124,11
2669	129,75	81,19	84,04	2,478	80,55	126,13
2670	130,16	81,46	84,02	2,477	80,39	127,94
2671	131,67	81,22	84,27	2,575	80,85	111,20
2672	132,53	81,24	84,57	2,575	80,90	107,43
2673	132,26	81,25	84,56	2,478	80,75	106,04
2674	130,79	81,79	84,13	2,478	80,66	118,32
2675	130,03	81,12	84,04	2,477	80,42	122,62
2676	130,15	81,29	84,04	2,380	80,45	125,02
2677	130,51	81,04	84,01	2,380	80,41	127,04
2678	131,11	81,18	84,02	2,478	80,81	116,42
2679	132,77	81,10	84,34	2,478	80,80	109,09
2680	132,77	81,17	84,42	2,477	80,80	106,23
2681	132,23	81,12	84,48	2,477	81,06	104,25
2682	131,23	81,27	84,45	2,380	80,97	107,48
2683	129,63	81,94	84,19	2,380	80,78	116,73
2684	129,07	81,59	84,04	2,380	80,69	120,37
2685	129,23	81,06	83,96	2,264	80,57	122,72
2686	129,65	81,18	83,95	2,264	80,42	125,03
2687	130,11	81,22	83,88	2,264	80,43	126,86
2688	131,53	81,14	84,11	2,380	80,77	111,18
2689	132,31	81,19	84,38	2,380	80,86	107,32
2690	132,06	81,18	84,33	2,380	80,77	104,97
2691	131,35	81,10	84,32	2,264	80,85	103,35
2692	129,77	81,88	84,15	2,193	80,68	113,77
2693	129,00	81,45	83,99	2,166	80,59	118,85
2694	128,98	81,07	83,94	2,166	80,54	121,65

2695	129,17	81,05	83,86	2,166	80,31	123,96
2696	129,76	81,06	83,87	2,167	80,31	126,00
2697	130,48	81,38	83,85	2,166	80,37	128,18
2698	132,01	81,09	84,17	2,263	80,61	109,37
2699	132,37	81,13	84,27	2,171	80,85	106,37
2700	131,61	81,35	84,28	2,165	80,71	111,39
2701	130,39	81,21	84,00	2,069	80,64	119,60
2702	129,97	81,10	83,88	2,069	80,44	122,83
2703	130,12	80,84	83,85	1,971	80,47	125,16
2704	130,68	81,09	83,85	2,069	80,30	127,22
2705	131,39	81,13	83,84	2,070	80,61	116,72
2706	133,01	81,06	84,20	2,069	80,58	109,28
2707	133,11	81,12	84,20	2,069	81,02	106,32
2708	132,02	81,51	84,01	1,988	80,67	113,47
2709	130,86	81,36	83,88	1,971	80,60	120,93
2710	130,71	81,31	83,85	1,972	80,42	123,98
2711	131,12	81,29	83,87	1,916	80,28	126,22
2712	131,45	81,42	83,80	1,971	80,34	128,24
2713	132,85	81,14	84,09	1,971	80,88	111,40
2714	133,46	81,15	84,27	1,971	80,90	107,59
2715	133,14	81,10	84,24	1,972	80,91	105,17
2716	132,40	81,21	84,18	1,875	80,77	107,26
2717	130,68	81,19	84,00	1,875	80,61	117,41
2718	130,20	81,05	83,84	1,874	80,58	121,25
2719	130,13	80,85	83,80	1,777	80,47	123,67
2720	130,55	80,89	83,76	1,777	80,26	125,77
2721	131,16	81,03	83,73	1,777	80,30	127,53
2722	132,76	81,03	84,00	1,874	80,58	109,88
2723	133,08	81,04	84,16	1,875	80,57	106,57
2724	132,61	81,00	84,09	1,874	80,70	104,40
2725	131,20	81,58	83,87	1,777	80,59	114,59
2726	130,19	81,16	83,77	1,777	80,40	120,16
2727	130,01	81,26	83,75	1,778	80,37	122,95
2728	130,23	81,03	83,68	1,680	80,17	124,91
2729	130,85	81,01	83,70	1,679	80,22	127,03
2730	131,69	80,94	83,72	1,777	80,77	113,33
2731	133,15	80,95	83,98	1,777	80,63	108,44
2732	133,01	81,00	84,13	1,680	80,74	105,70
2733	132,05	81,41	83,95	1,680	80,55	112,07
2734	130,63	80,85	83,83	1,583	80,45	119,88
2735	130,30	80,87	83,70	1,582	80,40	122,91
2736	130,41	80,93	83,70	1,582	80,26	125,20
2737	130,94	80,93	83,66	1,583	80,28	127,14
2738	131,45	80,92	83,66	1,582	80,64	121,25
2739	133,09	80,83	84,02	1,680	80,60	109,42
2740	133,33	80,92	84,00	1,582	80,56	106,37
2741	132,19	81,22	83,90	1,582	80,46	113,52
2742	131,14	81,00	83,69	1,466	80,43	120,99
2743	130,80	80,86	83,62	1,465	80,26	124,11
2744	131,02	80,88	83,61	1,465	80,18	126,37
2745	131,43	81,08	83,57	1,466	80,12	128,35
2746	79,57	72,75	76,47	12,659	73,36	75,20
2747	91,76	72,34	77,44	12,152	73,54	75,37
2748	92,12	71,90	77,24	13,552	73,54	75,79
2749	98,26	72,04	78,21	11,955	73,56	76,18
2750	131,07	71,39	82,46	11,760	73,39	76,80
2751	176,62	71,38	88,58	11,449	73,64	78,45
2752	215,30	71,63	94,35	11,158	73,79	81,09
2753	258,22	71,83	101,07	10,752	73,76	84,37
2754	300,01	71,55	108,14	10,457	73,81	88,84
2755	347,30	71,56	117,31	10,051	73,25	94,58
2756	384,37	71,69	125,43	9,659	73,10	102,00
2757	400,27	71,71	130,70	9,253	73,59	109,21
2758	414,84	72,04	135,34	8,862	73,92	116,41
2759	425,29	71,82	139,12	8,572	73,71	123,10
2760	441,91	71,79	143,82	8,355	72,73	109,23
2761	457,00	72,24	147,26	8,067	73,25	105,43
2762	495,08	72,59	154,76	7,461	73,89	106,45
2763	527,19	72,71	162,79	6,860	73,73	109,05
2764	506,05	73,24	162,07	23,820	74,61	110,61
2765	500,34	73,18	162,67	23,440	73,69	110,37
2766	522,17	73,50	166,92	23,029	73,86	111,52
2767	545,06	73,50	171,95	22,438	74,22	113,47
2768	563,83	73,88	176,92	21,940	74,30	115,84
2769	581,39	73,93	181,24	21,329	74,41	118,49
2770	597,02	74,05	186,04	20,830	74,01	121,34
2771	616,81	74,06	190,57	20,244	74,06	124,03
2772	600,75	74,04	170,34	19,645	74,24	127,42
2773	625,72	73,99	174,16	19,040	74,22	131,82
2774	643,88	74,15	176,86	18,242	74,29	136,82
2775	661,47	73,98	179,39	17,538	74,07	141,95
2776	679,08	73,65	182,48	16,839	73,74	146,48
2777	693,90	73,70	184,37	16,235	74,12	150,90
2778	706,39	73,32	185,63	15,554	74,98	154,93
2779	714,24	73,45	185,88	15,048	73,47	158,53
2780	715,19	73,19	185,45	14,544	73,87	161,07
2781	711,56	73,73	184,14	13,941	74,71	162,89
2782	701,75	73,61	181,76	13,468	74,07	164,37
2783	690,68	73,85	179,00	13,049	74,40	164,90
2784	685,99	73,70	177,51	12,658	76,39	164,93
2785	679,53	74,00	176,14	12,251	75,42	164,31
2786	670,28	74,44	174,07	11,862	75,04	163,23
2787	659,78	74,39	171,90	11,454	74,43	162,05

19-18-20-21

20-22-21-23

2788	649,10	74,06	170,17	11,158	74,78	160,10
2789	639,27	73,68	168,19	10,846	73,41	158,72
2790	630,27	74,13	165,85	10,558	74,94	157,41
2791	621,99	74,30	164,70	10,264	74,95	155,43
2792	615,46	74,49	163,50	9,952	75,00	154,32
2793	607,74	74,55	161,93	9,664	75,54	152,85
2794	600,55	74,55	160,43	9,468	75,09	151,59
2795	593,67	73,87	158,96	9,157	77,04	150,26
2796	587,93	74,12	157,93	8,862	74,65	148,53
2797	581,72	74,29	156,86	8,670	74,93	147,71
2798	572,58	74,25	154,76	8,455	74,41	146,62
2799	564,21	74,10	153,14	8,259	75,24	145,02
2800	555,11	74,45	151,49	8,065	74,76	143,60
2801	546,99	74,56	149,91	7,969	74,46	142,18
2802	573,24	74,72	171,02	48,778	74,62	140,82
2803	593,38	75,03	188,27	47,972	73,92	140,01
2804	665,41	74,81	203,77	47,166	74,72	143,09
2805	718,28	74,84	215,59	46,277	75,36	149,45
2806	714,10	74,42	206,10	45,483	74,99	155,89
2807	702,57	74,23	196,31	44,783	74,35	160,61
2808	709,56	74,28	195,74	44,183	74,85	164,69
2809	715,35	75,18	194,87	43,475	75,28	168,76
2810	722,06	75,51	195,51	42,789	76,12	172,13
2811	726,28	75,30	195,63	41,991	75,54	174,84
2812	731,58	75,23	195,47	41,393	75,30	177,35
2813	736,42	75,36	195,64	40,699	75,65	179,79
2814	740,15	74,89	196,38	40,084	74,41	181,00
2815	743,88	75,01	196,56	39,486	74,19	182,72
2816	746,41	74,95	197,54	38,789	75,08	184,15
2817	748,42	75,12	197,79	38,212	75,64	186,11
2818	748,86	74,79	197,46	37,601	74,60	187,00
2819	750,25	75,01	197,54	37,005	74,79	188,02
2820	750,68	74,72	197,80	36,401	74,81	189,19
2821	751,47	74,81	197,30	35,801	74,31	189,54
2822	752,05	74,91	197,80	35,201	75,04	190,11
2823	751,91	75,14	197,10	34,597	75,26	190,69
2824	751,11	75,03	197,83	33,994	74,76	191,35
2825	750,37	74,83	197,10	33,399	74,85	191,85
2826	749,38	74,96	196,20	32,914	74,97	192,04
2827	749,60	74,66	195,71	32,301	74,72	192,32
2828	748,95	74,96	195,33	31,805	75,13	192,50
2829	748,28	75,29	194,56	31,321	75,41	193,10
2830	747,50	74,89	193,79	30,718	75,04	192,95
2831	744,20	75,17	192,72	30,204	75,31	193,09
2832	741,74	75,68	192,04	29,721	75,19	192,78
2833	739,13	74,87	191,39	29,215	75,04	192,64
2834	735,35	75,24	190,70	28,708	75,51	192,30
2835	732,86	74,93	190,21	28,226	75,15	191,96
2836	730,69	75,13	189,61	27,818	75,78	191,56
2837	727,65	75,18	188,77	27,330	75,00	191,12
2838	723,27	75,60	188,10	26,922	75,48	191,08
2839	719,38	75,62	187,45	26,428	75,80	190,47
2840	714,36	75,61	185,64	26,021	75,13	190,05
2841	710,54	75,39	184,66	25,615	75,36	188,62
2842	706,18	75,13	183,49	25,228	74,84	188,22
2843	701,54	75,11	182,63	24,718	75,33	187,41
2844	697,79	75,07	181,91	24,429	75,27	186,75
2845	693,72	75,68	180,90	24,021	75,97	185,49
2846	690,03	75,81	179,84	23,628	76,08	184,41
2847	686,10	75,46	179,13	23,215	75,65	183,34
2848	681,88	75,52	177,92	22,828	75,70	183,15
2849	676,67	75,66	176,69	22,538	75,54	181,92
2850	672,02	75,60	175,75	22,137	75,70	180,46
2851	666,97	74,70	174,99	21,842	74,95	179,39
2852	662,61	75,43	173,65	21,435	75,89	178,27
2853	659,38	75,64	173,55	21,142	75,65	177,35
2854	655,92	75,30	172,41	20,831	75,76	176,42
2855	654,01	75,75	172,14	20,537	75,91	175,43
2856	651,63	75,70	171,23	20,125	75,74	174,85
2857	648,19	75,69	170,48	19,832	75,91	174,23
2858	644,58	75,94	169,72	19,540	76,08	173,61
2859	641,61	76,05	168,49	19,230	76,28	172,89
2860	637,77	76,16	168,14	18,941	75,80	172,06
2861	634,16	76,14	166,65	18,629	76,06	171,43
2862	629,98	76,28	166,40	18,336	76,03	170,58
2863	625,89	75,47	164,96	18,143	75,70	169,47
2864	621,73	76,12	164,31	17,830	76,40	168,67
2865	617,54	75,91	163,71	17,538	75,28	167,33
2866	613,30	76,10	163,22	17,245	76,05	166,29
2867	609,45	75,80	162,56	17,030	75,90	165,52
2868	607,58	75,80	161,87	16,739	75,92	164,80
2869	603,86	76,16	160,80	16,550	76,07	164,33
2870	600,31	75,97	160,17	16,238	76,19	163,62
2871	595,04	75,88	158,45	16,054	76,27	162,60
2872	589,44	76,25	157,43	15,849	76,13	161,69
2873	584,99	76,15	156,33	15,650	75,93	160,32
2874	579,96	76,19	156,59	15,441	76,60	159,30
2875	574,67	76,76	156,41	15,343	77,70	158,73
2876	568,21	77,24	157,32	15,047	77,73	157,88
2877	563,14	77,65	156,77	14,857	78,33	157,10
2878	558,12	78,12	156,13	14,736	79,37	156,55
2879	552,89	78,40	155,38	14,543	79,17	155,35
2880	548,17	78,66	154,70	14,445	79,78	154,57

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2881	542,78	79,11	153,98	14,250	79,66	153,62
2882	538,28	79,25	153,31	14,059	79,31	152,90
2883	534,70	79,48	152,74	13,943	79,83	151,84
2884	531,04	79,64	152,08	13,749	79,64	150,97
2885	527,95	79,75	151,88	13,650	80,07	150,16
2886	525,53	79,86	151,37	13,457	80,41	149,92
2887	523,30	79,90	150,72	13,259	80,10	149,09
2888	520,11	80,14	150,44	13,143	80,43	148,73
2889	516,79	80,16	149,86	12,947	80,34	148,10
2890	513,98	80,16	149,03	12,851	80,34	147,52
2891	511,03	80,24	148,48	12,757	80,53	147,01
2892	507,35	80,28	147,65	12,659	80,56	146,48
2893	502,33	80,51	147,10	12,563	80,45	145,71
2894	498,14	80,51	146,23	12,464	80,59	144,93
2895	493,25	80,56	145,09	12,344	80,57	144,23
2896	487,43	80,77	144,22	12,249	80,93	143,50
2897	481,97	80,80	143,37	12,154	81,06	142,57
2898	477,34	80,74	142,63	12,153	80,83	141,72
2899	472,85	80,90	141,92	12,057	81,19	140,91
2900	468,14	80,99	141,08	12,008	81,33	140,14
2901	463,33	80,95	140,31	11,960	81,40	139,24
2902	458,76	81,08	139,82	11,859	81,64	138,56
2903	454,33	81,16	139,27	11,860	81,87	137,68
2904	449,73	81,16	138,50	11,766	81,65	137,04
2905	445,12	81,20	137,62	11,664	81,93	136,54
2906	441,05	81,17	137,01	11,666	81,24	135,81
2907	387,07	81,34	118,37	11,550	81,32	134,99
2908	329,59	81,30	108,38	11,547	81,48	133,79
2909	300,96	81,47	104,22	11,552	81,62	132,71
2910	282,52	81,45	101,93	11,548	81,96	131,40
2911	268,76	81,45	100,32	11,547	81,93	130,47
2912	257,71	81,58	99,03	11,551	82,10	129,67
2913	248,80	81,37	97,96	11,547	82,41	128,90
2914	241,16	81,48	97,26	11,454	82,03	128,14
2915	234,50	80,27	96,65	11,450	79,94	126,57
2916	228,78	79,66	95,45	11,452	80,00	125,34
2917	223,52	79,10	94,44	11,451	78,74	124,10
2918	218,91	78,92	93,76	11,454	78,84	123,17
2919	214,67	78,66	93,05	11,355	78,62	122,03
2920	210,77	78,60	92,31	11,355	78,03	121,10
2921	207,09	77,59	91,81	11,356	77,32	120,27
2922	203,67	78,24	91,47	11,355	77,31	119,45
2923	200,54	78,11	90,97	11,352	77,88	118,78
2924	197,70	77,99	90,75	11,353	77,85	118,11
2925	194,97	77,32	90,06	11,255	77,53	117,65
2926	192,08	77,48	89,54	11,256	77,41	117,14
2927	189,78	77,52	89,46	11,255	77,34	116,63
2928	187,58	77,68	88,95	11,354	77,93	116,05
2929	185,31	76,96	88,44	11,254	77,08	115,48
2930	183,20	77,29	88,53	11,253	77,46	115,02
2931	181,26	77,30	88,21	11,256	77,90	114,66
2932	179,37	76,91	88,10	11,255	77,61	114,11
2933	177,53	77,03	87,97	11,156	77,42	113,74
2934	176,01	77,12	87,63	11,159	78,19	113,52
2935	174,37	76,69	87,84	11,158	77,67	112,73
2936	172,79	76,83	87,74	11,155	77,47	114,31
2937	170,56	76,39	87,56	11,061	77,15	134,88
2938	170,62	76,30	87,49	11,156	76,80	119,59
2939	171,25	76,63	86,86	11,155	77,17	116,75
2940	170,34	76,71	86,80	11,061	77,02	115,00
2941	169,32	76,67	86,64	11,062	76,66	113,59
2942	167,91	76,77	86,84	11,057	77,68	112,39
2943	166,30	76,62	86,87	11,057	77,03	111,64
2944	164,99	76,48	86,77	11,061	77,47	110,80
2945	163,56	76,80	86,64	11,059	77,10	110,36
2946	162,30	77,09	86,49	10,959	77,35	110,01
2947	161,04	77,15	86,20	11,058	77,64	109,53
2948	159,92	77,05	86,34	10,963	77,62	109,12
2949	158,89	76,88	86,29	10,963	77,60	108,59
2950	157,60	77,14	86,04	10,960	77,43	108,35
2951	156,11	76,73	85,92	10,842	76,91	125,98
2952	155,70	76,57	85,97	10,749	76,96	133,53
2953	157,09	76,23	85,85	10,843	76,73	115,05
2954	157,40	76,74	85,57	10,846	77,23	112,54
2955	156,71	76,73	85,57	10,843	77,78	111,00
2956	155,07	76,93	85,45	10,748	77,14	126,32
2957	154,38	77,10	85,58	10,747	76,87	134,99
2958	155,66	77,40	85,49	10,843	77,92	115,77
2959	155,82	77,64	85,07	10,748	78,23	113,28
2960	155,26	77,39	85,07	10,748	77,85	111,53
2961	154,42	77,08	84,91	10,750	77,70	112,51
2962	152,71	77,01	85,01	10,648	77,83	129,51
2963	152,30	77,08	85,18	10,652	77,82	136,01
2964	153,96	77,38	85,12	10,648	78,19	114,90
2965	154,21	77,38	84,87	10,759	78,08	112,32
2966	183,83	77,53	88,25	10,550	77,41	128,90
2967	173,91	77,51	87,32	8,853	77,71	136,79
2968	232,72	77,93	97,07	8,762	78,02	115,55
2969	193,70	77,92	88,03	8,671	78,29	113,35
2970	256,27	77,73	107,51	39,588	77,04	117,24
2971	277,16	77,69	114,07	38,782	77,81	133,01
2972	306,85	77,92	121,11	38,496	78,02	118,21
2973	383,81	78,21	135,06	37,894	78,65	116,52

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2974	475,56	78,13	152,38	37,085	78,60	118,65
2975	541,72	77,92	166,10	36,388	78,26	122,99
2976	531,42	78,06	156,45	35,807	78,25	126,82
2977	477,78	78,39	134,32	35,209	78,52	129,95
2978	407,66	78,24	116,64	35,014	78,21	130,72
2979	377,34	78,08	110,35	34,790	78,70	131,02
2980	359,16	77,78	106,67	34,599	78,42	130,26
2981	346,89	77,61	104,31	34,315	78,34	129,36
2982	337,20	77,52	102,59	34,209	78,62	128,55
2983	329,13	77,83	101,49	33,900	78,39	128,05
2984	323,02	77,45	100,92	33,712	78,15	127,33
2985	318,43	77,82	100,60	33,505	78,61	126,99
2986	315,04	77,93	100,24	33,295	79,08	126,78
2987	312,46	77,87	99,67	33,097	79,19	126,53
2988	310,29	78,14	99,55	32,811	80,04	126,28
2989	308,18	78,50	99,56	32,603	79,68	126,37
2990	307,25	78,66	99,31	32,296	80,00	126,62
2991	306,06	78,64	99,20	32,117	79,05	126,06
2992	305,59	78,66	99,05	31,911	79,68	126,16
2993	305,57	78,07	98,93	31,697	78,54	125,93
2994	306,25	78,15	98,81	31,407	79,09	125,80
2995	306,43	77,97	98,43	31,221	79,36	126,31
2996	306,82	77,86	98,61	30,997	79,25	126,22
2997	307,08	78,17	98,39	30,803	78,65	126,90
2998	307,62	77,90	98,32	30,614	79,82	127,18
2999	307,63	78,34	98,38	30,323	79,41	127,52
3000	308,15	78,41	97,85	30,099	79,64	128,09
3001	309,13	78,26	97,95	29,917	79,39	127,99
3002	309,46	78,09	98,21	29,626	79,62	128,39
3003	309,55	78,55	98,11	29,399	79,16	128,68
3004	309,83	78,24	98,03	29,213	79,59	129,07
3005	310,16	78,11	97,98	29,011	79,27	129,16
3006	310,05	78,36	98,14	28,818	79,30	129,36
3007	310,28	78,55	97,78	28,612	79,78	129,83
3008	310,19	78,29	97,33	28,318	80,00	129,97
3009	309,71	78,54	97,27	28,121	80,10	130,30
3010	309,48	78,55	96,91	27,908	79,59	130,39
3011	309,35	78,34	97,29	27,707	79,46	130,38
3012	308,81	78,64	97,16	27,523	79,45	130,46
3013	308,34	78,74	97,25	27,319	79,38	130,52
3014	308,12	78,22	97,16	27,113	80,12	130,36
3015	307,78	77,93	97,37	26,920	78,58	130,04
3016	306,79	78,50	97,60	26,715	80,48	130,28
3017	306,93	78,69	97,69	26,432	79,84	130,26
3018	306,44	78,10	97,56	26,292	78,80	130,07
3019	305,69	78,32	97,62	26,123	79,48	130,07
3020	305,53	78,15	97,48	25,928	79,58	130,22
3021	305,31	78,61	97,63	25,685	79,94	130,47
3022	304,67	78,54	97,59	25,512	79,61	130,46
3023	305,12	77,86	97,61	25,317	78,94	130,32
3024	304,92	78,68	97,66	25,033	79,85	130,21
3025	304,30	78,58	97,65	24,934	79,96	130,47
3026	304,08	78,31	97,66	24,718	79,77	130,56
3027	304,06	78,49	97,76	24,522	80,30	130,57
3028	303,99	78,46	97,63	24,330	79,66	130,37
3029	304,35	78,50	97,66	24,137	79,79	130,54
3030	304,41	78,13	97,82	23,914	79,37	130,53
3031	303,58	78,48	97,41	23,716	79,39	130,42
3032	303,53	78,86	97,68	23,526	80,30	131,05
3033	303,21	78,99	98,12	23,338	80,27	131,39
3034	302,55	79,22	98,26	23,127	80,83	131,97
3035	301,37	79,32	97,92	22,930	81,08	131,77
3036	301,43	79,19	97,65	22,734	80,80	131,64
3037	301,33	79,47	97,64	22,538	80,78	131,88
3038	300,76	79,01	97,29	22,422	80,37	131,59
3039	300,11	79,09	97,18	22,134	80,47	131,89
3040	299,89	78,91	96,90	22,030	79,86	131,80
3041	299,50	79,00	97,09	21,841	80,26	131,51
3042	298,89	79,33	97,30	21,624	80,07	131,68
3043	298,40	78,72	97,11	21,426	78,86	131,71
3044	297,77	79,00	97,12	21,330	80,90	131,83
3045	297,31	78,87	97,12	21,138	80,49	131,58
3046	297,00	79,07	96,85	20,924	79,97	131,65
3047	296,37	78,91	97,04	20,825	80,60	131,40
3048	296,24	78,99	97,05	20,631	80,36	131,47
3049	296,16	79,22	96,95	20,437	80,38	131,73
3050	295,83	79,08	96,71	20,242	80,49	131,59
3051	296,06	79,18	96,86	20,122	80,57	131,70
3052	295,94	79,36	96,53	19,929	80,13	132,01
3053	296,67	79,17	96,20	19,741	80,48	132,06
3054	296,46	79,31	96,12	19,540	80,70	132,09
3055	295,70	79,05	96,27	19,322	80,19	132,48
3056	295,66	79,37	96,26	19,230	80,57	132,30
3057	295,38	79,48	96,47	19,039	80,23	132,49
3058	295,11	79,35	96,47	18,838	80,87	132,63
3059	295,58	79,05	96,70	18,745	80,02	132,20
3060	295,57	79,24	96,83	18,531	79,15	132,24
3061	295,66	79,16	97,03	18,340	80,95	132,56
3062	295,98	79,19	97,00	18,236	80,45	132,56
3063	295,73	79,35	96,55	18,042	80,91	132,90
3064	295,95	79,69	97,12	17,950	80,51	133,04
3065	296,32	79,74	97,40	17,730	81,52	133,34
3066	296,04	79,87	97,71	17,537	81,42	133,56



3067	295,92	79,89	97,53	17,438	81,08	133,56
3068	295,88	79,84	97,29	17,249	80,14	133,21
3069	294,97	79,49	97,27	17,030	80,06	133,44
3070	294,62	80,04	97,14	16,841	79,97	133,46
3071	294,07	79,38	96,62	16,738	80,45	133,23
3072	292,80	79,40	96,50	16,643	79,86	133,20
3073	291,73	79,42	96,16	16,445	80,38	133,31
3074	290,78	79,52	96,07	16,237	81,58	133,33
3075	289,56	79,94	96,10	16,134	80,24	133,13
3076	288,15	79,39	95,64	16,041	80,70	132,93
3077	286,33	79,24	95,75	15,875	79,77	132,58
3078	284,85	79,52	95,70	15,752	80,98	132,49
3079	283,31	79,37	95,80	15,648	80,19	132,09
3080	281,78	79,30	95,64	15,440	80,00	131,79
3081	279,97	79,09	95,54	15,337	79,91	131,17
3082	278,20	79,16	95,42	15,245	80,79	131,25
3083	276,70	79,31	95,43	15,046	80,44	130,72
3084	274,92	79,36	95,28	15,051	80,16	130,49
3085	273,43	79,20	95,17	14,855	80,04	130,13
3086	271,95	79,16	95,23	14,739	80,45	129,69
3087	270,72	79,27	95,22	14,637	79,72	129,69
3088	269,54	79,20	95,07	14,448	80,70	129,60
3089	268,33	79,33	95,05	14,345	80,48	129,62
3090	267,63	79,52	95,03	14,252	80,53	129,46
3091	266,80	79,27	95,09	14,150	80,74	129,20
3092	266,29	79,21	95,05	14,058	80,68	128,95
3093	265,42	79,59	94,94	13,840	80,49	129,09
3094	264,39	79,67	94,67	13,744	80,26	128,93
3095	262,26	79,42	94,55	13,647	80,35	128,60
3096	260,35	79,42	94,35	13,649	80,93	128,54
3097	258,18	79,36	94,20	13,550	80,42	128,17
3098	256,60	79,61	93,84	13,355	80,57	127,64
3099	254,66	79,47	93,73	13,358	79,96	127,29
3100	252,66	79,44	93,33	13,257	80,57	126,96
3101	250,88	79,62	93,18	13,143	80,99	126,77
3102	248,91	79,30	93,09	13,041	79,82	126,21
3103	246,69	79,51	92,86	13,035	80,33	125,70
3104	244,79	79,50	92,85	12,944	80,39	125,49
3105	242,33	79,38	92,57	12,850	80,04	125,00
3106	240,09	79,47	92,51	12,781	80,66	124,82
3107	237,90	79,66	92,60	12,755	80,31	124,29
3108	235,59	79,32	92,39	12,652	80,68	124,09
3109	233,78	79,60	92,39	12,559	80,26	123,48
3110	231,22	79,58	92,35	12,556	80,55	122,90
3111	229,64	79,29	92,23	12,461	80,78	122,65
3112	227,90	79,26	92,07	12,345	80,86	122,40
3113	225,92	79,54	92,10	12,343	80,22	121,84
3114	224,14	79,47	91,90	12,248	80,94	121,53
3115	222,69	79,45	91,95	12,245	80,52	120,87
3116	221,25	79,52	91,61	12,147	80,54	120,58
3117	219,68	79,37	91,29	12,052	80,25	120,61
3118	218,13	79,10	91,07	11,952	79,88	119,75
3119	216,64	79,39	91,04	11,955	80,54	119,39
3120	215,06	79,27	90,89	11,856	80,31	119,27
3121	213,66	79,47	90,64	11,854	79,74	118,63
3122	212,42	78,81	90,58	11,761	80,20	118,04
3123	210,89	79,12	90,50	11,660	80,13	117,80
3124	209,86	78,61	90,43	11,661	80,32	117,30
3125	208,45	78,71	90,03	11,663	79,83	117,00
3126	207,11	79,10	89,97	11,547	80,11	116,71
3127	205,93	78,93	89,95	11,445	79,85	116,52
3128	204,49	79,03	89,99	11,447	80,61	116,21
3129	203,49	78,82	89,76	11,350	79,57	115,95
3130	202,62	78,83	89,67	11,348	79,63	115,65
3131	201,33	79,17	89,76	11,253	80,22	115,60
3132	200,58	79,24	89,36	11,157	79,97	115,82
3133	199,34	79,23	89,46	11,156	80,20	115,55
3134	198,54	79,47	89,65	11,154	79,89	115,15
3135	197,69	79,19	89,52	11,060	80,51	114,70
3136	196,64	79,17	89,49	10,963	80,48	114,82
3137	195,92	79,06	89,36	10,963	80,01	114,57
3138	195,06	78,91	89,46	10,842	80,16	114,28
3139	193,92	78,98	89,43	10,745	80,06	113,96
3140	192,81	79,10	89,54	10,747	80,08	113,74
3141	191,78	78,84	89,55	10,749	80,31	113,72
3142	190,65	79,02	89,24	10,648	79,78	113,44
3143	189,51	78,36	89,20	10,648	79,75	112,91
3144	188,53	78,70	88,97	10,555	79,89	112,61
3145	187,58	78,81	88,92	10,553	79,78	112,46
3146	186,49	78,74	88,74	10,453	80,00	112,29
3147	185,49	78,53	88,58	10,458	79,53	111,93
3148	184,67	78,50	88,58	10,359	79,76	111,80
3149	183,56	79,24	88,73	10,356	80,68	112,09
3150	182,57	79,59	88,90	10,259	81,06	112,14
3151	181,80	79,83	89,04	10,261	81,27	112,12
3152	180,78	80,01	89,16	10,163	81,54	112,10
3153	180,41	80,28	89,37	10,166	81,66	112,10
3154	179,69	80,37	89,47	10,045	81,57	111,99
3155	178,56	80,51	89,34	10,049	80,89	111,72
3156	177,73	80,59	89,50	9,973	81,35	111,54
3157	176,58	80,78	89,51	9,948	81,83	111,56
3158	175,71	80,82	89,58	9,854	82,39	111,44
3159	174,83	80,86	89,55	9,853	82,44	111,37

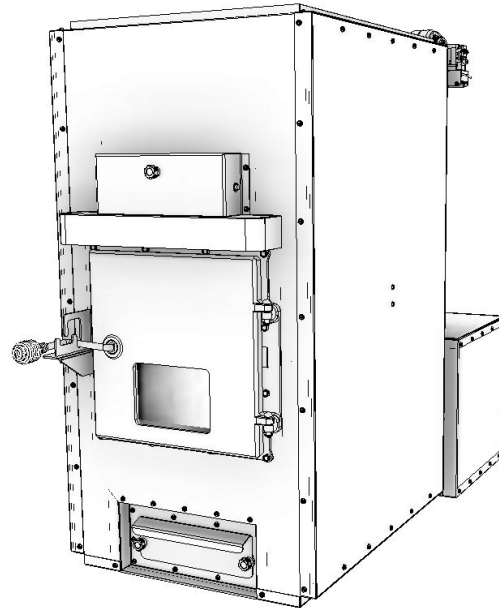
3160	174,14	81,03	89,63	9,753	82,39	111,35
3161	173,44	81,14	89,64	9,755	82,62	111,11
3162	172,72	81,25	89,71	9,757	83,07	111,20
3163	171,98	81,29	89,70	9,658	82,86	110,93
3164	170,95	81,44	89,67	9,656	83,21	110,85
3165	170,14	81,49	89,67	9,563	83,29	110,69
3166	169,27	81,59	89,55	9,560	83,23	110,55
3167	168,13	81,66	89,61	9,464	83,09	110,33
3168	167,09	81,72	89,53	9,466	82,77	110,19
3169	166,17	81,69	89,46	9,443	83,32	109,92
3170	165,36	81,83	89,38	9,368	83,38	109,90
3171	164,38	81,82	89,39	9,368	82,94	109,56
3172	163,59	81,87	89,35	9,365	83,50	109,42
3173	162,70	81,91	89,24	9,252	83,05	109,25
3174	161,98	81,86	89,26	9,252	83,40	109,03
3175	161,14	81,95	89,24	9,251	83,42	108,84
3176	160,39	81,96	89,16	9,154	83,50	108,62
3177	159,48	82,03	89,11	9,154	83,87	108,50
3178	158,83	82,05	89,08	9,055	83,42	108,30
3179	158,25	82,05	89,06	9,057	83,50	108,11
3180	157,42	82,07	88,99	9,055	83,53	107,94
3181	156,78	82,09	88,97	8,957	83,34	107,75
3182	156,06	82,05	88,88	8,958	83,91	107,66
3183	155,24	82,08	88,82	8,960	83,97	107,53
3184	154,85	82,14	88,81	8,859	83,56	107,47
3185	154,28	82,16	88,82	8,860	83,58	107,24
3186	153,87	82,14	88,73	8,860	83,36	107,09
3187	153,51	82,17	88,71	8,763	83,53	106,94
3188	152,98	82,19	88,72	8,763	83,49	106,91
3189	152,48	82,16	88,73	8,668	83,91	106,70
3190	152,10	82,11	88,68	8,667	83,67	106,69
3191	151,61	82,19	88,63	8,666	83,34	106,54
3192	151,52	82,24	88,64	8,568	83,96	106,48
3193	151,15	82,26	88,59	8,571	83,48	106,42
3194	150,77	82,19	88,60	8,451	83,98	106,27
3195	150,28	82,26	88,53	8,452	83,85	106,02
3196	149,87	82,25	88,46	8,453	83,57	106,04
3197	149,43	82,28	88,50	8,355	83,95	105,88
3198	148,88	82,30	88,43	8,357	83,45	105,77
3199	148,53	82,27	88,37	8,263	83,78	105,69
3200	148,16	82,33	88,33	8,255	83,47	105,59
3201	147,58	82,32	88,30	8,257	83,87	105,52
3202	147,05	82,36	88,33	8,162	83,78	105,32
3203	146,44	82,25	88,29	8,259	83,64	105,34
3204	146,07	82,35	88,22	8,193	83,72	105,21
3205	145,36	82,34	88,17	8,162	83,75	105,10

## **Appendix 6    Operator's manual**

# Owner's Instruction and Operation Manual



Model Number:  
HB1520



## Wood Only Central Furnace

Certified to UL-391 (R2015), Certified to: CSA B366.1-11 (R2014), and CSA B415.1-10 (R2015)

\* All Pictures In This Manual Are For Illustrative Purposes Only. Actual Product May Vary.

853966 - 3102L

Save These Instructions In A Safe Place For Future Reference.



**SAFETY NOTICE:** If this unit is not properly installed, a fire may result. For your safety, follow the installation instructions. Never use make-shift compromises during the installation of this unit. Contact local building or fire officials about permits, restrictions and installation requirements in your area.



**CAUTION!** Please read this entire manual before you install or use this unit. Failure to follow instructions may result in property damage, bodily injury, or even death. Improper Installation Will Void Your Warranty!

**U.S. Environmental Protection Agency**  
Certified to comply with 2020 particulate emission standards

**⚠ CALIFORNIA PROPOSITION 65 WARNING:**  
This product can expose you to chemicals including carbon monoxide, which is known to the State of California to cause cancer, birth defects, and/or other reproductive harm. For more information, go to [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

THIS MANUAL IS SUBJECT TO CHANGE WITHOUT NOTICE.

This manual describes the installation and operation of the Hotblast, HB1520 wood furnace. This furnace meets the 2020 U.S. Environmental Protection Agency’s emission limits for wood furnaces. Under specific EPA test conditions this furnace has been shown to deliver heat at a rate of 15,997 – 53,042 BTU/hr. This furnace achieved a particulate emissions rate of 0.13 lb/mmBtu when tested to method CSA B415.1-10 (\*and an overall efficiency of 70%). The maximum overall heat output of this furnace was tested to be 65,258 Btu/hr.

Combustible:	Wood
Flue Pipe Diameter:	6” (153cm)
Flue Pipe Type: (Standard, Single Wall, or Double Wall):	Black or Blued Steel 2100°F (650°C) Class “A”
Minimum Chimney Height:	12 ft (3.65 m)
Maximum Log Length:	23” (585 mm)
Electrical:	120 Volts, 60 Hz, 6.0 Amps
Dimensions	
Combustion Chamber: Width x Depth:	13.75” (350 mm) x 24” (610 mm)
Volume: Cubic Feet:	3.95 Cu Ft.
Door Opening: Width x Height:	14” (356 mm) x 13.89” (353 mm)

### CAUTIONS:

- **HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**
- **DO NOT USE CHEMICALS OR FLUIDS TO IGNITE THE FIRE.**
- **DO NOT LEAVE THE STOVE UNATTENDED WHEN THE DOOR IS SLIGHTLY OPENED.**
- **DO NOT BURN GARBAGE, FLAMMABLE FLUID SUCH AS GASOLINE, NAPHTHA OR MOTOR OIL.**
- **DO NOT CONNECT TO ANY AIR DISTRIBUTION DUCT OR SYSTEM.**
- **ALWAYS CLOSE THE DOOR AFTER THE IGNITION.**
- **YOUR CHIMNEY MUST BE INSPECTED PRIOR TO THE INSTALLATION OF YOUR NEW WOOD STOVE. IN ADDITION, YOU SHOULD HAVE YOUR CHIMNEY INSPECTED FOR CREOSOTE DEPOSTS MONTHLY DURING THE HEATING SEASON AND ANNUALLY INSPECTED AND CLEANED.**



**Note:** Register your product online at [www.usstove.com](http://www.usstove.com) or download the free app today. This app is available only on the App Store for iPhone and iPad. Search US Stove. Save your receipt with your records for any claims.

**For Customer Service, please call:**  
**1-800-750-2723 Ext 5050 or;**  
**Text to 423-301-5624 or;**  
**Email us at:**  
**customerservice@usstove.com**



# INSTALLATION CHECKLIST



Your Wood Stove should be installed by a qualified installer only. An NFI qualified Installer can be found at [www.nficertified.org/public/find-an-nfi-pro/](http://www.nficertified.org/public/find-an-nfi-pro/)

## CUSTOMER SERVICE

1-800-750-2723 ext 5050  
Text to 423-301-5624  
Email to: Customerservice@usstove.com

## COMMISSIONING CHECKLIST

This checklist is to be completed in full by the qualified person who installs this unit. Keep this page for future reference. Failure to install and commission according to the manufacturer's instructions and complete this checklist will invalidate the warranty.

Please Print

Customer Name:	Telephone Number:
Address:	
Model:	
Serial Number:	
Installation Company Name:	Phone Number:
Installation Technician's Name:	License Number:

## DESCRIPTION OF WORK

Location of installed appliance: \_\_\_\_\_

Chimney System: New Chimney System  Yes  No If yes, Brand \_\_\_\_\_

If no, Date of inspection of the existing chimney system: \_\_\_\_\_

## COMMISSIONING

- Confirm Hearth Pad Installation as per Installation Instructions.....
- Confirm proper placement of internal parts.....
- Check soundness of door gasket and door seals .....
- Confirm clearances to combustibles as per installation instructions in this manual .....
- Check the operations of the air controls.....
- Confirm all flue pipe and chimney system are secure and sealed.....
- Confirm the stove properly drafts when fired.....
- Check to ensure a CO alarm is installed as per local building codes and is functional .....
- Explain the safe operation, proper fuel usage, cleaning and routine maintenance requirements.....

Declaration of Completion: As the qualified person responsible for the work described above, I confirm that the appliance as associated work has been installed as per manufacturer's instructions and following any applicable building and installation codes.

Signed: \_\_\_\_\_ Print Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Home Owner: RETAIN THIS INFORMATION FOR FUTURE REFERENCE**

**FOR CUSTOMER SERVICE CALL: 800-750-2723 EXT 5050**

## TOOLS AND MATERIALS

The following is a list of tools and materials needed to install your furnace.

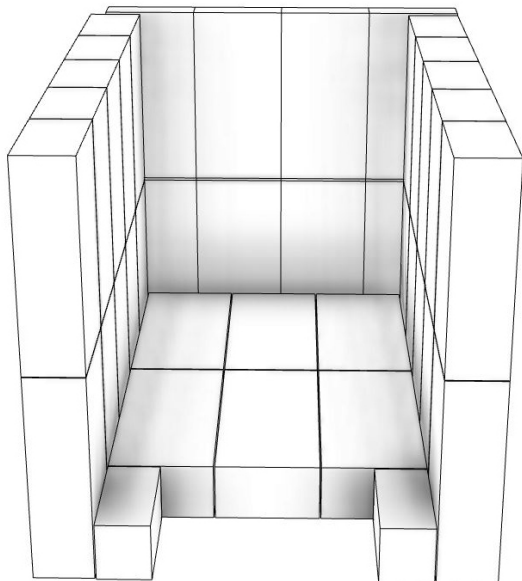
- Safety glasses and gloves
- Various Hand Tools for component assembly. (Power tools preferably)
- All Chimney and Chimney Connector materials required for your particular installation.
- Electrical wiring tools and supplies
- All materials needed for Ductwork Installation (Supply and return air) (Return Air Box is supplied with the unit)

## UNPACKING

1. Remove all packaging from the furnace.
2. Remove the supplied parts from the furnace.

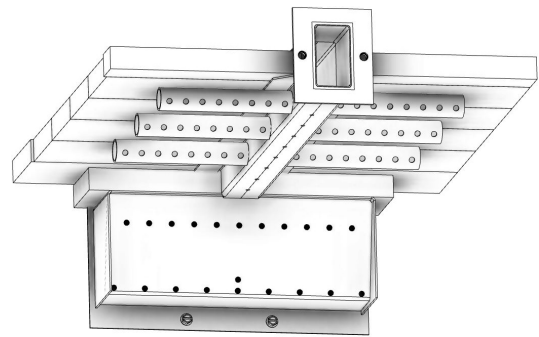
## FIREBRICK CONFIGURATION

Inspect for any damage. Ensure that the bricks and ash plug are positioned correctly and not broken (see illustration for proper brick arrangement). NOTE: The firebricks are silicone into place to prevent damage from shipping. Attempting to remove the firebricks before operation could result in damage.



## CERAMIC FIBER BOARD CONFIGURATION

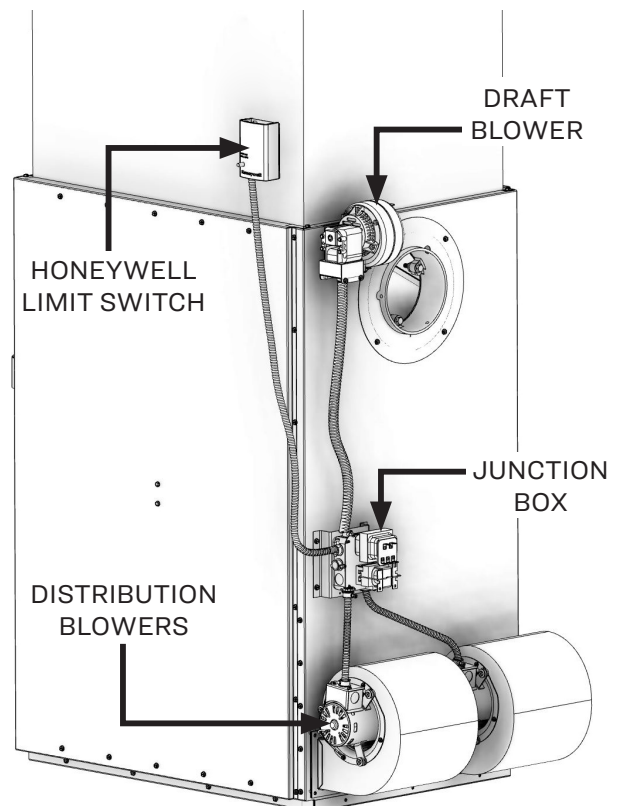
Inspect for any damage. Ensure the fiber board is positioned correctly and not broken (see illustration for proper fiber board arrangement). NOTE: The ceramic fiber boards are silicone into place to prevent damage from shipping. Attempting to remove the ceramic fiber board before operation could result in damage.



## ASSEMBLY OF FURNACE

Your furnace requires the following items to be assembled or installed by the service person:

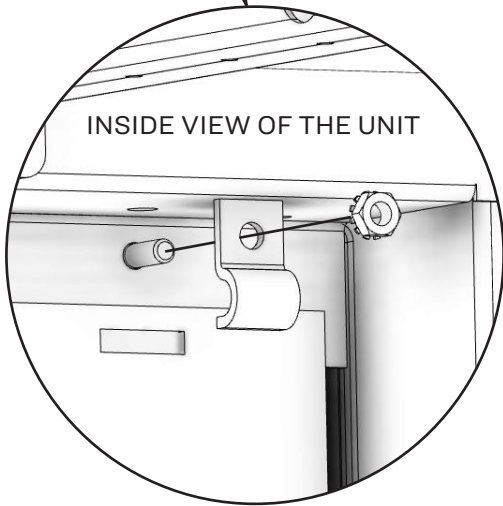
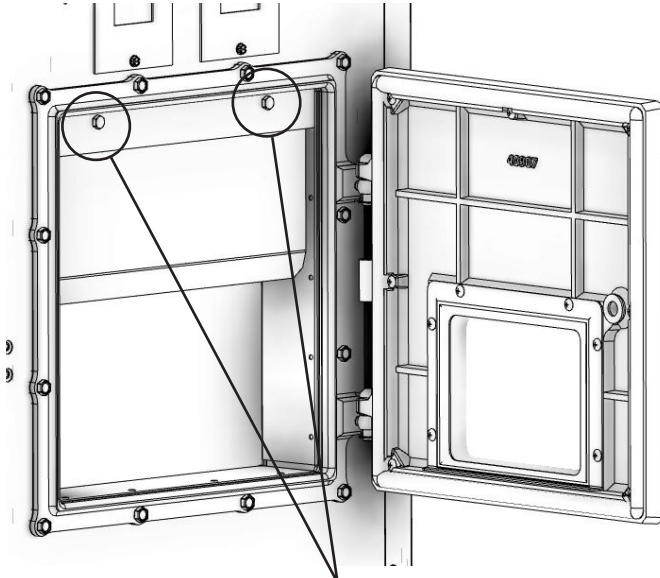
- Smoke Curtain
- Feed Door Handle & Latch
- Front Cover/Hood
- Distribution Blowers With Gaskets
- Junction Box Bracket
- Junction Box and Fan Center
- Draft Blower
- Honeywell Probe
- Filter Box
- Electrical Connections



## SMOKE CURTAIN

Using two (2) 1/4-20 x 1-1/4" Carriage bolts, two (2) smoke curtain clips, and two (2) nuts, attach the smoke curtain in place above the fuel feed door as shown. After installation, the smoke curtain should swing freely back into the furnace.

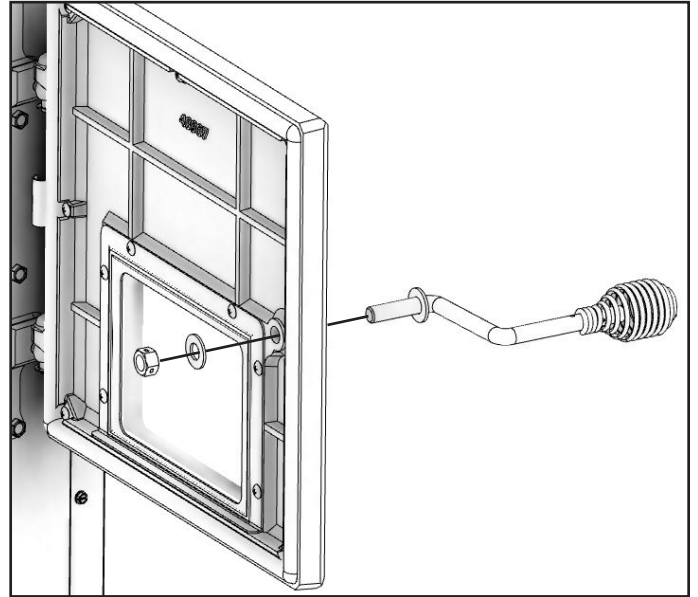
OUTSIDE VIEW OF THE UNIT



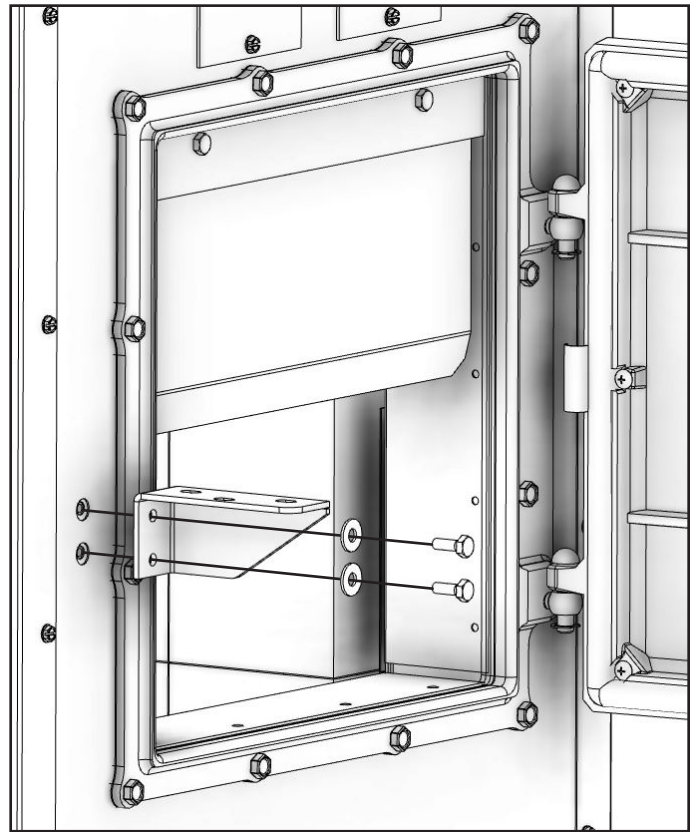
INSIDE VIEW OF THE UNIT

## FEED DOOR HANDLE & LATCH

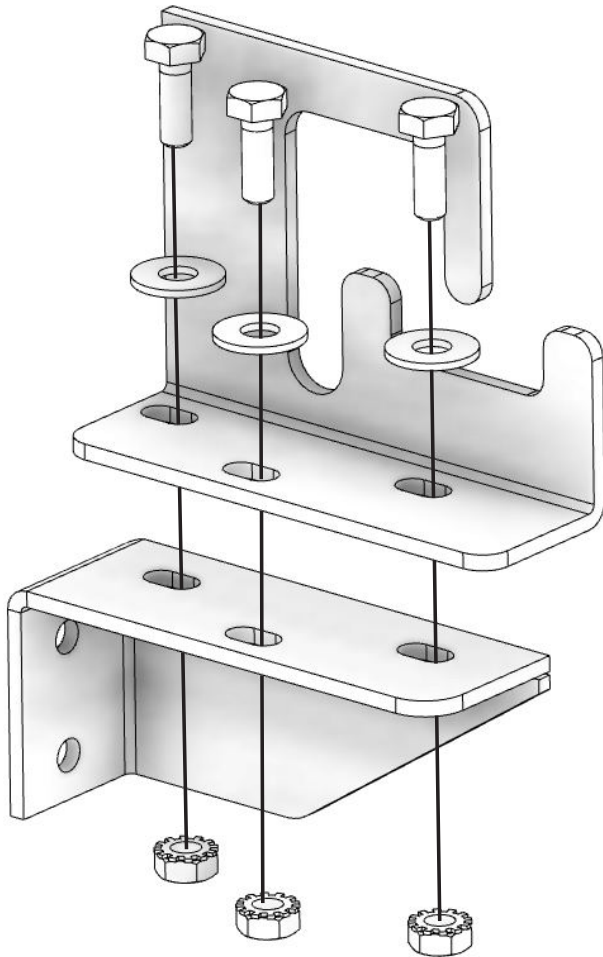
Use the included one (1) nut and one (1) washer to secure the handle to the stove as shown. Note: Adjust the handle as needed to ensure a proper seal.



Use two (2) 1/4-20 x 3/4 bolts and two (2) washers to secure the latch assembly to the unit.

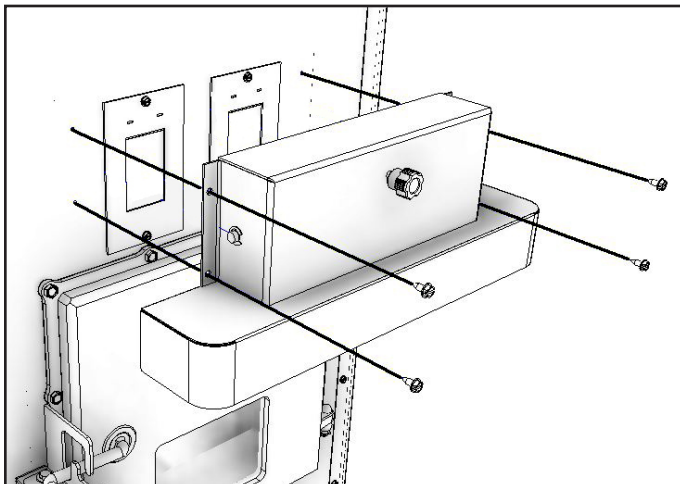


Use three (3) 1/4-20 x 3/4 bolts, three (3) washers, and three (3) 1/4-20 kep nuts to secure the latch top to the latch bottom.



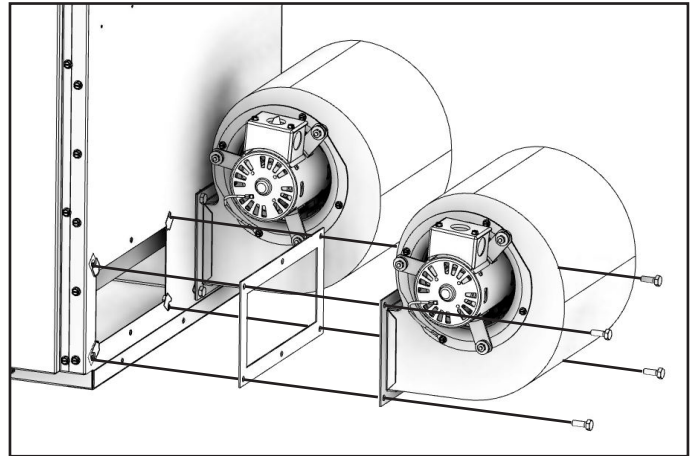
## FRONT COVER/HOOD

Use the four (4) provided #10A x 1/2 screws to secure the front cover hood to the unit as shown.



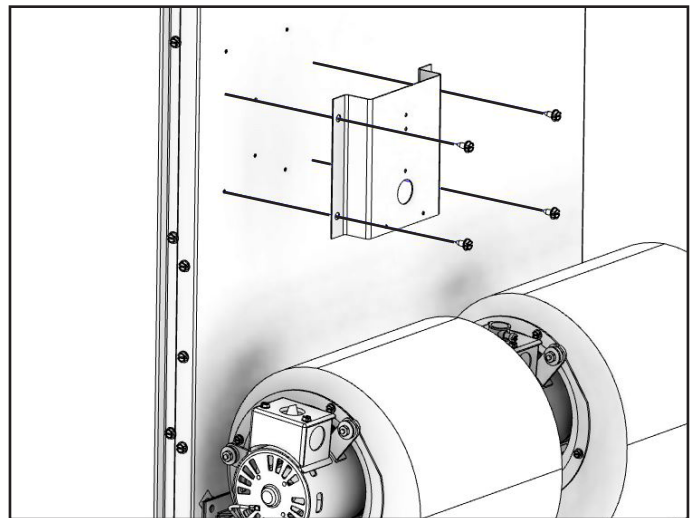
## DISTRIBUTION BLOWERS WITH GASKETS

Secure the two blowers and gaskets to the unit using the eight (8) provided 1/4-20 x 3/4 bolts.



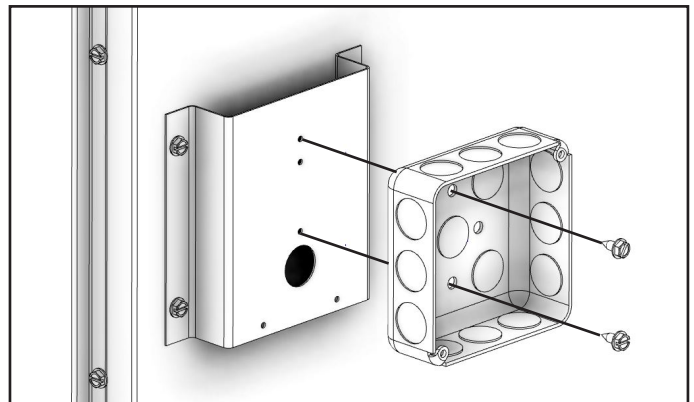
## JUNCTION BOX BRACKET

Secure the junction box bracket to the unit using the four (4) provided #10A x 1/2 screws.



## JUNCTION BOX & FAN CENTER

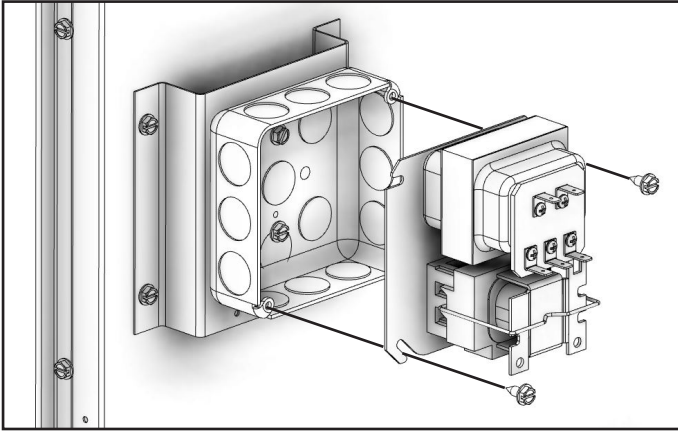
Secure the junction box to the junction box bracket using the two (2) provided #10A x 1/2 screws as shown.





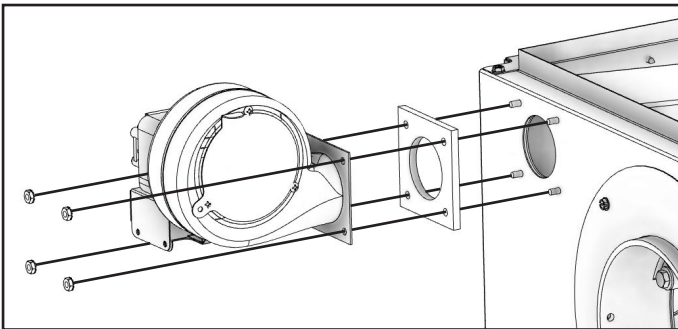
# ASSEMBLY INSTRUCTIONS

Secure the fan center to the junction box using the two (2) provided screws as shown.



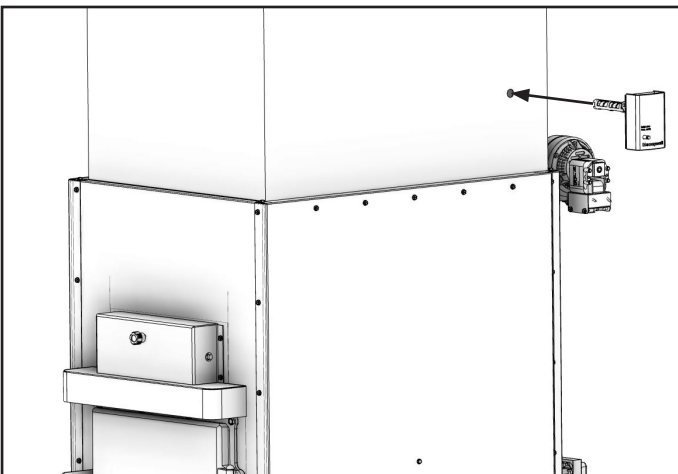
## DRAFT BLOWER

Secure the draft blower and gasket to the back upper left-hand side of the unit using the four (4) provided 10-24 kep nuts.



## HONEYWELL PROBE

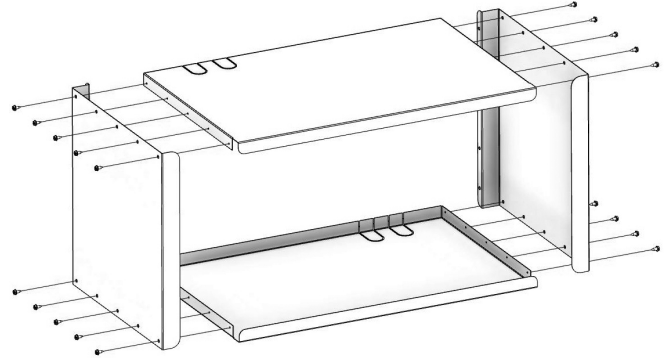
Install the Honeywell probe into the ductwork above the unit. NOTE: The conduit is supplied at a predetermined length of approximately 3 feet



## FILTER BOX

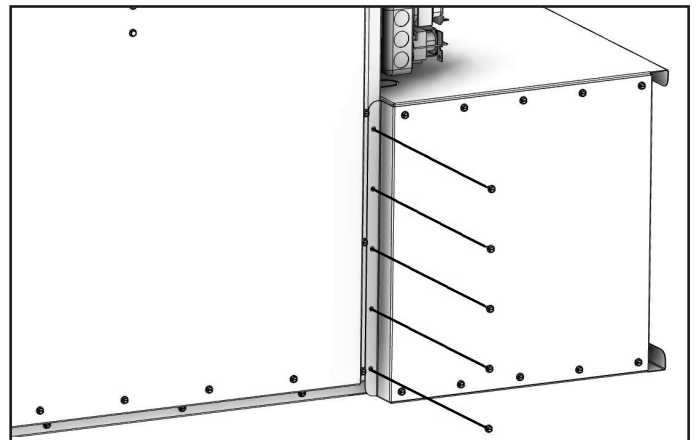
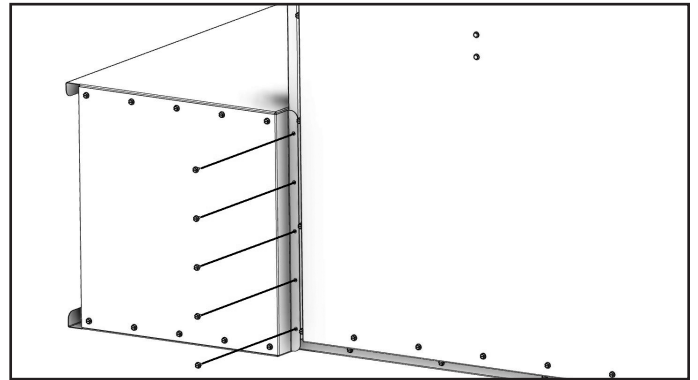
The filter box is made up of 4 parts, plus all hardware necessary for assembly.

Assemble the filter box sides, top, and bottom using twenty (20) #10 A x 1/2 HX screws.



If your BX Cables will not match up to the previously matched arrangement on the top, carefully measure and custom notch to accommodate your particular arrangement of BX Cables. There are several different configurations.

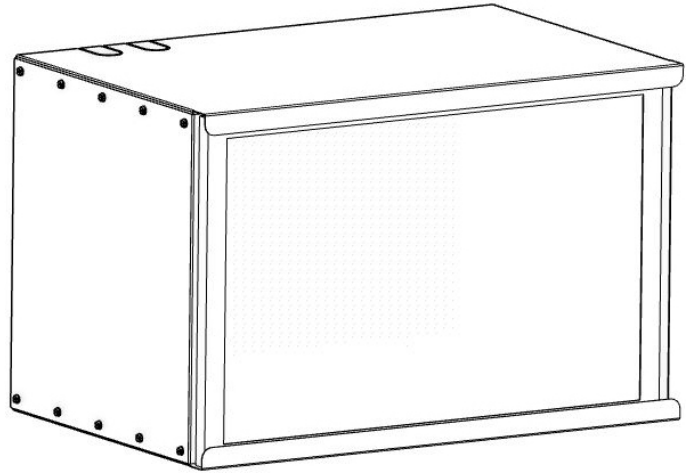
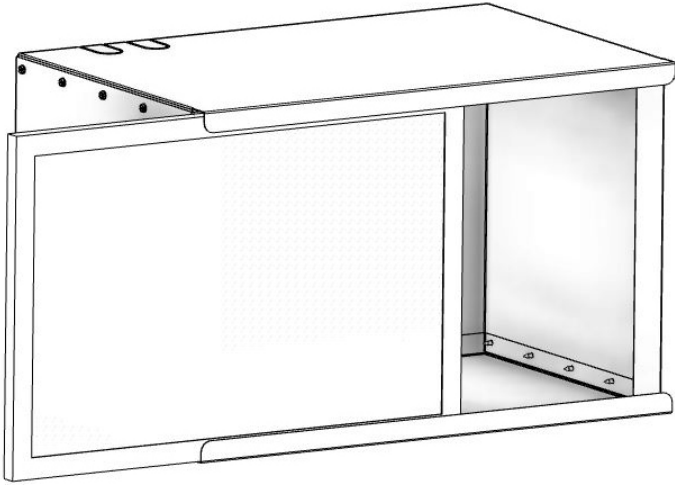
Secure the filter box to the unit using a total of ten (10) #10 A x 1/2 HX screws, five (5) on each side.





## AIR FILTER REPLACEMENT

Insert one 16 x 24 x 1 air filter (not included).



**ATTENTION:**

- **FAILURE TO FOLLOW THE INFORMATION IN THIS MANUAL WILL CAUSE A HAZARD THAT COULD RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR PROPERTY DAMAGE.**
- **CHECK YOUR LOCAL CODES. THE INSTALLATION MUST COMPLY WITH THEIR RULINGS.**
- **ALWAYS CONNECT THIS FURNACE TO A CHIMNEY AND VENT TO THE OUTSIDE. NEVER VENT TO ANOTHER ROOM OR INSIDE A BUILDING.**
- **DO NOT CONNECT THIS FURNACE TO AN ALUMINUM TYPE B GAS VENT. THIS IS NOT SAFE AND IS PROHIBITED BY THE NATIONAL FIRE PROTECTION ASSOCIATION CODE. THIS FURNACE REQUIRES A MASONRY OR LISTED FACTORY BUILT CHIMNEY FOR RESIDENTIAL TYPE OR BUILDING HEATING APPLIANCE CHIMNEY. USE A 6" DIAMETER CHIMNEY OR LARGER, THAT IS HIGH ENOUGH TO GIVE A GOOD DRAFT.**
- **INSPECT CHIMNEY CONNECTOR AND CHIMNEY BEFORE AND FREQUENTLY DURING THE HEATING SEASON FOR ANY DEPOSIT OF CREOSOTE OR SOOT WHICH MUST BE REMOVED.**
- **PROVIDE AIR FOR COMBUSTION INTO THE ROOM WHERE THE FURNACE IS LOCATED. IF THE INTAKE IS NOT IN THE SAME ROOM, AIR MUST HAVE FREE ACCESS TO THE ROOM.**
- **CAST IRON PARTS MUST BE "SEASONED" TO AVOID CRACKING, BUILD ONLY SMALL FIRES ON FIRST USE.**
- **TO PREVENT INJURY, DO NOT ALLOW ANYONE TO USE THIS FURNACE WHO IS UNFAMILIAR WITH THE CORRECT OPERATION OF THE FURNACE.**

**CAUTION**

**GASES THAT ARE DRIVEN FROM FRESH WOOD MUST BE BURNED OR THEY WILL ACCUMULATE AND EXPLODE. NEVER SMOTHER A FIRE WHEN ADDING FRESH WOOD.**

**DANGER: RISK OF FIRE OR EXPLOSION.**

**DO NOT BURN GARBAGE, GASOLINE, DRAIN OIL, OR OTHER FLAMMABLE LIQUIDS.**

**WARNING: FIRE HAZARD.**

- **DO NOT OPERATE WITH FIRE DRAFT EXCEEDING 0.06" W.C.**
- **DO NOT STORE FUELS, PAINTS, THINNERS, FLAMMABLE LIQUIDS, OR OTHER HIGHLY VOLATILE SUBSTANCES IN THE FURNACE ROOM.**

**CAUTION!**

**CLEANOUT OF THE COMBUSTION CHAMBER, FLUE PIPE, AND CHIMNEY IS ESPECIALLY IMPORTANT AT THE END OF THE HEATING SEASON TO MINIMIZE CORROSION DURING THE SUMMER MONTHS CAUSED BY MOISTURE ACCUMULATING IN LEFT-OVER ASH.**

**CAUTION!**

**INSPECT FLUE PIPES, FLUE PIPE JOINTS AND FLUE PIPE SEALS REGULARLY TO ENSURE THAT SMOKE AND FLUE GASES ARE NOT DRAWN INTO, AND CIRCULATED BY, THE AIR CIRCULATION SYSTEM.**

**SAFETY NOTICE:**

**IF THIS FURNACE IS NOT PROPERLY INSTALLED, A HOUSE FIRE MAY RESULT. FOR YOUR SAFETY, FOLLOW THE INSTALLATION DIRECTIONS. CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION REQUIREMENTS IN YOUR AREA. IF NOT ALREADY INSTALLED, WE RECOMMEND THAT SMOKE DETECTORS BE INSTALLED.**

**CAUTION:**

**HOT SURFACES! KEEP CHILDREN AWAY. DO NOT TOUCH DURING OPERATION.**

**FOR CUSTOMER SERVICE CALL: 800-750-2723 EXT 5050**



**NATIONAL FIREPLACE INSTITUTE**  
**CERTIFIED**  
[www.nficertified.org](http://www.nficertified.org)

We recommend 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).



**Wood Energy Technical Training**  
[www.wettinc.ca](http://www.wettinc.ca)

US Stove highly recommends your stove be installed by a qualified NFI (US) or WETT (Canada) technician. To find the nearest qualified installer, go to:

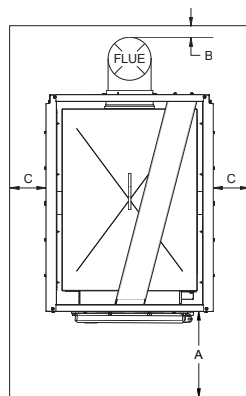
<https://nficertified.org>,

<https://www.wettinc.ca/>

## FLOOR PROTECTOR

The furnace must be placed on solid concrete, solid masonry, or when installed on a combustible floor, on a floor protector. The floor protector is required to provide heat, live ember, and ash protection and must be of a non-combustible, continuous solid surface to protect against infiltration of live embers and ash. Floor protection must have an R-Value of at least 1.4. Refer to floor protector manufacturer's instructions for installation directions. The floor protector or non-combustible floor must extend under the furnace and beyond each side as shown below.

Dimension		Inch	mm
A	Front	24	609.6
B	Flue Rear	2	50.8
C	Side	8	203.2

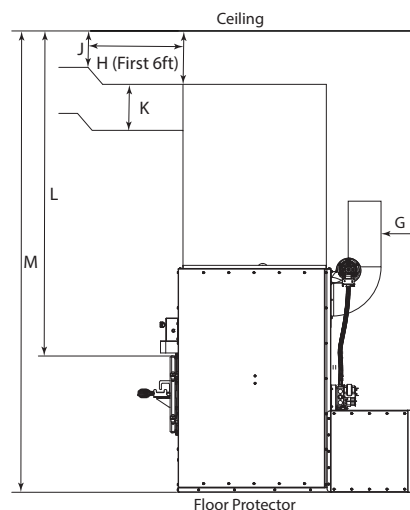
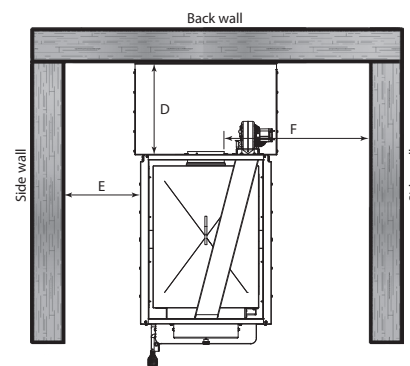


## CLEARANCES TO COMBUSTIBLES

The installation of this furnace includes supplying electrical power, return air ductwork, and supply air ductwork. This furnace may be installed as a stand alone

wood furnace only. See installation section in this manual to ensure proper assembly, installation and operation of your new furnace. If installing in an area with a fan it should not be allowed to create negative pressure in the room where the furnace is installed. When locating your furnace ensure the required maintenance clearances are maintained. Your furnace must be installed as shown in this manual and in compliance with all local and national codes. It is of the utmost importance that the clearances to combustible materials be strictly adhered to during installation of the furnace. Refer to the table and diagrams below for minimum required clearances.

Dimension		Inch	mm
D	Backwall To Furnace	26	661
E	Sidewall To Furnace	16	407
F	Sidewall To Flue	25	635
G	Backwall To Flue	18	458
H	Supply Duct (first 6 feet)	6	153
J	Supply Duct (after first 6 feet)	2	51
K	Minimum Duct Height	8	204
L	Top Of Door To Ceiling	48	1220
M	Minimum Ceiling Height	75	1905



## DUCT WORK

We strongly recommend that the hot air ductwork be installed by a home heating specialist. If doing the installation yourself, consult a qualified heating technician and follow his recommendations as to the safest and most efficient method of installation.

## SUPPLY AIR

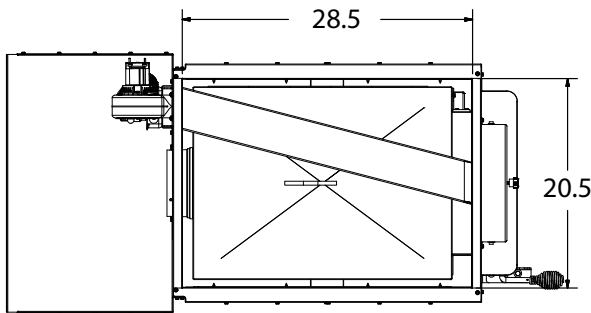
The supply air duct shall be constructed of metal in accordance with NFPA 90B, 2-1.1. The plenums installed to the furnace shall be constructed of metal in accordance with NFPA 90B, 2-1.3. When installing this furnace the supply air plenum is to have a minimum height of 24" (610mm) if the top of the first vertical section is not flush with the top of the first horizontal section of ductwork. If the top of the plenum is flush with the top of the first horizontal section of ductwork then the minimum height is 15" (381mm).

## RETURN AIR

The return air intake on the furnace is on the rear of the unit. The ductwork must be mechanically attached to the unit or blower box with sheet metal screws to ensure a proper operation.

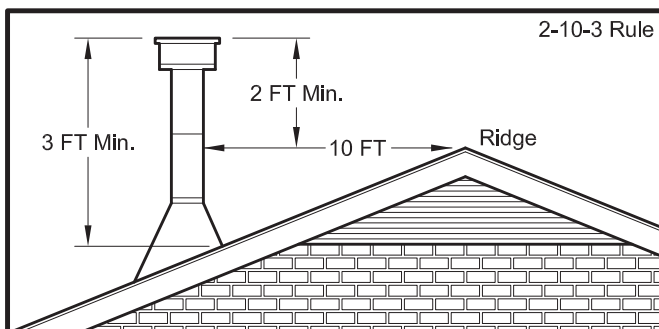
## STAND ALONE INSTALLATION

When installing this stand alone furnace, ensure all local codes and all instructions in this manual are followed, including clearance to combustibles, floor protector specifications and safety warnings.



Supply Air Duct Work Outlet Size

## LISTED FACTORY BUILT CHIMNEY



Your wood furnace may be hooked up with a factory built or masonry chimney, matching the diameter of the exhaust. If you are using a factory built chimney, it must comply with UL 103 or CSA-B365 standard; therefore it must be a Type HT (2100°F). It is extremely important that it be installed according to the manufacturer's specifications.

If you are using a masonry chimney, it is important that it be built in compliance with the specifications of the National Building Code. It must be lined with fire clay bricks, metal or clay tiles sealed together with fire cement. (Round flues are the most efficient).

The interior diameter of the chimney flue must be identical to the furnace smoke exhaust. A flue which is too small may cause draft problems, while a large flue favors rapid cooling of the gas, and hence the build-up of creosote and the risk of chimney fires. Note that it is the chimney and not the furnace which creates the draft effect; your furnace's performance is directly dependent on an adequate draft from your chimney.

Do not connect this unit to a chimney flue serving another appliance.

The following recommendations may be useful for the installation of your chimney:

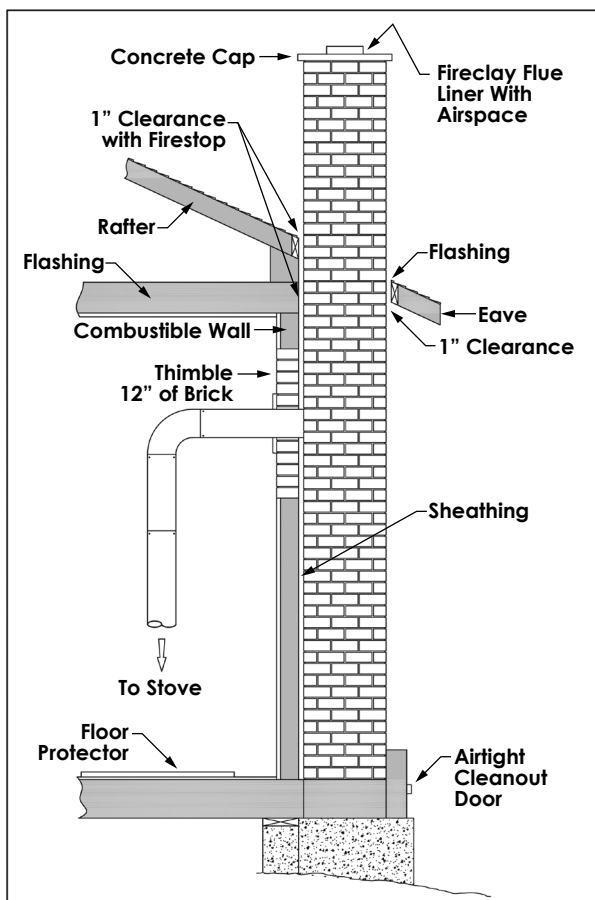
- It must rise above the roof at least 3' (0.9m) from the uppermost point of contact.
- The exterior portion should be double or triple wall pipe to ensure proper draft.
- The chimney must exceed any part of the building or other obstruction within a 10' (3.04m) distance by a height of 2' (0.6m).
- Installation of an interior chimney is always preferable to an exterior chimney. The interior chimney will be hotter than an exterior chimney that is being cooled by the ambient air outside the house. Therefore the gas which circulates will cool slower, thus reducing the build-up of creosote and the risk of chimney fires.
- The draft caused by the tendency for hot air to rise will be increased with an interior chimney.
- Using a fire screen at the extremity of the chimney requires regular inspection in order to ensure that it is not obstructed thus blocking the draft, and it should be cleaned when used regularly.

## IMPORTANCE OF PROPER DRAFT

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too

much draft may cause excessive temperatures in the appliance. Inadequate draft may cause back puffing into the room and ‘plugging’ of the chimney. Inadequate draft will cause the appliance to leak smoke into the room through appliance and chimney connector joints. An uncontrollable burn or excessive temperature indicates excessive draft. Do not operate with the flue draft exceeding .06 water column/14.93 Pascals. The draft can be checked with a draft gauge or manometer. Take into account the chimney’s location to ensure it is not too close to neighbors or in a valley which may cause unhealthy or nuisance conditions.

## MASONRY CHIMNEY



### CAUTION:

**BE SURE THAT IF A MASONRY CHIMNEY IS USED, IT IS SAFELY CONSTRUCTED AND IN GOOD REPAIR. HAVE THE CHIMNEY INSPECTED BY THE FIRE DEPARTMENT OR AN INSPECTOR.**

Ensure that a masonry chimney meets the minimum standards of the National Fire Protection Association (NFPA) by having it inspected by a professional. Make sure there are no cracks, loose mortar or other signs of deterioration and blockage. Have the chimney cleaned

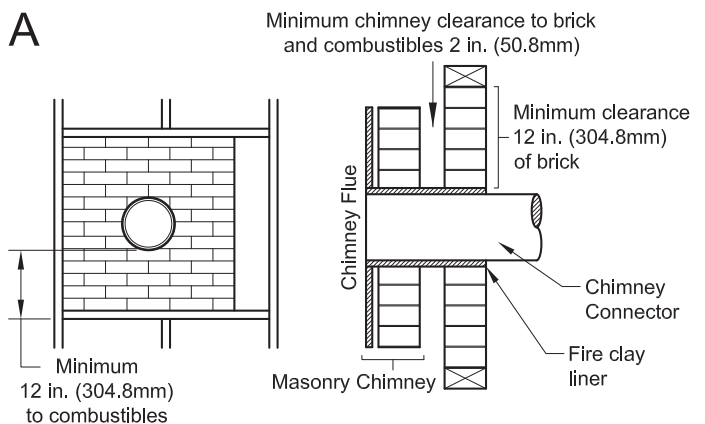
before the furnace is installed and operated. When connecting the furnace through a combustible wall to a masonry chimney, special methods are needed as explained in the “Combustible Wall Chimney Connector Pass-Throughs” Section.

### WARNING:

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

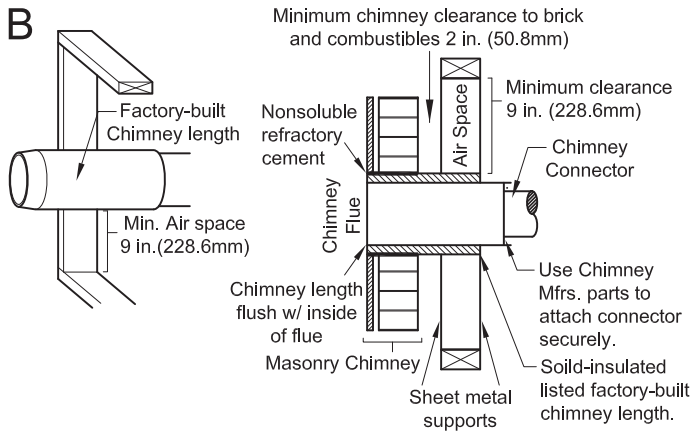
## COMBUSTIBLE WALL CHIMNEY CONNECTOR PASS-THROUGHS

**METHOD A - 12” (304.8 mm) Clearance to Combustible Wall Member:** Using a minimum thickness 3.5” (89 mm) brick and a 5/8” (15.9 mm) minimum wall thickness clay liner, construct a wall pass-through. The clay liner must conform to ASTM C315 (Standard Specification for Clay Fire Linings) or its equivalent. Keep a minimum of 12” (304.8 mm) of brick masonry between the clay liner and wall combustibles. The clay liner shall run from the brick masonry outer surface to the inner surface of the chimney flue liner but not past the inner surface. Firmly grout or cement the clay liner in place to the chimney flue liner.

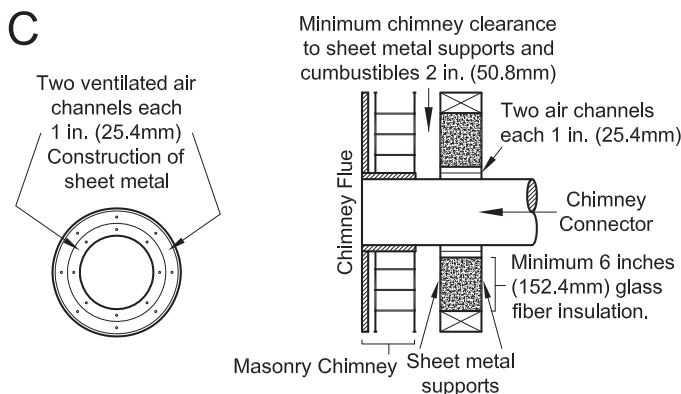


**METHOD B - 9” (228.6 mm) Clearance to Combustible Wall Member:** Using a 6” (152.4 mm) inside diameter, listed, factory-built Solid-Pak chimney section with insulation of 1” (25.4 mm) or more, build a wall pass-through with a minimum 9” (228.6 mm) air space between the outer wall of the chimney length and wall combustibles. Use sheet metal supports fastened securely to wall surfaces on all sides, to maintain the 9” (228.6 mm) air space. When fastening supports to chimney length, do not penetrate the chimney liner (the inside wall of the Solid-Pak chimney). The inner end of the Solid-Pak chimney section shall be flush with the inside of the masonry chimney flue, and sealed with a non-water soluble refractory cement. Use this cement to also seal to the brick masonry penetration.



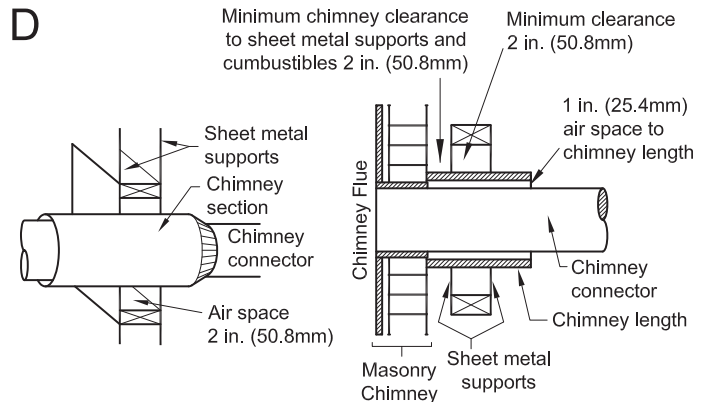


**METHOD C - 6" (152.4 mm) Clearance to Combustible Wall Member:** Starting with a minimum 24 gage (.024" [.61 mm]) 6" (152.4 mm) metal chimney connector, and a minimum 24 gage ventilated wall thimble which has two air channels of 1" (25.4 mm) each, construct a wall pass-through. There shall be a minimum 6" (152.4 mm) separation area containing fiberglass insulation, from the outer surface of the wall thimble to wall combustibles. Support the wall thimble, and cover its opening with a 24-gage minimum sheet metal support. Maintain the 6" (152.4 mm) space. There should also be a support sized to fit and hold the metal chimney connector. See that the supports are fastened securely to wall surfaces on all sides. Make sure fasteners used to secure the metal chimney connector do not penetrate chimney flue liner.



**METHOD D - 2" (50.8 mm) Clearance to Combustible Wall Member:** Start with a solid-pak listed factory built chimney section at least 12" (304 mm) long, with insulation of 1" (25.4 mm) or more, and an inside diameter of 8" (2 inches [51 mm] larger than the 6" [152.4 mm] chimney connector). Use this as a pass-through for a minimum 24-gauge single wall steel chimney connector. Keep solid-pak section concentric with and spaced 1" (25.4 mm) off the chimney connector by way of sheet metal support plates at both ends of chimney section. Cover opening with and support chimney section on both sides with 24 gage minimum sheet metal supports. See

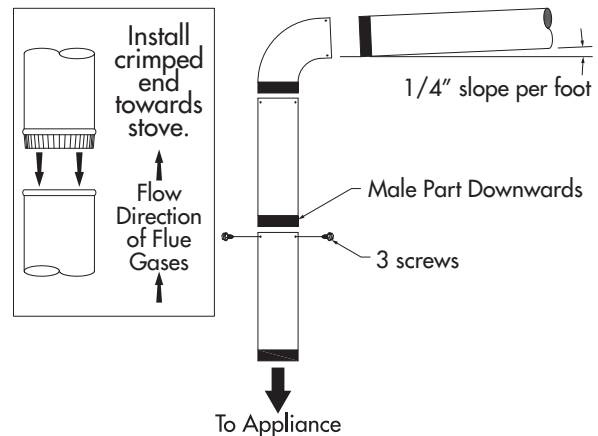
that the supports are fastened securely to wall surfaces on all sides. Make sure fasteners used to secure chimney flue line do not penetrate the inner liner.



## NOTES:

- Connectors to a masonry chimney, excepting method B, shall extend in one continuous section through the wall pass-through system and the chimney wall, to but not past the inner flue liner face.
- A chimney connector shall not pass through an attic or roof space, closet or similar concealed space, or a floor, or ceiling.

## CHIMNEY CONNECTOR



Your chimney connector and chimney must have the same diameter as the furnace outlet. If this is not the case, we recommend you contact your dealer in order to ensure there will be no problem with the draft.

The furnace pipe must be made of aluminized or cold roll steel with a minimum thickness of 0.021" or 0.53 mm. It is strictly forbidden to use galvanized steel.

Your connector should be assembled in such a way that the male section (crimped end) of the pipe faces down. Attach each of the sections to one another with three equidistant metal screws. Seal the joints with furnace cement.

The pipe must be short and straight. All sections installed horizontally must slope at least 1/4 inch per foot, with the upper end of the section toward the chimney. Any installation with a horizontal run of furnace pipe must conform to NFPA 211. You may contact NFPA (National Fire Protection Association) and request the latest edition of the NFPA Standard 211.

To ensure a good draft, the total length of the furnace pipe should never exceed 8' to 10' (2.4m to 3.04 m). (Except for cases of vertical installation, cathedral-roof style where the smoke exhaust system can be much longer and connected without problem to the chimney at the ceiling of the room).

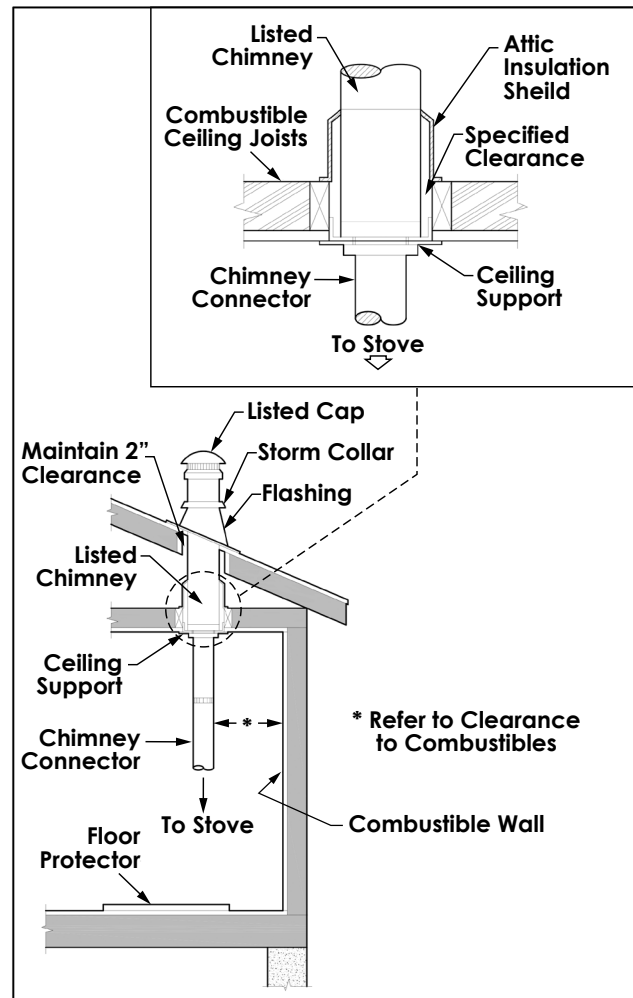
There should never be more than two 90 degrees elbows in the smoke exhaust system.

Installation of a "barometric draft stabilizer" (fireplace register) on a smoke exhaust system is prohibited.

Do not use with a flue damper. With a controlled combustion wood furnaces the draft is regulated upon intake of the combustion air in the furnace and not at the exhaust.

## FACTORY BUILT CHIMNEY

When a metal prefabricated chimney is used, the manufacturer's installation instructions must be followed. You must also purchase (from the same manufacturer) and install the ceiling support package or wall pass-through and "T" section package, firestops (where needed), insulation shield, roof flashing, chimney cap, etc. Maintain proper clearance to the structure as recommended by the manufacturer. The chimney must be the required height above the roof or other obstructions for safety and proper draft operation.



## NEVER OPERATE THIS PRODUCT WHILE UNATTENDED

### CAUTIONS: HOUSE FIRE HAZARDS

- **DO NOT STORE WOOD ON FLOOR PROTECTOR, UNDERNEATH STOVEPIPE(S) OR ANYWHERE WITHIN CLEARANCES TO COMBUSTIBLE SURFACES SPECIFIED FOR THIS APPLIANCE.**
- **NEVER OPERATE WITH SECONDARY TUBES, FIBERBOARD, OR INSULATION REMOVED.**

### OPERATING SAFETY PRECAUTIONS

- **NEVER OVERFIRE THIS APPLIANCE BY BUILDING EXCESSIVELY HOT FIRES AS A HOUSE/BUILDING FIRE MAY RESULT. YOU ARE OVERFIRING THE APPLIANCE IF IT BEGINS TO GLOW OR TURN RED.**
- **NEVER BUILD EXCESSIVELY LARGE FIRES IN THIS TYPE OF APPLIANCE AS DAMAGE TO THE FIREBOX OR SMOKE LEAKAGE MAY RESULT.**
- **DO NOT BUILD FIRE TOO CLOSE TO THE GLASS.**
- **HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. DO NOT TOUCH THE APPLIANCE UNTIL IT HAS COOLED.**
- **PROVIDE ADEQUATE AIR FOR COMBUSTION TO THE ROOM WHERE THE APPLIANCE IS INSTALLED.**
- **INSPECT CHIMNEY LINER EVERY 60 DAYS. REPLACE LINER IMMEDIATELY IF IT IS RUSTING OR LEAKING SMOKE INTO THE ROOM.**
- **ATTEMPTS TO ACHIEVE HEAT OUTPUT RATES THAT EXCEED FURNACE DESIGN SPECIFICATIONS CAN RESULT IN PERMANENT DAMAGE TO THE FURNACE.**

### WARNING: EXPLOSION HAZARD

- **NEVER USE CHEMICALS, GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR FLAMMABLE LIQUIDS TO START OR “FRESHEN UP” A FIRE IN THE APPLIANCE.**
- **KEEP ALL FLAMMABLE LIQUIDS, ESPECIALLY GASOLINE, OUT OF THE VICINITY OF THE APPLIANCE - WHETHER IN USE OR IN STORAGE.**

Your heating appliance was designed to burn well seasoned natural wood only; no other materials should be burned. Any type of well seasoned natural wood

may be used in your stove, but specific varieties have better energy yields than others. Higher efficiencies and lower emissions generally result when burning air dried seasoned hardwoods, as compared to softwoods or too green or freshly cut hardwoods. The following resources can assist in learning the burn characteristics of various species of wood:

<http://firewoodresource.com/firewood-btu-ratings/>; or <https://forestry.usu.edu/forest-products/wood-heating>

The operation of this wood furnace in a manner inconsistent with the owner’s manual will void your warranty and is also against federal regulations. Waste and other flammable materials should not be burned in your stove. DO NOT BURN:

1. Garbage;
2. Lawn clippings or yard waste;
3. Materials containing rubber, including tires;
4. Materials containing plastic;
5. Waste petroleum products, paints or paint thinners, or asphalt products;
6. Materials containing asbestos;
7. Construction or demolition debris;
8. Railroad ties or pressure-treated wood;
9. Manure or animal remains;
10. Saltwater driftwood or other previously salt water-saturated materials;
11. Unseasoned wood; or
12. Paper products, cardboard, plywood, or particleboard. The prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, sawdust, wax, and similar substances to start a fire in an affected wood furnace.

Burning these materials may result in the release of toxic fumes or render the furnace ineffective and cause smoke. Deadwood lying on the forest floor should be considered wet and requires full seasoning time. Standing deadwood can usually be considered to be about 2/3 seasoned. Smaller pieces of wood will dry faster. All logs exceeding 6” in diameter should be split. The wood should not be stored directly on the ground. Air should circulate through the logs. A 24” to 48” air space should be left between each row of logs, which should be placed in the sunniest location possible. The upper layer of wood should be protected from the element but not the sides. A good indicator of if the wood is ready to burn is to check the

piece ends. If cracks are radiating in all directions from the center then the wood should be dry enough to burn. If your wood sizzles in the fire, even though the surface is dry, it may not be fully cured and should be seasoned longer. It is **EXTREMELY IMPORTANT** that you use **DRY WOOD** only in your wood stove. The wood should have dried for 9 to 15 months, such that the humidity content (in weight) is reduced below 20% of the weight of the log. It is very important to keep in mind that even if the wood has been cut for one, two, or even more years, it is not necessarily dry, if it has been stored in poor conditions. Under extreme conditions, it may rot instead of drying. This point cannot be overstressed; the vast majority of the problems related to the operation of a wood stove is caused by the fact that the wood used was too damp or had dried in poor conditions. These problems can be:

- ignition problems
- creosote build-up causing chimney fires
- low energy yield
- blackened windows
- incomplete log combustion

**Do not burn manufactured logs made of wax impregnated sawdust or logs with any chemical additives.** Manufactured logs made of 100% compressed sawdust can be burned, but be careful burning too much of these logs at the same time. Start with one manufactured log and see how the stove reacts. You can increase the number of logs burned at a time but make sure the temperature never rises higher than 475 °F (246 °C) on a magnetic thermometer for installation on single wall stove pipes. The thermometer should be placed about 18" (457 mm) above the stove. Higher temperatures can lead to overheat and damage your stove.



## TESTING YOUR WOOD

- When the furnace is thoroughly warmed, place one piece of split wood (about five inches in diameter) parallel to the door on the bed of red embers.
- Adjust all air controls to their maximum settings and close the door. If ignition of the piece is accomplished within 90 seconds from the time it was placed in the furnace, your wood is correctly dried. If ignition takes longer, your wood is damp.

If your wood hisses and water or vapor escapes at the ends of the piece, your wood is soaked or freshly cut (green). Do not use this wood in your stove. Large amounts of creosote could be deposited in your chimney, creating potential conditions for a chimney fire.

## POWER FAILURE

DO NOT add additional fuel after a power failure, remove all air filters and reduce combustion air to a minimum. Observe furnace closely until power is restored.

## TAMPER WARNING

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

## EFFICIENCIES

Efficiencies can be based on either the lower heating value (LHV) or the higher heating value (HHV) of the fuel. The lower heating value is when water leaves the combustion process as a vapor, in the case of woodstoves the moisture in the wood being burned leaves the stove as a vapor. The higher heating value is when water leaves the combustion process completely condensed. In the case of woodstoves this would assume the exhaust gases are room temperature when leaving the system, and therefore calculations using this heating value consider the heat going up the chimney as lost energy. Therefore, efficiency calculated using the lower heating value of wood will be higher than efficiency calculated using the higher heating value. The best way to achieve optimum efficiencies is to learn the burn characteristic of your appliance and burn well-seasoned wood. Higher burn rates are not always the best heating burn rates; after a good fire is established a lower burn rate may be a better option for efficient heating. A lower burn rate slows the flow of usable heat out of the home through the chimney, and it also consumes less wood.

## NOTICE - INITIAL BURNS TO CURE PAINT

BECAUSE OF THE HIGH OPERATING TEMPERATURES, THIS APPLIANCE IS COATED WITH A SPECIAL HIGH TEMP PAINT WHICH REQUIRES A SERIES OF LOW TO MEDIUM BURNS TO FULLY CURE FOR DURABILITY AND A LIFETIME OF SERVICE.

Proper curing of the high-temp paint requires a series of three initial burns. The appliance should be allowed to cool off between each burn. The first two burns should be small fires and low temperatures (250°F) for a duration of 20 minutes each. The third fire should be at a temperature of approximately 500°F for 20 minutes. Provide adequate cross ventilation to clear any smoke or odor caused by initial firings.

**Notice: Use solid wood fuel only! Do not burn garbage, or flammable fluids. Do not use coal. This appliance**

**is not designed to accommodate the air flow (draft) required to properly burn coal or coal products. Do not elevate the fire using grates or irons. Build the fire directly on the firebrick.**

## FUELING INSTRUCTIONS

To ensure this unit produces the optimal minimum emissions it is critical that only well-seasoned cordwood is burned. Burning unseasoned wet wood only hurts your stoves efficiency and leads to accelerated creosote buildup in your chimney. Be considerate of the environment and only burn dry wood.

<b>CAUTION:</b>
<b>DO NOT LEAVE APPLIANCE UNATTENDED WITH THE DOOR OPEN.</b>

<b>WARNINGS:</b>
<ul style="list-style-type: none"><li>• <b>NEVER OVERFIRE YOUR STOVE. IF ANY PART OF THE STOVE STARTS TO GLOW RED, OVER FIRING IS HAPPENING. READJUST THE AIR INTAKE CONTROL AT A LOWER SETTING.</b></li><li>• <b>THE INSTALLATION OF A LOG CRADLE OR GRATES IS NOT RECOMMENDED IN YOUR WOOD STOVE. BUILD FIRE DIRECTLY ON FIREBRICK.</b></li><li>• <b>NEVER PUT WOOD ABOVE THE FIREBRICK LINING OF THE FIREBOX.</b></li><li>• <b>ATTEMPTS TO ACHIEVE HEAT OUTPUT RATES THAT EXCEED FURNACE DESIGN SPECIFICATIONS CAN RESULT IN PERMANENT DAMAGE TO THE FURNACE.</b></li></ul>

## GENERAL FURNACE OPERATION

### Honeywell Limit Control

This device, mounted in the ductwork, just above the air discharge atop the furnace, works in conjunction with a wall thermostat, operating the distribution blowers and the combustion fan on the rear of the furnace. The factory settings are 100/150/200. The wall thermostat setting operates the ON time of the combustion fan. If the temperature is below the setting on the wall thermostat, the combustion fan will come ON. (Recommended setting at 5 to 10 degrees higher than other heating thermostats.) The first two set points on the limit control operates the distribution blowers. When the furnace plenum temperature reaches the second set point on the limit control, the distribution blowers will come on. If the temperature falls to the first set point, the distribution blower will shut-off. When the furnace reaches the third set point on the limit control, the combustion fan

will shut-off. Once the temperature falls below that set point and the wall thermostat is still calling for heat, the combustion fan will turn back ON. The 200° is a Factory Preset Limit for the combustion fan and should never be changed. Doing so could result in excessive firebox temperatures and could permanently damage your firebox.

## FURNACE LOADING PROCEDURE

### Starting your Furnace

- When lighting the furnace, the wall thermostat should be set to its MAX setting so that the combustion fan is ON. Start the fire with approximately 12 lbs. of kindling, which will be several small strips of wood, 1-1/2 to 2-1/2 inches wide, approximately 12 to 15 inches deep in the bottom of the firebox. Leave the fuel loading door slightly open to ensure good ignition of the kindling. Make sure the combustion fan is ON and its damper is closed, then pull the knob/loop on the front of the unit to prop open the barometric dampers.
- Once the kindling is fully ignited, add another 12 to 15 lbs. of kindling, which will be around the same amount as the initial load.
- Leave the door slightly open for three to five minutes (3-5 min) to ensure full ignition of the second kindling load.
- After the second load of kindling is fully ignited, you can close the door and push the knob/loop on the front of the unit back in to allow the barometric dampers to function freely. After 15 minutes, fully open the damper on the combustion fan.
- Once the kindling burns down to about 8 lbs., which should be to the point that the kindling will break up into a full bed of coals, the preload can be added into the firebox. The preload should consist of around 40 pounds of properly seasoned cord wood, which should be about 6 to 8 pieces of wood.
- After loading the preload, close the door, and make certain the combustion fan is ON.
- Allow about one hour (1hr) for the preload to burn down to around 10-12 lbs. or when all the preload wood will break up into coals. You should now have a coal bed that is several inches deep in the bottom of the firebox.
- The purpose of the preload burn is to establish a proper coal bed prior to inserting the main load of wood. Having a proper coal bed is the key to a complete ignition of the main wood load and to maintain the correct firebox temperatures to get the best emissions and efficiency output of the furnace.



- After you have completed the preload burn, you may insert your main firewood load.
- The main load should be the same size or amount as the preload, approximately 40 pounds of cord wood, 6 to 8 pieces.
- Try to keep gaps between the pieces of wood to help with the ignition and maintain a good fire.

## MAIN FIREWOOD LOAD

- Ensure that the combustion fan is ON, and open the feed door to insert the main firewood load.
- After loading, leave the feed door slightly open for five minutes (5 min) to ensure proper ignition, then close the door.
- The damper on the combustion fan should be open.
- Depending on the temperature at which the wall thermostat is set, this will determine the burn duration of the main load. A lower setting on the thermostat should result in a longer burn time as this would allow the combustion fan to remain OFF for longer periods. A higher thermostat setting will cycle the combustion blower ON/OFF more often, resulting in a hotter, but shorter duration burn time of course. However, colder outside temperatures and your home's construction (insulation) will play a big factor in how well the thermostat can maintain it's set temperature.

## VISIBLE SMOKE

The amount of visible smoke being produced can be an effective method of determining how efficiently the combustion process is taking place at the given settings. Visible smoke consist of unburned fuel and moisture leaving your stove. Learn to adjust the air settings of your specific unit to produce the smallest amount of visible smoke. Wood that has not been seasoned properly and has a high wood moisture content will produce excess visible smoke and burn poorly. Use the included moisture meter to ensure your wood has a 20% or less moisture content.

## AIR TUBES

The air tubes assembled in this unit are designed to provide an accurate mix of secondary air to ensure the highest efficiency. Any damage or deterioration of these tubes may reduce the efficiency of combustion. The air tubes are held in position by screws or snap pins. Locate these to either side of the tube and remove it to allow the tube to be removed and replaced.

## NEVER OPERATE THIS PRODUCT WHILE UNATTENDED

**CAUTION:**

**DO NOT OVERFIRE APPLIANCE. YOU ARE OVERFIRING IF ANY PART OF THE APPLIANCE GLOWS RED. CLOSE THE DOOR AND SHUT DAMPER IMMEDIATELY TO REDUCE THE AIR SUPPLY AND SLOW DOWN THE FIRE.**

**CAUTION:**

**SLOW BURNING FIRES FOR EXTENDED USE OR BURNING GREEN WOOD MAY CAUSE EXCESSIVE CREOSOTE BUILD-UP. IGNITION OF CREOSOTE OR OVERFIRING COULD CAUSE A CHIMNEY FIRE. CHIMNEY FIRES BURN EXTREMELY HOT AND MAY IGNITE SURROUNDING COMBUSTIBLE MATERIALS. IN CASE OF A CHIMNEY FIRE, CALL THE FIRE DEPARTMENT IMMEDIATELY!**

### CREOSOTE & SOOT - FORMATION & NEED FOR REMOVAL

When wood is burned slowly, the products of combustion combine with moisture to form a soot residue which accumulates on the flue lining. When ignited, this soot makes an extremely hot fire. The chimney should be inspected at least twice monthly during the heating season to determine if a creosote or soot build up has occurred. If creosote or soot has accumulated, it should be removed to reduce the risk of a chimney fire. Chimney fires burn very hot. If the chimney catches fire, immediately call the fire department, then reduce the fire by closing the inlet air control. Pour a large quantity of coarse salt, baking soda or cool ashes on top of the fire in the firebox.

**CREOSOTE ACCUMULATION CAUSES CHIMNEY FIRES. YOU SHOULD CHECK (OR HAVE CHECKED BY A QUALIFIED CHIMNEY SWEEP) YOUR CHIMNEY FOR CREOSOTE DEPOSITS AT LEAST MONTHLY DURING THE HEATING SEASON. ANY ACCUMULATIONS SHOULD BE REMOVED. COMPLETE CHIMNEY INSPECTIONS AND CLEANING SHOULD BE CONDUCTED ANNUALLY; TYPICALLY, THIS TASK SHOULD BE PERFORMED PRIOR TO EACH HEATING SEASON. IF USING AN EXISTING CHIMNEY, IT MUST BE INSPECTED PRIOR TO THE INSTALLATION OF YOUR NEW WOOD STOVE.**

**CAUTION**

**A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH YOU THOUGHT WERE A SAFE DISTANCE FROM THE CHIMNEY. IF YOU HAVE A CHIMNEY FIRE, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED PERSON BEFORE USING AGAIN.**

**ATTENTION:**

**THIS FURNACE NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS FURNACE IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.**

### TO PREVENT CREOSOTE BUILD UP

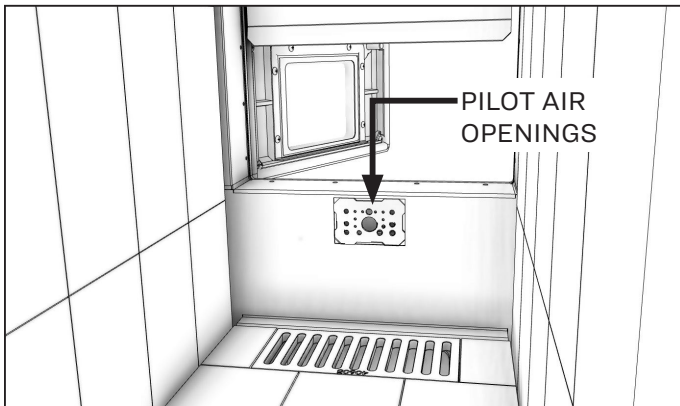
- Always burn dry wood. This allows clean burns and higher chimney temperatures, therefore less creosote deposit.
- Always check for creosote deposit once every two months and have your chimney cleaned at least once a year.
- If a chimney or creosote fire occurs, close all dampers immediately. Wait for the fire to go out and the furnace to cool, then inspect the chimney for damage. If no damage results, perform a chimney cleaning to ensure no more creosote deposits is remaining in the chimney.

**CAUTION:**

**A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE AWAY FROM THE CHIMNEY. IF A CHIMNEY FIRE OCCURS, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.**

## ASH REMOVAL & DISPOSAL

Never let your ashes get any higher than the pilot air hole. Remove ashes as needed leaving at least 2 inches of ash in the bottom of the firebox. Ashes should be placed in a metal container with a tight-fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, away from all combustible materials, pending final disposal. The ashes should be retained in the closed container until all cinders have thoroughly cooled.



### CAUTIONS:

- **ASHES COULD CONTAIN HOT EMBERS EVEN AFTER TWO DAYS WITHOUT OPERATING THE STOVE.**
- **THE ASH PAN CAN BECOME VERY HOT. WEAR GLOVES TO PREVENT INJURY.**
- **NEVER BURN THE STOVE WITH THE ASH TRAP OPEN. THIS WOULD RESULT IN OVER FIRING THE STOVE. DAMAGE TO THE STOVE AND EVEN HOUSE FIRE MAY RESULT.**

## SMOKE & CO MONITORS

Burning wood naturally produces smoke and carbon monoxide(CO) emissions. CO is a poisonous gas when exposed to elevated concentrations for extended periods of time. While the modern combustion systems in furnaces drastically reduce the amount of CO emitted out the chimney, exposure to the gases in closed or confined areas can be dangerous. Make sure you stove gaskets and chimney joints are in good working order and sealing properly to ensure unintended exposure. It is recommended that you use both smoke and CO monitors in areas having the potential to generate CO.

## GASKET CARE

### WARNING:

**NEVER OPERATE THE STOVE WITHOUT GASKETS OR WITH BROKEN GASKETS. DAMAGE TO THE STOVE OR EVEN HOUSE FIRE MAY RESULT.**

It is recommended that you change the door gasket (which makes your furnace door air tight) once a year, in order to ensure good control over the combustion, maximum efficiency and security. To change the door gasket, simply remove the damaged one. Carefully clean the available gasket groove, apply a high temperature silicone sold for this purpose and install the new gasket. You may light up your furnace again approximately 24 hours after having completed this operation. This unit's feed door uses a 5/8" diameter rope gasket. The door glass on this unit uses a 1 x 1/8 gasket.

### ATTENTION:

**THIS WOOD FURNACE NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD FURNACE IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.**

## SERVICE HINTS

Do not expect a furnace to draw. It is the chimney that creates the draft. Smoke spillage into the house or excessive build-up of water or creosote in the chimney are warnings that the chimney is not functioning properly. Correct the problem before using furnace. Possible causes are:

1. The connector pipe may be pushed into the chimney too far, stopping the draft.
2. Do not connect two furnaces or a stove and furnace into the same chimney flue.
3. The chimney used for a furnace must not be used to ventilate the cellar or basement. If there is a cleanout opening at the base of the chimney, it must be closed tightly.
4. If the chimney is operating too cool, water will condense in the chimney and run back into the furnace. Creosote formation will be rapid and may block the chimney. Operate the furnace at a high enough fire to keep the chimney warm, preventing this condensation.

5. If the fire burns well, but sometimes smokes or burns slowly, it may be caused by the chimney top being lower than another part of the house or a nearby tree. The wind blowing over a house or a tree, falls on top of the chimney like water over a dam, beating down the smoke. The top of the chimney should be at least 3 feet above the roof and be at least 2 feet higher than any point of the roof within 10 feet.

## CARING FOR PAINTED PARTS

This furnace has a painted outside jacket, which is durable, but it will not stand rough handling or abuse. When installing your furnace, use care in handling. Clean with soap and warm water when furnace is not hot. DO NOT use any acids or scouring soap, as these wear and dull the finish. DISCOLORATION WILL OCCUR IF THE FURNACE IS OVERHEATED. FOLLOW OPERATING INSTRUCTIONS CAREFULLY.

**CAUTION:**

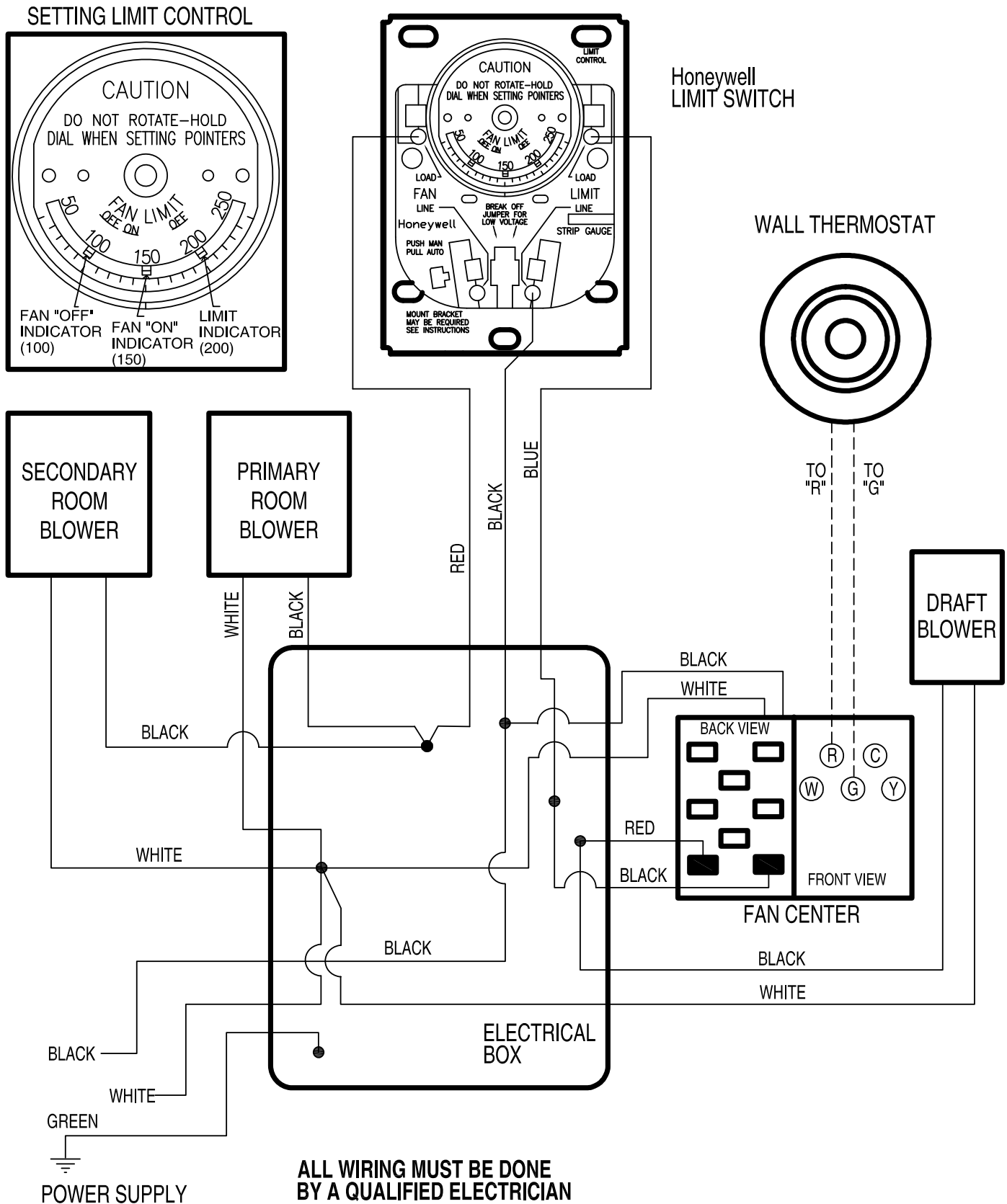
**THE SPECIAL PAINTS USED ON YOUR FURNACE MAY GIVE OFF SOME SMOKE WHILE THEY ARE CURING DURING FIRST FEW FIRES., BUILD SMALL FIRES AT FIRST. THE METAL USED IN CONSTRUCTION OF THE FURNACE AND DUCT WORK HAS A LIGHT COATING OF OIL. THIS COULD GIVE OFF SMOKE AND/OR ODOR FROM REGISTERS WHEN FURNACE IS USED FOR THE FIRST TIME. THIS SHOULD DISAPPEAR AFTER A SHORT PERIOD OF TIME. ONCE THIS BURN-OFF HAS OCCURRED, IT SHOULD NOT REOCCUR.**

## HOW TO ORDER REPAIR PARTS

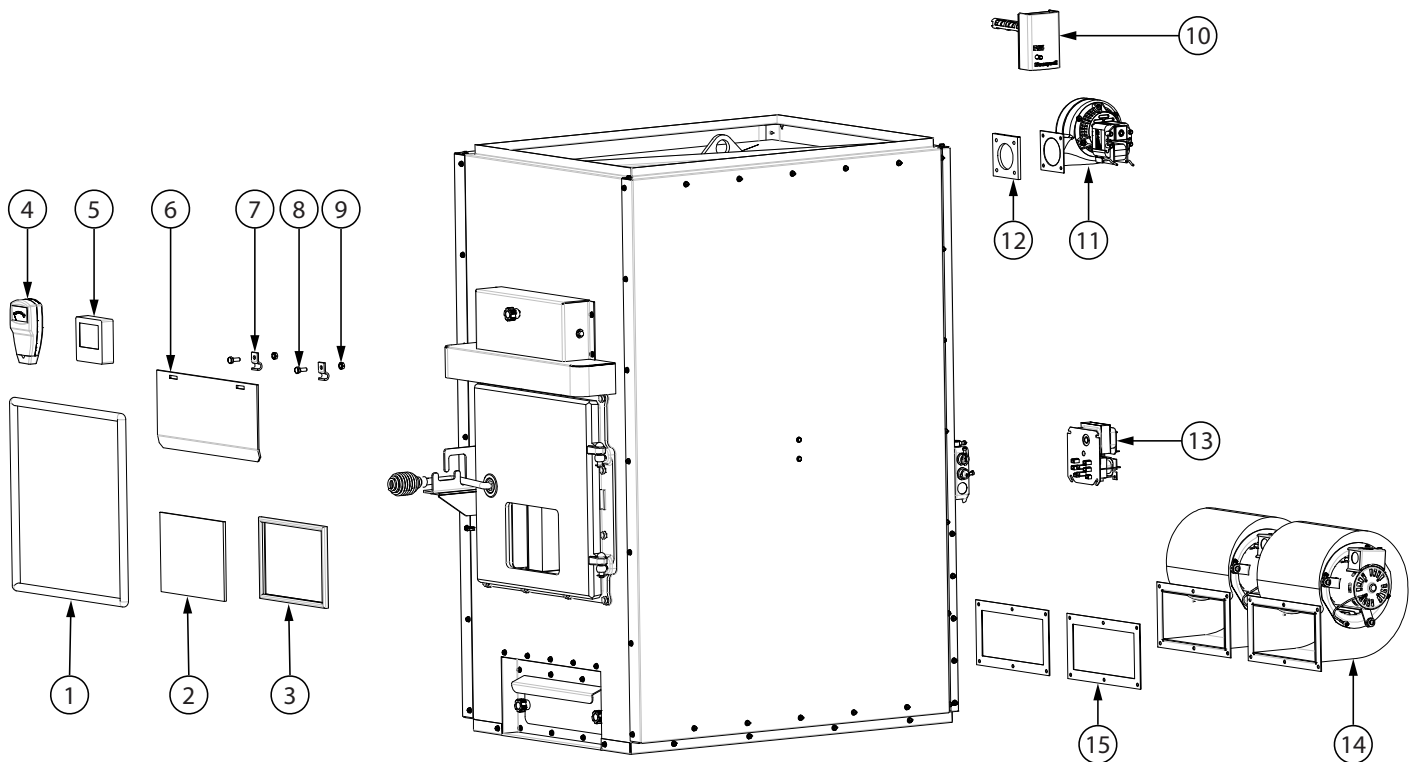
**For Parts Assistance Call: 800-750-2723 Ext 5051 or Email: [parts@usstove.com](mailto:parts@usstove.com)**

The information in this owner's manual is specific to your unit. When ordering replacement parts the information in this manual will help to ensure the correct items are ordered. Before contacting customer service write down the model number and the serial number of this unit. That information can be found on the certification label attached to the back of the unit. Other information that may be needed would be the part number and part description of the item(s) in question. Part numbers and descriptions can be found in the "Repair Parts" section of this manual. Once this information has been gathered you can contact customer service by phone 1-800-750-2723 Ext 5051 or Email [parts@usstove.com](mailto:parts@usstove.com).

Model Information	
Model Number	
Serial Number	







Key	Part #	Description	Qty
1	88126	DOOR GASKET	5ft
2	892686	DOOR GLASS	1
3	88087	GLASS GASKET	30"
4	80697	MOISTURE METER	1
5	80779	DIGITAL WALL THERMOSTAT	1
6	893794	SMOKE CURTAIN	1
7	23787	CLIP, SMOKE DOOR (C000079)	2
8	83339	1/4-20 x 3/4 HEX BOLT	2
9	83250	1/4-20 KEP NUT (BLACK)	2
10	80145	LIMIT CONTROL	1
11	80884	BLOWER, FORCED DRAFT MH	1
12	88365	FORCED BLOWER GASKET	1
13	80130	TRANSFORMER, FAN CENTER	1
14	80594	BLOWER ASSEMBLY	2
15	89319	BLOWER GASKET	2

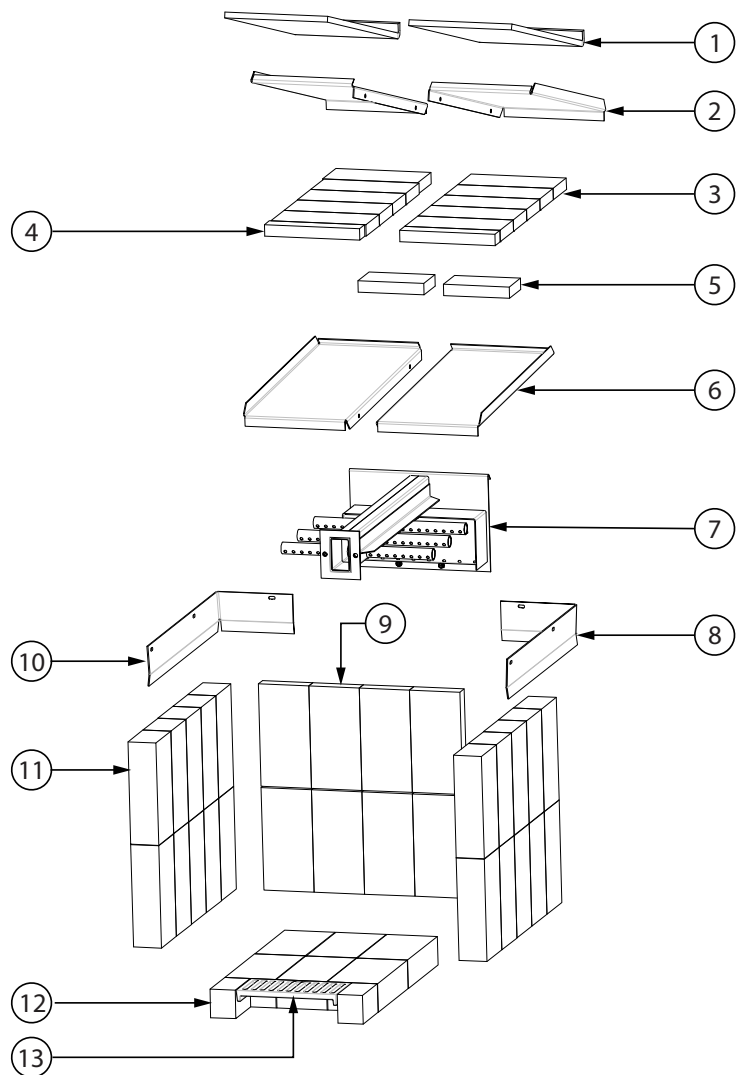
To order parts:

Call 1-800-750-2723 Ext 5051 or

Email to: [parts@usstove.com](mailto:parts@usstove.com)

**IN ORDER TO MAINTAIN WARRANTY, COMPONENTS MUST BE REPLACED USING ORIGINAL MANUFACTURERS PARTS PURCHASED THROUGH YOUR DEALER OR DIRECTLY FROM THE APPLIANCE MANUFACTURER. USE OF THIRD PARTY COMPONENTS WILL VOID THE WARRANTY.**

Key	Part #	Description	Qty
1	88353	BAFFLE BLANKET	2
2		TOP BAFFLE (SET OF 2)	1
3	88360	C-CAST LARGE	10
4	88362	C-CAST SMALL	2
5	88361	C-CAST MEDIUM	2
6		BOTTOM BAFFLE (SET OF 2)	1
7	893792	TRUNK ASSEMBLY	1
8	893806	RETAINER, BRICK	1
9	89066A	THIN BRICK (4-1/2 x 9) PUMICE	8
10	893807	RETAINER, BRICK	1
11	D2030010	THICK BRICK STRAIGHTS (4-1/2 X 9) PUMICE	26
12	2021-025	THICK BRICK STRAIGHTS (4-1/2 X 9) PUMICE	2
13	40605	CAST GRATE	1



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Email to: [parts@usstove.com](mailto:parts@usstove.com)

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# SERVICE RECORD



It is recommended that your heating system is serviced regularly and that the appropriate Service Interval Record is completed.

## SERVICE PROVIDER

Before completing the appropriate Service Record below, please ensure you have carried out the service as described in the manufacturer's instructions. Always use the manufacturer's specified spare part when replacement is necessary.

<b>Service 01</b>	Date: _____
Engineer Name: _____	
License No.: _____	
Company: _____	
Telephone No.: _____	
Stove Inspected: <input type="checkbox"/>	Chimney Swept: <input type="checkbox"/>
Items Replaced: _____	

<b>Service 02</b>	Date: _____
Engineer Name: _____	
License No.: _____	
Company: _____	
Telephone No.: _____	
Stove Inspected: <input type="checkbox"/>	Chimney Swept: <input type="checkbox"/>
Items Replaced: _____	

<b>Service 03</b>	Date: _____
Engineer Name: _____	
License No.: _____	
Company: _____	
Telephone No.: _____	
Stove Inspected: <input type="checkbox"/>	Chimney Swept: <input type="checkbox"/>
Items Replaced: _____	

<b>Service 04</b>	Date: _____
Engineer Name: _____	
License No.: _____	
Company: _____	
Telephone No.: _____	
Stove Inspected: <input type="checkbox"/>	Chimney Swept: <input type="checkbox"/>
Items Replaced: _____	

<b>Service 05</b>	Date: _____
Engineer Name: _____	
License No.: _____	
Company: _____	
Telephone No.: _____	
Stove Inspected: <input type="checkbox"/>	Chimney Swept: <input type="checkbox"/>
Items Replaced: _____	

<b>Service 06</b>	Date: _____
Engineer Name: _____	
License No.: _____	
Company: _____	
Telephone No.: _____	
Stove Inspected: <input type="checkbox"/>	Chimney Swept: <input type="checkbox"/>
Items Replaced: _____	

<b>Service 07</b>	Date: _____
Engineer Name: _____	
License No.: _____	
Company: _____	
Telephone No.: _____	
Stove Inspected: <input type="checkbox"/>	Chimney Swept: <input type="checkbox"/>
Items Replaced: _____	

<b>Service 08</b>	Date: _____
Engineer Name: _____	
License No.: _____	
Company: _____	
Telephone No.: _____	
Stove Inspected: <input type="checkbox"/>	Chimney Swept: <input type="checkbox"/>
Items Replaced: _____	

# Owner's Instruction and Operation Manual

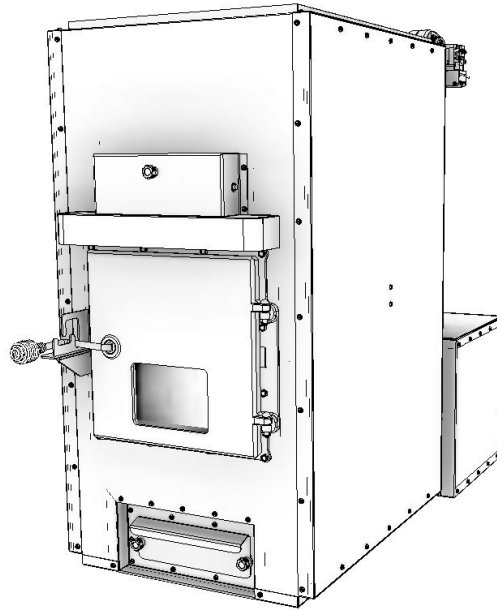
**UNITED STATES  
STOVE CO.**

EST<sup>d</sup> 1869

Model Number:  
US1520



Certified to UL-391 (R2015), Certified to: CSA  
B366.1-11 (R2014), and CSA B415.1-10 (R2015)



**Wood Only Central Furnace**

\* All Pictures In This Manual Are For Illustrative Purposes Only. Actual Product May Vary.

Save These Instructions In A Safe Place For Future Reference.



**SAFETY NOTICE:** If this unit is not properly installed, a fire may result. For your safety, follow the installation instructions. Never use make-shift compromises during the installation of this unit. Contact local building or fire officials about permits, restrictions and installation requirements in your area.



**CAUTION!** Please read this entire manual before you install or use this unit. Failure to follow instructions may result in property damage, bodily injury, or even death. Improper Installation Will Void Your Warranty!

## **U.S. Environmental Protection Agency**

Certified to comply with 2020 particulate  
emission standards

## **⚠ CALIFORNIA PROPOSITION 65 WARNING:**

This product can expose you to chemicals including carbon monoxide, which is known to the State of California to cause cancer, birth defects, and/or other reproductive harm. For more information, go to [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

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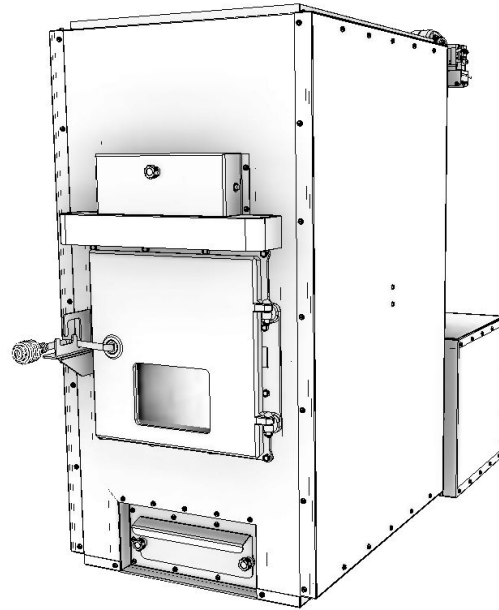
# Owner's Instruction and Operation Manual

# VOGELZANG

Model Number:  
VG1520



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B366.1-11 (R2014), and CSA B415.1-10 (R2015)



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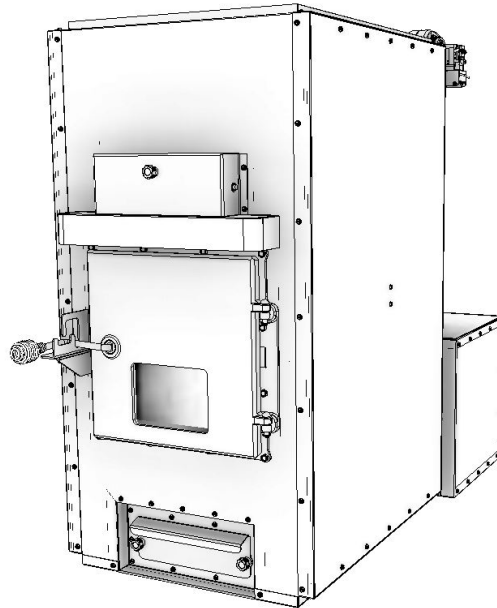
# Owner's Instruction and Operation Manual



Model Number:  
N35



Certified to UL-391 (R2015), Certified to: CSA  
B366.1-11 (R2014), and CSA B415.1-10 (R2015)



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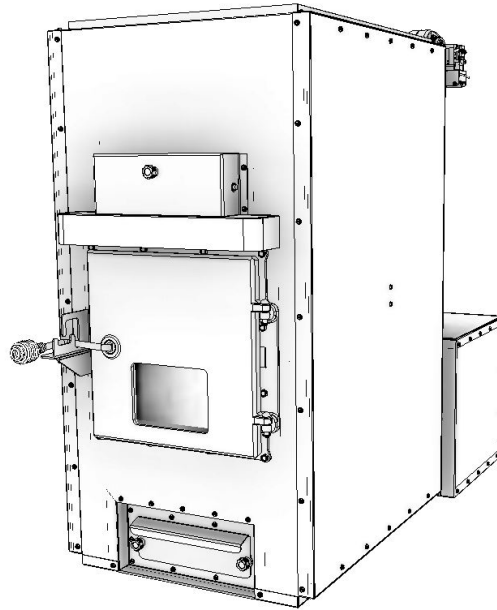
# Owner's Instruction and Operation Manual



Model Number:  
C2235



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B366.1-11 (R2014), and CSA B415.1-10 (R2015)



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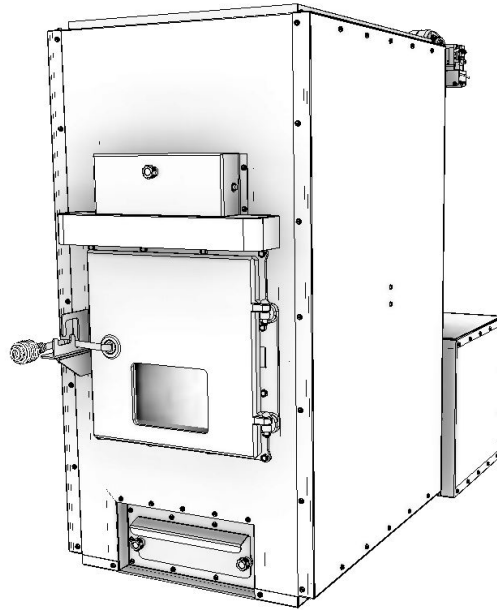


**BRECKWELL**

Model Number:  
SWF1035



Certified to UL-391 (R2015), Certified to: CSA  
B366.1-11 (R2014), and CSA B415.1-10 (R2015)



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**U.S. Environmental Protection Agency**

Certified to comply with 2020 particulate  
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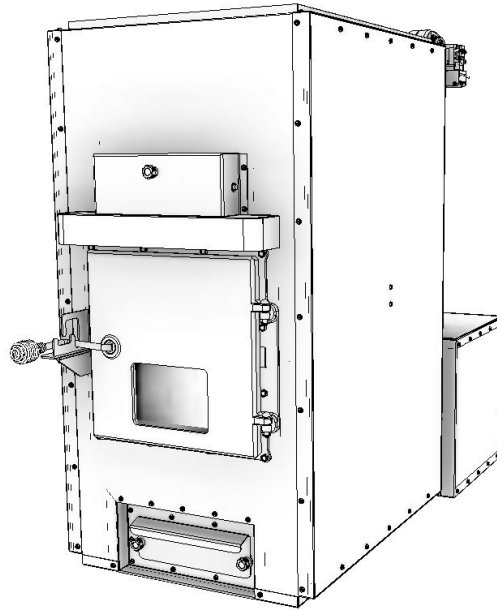


**BRECKWELL**

Model Number:  
SWF1035K



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B366.1-11 (R2014), and CSA B415.1-10 (R2015)



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**U.S. Environmental Protection Agency**

Certified to comply with 2020 particulate  
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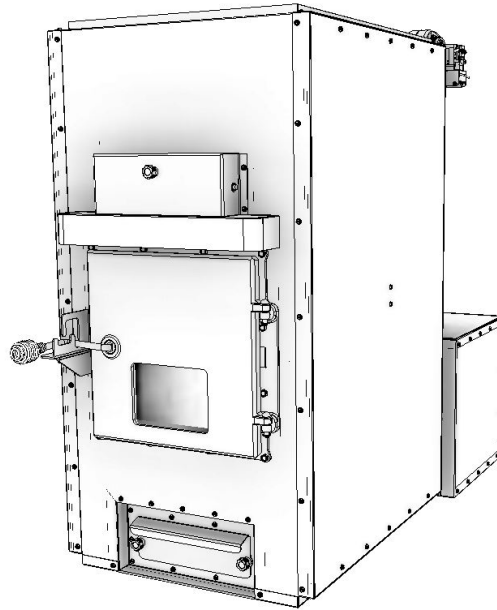
# Owner's Instruction and Operation Manual



Model Number:  
WC1520



Certified to UL-391 (R2015), Certified to: CSA  
B366.1-11 (R2014), and CSA B415.1-10 (R2015)



## Wood Only Central Furnace

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# Manuel d'instructions et d'utilisation du propriétaire

**UNITED STATES  
STOVE CO.**

EST<sup>d</sup> 1869

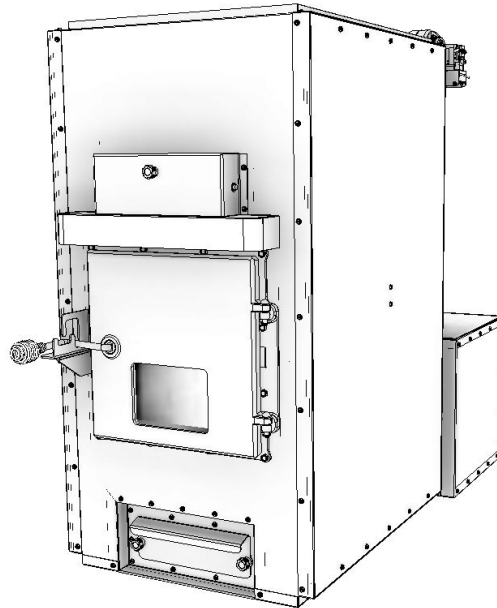
Numéros De Modèle:

US1520



Signaler Le Numéro: 22-808

Certifié selon UL-391 (R2015), Certifié selon: CSA B366.1-11 (R2014) et CSA B415.1-10 (R2015)



**Fournaise centrale au bois  
seulement**

\* Toutes les images de ce manuel sont à des fins d'illustration uniquement. Le produit réel peut varier.

Conservez ces instructions dans un endroit sûr pour référence ultérieure.



**AVIS DE SÉCURITÉ :** Si cet appareil n'est pas correctement installé, un incendie peut survenir. Pour votre sécurité, suivez les instructions d'installation. N'utilisez jamais de compromis de fortune lors de l'installation de cet appareil. Contactez les responsables locaux du bâtiment ou des pompiers au sujet des permis, des restrictions et des exigences d'installation dans votre région.



**MISE EN GARDE!** Veuillez lire ce manuel dans son intégralité avant d'installer ou d'utiliser cet appareil. Le non-respect des instructions peut entraîner des dommages matériels, des blessures corporelles ou même la mort. Une installation incorrecte annulera votre garantie !

**AGENCE AMÉRICAINE DE PROTECTION  
DE L'ENVIRONNEMENT**

Certifié conforme aux normes d'émissions  
de particules 2020.



**AVERTISSEMENT SUR LA PROPOSITION 65 DE LA  
CALIFORNIE:**

Ce produit peut vous exposer à des produits chimiques, y compris le monoxyde de carbone, qui est connu dans l'État de Californie pour provoquer le cancer, des anomalies congénitales et / ou d'autres troubles de la reproduction. Pour plus d'informations, visitez [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

CE MANUEL EST SUJET À MODIFICATION SANS PRÉAVIS.

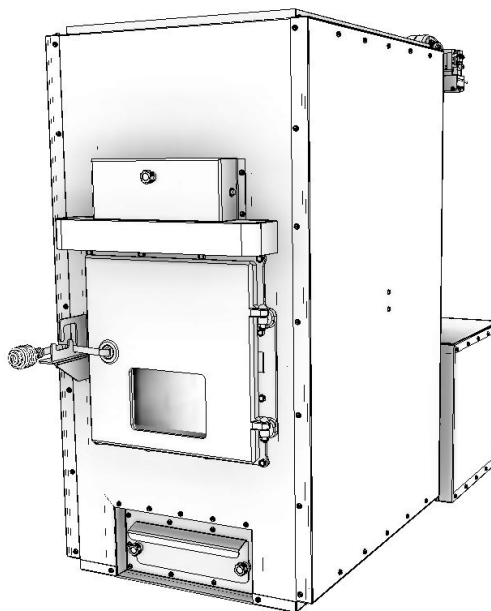
# Manuel d'instructions et d'utilisation du propriétaire

# VOGELZANG

Numéros De Modèle:  
VG1520



Certifié selon UL-391 (R2015), Certifié selon: CSA B366.1-11 (R2014) et CSA B415.1-10 (R2015)



**Fournaise centrale au bois  
seulement**

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Conservez ces instructions dans un endroit sûr pour référence ultérieure.



**AVIS DE SÉCURITÉ :** Si cet appareil n'est pas correctement installé, un incendie peut survenir. Pour votre sécurité, suivez les instructions d'installation. N'utilisez jamais de compromis de fortune lors de l'installation de cet appareil. Contactez les responsables locaux du bâtiment ou des pompiers au sujet des permis, des restrictions et des exigences d'installation dans votre région.



**MISE EN GARDE!** Veuillez lire ce manuel dans son intégralité avant d'installer ou d'utiliser cet appareil. Le non-respect des instructions peut entraîner des dommages matériels, des blessures corporelles ou même la mort. Une installation incorrecte annulera votre garantie !

**AGENCE AMÉRICAINE DE PROTECTION  
DE L'ENVIRONNEMENT**

Certifié conforme aux normes d'émissions  
de particules 2020.



**AVERTISSEMENT SUR LA PROPOSITION 65 DE LA  
CALIFORNIE:**

Ce produit peut vous exposer à des produits chimiques, y compris le monoxyde de carbone, qui est connu dans l'État de Californie pour provoquer le cancer, des anomalies congénitales et / ou d'autres troubles de la reproduction. Pour plus d'informations, visitez [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

CE MANUEL EST SUJET À MODIFICATION SANS PRÉAVIS.

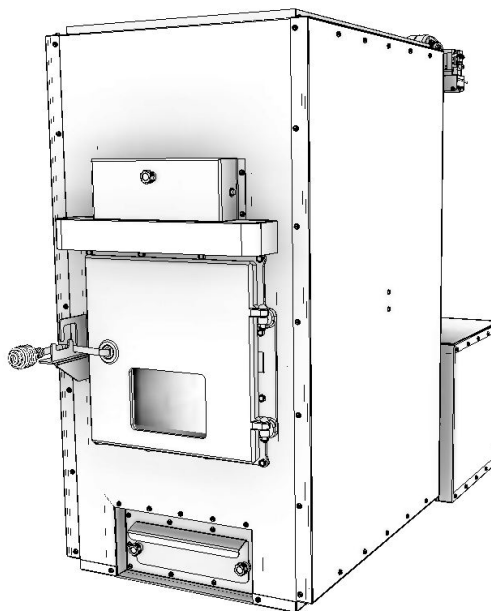
# Manuel d'instructions et d'utilisation du propriétaire



Numéros De Modèle:  
N35



Certifié selon UL-391 (R2015), Certifié  
selon: CSA B366.1-11 (R2014) et CSA  
B415.1-10 (R2015)



**Fournaise centrale au bois  
seulement**

\* Toutes les images de ce manuel sont à des fins d'illustration uniquement. Le produit réel peut varier.

Conservez ces instructions dans un endroit sûr pour référence ultérieure.



**AVIS DE SÉCURITÉ :** Si cet appareil n'est pas correctement installé, un incendie peut survenir. Pour votre sécurité, suivez les instructions d'installation. N'utilisez jamais de compromis de fortune lors de l'installation de cet appareil. Contactez les responsables locaux du bâtiment ou des pompiers au sujet des permis, des restrictions et des exigences d'installation dans votre région.



**MISE EN GARDE!** Veuillez lire ce manuel dans son intégralité avant d'installer ou d'utiliser cet appareil. Le non-respect des instructions peut entraîner des dommages matériels, des blessures corporelles ou même la mort. Une installation incorrecte annulera votre garantie !

## **AGENCE AMÉRICAINE DE PROTECTION DE L'ENVIRONNEMENT**

Certifié conforme aux normes d'émissions  
de particules 2020.



## **AVERTISSEMENT SUR LA PROPOSITION 65 DE LA CALIFORNIE:**

Ce produit peut vous exposer à des produits chimiques, y compris le monoxyde de carbone, qui est connu dans l'État de Californie pour provoquer le cancer, des anomalies congénitales et / ou d'autres troubles de la reproduction. Pour plus d'informations, visitez [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

CE MANUEL EST SUJET À MODIFICATION SANS PRÉAVIS.

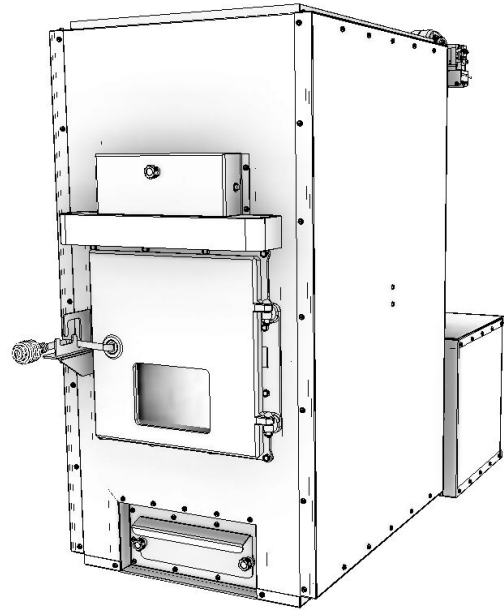
# Manuel d'instructions et d'utilisation du propriétaire



Numéros De Modèle:  
C2235



Certifié selon UL-391 (R2015), Certifié  
selon: CSA B366.1-11 (R2014) et CSA  
B415.1-10 (R2015)



**Fournaise centrale au bois  
seulement**

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**AVIS DE SÉCURITÉ :** Si cet appareil n'est pas correctement installé, un incendie peut survenir. Pour votre sécurité, suivez les instructions d'installation. N'utilisez jamais de compromis de fortune lors de l'installation de cet appareil. Contactez les responsables locaux du bâtiment ou des pompiers au sujet des permis, des restrictions et des exigences d'installation dans votre région.



**MISE EN GARDE!** Veuillez lire ce manuel dans son intégralité avant d'installer ou d'utiliser cet appareil. Le non-respect des instructions peut entraîner des dommages matériels, des blessures corporelles ou même la mort. Une installation incorrecte annulera votre garantie !

## **AGENCE AMÉRICAINE DE PROTECTION DE L'ENVIRONNEMENT**

Certifié conforme aux normes d'émissions  
de particules 2020.



## **AVERTISSEMENT SUR LA PROPOSITION 65 DE LA CALIFORNIE:**

Ce produit peut vous exposer à des produits chimiques, y compris le monoxyde de carbone, qui est connu dans l'État de Californie pour provoquer le cancer, des anomalies congénitales et / ou d'autres troubles de la reproduction. Pour plus d'informations, visitez [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

CE MANUEL EST SUJET À MODIFICATION SANS PRÉAVIS.

# Manuel d'instructions et d'utilisation du propriétaire

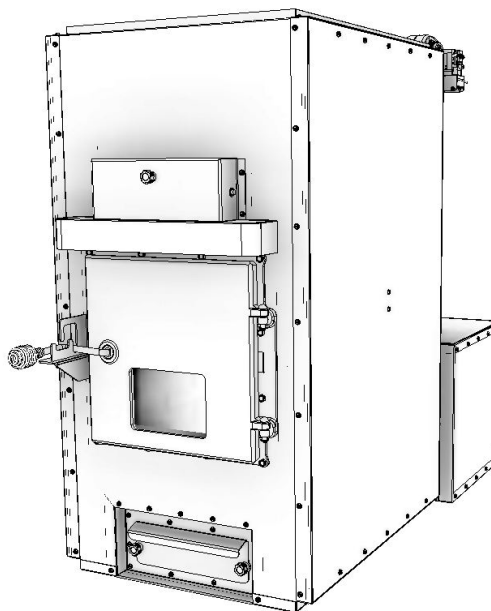


**BRECKWELL**

Numéros De Modèle:  
SWF1035



Certifié selon UL-391 (R2015), Certifié  
selon: CSA B366.1-11 (R2014) et CSA  
B415.1-10 (R2015)



**Fournaise centrale au bois  
seulement**

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Conservez ces instructions dans un endroit sûr pour référence ultérieure.



**AVIS DE SÉCURITÉ :** Si cet appareil n'est pas correctement installé, un incendie peut survenir. Pour votre sécurité, suivez les instructions d'installation. N'utilisez jamais de compromis de fortune lors de l'installation de cet appareil. Contactez les responsables locaux du bâtiment ou des pompiers au sujet des permis, des restrictions et des exigences d'installation dans votre région.



**MISE EN GARDE!** Veuillez lire ce manuel dans son intégralité avant d'installer ou d'utiliser cet appareil. Le non-respect des instructions peut entraîner des dommages matériels, des blessures corporelles ou même la mort. Une installation incorrecte annulera votre garantie !

**AGENCE AMÉRICAINE DE PROTECTION  
DE L'ENVIRONNEMENT**

Certifié conforme aux normes d'émissions  
de particules 2020.



**AVERTISSEMENT SUR LA PROPOSITION 65 DE LA  
CALIFORNIE:**

Ce produit peut vous exposer à des produits chimiques, y compris le monoxyde de carbone, qui est connu dans l'État de Californie pour provoquer le cancer, des anomalies congénitales et / ou d'autres troubles de la reproduction. Pour plus d'informations, visitez [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

CE MANUEL EST SUJET À MODIFICATION SANS PRÉAVIS.



# Manuel d'instructions et d'utilisation du propriétaire

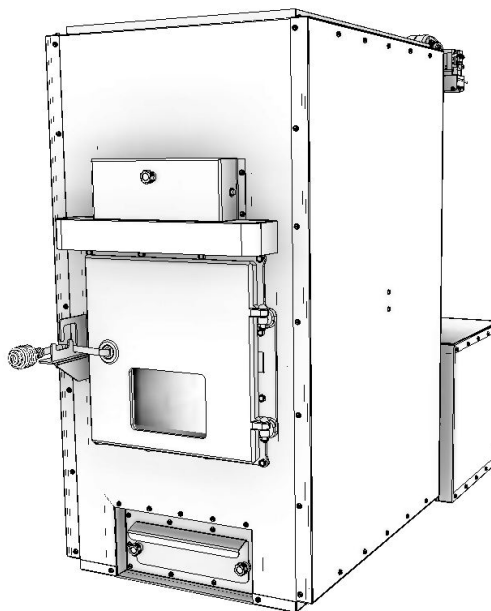


**BRECKWELL**

Numéros De Modèle:  
SWF1035K



Certifié selon UL-391 (R2015), Certifié  
selon: CSA B366.1-11 (R2014) et CSA  
B415.1-10 (R2015)



**Fournaise centrale au bois  
seulement**

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**AGENCE AMÉRICAINE DE PROTECTION  
DE L'ENVIRONNEMENT**

Certifié conforme aux normes d'émissions  
de particules 2020.



**AVERTISSEMENT SUR LA PROPOSITION 65 DE LA  
CALIFORNIE:**

Ce produit peut vous exposer à des produits chimiques, y compris le monoxyde de carbone, qui est connu dans l'État de Californie pour provoquer le cancer, des anomalies congénitales et / ou d'autres troubles de la reproduction. Pour plus d'informations, visitez [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

CE MANUEL EST SUJET À MODIFICATION SANS PRÉAVIS.

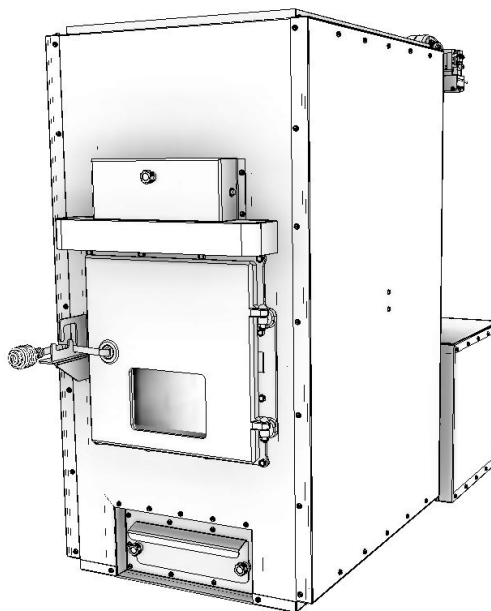
# Manuel d'instructions et d'utilisation du propriétaire



Numéros De Modèle:  
WC1520



Certifié selon UL-391 (R2015), Certifié  
selon: CSA B366.1-11 (R2014) et CSA  
B415.1-10 (R2015)



**Fournaise centrale au bois  
seulement**

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## **AGENCE AMÉRICAINE DE PROTECTION DE L'ENVIRONNEMENT**

Certifié conforme aux normes d'émissions  
de particules 2020.



## **AVERTISSEMENT SUR LA PROPOSITION 65 DE LA CALIFORNIE:**

Ce produit peut vous exposer à des produits chimiques, y compris le monoxyde de carbone, qui est connu dans l'État de Californie pour provoquer le cancer, des anomalies congénitales et / ou d'autres troubles de la reproduction. Pour plus d'informations, visitez [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

CE MANUEL EST SUJET À MODIFICATION SANS PRÉAVIS.

# Manuel d'instructions et d'utilisation du propriétaire

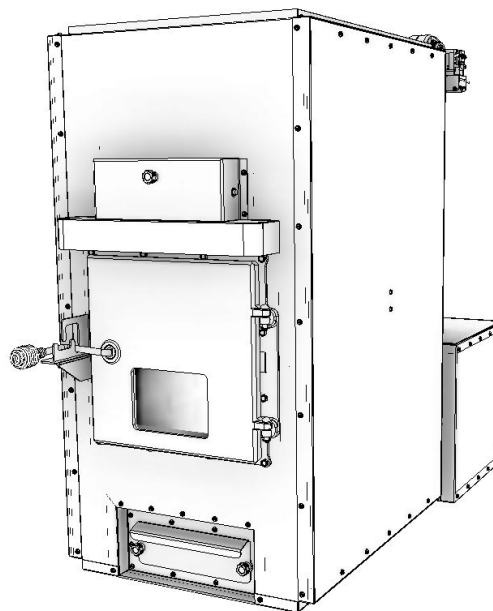


Numéros De Modèle:  
HB1520



Certifié selon UL-391 (R2015), Certifié selon: CSA B366.1-11 (R2014) et CSA B415.1-10 (R2015)

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**Fournaise centrale au bois  
seulement**

Conservez ces instructions dans un endroit sûr pour référence ultérieure.



**AVIS DE SÉCURITÉ :** Si cet appareil n'est pas correctement installé, un incendie peut survenir. Pour votre sécurité, suivez les instructions d'installation. N'utilisez jamais de compromis de fortune lors de l'installation de cet appareil. Contactez les responsables locaux du bâtiment ou des pompiers au sujet des permis, des restrictions et des exigences d'installation dans votre région.



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## AGENCE AMÉRICAINE DE PROTECTION DE L'ENVIRONNEMENT

Certifié conforme aux normes d'émissions  
de particules 2020.



## AVERTISSEMENT SUR LA PROPOSITION 65 DE LA CALIFORNIE:

Ce produit peut vous exposer à des produits chimiques, y compris le monoxyde de carbone, qui est connu dans l'État de Californie pour provoquer le cancer, des anomalies congénitales et / ou d'autres troubles de la reproduction. Pour plus d'informations, visitez [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

CE MANUEL EST SUJET À MODIFICATION SANS PRÉAVIS.

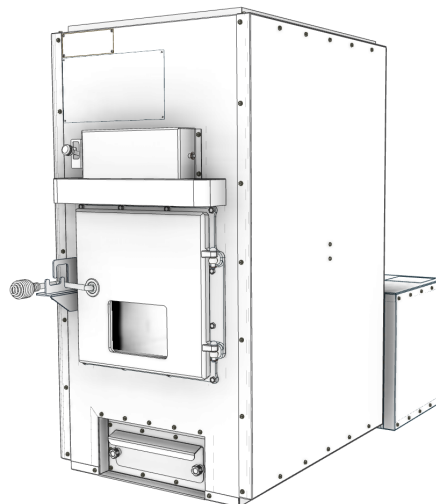
# Owner's Instruction and Operation Manual



Model Number:  
KWF1520



Certified to UL-391-2006 (R2019), Certified to: CSA B366.1-11 (R2020), and CSA B415.1:22



## Wood Only Central Furnace



\* All Pictures In This Manual Are For Illustrative Purposes Only. Actual Product May Vary.

KG-0502N

Save These Instructions In A Safe Place For Future Reference.



**SAFETY NOTICE:** If this unit is not properly installed, a fire may result. For your safety, follow the installation instructions. Never use make-shift compromises during the installation of this unit. Contact local building or fire officials about permits, restrictions and installation requirements in your area.



**CAUTION!** Please read this entire manual before you install or use this unit. Failure to follow instructions may result in property damage, bodily injury, or even death. Improper Installation Will Void Your Warranty!

### U.S. Environmental Protection Agency

Certified to comply with 2020 particulate emission standards

### ⚠️ CALIFORNIA PROPOSITION 65 WARNING:

This product can expose you to chemicals including carbon monoxide, which is known to the State of California to cause cancer, birth defects, and/or other reproductive harm. For more information, go to [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

THIS MANUAL IS SUBJECT TO CHANGE WITHOUT NOTICE.

# Manuel d'instructions et d'utilisation destiné au propriétaire

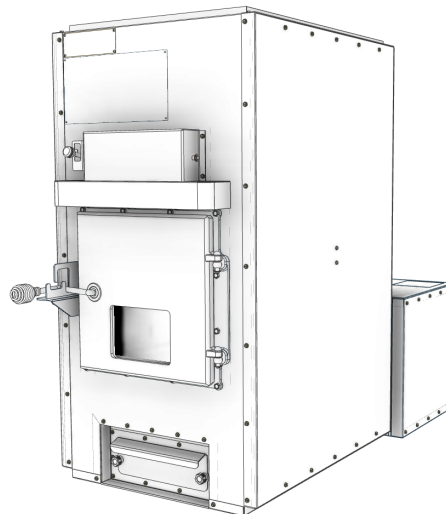


Numéro de modèle :  
KWF1520



Numéro de rapport : 22-808

Certifié selon UL-391-2006 (R2019), Certifié selon :  
CSA B366.1-11 (R2020), et CSA B415.1:22



**Fournaise centrale au bois seulement**



\* Toutes les images contenues dans le présent manuel ne sont fournies qu'à titre d'illustration. Le produit en question peut différer de celui illustré.

Gardez les instructions dans un endroit sécuritaire pour consultation ultérieure.



**AVIS DE SÉCURITÉ** : Si cette unité n'est pas correctement installée, un incendie pourrait se produire. Pour votre sécurité, respectez les directives d'installation. Ne faites jamais de compromis de fortune pendant l'installation de cette unité. Communiquez avec les responsables du bâtiment ou le service d'incendie local au sujet des permis, restrictions et exigences d'installation de votre région.



**ATTENTION!** Lisez entièrement ce manuel avant d'installer ou d'utiliser cette unité. Ne pas respecter ces instructions pourrait causer des dommages à la propriété, des blessures corporelles ou même la mort. Une installation incorrecte annulera votre garantie!

**Environmental Protection Agency  
des États-Unis**

Certifié conforme aux normes d'émission  
de particules de 2020



**AVERTISSEMENT CONCERNANT  
LA PROPOSITION 65 DE LA CALIFORNIE :**

Ce produit peut vous exposer à des agents chimiques, notamment au monoxyde de carbone, qui est reconnu dans l'État de la Californie comme causant le cancer, des malformations congénitales et/ou d'autres dommages à l'appareil reproductif. Pour obtenir plus de renseignements, veuillez consulter le site [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

LE PRÉSENT MANUEL EST SUSCEPTIBLE D'ÊTRE MODIFIÉ SANS PRÉAVIS.



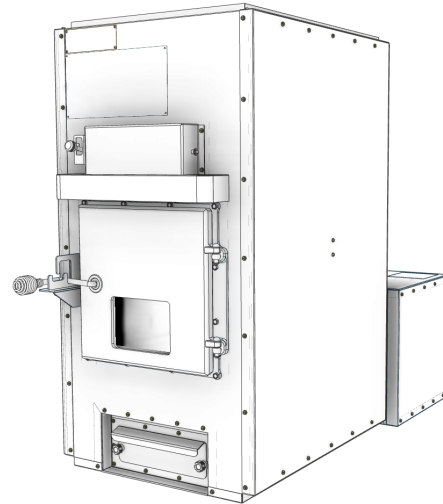
# Owner's Instruction and Operation Manual

*Comfort Glow*

Model Number:  
CGWF4000



Certified to UL-391-2006 (R2019), Certified to: CSA B366.1-11 (R2020), and CSA B415.1:22



## Wood Only Central Furnace



\* All Pictures In This Manual Are For Illustrative Purposes Only. Actual Product May Vary.

CG-0502N

Save These Instructions In A Safe Place For Future Reference.



**SAFETY NOTICE:** If this unit is not properly installed, a fire may result. For your safety, follow the installation instructions. Never use make-shift compromises during the installation of this unit. Contact local building or fire officials about permits, restrictions and installation requirements in your area.



**CAUTION!** Please read this entire manual before you install or use this unit. Failure to follow instructions may result in property damage, bodily injury, or even death. Improper Installation Will Void Your Warranty!

### **U.S. Environmental Protection Agency**

Certified to comply with 2020 particulate emission standards

### **⚠ CALIFORNIA PROPOSITION 65 WARNING:**

This product can expose you to chemicals including carbon monoxide, which is known to the State of California to cause cancer, birth defects, and/or other reproductive harm. For more information, go to [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

THIS MANUAL IS SUBJECT TO CHANGE WITHOUT NOTICE.

# Manuel d'instructions et d'utilisation destiné au propriétaire

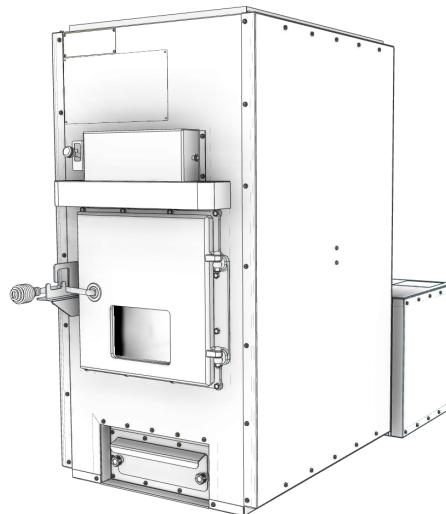
*Comfort Glow*

Numéro de modèle :  
CGWF4000



Numéro de rapport : 22-808

Certifié selon UL-391-2006 (R2019), Certifié selon :  
CSA B366.1-11 (R2020), et CSA B415.1:22



**Fournaise centrale au bois seulement**



\* Toutes les images contenues dans le présent manuel ne sont fournies qu'à titre d'illustration. Le produit en question peut différer de celui illustré.

Gardez les instructions dans un endroit sécuritaire pour consultation ultérieure.



**AVIS DE SÉCURITÉ** : Si cette unité n'est pas correctement installée, un incendie pourrait se produire. Pour votre sécurité, respectez les directives d'installation. Ne faites jamais de compromis de fortune pendant l'installation de cette unité. Communiquez avec les responsables du bâtiment ou le service d'incendie local au sujet des permis, restrictions et exigences d'installation de votre région.



**ATTENTION!** Lisez entièrement ce manuel avant d'installer ou d'utiliser cette unité. Ne pas respecter ces instructions pourrait causer des dommages à la propriété, des blessures corporelles ou même la mort. Une installation incorrecte annulera votre garantie!

**Environmental Protection Agency  
des États-Unis**

Certifié conforme aux normes d'émission  
de particules de 2020



**AVERTISSEMENT CONCERNANT  
LA PROPOSITION 65 DE LA CALIFORNIE :**

Ce produit peut vous exposer à des agents chimiques, notamment au monoxyde de carbone, qui est reconnu dans l'État de la Californie comme causant le cancer, des malformations congénitales et/ou d'autres dommages à l'appareil reproductif. Pour obtenir plus de renseignements, veuillez consulter le site [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

LE PRÉSENT MANUEL EST SUSCEPTIBLE D'ÊTRE MODIFIÉ SANS PRÉAVIS.

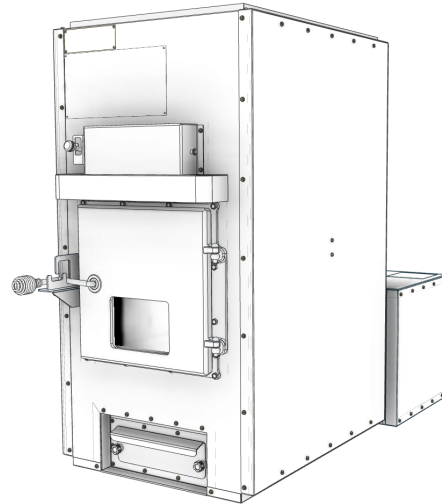
# Owner's Instruction and Operation Manual



Model Number:  
DHWF4000



Certified to UL-391-2006 (R2019), Certified to: CSA B366.1-11 (R2020), and CSA B415.1:22



## Wood Only Central Furnace



\* All Pictures In This Manual Are For Illustrative Purposes Only. Actual Product May Vary.

DH-0502N

Save These Instructions In A Safe Place For Future Reference.



**SAFETY NOTICE:** If this unit is not properly installed, a fire may result. For your safety, follow the installation instructions. Never use make-shift compromises during the installation of this unit. Contact local building or fire officials about permits, restrictions and installation requirements in your area.



**CAUTION!** Please read this entire manual before you install or use this unit. Failure to follow instructions may result in property damage, bodily injury, or even death. Improper Installation Will Void Your Warranty!

### U.S. Environmental Protection Agency

Certified to comply with 2020 particulate emission standards



### CALIFORNIA PROPOSITION 65 WARNING:

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# Manuel d'instructions et d'utilisation destiné au propriétaire

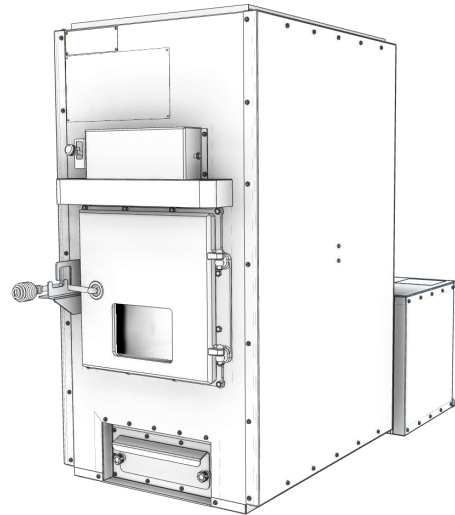


Numéro de modèle :  
DHWF4000



Numéro de rapport : 22-808

Certifié selon UL-391-2006 (R2019), Certifié selon :  
CSA B366.1-11 (R2020), et CSA B415.1:22



**Fournaise centrale au bois seulement**



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**Gardez les instructions dans un endroit sécuritaire pour consultation ultérieure.**



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**ATTENTION!** Lisez entièrement ce manuel avant d'installer ou d'utiliser cette unité. Ne pas respecter ces instructions pourrait causer des dommages à la propriété, des blessures corporelles ou même la mort. Une installation incorrecte annulera votre garantie!

**Environmental Protection Agency  
des États-Unis**

Certifié conforme aux normes d'émission  
de particules de 2020



**AVERTISSEMENT CONCERNANT  
LA PROPOSITION 65 DE LA CALIFORNIE :**

Ce produit peut vous exposer à des agents chimiques, notamment au monoxyde de carbone, qui est reconnu dans l'État de la Californie comme causant le cancer, des malformations congénitales et/ou d'autres dommages à l'appareil reproductif. Pour obtenir plus de renseignements, veuillez consulter le site [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

LE PRÉSENT MANUEL EST SUSCEPTIBLE D'ÊTRE MODIFIÉ SANS PRÉAVIS.

REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
A	INITIAL RELEASE	8/31/2022	CDB

Ø0.20 (4X)

Serial No. / N° de série

Mfg Date. / Date de Fabrication

Model / Modèle:

- HB1520
- US1520
- WC1520

**PFS**  
Report No. / Rapport N° 22-808

Listed Solid Wood Fuel Burning Central Furnace:  
USA and Canada.  
Certified to / Certifié à: UL STD 391(R2014)  
Certified to / Certifié à: CAN/CSA-B366.1 (R2015)  
Tested to: CSA B415.1-10 at 0.13 lb/mmBtu

**U.S. ENVIRONMENTAL PROTECTION AGENCY**  
Certified to comply with the 2020 particulate emission standards using cord wood.

FUEL / CARBURANT: WOOD ONLY / BOIS SEULEMENT	
Maximum Flue Draft / Tirant d'air maximum:	0.060 in./14.93 Pa
Electrical Rating / Tarif Electrique:	120VAC, 60Hz, 6 Amps
Minimum Supply Circuit Ampacity / Ampérage du circuit d'alimentation minimum:	15 Amps

MINIMUM CLEARANCES TO COMBUSTIBLES			
Backwall to furnace / Mur arrière à la fournaise	18 [457]	Supply duct (first 6') / Conduit d'alimentation (premier 6')	6 [153]
Sidewall to furnace / Paroi latérale à la fournaise	16 [407]	Supply duct after 6' / Conduit d'alimentation (après 6')	2 [52]
Sidewall to flue / Paroi latérale à coler	25 [635]	Minimum duct height / Hauteur minimale du conduit	8 [204]
Back wall to flue / Paroi arrière pour la combustion	18 [458]	Ceiling height to floor / Hauteur du plafond au sol	75 [1905]

FLOOR PROTECTOR / PROTECTEUR DE PLANCHER	
Beyond Front of Unit / Unité à côté	24 [610]
R-Value of /	1.4

Unit must be installed on a level, non-combustible floor, or if a floor protector is used it should be listed to UL 1618 (type 2 thermal protection) or equal. Use a listed 6 inch, Class "A", All Fuel Chimney - Refer to chimney manufacturer's instructions.

5.75 5.38

0.19 0.19

11.63

12.00

**DO NOT COVER OR REMOVE THIS LABEL / VEILLEZ A NE JAMAIS DISSIMULER NI ENLEVER CETTE ETIQUETTE.**

Install and use ONLY in accordance with the manufacturer's installation and operation instructions. Contact your local building code officials about restrictions and installation inspection in your area. FOR SAFETY KEEP FIRING AND ASHPIT DOORS TIGHTLY CLOSED. REFER TO OWNER'S MANUAL. NOT FOR USE IN MOBILE HOME.

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

**DANGER: RISK OF FIRE OR EXPLOSION. DO NOT BURN GARBAGE, GASOLINE, NAPHTHA, DRAIN OIL, OR OTHER INAPPROPRIATE MATERIALS. DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.**

**WARNING: RISK OF FIRE. DO NOT OPERATE WITH FLUE DRAFT EXCEEDING 0.060in W.C. / 14.93 Pa WATER COLUMN. DO NOT OPERATE WITH FUEL LOADING AND ASH REMOVAL DOORS OPEN. DO NOT STORE FUEL OR OTHER COMBUSTIBLE MATERIALS WITHIN MARKED INSTALLATION CLEARANCES. INSPECT AND CLEAN FLUES AND CHIMNEY REGULARLY.**

**CAUTION: HOT SURFACES. KEEP CHILDREN AWAY. DO NOT TOUCH DURING OPERATION.**

The heat exchanger, flue pipe, and chimney must be cleaned regularly to remove accumulated creosote and ash. Ensure that the heat exchanger, flue pipe, and chimney are cleaned at the end of the heating season to minimize corrosion during the summer months. The appliance, flue pipe, and chimney must be kept in good condition. To prevent flame or smoke spillage, crack open the fuel loading door for 10 seconds prior to opening door fully. Load fuel carefully or damage may result. Power Failure Instructions: DO NOT add additional fuel. Remove all air filters. Reduce combustion air to a minimum. Open Ductwork bypass damper. Observe furnace closely until power is restored. "Run-Away" Fire Instructions: Completely close all combustion air inlets. Alert your local fire dept. and everyone in the household. This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owner's manual. Not to be connected to ductwork that is still connected to another furnace.

Installez et utilisez UNIQUEMENT conformément aux instructions d'installation et d'utilisation du fabricant. Communiquez avec les responsables du code du bâtiment local au sujet des restrictions et de l'inspection de l'installation dans votre région. POUR PLUS DE SÉCURITÉ, TENIR LES PORTES DE CUISSON ET D'ASSIETTE FERMÉES FERMEMENT. RÉFÉREZ-VOUS AU MANUEL DU PROPRIÉTAIRE. NE PAS UTILISER DANS UNE MAISON MOBILE.

**UNE CHEMINÉE DESSERVANT DÉJÀ UN AUTRE APPAREIL NE POURRA ÊTRE UTILISÉE POUR Y RACCORDER CELUI-CI.**

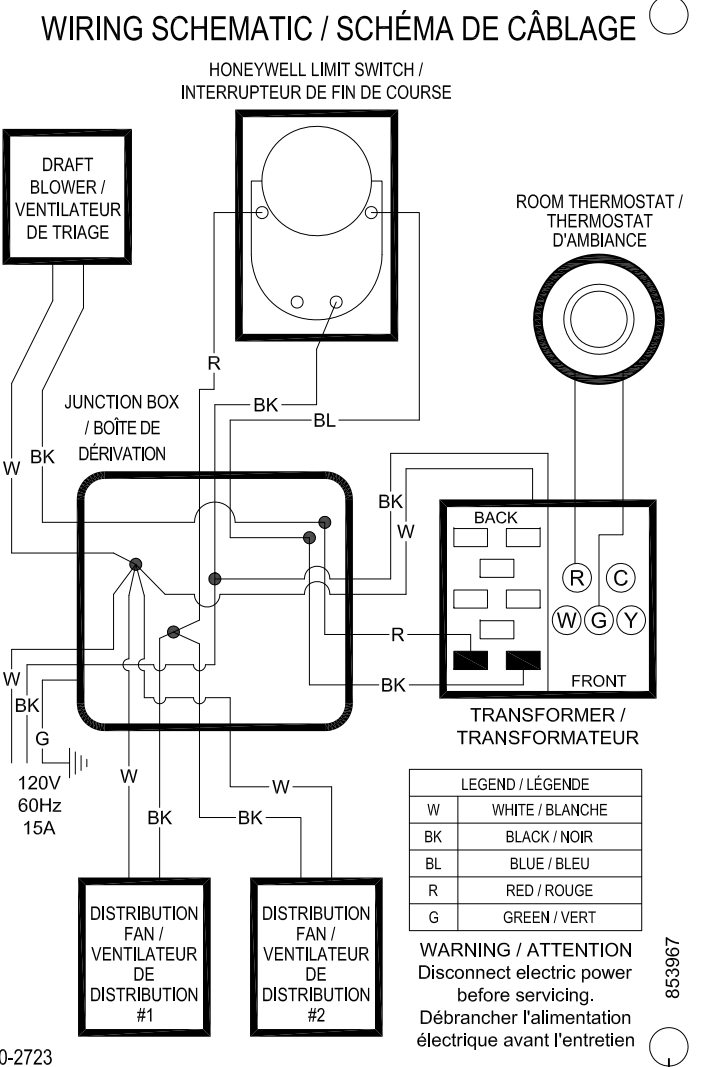
**DANGER: RISQUE D'INCENDIE ET D'EXPLOSION. NE FAITES PAS BRÛLER D'ORDURES, D'ESSENCE, DE NAPHTA, D'HUILE DE CANALISATION, NI D'AUTRES MATÉRIEAUX IMPROPRES. N'UTILISEZ PAS DE PRODUITS CHIMIQUES NI DE LIQUIDES EN ALLUMANT LE FEU.**

**AVIS: RISQUE D'INCENDIE. VEILLEZ A CE QUE LE TIRAGE DE TUYAU N'EXCÈDE JAMAIS UNE COLONNE MONTANTE .06 po/14.93 Pa ET QUE LES PORTES DE CHARGEMENT ET DU CENDRIER DEMEURENT FERMÉES PENDANT L'USAGE. NE PLACEZ NI VOS RÉSERVES DE COMBUSTIBLES NI AUCUN AUTRE OBJET COMBUSTIBLE A DES INTERVALLES PLUS RAPPROCHÉS QUE CEUX INDIQUÉS AUX DIRECTIVES D'INSTALLATION. VÉRIFIEZ ET NETTOYEZ RÉGULIÈREMENT TUYAUX ET CHEMINÉE.**

**ATTENTION: SURFACES CHAUDES, A NE PAS TOUCHER PENDANT LE FONCTIONNEMENT. ÉLOIGNEZ LES ENFANTS DE L'APPAREIL ALLUME.**

Nettoyer régulièrement l'échangeur de chaleur, le tuyau de fumée, et la cheminée à fin d'éviter l'accumulation de crésote ou de carbone. Pour éviter la corrosion en été, nettoyez l'échangeur de chaleur, le tuyau de fumée, et la cheminée à la fin de la saison de chauffage. Il faut bien maintenir l'outil, le tuyau de fumée, la cheminée, et aussi l'inducteur d'air si vous en utilisez. Pour empêcher la sortie de fumée et d'étincelles, avant d'ouvrir entièrement la porte de remplissage de carburant, entrouvrir la porte pendant 10 secondes. En cas de coupure de courant: Ne pas ajouter de carburant supplémentaire. Enlevez toutes les filtres d'air. Réduisez le plus que possible l'air carburant. Ouvrez registre de dérivation conduits. Surveillez bien le fourneau. Chargez le carburant avec précaution ou des dommages peuvent en résulter. Ne pas être connecté à un réseau de canalisation encore connecté à un autre four. Incendie incontrôlée: Fermez les canalisations d'air. Alertez les pompiers et tous les gens dans la maison. Pour les installations au Canada: Ne pas brancher aux tuyaux qui sont utilisés par un autre fourneau.

Manufactured For: U.S. Stove Company • 227 Industrial Park Road • South Pittsburg, TN 37380 • Ph.#: (800) 750-2723



**FINISH NOTES:**  
BLACK BACKGROUND. ALUMINUM TO SHOW THRU.

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	EXCEPT	±.005"	0.012 ALUMINUM	1:1	B	A	
	AS	DECIMAL	SEE NOTES	DWN BY	TITLE		
	NOTED	ANGULAR	HB1520	CDB	CERTIFICATION LABEL		
		±.2°	REFERENCE	DATE	NUMBER	SHEET	
				8/31/2022	853967	1 OF 1	



REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
A	INITIAL RELEASE	8/31/2022	CDB

Ø0.20 (4X)

Model / Modèle:  
 SWF1035  
 SWF1035K

Serial No. / N° de série

Mfg Date. / Date de Fabrication

**PFS**  
 Report No. / Rapport N° 22-808

Listed Solid Wood Fuel Burning Central Furnace:  
 USA and Canada.  
 Certified to / Certifié à: UL STD 391(R2014)  
 Certified to / Certifié à: CAN/CSA-B366.1 (R2015)  
 Tested to: CSA B415.1-10 at 0.13 lb/mmBtu

**U.S. ENVIRONMENTAL PROTECTION AGENCY**  
 Certified to comply with the 2020 particulate emission standards using cord wood.

FUEL / CARBURANT: WOOD ONLY / BOIS SEULEMENT	
Maximum Flue Draft / Tirant d'air maximum:	0.060 in./14.93 Pa
Electrical Rating / Tarif Electrique:	120VAC, 60Hz, 6 Amps
Minimum Supply Circuit Ampacity / Ampérage du circuit d'alimentation minimum:	15 Amps

MINIMUM CLEARANCES TO COMBUSTIBLES			
Backwall to furnace / Mur arrière à la fournaise	18 [457]	Supply duct (first 6') / Conduit d'alimentation (premier 6')	6 [153]
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Back wall to flue / Paroi arrière pour la combustion	18 [458]	Ceiling height to floor / Hauteur du plafond au sol	75 [1905]

FLOOR PROTECTOR / PROTECTEUR DE PLANCHER	
Beyond Front of Unit / Unité à côté	24 [610]
R-Value of /	1.4

Unit must be installed on a level, non-combustible floor, or if a floor protector is used it should be listed to UL 1618 (type 2 thermal protection) or equal. Use a listed 6 inch, Class "A", All Fuel Chimney - Refer to chimney manufacturer's instructions.

Dimensions: 5.75, 5.38, 0.19, 0.19, 11.63, 12.00

**DO NOT COVER OR REMOVE THIS LABEL / VEILLEZ A NE JAMAIS DISSIMULER NI ENLEVER CETTE ETIQUETTE.**

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**DANGER: RISK OF FIRE OR EXPLOSION. DO NOT BURN GARBAGE, GASOLINE, NAPHTHA, DRAIN OIL, OR OTHER INAPPROPRIATE MATERIALS. DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.**

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**CAUTION: HOT SURFACES. KEEP CHILDREN AWAY. DO NOT TOUCH DURING OPERATION.**

The heat exchanger, flue pipe, and chimney must be cleaned regularly to remove accumulated creosote and ash. Ensure that the heat exchanger, flue pipe, and chimney are cleaned at the end of the heating season to minimize corrosion during the summer months. The appliance, flue pipe, and chimney must be kept in good condition. To prevent flame or smoke spillage, crack open the fuel loading door for 10 seconds prior to opening door fully. Load fuel carefully or damage may result. Power Failure Instructions: DO NOT add additional fuel. Remove all air filters. Reduce combustion air to a minimum. Open Ductwork bypass damper. Observe furnace closely until power is restored. "Run-Away" Fire Instructions: Completely close all combustion air inlets. Alert your local fire dept. and everyone in the household. This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owner's manual. Not to be connected to ductwork that is still connected to another furnace.

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**UNE CHEMINÉE DESSERVANT DÉJÀ UN AUTRE APPAREIL NE POURRA ÊTRE UTILISÉE POUR Y RACCORDER CELUI-CI.**

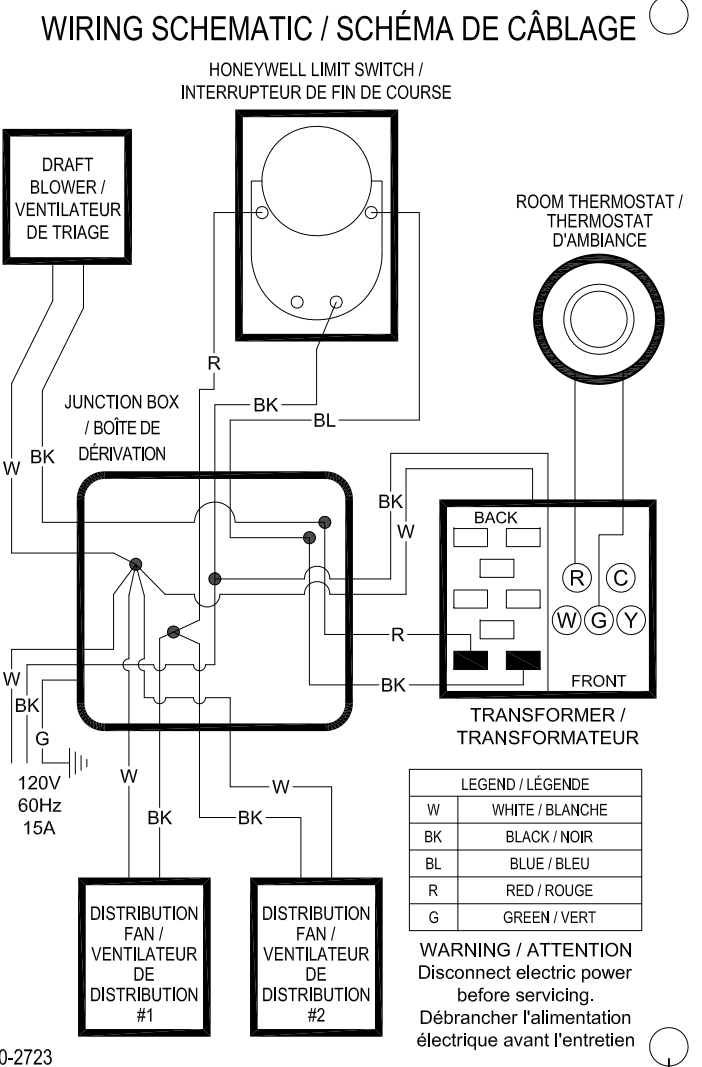
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**AVIS: RISQUE D'INCENDIE. VEILLEZ A CE QUE LE TIRAGE DE TUYAU N'EXCÈDE JAMAIS UNE COLONNE MONTANTE .06 po/14.93 Pa ET QUE LES PORTES DE CHARGEMENT ET DU CENDRIER DEMEURENT FERMÉES PENDANT L'USAGE. NE PLACEZ NI VOS RÉSERVES DE COMBUSTIBLES NI AUCUN AUTRE OBJET COMBUSTIBLE A DES INTERVALLES PLUS RAPPROCHÉS QUE CEUX INDIQUÉS AUX DIRECTIVES D'INSTALLATION. VÉRIFIEZ ET NETTOYEZ RÉGULIÈREMENT TUYAUX ET CHEMINÉE.**

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Manufactured For: U.S. Stove Company • 227 Industrial Park Road • South Pittsburg, TN 37380 • Ph.#: (800) 750-2723



**FINISH NOTES:**  
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	EXCEPT	±.005"	0.012 ALUMINUM	1:1	B	A	
	AS	DECIMAL	SEE NOTES	DWN BY	CDB	TITLE	
	NOTED	ANGULAR	REFERENCE	DATE	8/31/2022	CERTIFICATION LABEL	
							NUMBER
							SHEET
							1 OF 1

REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
A	INITIAL RELEASE	8/31/2022	CDB

Ø0.20 (4X)

Serial No. / N° de série

Mfg Date. / Date de Fabrication

Model / Modèle:

- VG1520
- N35
- C2235

**PFS** Report No. / Rapport N° 22-808

Listed Solid Wood Fuel Burning Central Furnace: USA and Canada.

Certified to / Certifié à: UL STD 391(R2014)  
 Certified to / Certifié à: CAN/CSA-B366.1 (R2015)  
 Tested to: CSA B415.1-10 at 0.13 lb/mmBtu

**U.S. ENVIRONMENTAL PROTECTION AGENCY**  
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FUEL / CARBURANT: WOOD ONLY / BOIS SEULEMENT	
Maximum Flue Draft / Tirant d'air maximum:	0.060 in./14.93 Pa
Electrical Rating / Tarif Electrique:	120VAC, 60Hz, 6 Amps
Minimum Supply Circuit Ampacity / Ampérage du circuit d'alimentation minimum:	15 Amps

MINIMUM CLEARANCES TO COMBUSTIBLES			
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FLOOR PROTECTOR / PROTECTEUR DE PLANCHER	
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R-Value of /	1.4

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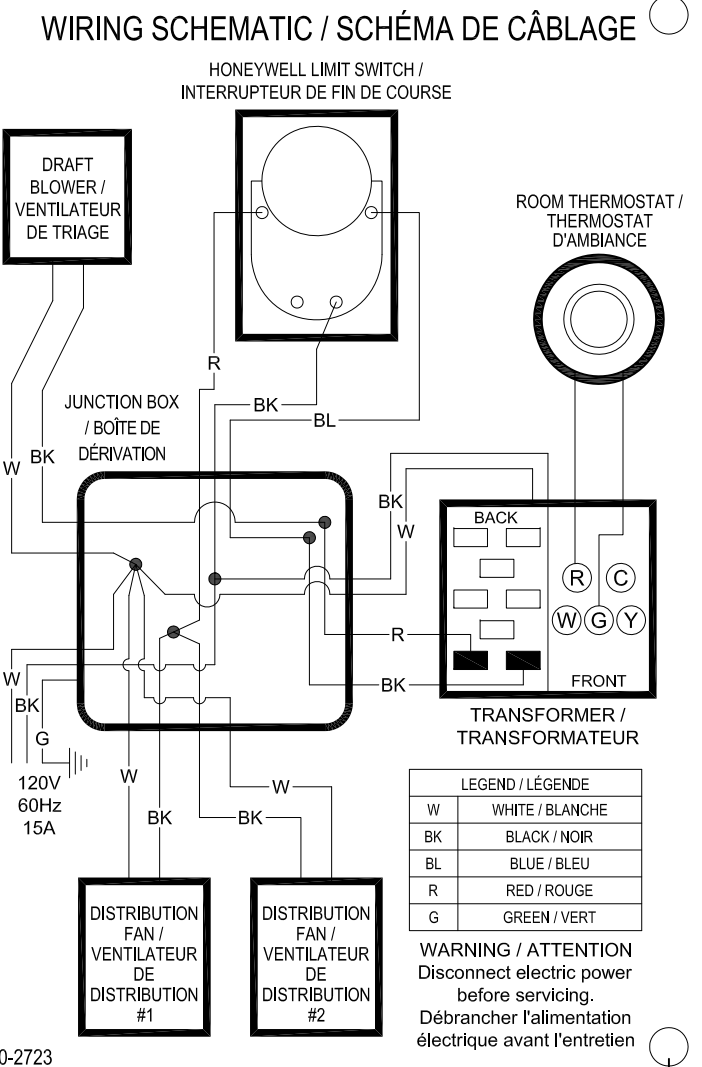
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Manufactured For: U.S. Stove Company • 227 Industrial Park Road • South Pittsburg, TN 37380 • Ph.#: (800) 750-2723



**FINISH NOTES:**  
 BLACK BACKGROUND. ALUMINUM TO SHOW THRU.

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	EXCEPT	±.005"	0.012 ALUMINUM	1:1	B	A	
	AS	DECIMAL	SEE NOTES	DWN BY			
	NOTED	ANGULAR	REFERENCE	CDB			
		±.2°		DATE	TITLE		NUMBER
				8/31/2022	CERTIFICATION LABEL		SHEET
							1 OF 1

REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
A	INITIAL RELEASE	1/30/24	SEH

ALUMINUM TO SHOW THROUGH SERIAL NUMBER TO BE STAMPED OR PRINTED. SEQUENTIAL RANGE ISSUED UPON ORDER OF LABELS OR APPLIANCES



Model / Modèle: CGWF4000

Serial No. / N° de série Mfg Date. / Date de Fabrication

Listed Solid Wood Fuel Burning Central Furnace: USA and Canada. Certified to / Certifié à: UL STD 391-2006 (R2019) Tested to: CSA B415.1:22 at 0.13 lb/mmBtu

U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with the 2020 particulate emission standards using cord wood.

CSA B415.1 DATA	
Average Particulate Emissions / Émissions moyennes de particules:	0.055 g/MJ
Average Delivered Efficiency / Efficacité moyenne délivrée	66% HHV
Minimum Delivered Output / Sortie minimale fournie	15,997 BTU/hr
Maximum Delivered Output / Puissance maximale délivrée	53,042 BTU/hr
Average Overall Efficiency / Efficacité globale moyenne	70% HHV
Minimum Overall Energy Output / Rendement énergétique globale min	16,351 BTU/hr
Maximum Overall Energy Output / Rendement énergétique globale max	65,258 BTU/hr
Electricity Usage / Consommation d'électricité	0.75 kW/hr

PATENT PENDING / BREVET EN COURS

FUEL / CARBURANT: WOOD ONLY / BOIS SEULEMENT	
Maximum Flue Draft / Tirant d'air maximum:	0.060 in./14.93 Pa
Electrical Rating / Tarif Electrique:	120VAC, 60Hz, 6 Amps
Minimum Supply Circuit Ampacity / Ampérage du circuit d'alimentation minimum:	15 Amps

MINIMUM CLEARANCES TO COMBUSTIBLES Inches [Metric]			
Backwall to furnace / Mur arrière à la fournaise	18 [457]	Supply duct (first 6') / Conduit d'alimentation (premier 6')	6 [153]
Sidewall to furnace / Paroi latérale à la fournaise	16 [407]	Supply duct after 6' / Conduit d'alimentation (après 6')	2 [52]
Sidewall to flue / Paroi latérale à coller	25 [635]	Minimum duct height / Hauteur minimale du conduit	8 [204]
Back wall to flue / Paroi arrière pour la combustion	18 [458]	Ceiling height to floor / Hauteur du plafond au sol	75 [1905]

FLOOR PROTECTOR / PROTECTEUR DE PLANCHER Requires an R-Value of / Nécessite une valeur R de: 1.4	
Beyond Front of Unit / Au-delà de l'avant de l'unité	24 [610]
Side/Back of Unit / Unité à côté/arrière	8 [204]
Beyond Venting / Autour de la ventilation	2 [50]

Unit must be installed on a level, non-combustible floor, or if a floor protector is used it should be listed to UL 1618 (type 2 thermal protection) or equal. Use a listed 6 inch, Class "A", All Fuel Chimney - Refer to chimney manufacturer's instructions.

L'unité doit être installée sur un plancher incombustible de plain-pied ou, si un protecteur de plancher est utilisé, il doit être homologué UL 1618 (protection thermique de type 2) ou équivalent. Utilisez une cheminée de 6 pouces, classe « A », entièrement combustible - Reportez-vous aux instructions du fabricant de la cheminée.

DO NOT COVER OR REMOVE THIS LABEL / VEILLEZ A NE JAMAIS DISSIMULER NI ENLEVER CETTE ETIQUETTE.

Install and use ONLY in accordance with the manufacturer's installation and operation instructions. Contact your local building code officials about restrictions and installation inspection in your area. FOR SAFETY KEEP FIRING AND ASHPIT DOORS TIGHTLY CLOSED. REFER TO OWNER'S MANUAL. NOT FOR USE IN MOBILE HOME.

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

DANGER: RISK OF FIRE OR EXPLOSION. DO NOT BURN GARBAGE, GASOLINE, NAPHTHA, DRAIN OIL, OR OTHER INAPPROPRIATE MATERIALS. DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.

WARNING: RISK OF FIRE. DO NOT OPERATE WITH FLUE DRAFT EXCEEDING 0.060in W.C. / 14.93 Pa WATER COLUMN. DO NOT OPERATE WITH FUEL LOADING AND ASH REMOVAL DOORS OPEN. DO NOT STORE FUEL OR OTHER COMBUSTIBLE MATERIALS WITHIN MARKED INSTALLATION CLEARANCES. INSPECT AND CLEAN FLUES AND CHIMNEY REGULARLY.

CAUTION: HOT SURFACES. KEEP CHILDREN AWAY. DO NOT TOUCH DURING OPERATION.

The heat exchanger, flue pipe, and chimney must be cleaned regularly to remove accumulated creosote and ash. Ensure that the heat exchanger, flue pipe, and chimney are cleaned at the end of the heating season to minimize corrosion during the summer months. The appliance, flue pipe, and chimney must be kept in good condition. To prevent flame or smoke spillage, crack open the fuel loading door for 10 seconds prior to opening door fully. Load fuel carefully or damage may result. Power Failure Instructions: DO NOT add additional fuel. Remove all air filters. Reduce combustion air to a minimum. Open Ductwork bypass damper. Observe furnace closely until power is restored. "Run-Away" Fire Instructions: Completely close all combustion air inlets. Alert your local fire dept. and everyone in the household.

This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owner's manual. Not to be connected to ductwork that is still connected to another furnace.

Installez et utilisez UNIQUEMENT conformément aux instructions d'installation et d'utilisation du fabricant. Communiquez avec les responsables du code du bâtiment local au sujet des restrictions et de l'inspection de l'installation dans votre région. POUR PLUS DE SÉCURITÉ, TENIR LES PORTES DE CUISSON ET D'ASSIETTE FERMÉES FERMEMENT. RÉFÉREZ-VOUS AU MANUEL DU PROPRIÉTAIRE. NE PAS UTILISER DANS UNE MAISON MOBILE.

UNE CHEMINÉE DESSERVANT DÉJÀ UN AUTRE APPAREIL NE POURRA ÊTRE UTILISÉE POUR Y RACCORDER CELUI-CI.

DANGER: RISQUE D'INCENDIE ET D'EXPLOSION. NE FAITES PAS BRÛLER D'ORDURES, D'ESSENCE, DE NAPHTHE, D'HUILE DE CANALISATION, NI D'AUTRES MATÉRIEAUX IMPROPRES. N'UTILISEZ PAS DE PRODUITS CHIMIQUES NI DE LIQUIDES EN ALLUMANT LE FEU.

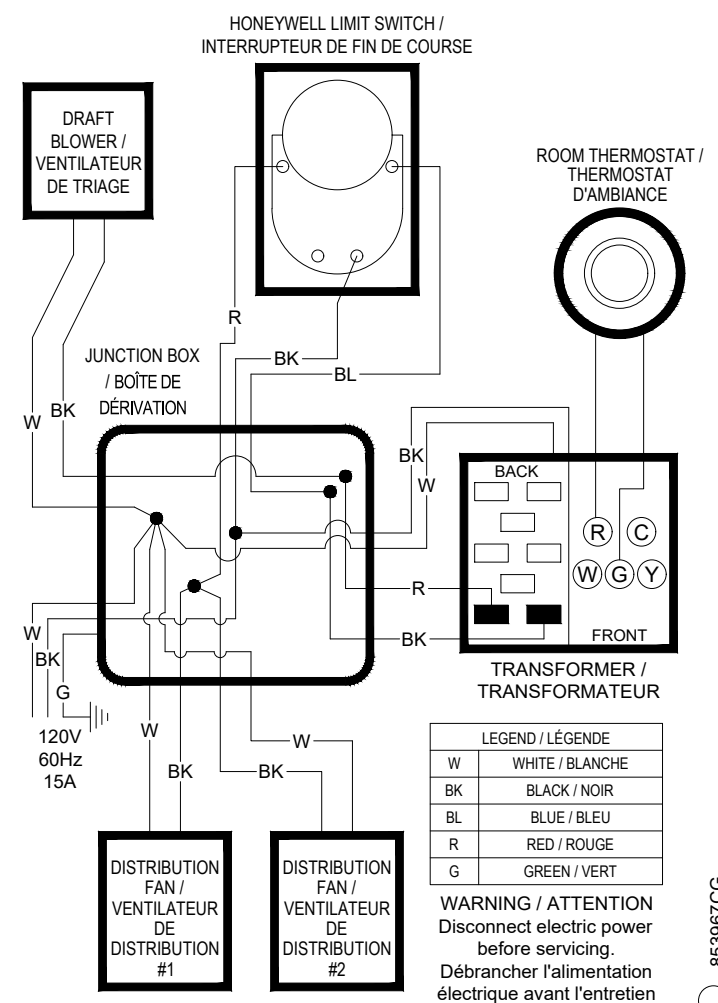
AVIS: RISQUE D'INCENDIE. VEILLEZ A CE QUE LE TIRAGE DE TUYAU NEXCÈDE JAMAIS UNE COLONNE MONTANTE .06 po/14.93 Pa Et QUE LES PORTES DE CHARGEMENT ET DU CENDRIER DEMEURENT FERMÉES PENDANT L'USAGE. NE PLACEZ NI VOS RÉSERVES DE COMBUSTIBLES NI AUCUN AUTRE OBJET COMBUSTIBLE A DES INTERVALLES PLUS RAPPROCHÉS QUE CEUX INDICUÉS AUX DIRECTIVES D'INSTALLATION. VÉRIFIEZ ET NETTOYEZ RÉGULIÈREMENT TUYAUX ET CHEMINÉE.

ATTENTION: SURFACES CHAUDES, A NE PAS TOUCHER PENDANT LE FONCTIONNEMENT. ÉLOIGNEZ LES ENFANTS DE L'APPAREIL ALLUME.

Nettoyer régulièrement l'échangeur de chaleur, le tuyau de fumée, et la cheminée à fin d'éviter l'accumulation de crésote ou de carbone. Pour éviter la corrosion en été, nettoyez l'échangeur de chaleur, le tuyau de fumée, et la cheminée à la fin de la saison de chauffage. Il faut bien maintenir l'outil, le tuyau de fumée, la cheminée, et aussi l'inducteur d'air si vous en utilisez. Pour empêcher la sortie de fumée et d'étincelles, avant d'ouvrir entièrement la porte de remplissage de carburant, entrouvrir la porte pendant 10 secondes. En cas de coupure de courant: Ne pas ajouter de carburant supplémentaire. Enlevez toutes les filtres d'air. Réduisez le plus que possible l'air comburant. Ouvrez registre de dérivation conduits. Surveillez bien le fourneau. Chargez le carburant avec précaution ou des dommages peuvent en résulter. Ne pas être connecté à un réseau de canalisation encore connecté à un autre four. Incendie incontrôlée: Fermez les canalisations d'air. Alertez les pompiers et tous les gens dans la maison. Pour les installations au Canada: Ne pas brancher aux tuyaux qui sont utilisés par un autre fourneau.

Manufactured For: U.S. Stove Company • 227 Industrial Park Road • South Pittsburg, TN 37380 • Ph.#: (800) 750-2723

WIRING SCHEMATIC / SCHÉMA DE CÂBLAGE



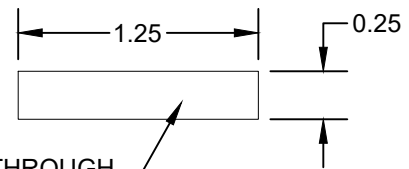
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CERTIFICATION LABEL							NUMBER 853967CG	SHEET 1 of 1



REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
A	INITIAL RELEASE	1/30/24	SEH

ALUMINUM TO SHOW THROUGH SERIAL NUMBER TO BE STAMPED OR PRINTED. SEQUENTIAL RANGE ISSUED UPON ORDER OF LABELS OR APPLIANCES



Model / Modèle:  
DHWF4000

Serial No. / N° de série  
Mfg Date. / Date de Fabrication

Listed Solid Wood Fuel Burning Central Furnace:  
USA and Canada.  
Certified to / Certifié à: UL STD 391-2006 (R2019)  
Certified to / Certifié à: CSA-B366.1-11 (R2020)  
Tested to: CSA B415.1:22 at 0.13 lb/mmBtu

**U.S. ENVIRONMENTAL PROTECTION AGENCY**  
Certified to comply with the 2020 particulate emission standards using cord wood.

CSA B415.1 DATA	
Average Particulate Emissions / Émissions moyennes de particules:	0.055 g/MJ
Average Delivered Efficiency / Efficacité moyenne délivrée	66% HHV
Minimum Delivered Output / Sortie minimale fournie	15,997 BTU/hr
Maximum Delivered Output / Puissance maximale délivrée	53,042 BTU/hr
Average Overall Efficiency / Efficacité globale moyenne	70% HHV
Minimum Overall Energy Output / Rendement énergétique globale min	16,351 BTU/hr
Maximum Overall Energy Output / Rendement énergétique globale max	65,258 BTU/hr
Electricity Usage / Consommation d'électricité	0.75 kW/hr

PATENT PENDING / BREVET EN COURS

FUEL / CARBURANT: WOOD ONLY / BOIS SEULEMENT	
Maximum Flue Draft / Tirant d'air maximum:	0.060 in./14.93 Pa
Electrical Rating / Tarif Electrique:	120VAC, 60Hz, 6 Amps
Minimum Supply Circuit Ampacity / Ampérage du circuit d'alimentation minimum:	15 Amps

MINIMUM CLEARANCES TO COMBUSTIBLES Inches [Metric]			
Backwall to furnace / Mur arrière à la fournaise	18 [457]	Supply duct (first 6') / Conduit d'alimentation (premier 6')	6 [153]
Sidewall to furnace / Paroi latérale à la fournaise	16 [407]	Supply duct after 6' / Conduit d'alimentation (après 6')	2 [52]
Sidewall to flue / Paroi latérale à coller	25 [635]	Minimum duct height / Hauteur minimale du conduit	8 [204]
Back wall to flue / Paroi arrière pour la combustion	18 [458]	Ceiling height to floor / Hauteur du plafond au sol	75 [1905]

FLOOR PROTECTOR / PROTECTEUR DE PLANCHER Requires an R-Value of / Nécessite une valeur R de: 1.4	
Beyond Front of Unit / Au-delà de l'avant de l'unité	24 [610]
Side/Back of Unit / Unité à côté/arrière	8 [204]
Beyond Venting / Autour de la ventilation	2 [50]

Unit must be installed on a level, non-combustible floor, or if a floor protector is used it should be listed to UL 1618 (type 2 thermal protection) or equal. Use a listed 6 inch, Class "A", All Fuel Chimney - Refer to chimney manufacturer's instructions.

L'unité doit être installée sur un plancher incombustible de plain-pied ou, si un protecteur de plancher est utilisé, il doit être homologué UL 1618 (protection thermique de type 2) ou équivalent. Utilisez une cheminée de 6 pouces, classe « A », entièrement combustible - Reportez-vous aux instructions du fabricant de la cheminée.

**DO NOT COVER OR REMOVE THIS LABEL / VEILLEZ A NE JAMAIS DISSIMULER NI ENLEVER CETTE ETIQUETTE.**

Install and use ONLY in accordance with the manufacturer's installation and operation instructions. Contact your local building code officials about restrictions and installation inspection in your area. FOR SAFETY KEEP FIRING AND ASHPIT DOORS TIGHTLY CLOSED. REFER TO OWNER'S MANUAL. NOT FOR USE IN MOBILE HOME.

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

**DANGER:** RISK OF FIRE OR EXPLOSION. DO NOT BURN GARBAGE, GASOLINE, NAPHTHA, DRAIN OIL, OR OTHER INAPPROPRIATE MATERIALS. DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.

**WARNING:** RISK OF FIRE. DO NOT OPERATE WITH FLUE DRAFT EXCEEDING 0.060in W.C. / 14.93 Pa WATER COLUMN. DO NOT OPERATE WITH FUEL LOADING AND ASH REMOVAL DOORS OPEN. DO NOT STORE FUEL OR OTHER COMBUSTIBLE MATERIALS WITHIN MARKED INSTALLATION CLEARANCES. INSPECT AND CLEAN FLUES AND CHIMNEY REGULARLY.

**CAUTION:** HOT SURFACES. KEEP CHILDREN AWAY. DO NOT TOUCH DURING OPERATION.

The heat exchanger, flue pipe, and chimney must be cleaned regularly to remove accumulated creosote and ash. Ensure that the heat exchanger, flue pipe, and chimney are cleaned at the end of the heating season to minimize corrosion during the summer months. The appliance, flue pipe, and chimney must be kept in good condition. To prevent flame or smoke spillage, crack open the fuel loading door for 10 seconds prior to opening door fully. Load fuel carefully or damage may result. Power Failure Instructions: DO NOT add additional fuel. Remove all air filters. Reduce combustion air to a minimum. Open Ductwork bypass damper. Observe furnace closely until power is restored. "Run-Away" Fire Instructions: Completely close all combustion air inlets. Alert your local fire dept. and everyone in the household.

This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owner's manual. Not to be connected to ductwork that is still connected to another furnace.

Installez et utilisez UNIQUEMENT conformément aux instructions d'installation et d'utilisation du fabricant. Communiquez avec les responsables du code du bâtiment local au sujet des restrictions et de l'inspection de l'installation dans votre région. POUR PLUS DE SÉCURITÉ, TENIR LES PORTES DE CUISSON ET D'ASSIETTE FERMÉES FERMEMENT. RÉFÉREZ-VOUS AU MANUEL DU PROPRIÉTAIRE. NE PAS UTILISER DANS UNE MAISON MOBILE.

**UNE CHEMINÉE DESSERVANT DÉJÀ UN AUTRE APPAREIL NE POURRA ÊTRE UTILISÉE POUR Y RACCORDER CELUI-CI.**

**DANGER:** RISQUE D'INCENDIE ET D'EXPLOSION. NE FAITES PAS BRÛLER D'ORDURES, D'ESSENCE, DE NAPHTA, D'HUILE DE CANALISATION, NI D'AUTRES MATÉRIEAUX IMPROPRES. N'UTILISEZ PAS DE PRODUITS CHIMIQUES NI DE LIQUIDES EN ALLUMANT LE FEU.

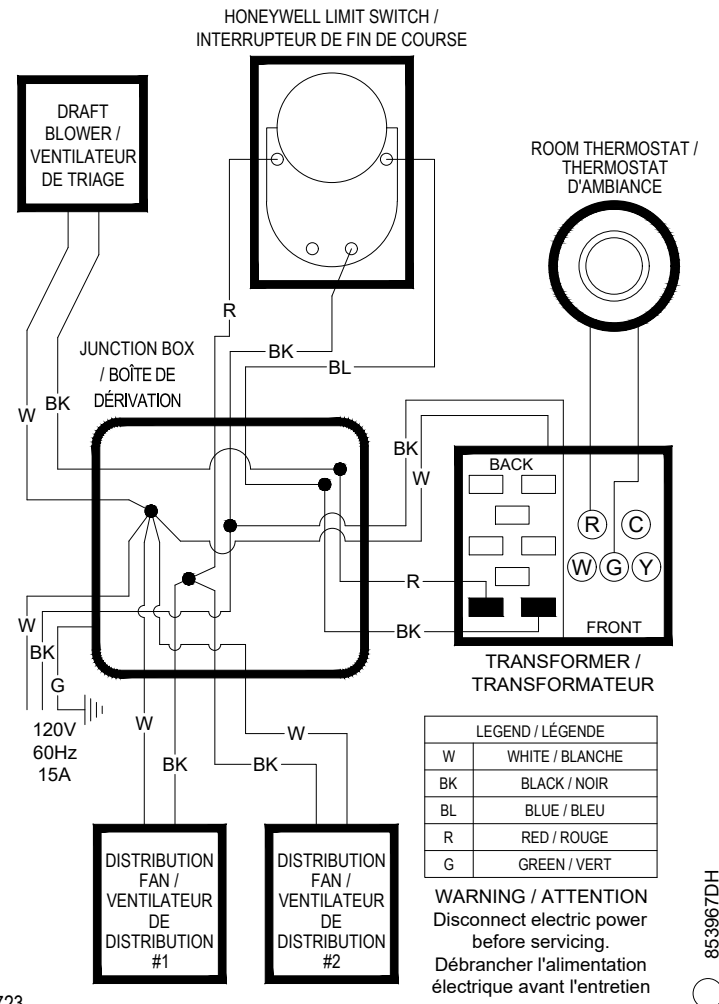
**AVIS:** RISQUE D'INCENDIE. VEILLEZ A CE QUE LE TIRAGE DE TUYAU N'EXCÈDE JAMAIS UNE COLONNE MONTANTE .06 po/14.93 Pa ET QUE LES PORTES DE CHARGEMENT ET DU CENDRIER DEMEURENT FERMÉES PENDANT L'USAGE. NE PLACEZ NI VOS RÉSERVES DE COMBUSTIBLES NI AUCUN AUTRE OBJET COMBUSTIBLE A DES INTERVALLES PLUS RAPPROCHÉS QUE CEUX INDICQUÉS AUX DIRECTIVES D'INSTALLATION. VÉRIFIEZ ET NETTOYEZ RÉGULIÈREMENT TUYAUX ET CHEMINÉE.

**ATTENTION:** SURFACES CHAUDES, A NE PAS TOUCHER PENDANT LE FONCTIONNEMENT. ÉLOIGNEZ LES ENFANTS DE L'APPAREIL ALLUMÉ.

Nettoyez régulièrement l'échangeur de chaleur, le tuyau de fumée, et la cheminée à la fin de la saison de chauffage. Il faut bien maintenir l'outil, le tuyau de fumée, la cheminée, et aussi l'inducteur d'air si vous en utilisez. Pour empêcher la sortie de fumée et d'étincelles, avant d'ouvrir entièrement la porte de remplissage de carburant, entrouvrir la porte pendant 10 secondes. En cas de coupure de courant : Ne pas ajouter de carburant supplémentaire. Enlevez toutes les filtres d'air. Réduisez le plus que possible l'air carburant. Ouvrez registre de dérivation conduits. Surveillez bien le fourneau. Chargez le carburant avec précaution ou des dommages peuvent en résulter. Ne pas être connecté à un réseau de canalisation encore connecté à un autre four. Incendie incontrôlée : Fermez les canalisations d'air. Alertez les pompiers et tous les gens dans la maison. Pour les installations au Canada : Ne pas branchez aux tuyaux qui sont utilisés par un autre fourneau.

Manufactured For: U.S. Stove Company • 227 Industrial Park Road • South Pittsburg, TN 37380 • Ph.#: (800) 750-2723

**WIRING SCHEMATIC / SCHÉMA DE CÂBLAGE**

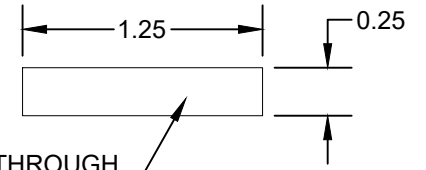


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CERTIFICATION LABEL							NUMBER 853967DH	SHEET 1 of 1

REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
A	INITIAL RELEASE	1/30/24	SEH

ALUMINUM TO SHOW THROUGH SERIAL NUMBER TO BE STAMPED OR PRINTED. SEQUENTIAL RANGE ISSUED UPON ORDER OF LABELS OR APPLIANCES



Model / Modèle:  
KWF1520

Serial No. / N° de série  
Mfg Date. / Date de Fabrication

Listed Solid Wood Fuel Burning Central Furnace:  
USA and Canada.  
Certified to / Certifié à: UL STD 391-2006 (R2019)  
Certified to / Certifié à: CSA-B366.1-11 (R2020)  
Tested to: CSA B415.1:22 at 0.13 lb/mmBtu

**U.S. ENVIRONMENTAL PROTECTION AGENCY**  
Certified to comply with the 2020 particulate emission standards using cord wood.

CSA B415.1 DATA	
Average Particulate Emissions / Émissions moyennes de particules:	0.055 g/MJ
Average Delivered Efficiency / Efficacité moyenne délivrée	66% HHV
Minimum Delivered Output / Sortie minimale fournie	15,997 BTU/hr
Maximum Delivered Output / Puissance maximale délivrée	53,042 BTU/hr
Average Overall Efficiency / Efficacité globale moyenne	70% HHV
Minimum Overall Energy Output / Rendement énergétique globale min	16,351 BTU/hr
Maximum Overall Energy Output / Rendement énergétique globale max	65,258 BTU/hr
Electricity Usage / Consommation d'électricité	0.75 kW/hr

PATENT PENDING / BREVET EN COURS

FUEL / CARBURANT: WOOD ONLY / BOIS SEULEMENT	
Maximum Flue Draft / Tirant d'air maximum:	0.060 in./14.93 Pa
Electrical Rating / Tarif Electrique:	120VAC, 60Hz, 6 Amps
Minimum Supply Circuit Ampacity / Ampérage du circuit d'alimentation minimum:	15 Amps

MINIMUM CLEARANCES TO COMBUSTIBLES Inches [Metric]			
Backwall to furnace / Mur arrière à la fournaise	18 [457]	Supply duct (first 6') / Conduit d'alimentation (premier 6')	6 [153]
Sidewall to furnace / Paroi latérale à la fournaise	16 [407]	Supply duct after 6' / Conduit d'alimentation (après 6')	2 [52]
Sidewall to flue / Paroi latérale à coller	25 [635]	Minimum duct height / Hauteur minimale du conduit	8 [204]
Back wall to flue / Paroi arrière pour la combustion	18 [458]	Ceiling height to floor / Hauteur du plafond au sol	75 [1905]

FLOOR PROTECTOR / PROTECTEUR DE PLANCHER	
Requires an R-Value of / Nécessite une valeur R de: 1.4	
Beyond Front of Unit / Au-delà de l'avant de l'unité	24 [610]
Side/Back of Unit / Unité à côté/arrière	8 [204]
Beyond Venting / Autour de la ventilation	2 [50]

Unit must be installed on a level, non-combustible floor, or if a floor protector is used it should be listed to UL 1618 (type 2 thermal protection) or equal. Use a listed 6 inch, Class "A", All Fuel Chimney - Refer to chimney manufacturer's instructions.

L'unité doit être installée sur un plancher incombustible de plain-pied ou, si un protecteur de plancher est utilisé, il doit être homologué UL 1618 (protection thermique de type 2) ou équivalent. Utilisez une cheminée de 6 pouces, classe « A », entièrement combustible - Reportez-vous aux instructions du fabricant de la cheminée.

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

**DANGER:** RISK OF FIRE OR EXPLOSION. DO NOT BURN GARBAGE, GASOLINE, NAPHTHA, DRAIN OIL, OR OTHER INAPPROPRIATE MATERIALS. DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.

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**CAUTION:** HOT SURFACES. KEEP CHILDREN AWAY. DO NOT TOUCH DURING OPERATION.

The heat exchanger, flue pipe, and chimney must be cleaned regularly to remove accumulated creosote and ash. Ensure that the heat exchanger, flue pipe, and chimney are cleaned at the end of the heating season to minimize corrosion during the summer months. The appliance, flue pipe, and chimney must be kept in good condition. To prevent flame or smoke spillage, crack open the fuel loading door for 10 seconds prior to opening door fully. Load fuel carefully or damage may result. Power Failure Instructions: DO NOT add additional fuel. Remove all air filters. Reduce combustion air to a minimum. Open Ductwork bypass damper. Observe furnace closely until power is restored. "Run-Away" Fire Instructions: Completely close all combustion air inlets. Alert your local fire dept. and everyone in the household.

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UNE CHEMINÉE DESSERVANT DÉJÀ UN AUTRE APPAREIL NE POURRA ÊTRE UTILISÉE POUR Y RACCORDER CELUI-CI.

**DANGER:** RISQUE D'INCENDIE ET D'EXPLOSION. NE FAITES PAS BRÛLER D'ORDURES, D'ESSENCE, DE NAPHTHE, D'HUILE DE CANALISATION, NI D'AUTRES MATÉRIEAUX IMPROPRES. NUTILISEZ PAS DE PRODUITS CHIMIQUES NI DE LIQUIDES EN ALLUMANT LE FEU.

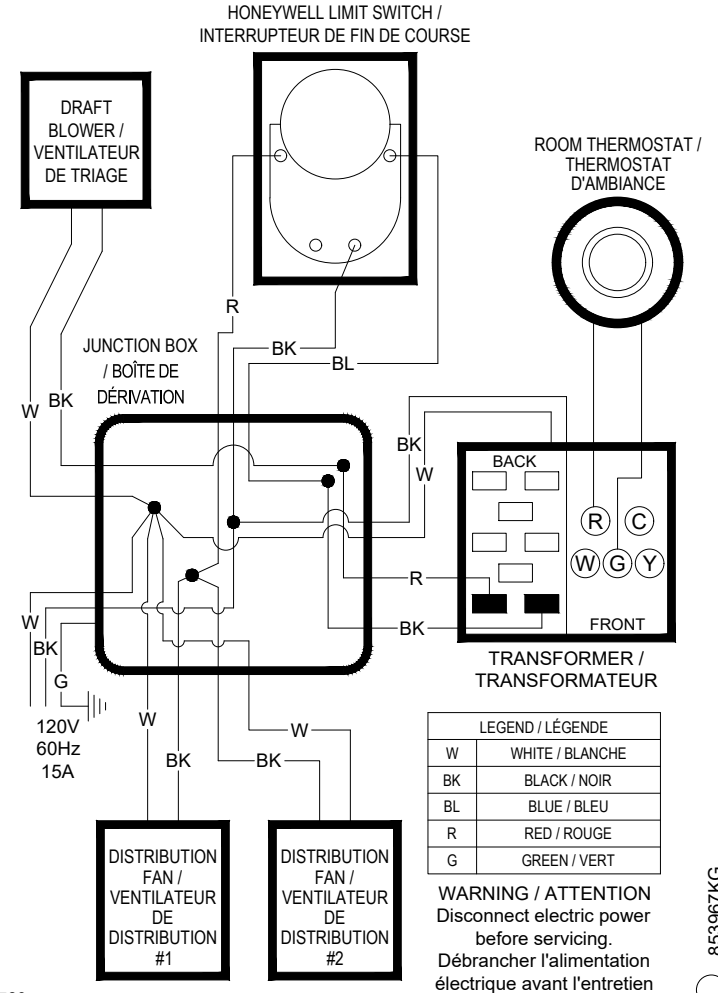
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**ATTENTION:** SURFACES CHAUDES, A NE PAS TOUCHER PENDANT LE FONCTIONNEMENT. ÉLOIGNEZ LES ENFANTS DE L'APPAREIL ALLUME.

Nettoyer régulièrement échangeur de chaleur, le tuyau de fumée, et la cheminée à fin d'éviter l'accumulation de créosote ou de carbone. Pour éviter la corrosion en été, nettoyez l'échangeur de chaleur, le tuyau de fumée, et la cheminée à la fin de la saison de chauffage. Il faut bien maintenir l'outil, le tuyau de fumée, la cheminée, et aussi l'inducteur d'air si vous en utilisez. Pour empêcher la sortie de fumée et d'étincelles, avant d'ouvrir entièrement la porte de remplissage de carburant, entrouvrir la porte pendant 10 secondes. En cas de coupure de courant: Ne pas ajouter de carburant supplémentaire. Enlevez toutes les filtres d'air. Réduisez le plus que possible l'air carburant. Ouvrez registre de dérivation conduits. Surveillez bien le fourneau. Chargez le carburant avec précaution ou des dommages peuvent en résulter. Ne pas être connecté à un réseau de canalisation encore connecté à un autre four. Incendie incontrôlé: Fermez les canalisations d'air. Alertez les pompiers et tous les gens dans la maison. Pour les installations au Canada: Ne pas branchez aux tuyaux qui sont utilisés par un autre fourneau.

Manufactured For: U.S. Stove Company • 227 Industrial Park Road • South Pittsburg, TN 37380 • Ph.#: (800) 750-2723

WIRING SCHEMATIC / SCHÉMA DE CÂBLAGE



FINISH NOTES:  
BLACK BACKGROUND. ALUMINUM TO SHOW THRU.

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CERTIFICATION LABEL							NUMBER 853967KG	SHEET 1 of 1



# Limited Warranty

The operation of this unit in a manner inconsistent with the owner's manual will void the warranty and is also against federal regulations. United States Stove Company warrants this product to be free from defects in material and workmanship, to the original retail purchaser only, for the time period identified below, measured from the date of the initial purchase as evidenced on an invoice, cancelled check, sales receipt, etc., to receipt of a claim by United States Stove Company ("USSC") or an authorized dealer, as follows:

TIME PERIOD	
Steel Part/Firebox, Heat Exchanger, Door, Trim	Five Year Limited
Gaskets	One Year Limited
All Electrical Components (Blower, Auger / Agitator Motor, PC Board, Switches)	One Year Limited
Ceramic Glass	One Year Limited

## WARRANTY CONDITIONS

- This warranty only covers USSC appliances that are purchased through an USSC authorized retailer, dealer or distributor.
- This warranty is only valid while the USSC appliance remains at the site of original installation. This warranty does not apply to products purchased for rental use.

## CLAIM PROCEDURE

Contact United States Stove Company for warranty service. You will be asked to provide detailed descriptions and pertinent data, including proof of purchase which will be returned upon request. Providing the heater has been installed and used in accordance with the Owner's Manual supplied with the heater and the issue does not fall under a situation of exclusion, United States Stove Company will either:

- Replace the defective part free of charge. Parts and/or service replacements made under the terms of this warranty are warranted only for the remaining period of the original heater warranty.
- Replace the heater free of charge. Should the heater be replaced by United States Stove Company "free of charge", all further warranty obligations are thereby met.
- Where the defect is of a cosmetic (non-functional) nature, United States Stove Company will bear reasonable expense to repair the heater, including such items as welding, painting, and incidental labor. A "reasonable expense" is defined by terms of this warranty as \$30.00/hour with full refund for any purchase of parts.

## WARRANTY EXCLUSIONS

This warranty does not cover the following:

- Damage to or changes in surface finishes as a result of normal use. As a heating appliance, some changes in color or interior and exterior surface finishes may occur. This is not a flaw and is not covered under warranty.
- Damage to printed, plated, or enameled surfaces caused by fingerprints, accidents, misuse, scratches, melted items, or other external sources and residues left on the plated surfaces from the use of abrasive cleaners or polishes.
- Repair or replacement of parts that are subject to normal wear and tear during the warranty period. These parts include: paint, pellet, and the discoloration of glass.
- Minor expansion, contraction, or movement of certain parts causing noise. These conditions are normal and complaints related to this noise are not covered by this warranty.
- Damages resulting from: (1) failure to install, operate, or maintain the appliance in accordance with the installation instructions, operating instructions, and listing agent identification label furnished with the appliance; (2) failure to install the appliance in accordance with local building codes and/or authorities having jurisdiction; (3) shipping or improper handling; (4) improper operation, abuse, misuse, continued operation with damaged, corroded or failed components, accident, alteration, or improperly/incorrectly performed repairs; (5) environmental conditions, weather, inadequate ventilation, negative pressure, or drafting caused by tightly sealed constructions, insufficient make-up air supply, or handling devices such as exhaust fans or forced air furnaces or other such causes; (6) use of fuels other than those specified in the operating instructions; (7) installation or use of components not supplied with appliance

- or any other components not expressly authorized and approved by USSC; (8) modification of the appliance not expressly authorized and approved by USSC in writing; and/or (9) interruptions or fluctuations of electrical power supply to the appliance.
- Non-USSC venting components, hearth components or other accessories used in conjunction with the appliance.
- USSC's obligation under this warranty does not extend to the appliance's capability to heat the desired space. Information is provided to assist the consumer and the dealer in selecting the proper appliance for the application. Consideration must be given to appliance location and configuration, environmental conditions, insulation and air tightness of the structure.
- Problems relating to smoking or creosote. Smoking is attributable to inadequate draft due to the design or installation of the flue system or installation of the heater itself. Creosote formation is largely attributable to improper operation of the unit and/or draft as mentioned above.
- Any cost associated with product removal and re-installation, travel, transportation, or shipping.
- Service calls to diagnose trouble (unless authorized in writing by the manufacturer, distributor, or dealer).

## THIS WARRANTY IS VOID IF

- The appliance has been over-fired or operated in atmospheres contaminated by chlorine, fluorine, or other damaging chemicals. Over-firing can be identified by, but not limited to, warped plates or tubes, rust colored cast iron, bubbling, cracking and discoloration of steel or enamel finishes.
- The appliance is subjected to prolonged periods of dampness or condensation.
- There is any damage to the appliance or other components due to water or weather damage which is the result of, but not limited to, improper chimney or venting installation.

## LIMITATIONS OF LIABILITY

The owner's exclusive remedy and USSC's sole obligation under this warranty, under any other warranty, express or implied, or in contract, tort or otherwise, shall be limited to replacement, repair, or refund, in USSC's sole and absolute discretion. In no event will USSC be liable for any incidental or consequential damages. THE LIMITED WARRANTY SET FORTH HEREIN IS THE SOLE WARRANTY PROVIDED TO PURCHASER AND IS IN LIEU OF ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESS OR IMPLIED. USSC MAKES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCT, OTHER THAN (i) THE LIMITED WARRANTY ABOVE, AND (ii) ANY IMPLIED WARRANTIES IMPOSED BY APPLICABLE LAW WHICH CANNOT BE WAIVED OR DISCLAIMED UNDER APPLICABLE LAW. ALL OTHER WARRANTIES OF ANY KIND, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED AND EXCLUDED TO THE FULLEST EXTENT NOT PROHIBITED BY APPLICABLE LAW. This Limited Warranty gives the purchaser specific legal rights; a purchaser may have other rights depending upon where he or she resides. Some states do not allow the exclusion or limitation of special, incidental or consequential damages, or state law may affect the duration of limitations, so the above exclusion and limitations may not be applicable.

## WARRANTOR

The warrantor of record is United States Stove Company, PO Box 151, 227 Industrial Park Road, South Pittsburg, Tennessee 37380. Phone number: (800)-750-2723. Register your product on line at [www.usstove.com](http://www.usstove.com). Save your proof of purchase, as documented in a receipt or invoice, with your records for any claims.

## IMPORTANT

We congratulate you on your selection of United States Stove Company and its products. As the oldest solid fuel manufacturer in the United States (since 1869), the United States Stove Company is very proud of its products, service, employees, and satisfied customers. We would like to hear from you if you are not satisfied with the manner in which you have been handled by our distributor, dealer, representative, customer service department, parts department, or sales department. Please reach out to us by using any of the contact information listed above.

# Garantie limitée

L'utilisation de cette unité en contradiction avec le manuel de l'utilisateur annulera la garantie, tout en enfreignant les réglementations fédérales. United States Stove Company garantit, uniquement à l'acheteur au détail original, que ce produit est exempt de défauts des matériaux et de qualité de l'exécution, pendant la période indiquée ci-dessous, de la date initiale d'achat prouvée par une facture, un chèque oblitéré, un reçu de vente, etc., de United States Stove Company (« USSC ») ou d'un détaillant autorisé, comme suit :

DÉLAI PRESCRIT	
Steel PartFirebox, Heat Exchanger, Door, Trim	Cinq ans limités
Joints d'étanchéité	Un an limités
Tous les composants électriques (Souffleur, moteur de la vis/agitateur, carte de circuit imprimé, commutateurs)	Un an limités
Vitre céramique	Un an limités

## CONDITIONS DE LA GARANTIE

- La garantie ne couvre que les appareils USSC achetés chez un détaillant ou distributeur USSC autorisé.
- Cette garantie n'est valide que si l'appareil USSC demeure sur le site d'installation d'origine. Cette garantie ne s'applique pas aux produits achetés pour la location.

## PROCÉDURE DE RÉCLAMATION

Contactez United States Stove Company pour un service sur garantie. Il vous sera demandé de fournir les descriptions et données pertinentes, incluant la preuve d'achat qui sera retournée sur demande. Sous réserve que l'appareil de chauffage ait été installé et utilisé conformément avec le Manuel du propriétaire fourni avec cet appareil de chauffage et que le problème ne porte pas sur une situation d'exclusion, United States Stove Company :

- Remplacera sans frais la pièce défectueuse. Les pièces et/ou les remplacements d'entretien effectués selon les termes de cette garantie le sont uniquement pour le reste de la période originale de la garantie de ce produit.
- Remplacer l'appareil de chauffage sans frais. Si l'appareil de chauffage doit être remplacé par United States Stove Company « sans frais », tous les engagements au titre de cette garantie seront respectés.
- Si le défaut est de nature esthétique (non fonctionnel), United States Stove Company assumera les frais pour réparation de l'appareil de chauffage, incluant les éléments comme la soudure, la peinture et la main-d'œuvre accessoire. Les « frais raisonnables » définis aux termes de cette garantie sont de 30,00 \$/heure avec un remboursement complet pour tout achat de pièces.

## EXCLUSIONS DE LA GARANTIE

Cette garantie ne couvre pas ce qui suit :

- Dommage ou modification du fini de la surface causé par une utilisation normale. Comme il s'agit d'un appareil de chauffage, il pourrait se produire une certaine modification de la couleur et des finis de la surface intérieure et extérieure. Il ne s'agit pas d'un défaut et ce n'est pas couvert par la garantie.
- Détérioration des surfaces imprimées, plaquées ou émaillées par les marques de doigts, accidents, abus, égratignures et pièces qui ont fondu ou autres causes externes, ainsi que les résidus laissés sur les surfaces plaquées par l'utilisation de nettoyeurs ou produits à polir abrasifs.
- Réparation ou remplacement des pièces soumises à une usure normale pendant la période de garantie. Ces pièces comprennent : peinture, granulés et décoloration de la vitre.
- Bruit causé par la dilatation, contraction ou déplacements mineurs de certaines pièces. Ces conditions sont normales et les réclamations liées à ce bruit ne sont pas couvertes par cette garantie.
- Dommages causés par : (1) l'installation, l'utilisation ou la maintenance de l'appareil sans tenir compte des instructions d'installation et d'utilisation, et sans consulter l'étiquette d'identification de l'agent de listé; (2) le non-respect des codes du bâtiment locaux et/ou des autorités ayant juridiction pendant l'installation de l'appareil; (3) l'expédition ou la mauvaise manutention; (4) la mauvaise utilisation, l'abus, l'utilisation continue alors que des composants sont endommagés, corrodés ou défectueux, l'utilisation après un accident, des modifications ou des réparations négligentes/incorrectes; (5) les conditions liées à l'environnement et à la météo, une mauvaise ventilation, une pression négative ou un mauvais tirage en raison de l'étanchéité de la construction, l'approvisionnement insuffisant en air d'appoint ou d'autres dispositifs tels que des ventilateurs de tirage, des chaudières à air pulsé ou toute autre cause; (6) l'utilisation de combustibles autres que ceux mentionnés dans les instructions d'utilisation; (7) l'installation ou l'utilisation de composants qui n'ont pas été

fournis avec l'appareil ou de tout autre composant n'ayant pas été expressément autorisé et approuvé par USSC; (8) les modifications de l'appareil qui n'ont pas été expressément autorisées et approuvées par écrit par USSC; et/ou (9) les interruptions ou fluctuations de l'alimentation électrique de l'appareil.

- Composants d'évacuation des gaz, composants de l'âtre ou accessoires utilisés avec l'appareil et qui n'ont pas été fournis par USSC.
- Obligations de USSC, en vertu de cette garantie, ne couvrent pas la capacité de l'appareil à chauffer l'espace souhaité. Des informations sont fournies pour aider le consommateur et le détaillant lors de la sélection de l'appareil adéquat pour l'application envisagée. On doit tenir compte de l'emplacement et de la configuration de l'appareil, des conditions liées à l'environnement, de l'isolation et de l'étanchéité de la structure.
- Problèmes liés à la fumée ou au créosote. La fumée provient généralement d'un tirage inadéquat en raison de la conception ou de l'installation du système de conduit ou de l'installation de l'appareil de chauffage lui-même. La formation de créosote est largement attribuable au mauvais fonctionnement de l'unité et/ou du tirage, comme il est mentionné ci-dessus.
- Tous les coûts associés à l'enlèvement et à la réinstallation du produit, son déplacement, transport ou expédition.
- Appels de service afin de diagnostiquer les problèmes (à moins d'être reconnu par écrit par le fabricant, le distributeur ou le détaillant).

## CETTE GARANTIE EST ANNULÉE SI

- L'appareil a subi une surchauffe ou a été utilisé avec de l'air contaminé par le chlore, le fluor ou d'autres produits chimiques nuisibles. La surchauffe peut être établie, sans s'y limiter, par la déformation des plaques ou tubes, la couleur rouille de la fonte, l'apparition de bulles et de craquelures, et la décoloration des surfaces en acier ou émaillées.
- L'appareil est soumis à l'humidité ou à la condensation pendant de longues périodes.
- Les dommages causés à l'appareil ou aux autres composants par l'eau ou les intempéries en raison, entre autres, d'une mauvaise installation de la cheminée ou du conduit d'évacuation.

## RESTRICTIONS DE LA GARANTIE

Le seul recours du propriétaire et la seule obligation de USSC en vertu de cette garantie ou de toute autre garantie, explicite ou tacite, contractuelle, à tort ou à raison, sont limités au remplacement, à la réparation ou au remboursement. En aucun cas, USSC ne saurait être tenue responsable des dommages fortuits ou consécutifs. LA GARANTIE LIMITÉE INCLUSE AUX PRÉSENTES EST LA SEULE DISPONIBLE POUR L'ACHETEUR, TENANT LIEU DE TOUTES AUTRES GARANTIES OU DÉCLARATIONS, FORMELLE OU TACITE. USSC NE FAIT AUCUNE DÉCLARATION OU GARANTIE DE TOUTE SORTE, QU'ELLE SOIT TACITE OU FORMELLE, RELATIVEMENT AU PRODUIT, AUTRE QUE (i) LA GARANTIE LIMITÉE MENTIONNÉE CI-DESSUS, ET (ii) TOUTE GARANTIE TACITE IMPOSÉE PAR LE DROIT APPLICABLE PAR LAQUELLE ELLE NE PEUT ÊTRE ANNULÉE OU DÉCLINÉE SELON LE DROIT APPLICABLE. TOUTES AUTRES GARANTIES DE TOUT GENRE, INCLUANT, MAIS SANS S'Y LIMITER, AUX GARANTIES TACITES DE QUALITÉ MARCHANDE OU D'APTITUDE À L'EMPLOI, SONT DONC AUX PRÉSENTES, DÉCLINÉES ET EXCLUES JUSQU'À LA LIMITE DU DROIT APPLICABLE. Cette garantie limitée confère à l'acheteur des droits juridiques spécifiques; les droits de l'acheteur pourraient différer selon son lieu de résidence. Certains États ne permettent pas l'exclusion ou la limitation de dommages particuliers, accessoires ou indirects, ou des lois d'État peuvent avoir un impact sur la durée des limitations; ainsi, l'exclusion et les limitations précédentes pourraient ne pas s'appliquer.

## GARANT

Le garant de ce dossier est United States Stove Company, PO Box 151, 227 Industrial Park Road, South Pittsburg, Tennessee 37380. Numéro de téléphone : (800)-750-2723. Enregistrez votre produit en ligne au [www.usstove.com](http://www.usstove.com). Conservez votre preuve d'achat, documentée sous forme de facture ou de reçu, en cas de réclamation.

## IMPORTANT

Félicitation d'avoir choisi United States Stove Company et ses produits. Étant le plus ancien fabricant de combustible solide aux États-Unis (depuis 1869), United States Stove Company est fière de ses produits, son service, ses employés, et ses clients satisfaits. Nous aimerions le savoir si vous êtes insatisfait de la façon dont vous auriez répondu l'un de nos distributeurs, détaillants, représentants, service à la clientèle, service des pièces ou service des ventes. Veuillez nous joindre en utilisant l'un des moyens pour nous contacter indiqués ci-dessous.

## Appendix 7 Participants

**Danick Power ing.**  
v-p operation  
**Services Polytests inc.**  
450.741.3636  
[www.polytests.com](http://www.polytests.com)

**Maxime Martin**  
Technicien  
**Services Polytests inc.**  
450.741.3636  
[www.polytests.com](http://www.polytests.com)

## **Appendix 8      Proportionality results**



Particulates Calculations

	Outlet	Outlet	Average	Average	# 1	# 2		
Tunnel	Temp.	Temp.	101,67	99,86	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) <sup>2</sup>
17,675	529,2	529,9			0,183	0,185	0	0,264867685835777
17,722	529,5	530,0	102,3	100,7	0,183	0,185	1	0,263169886
17,878	529,5	530,1	102,4	101,3	0,183	0,185	2	0,264020675
17,693	529,6	530,2	102,2	100,6	0,183	0,185	3	0,263242833
17,761	529,7	530,3	102,5	101,2	0,183	0,185	4	0,263243567
17,707	529,8	530,6	103,7	102,3	0,183	0,185	5	0,261244003
17,804	530,0	530,8	104,0	102,5	0,183	0,184	6	0,261678928
17,821	529,9	530,9	104,6	103,1	0,183	0,184	7	0,260888996
17,905	529,9	531,0	104,8	103,2	0,183	0,184	8	0,261278124
17,926	530,0	531,2	105,4	103,5	0,183	0,184	9	0,260892615
17,898	530,0	531,3	106,0	104,2	0,183	0,184	10	0,259907995
17,611	530,0	531,5	107,9	106,3	0,183	0,184	11	0,255271962
17,649	530,0	531,6	108,0	106,4	0,183	0,184	12	0,255526186
17,842	530,0	531,7	107,3	105,6	0,183	0,184	13	0,25792552
17,569	530,0	531,8	109,1	107,6	0,183	0,184	14	0,253710778
18,061	529,9	531,9	106,4	104,5	0,183	0,184	15	0,260689331
17,821	530,0	532,0	107,9	106,0	0,183	0,184	16	0,257122035
17,662	530,0	532,2	108,8	107,1	0,183	0,184	17	0,254723192
17,866	530,1	532,3	107,8	105,9	0,183	0,184	18	0,257528049
17,611	530,1	532,5	109,4	107,5	0,183	0,184	19	0,253657104
17,857	530,2	532,6	107,9	106,2	0,183	0,184	20	0,257129963
17,643	530,2	532,7	109,2	107,5	0,183	0,184	21	0,254117053
17,680	530,2	532,8	109,1	107,5	0,183	0,184	22	0,254457681
17,959	530,1	532,8	107,5	105,7	0,183	0,184	23	0,258402331
17,543	530,1	532,9	110,2	108,6	0,183	0,184	24	0,252295324
17,702	530,2	532,9	109,3	107,2	0,183	0,184	25	0,254632197
17,647	530,2	533,0	109,5	107,9	0,183	0,184	26	0,253815639
17,769	530,3	533,2	108,7	106,6	0,183	0,184	27	0,255539603
17,870	530,3	533,3	108,0	106,4	0,183	0,184	28	0,257129917
17,614	530,4	533,4	109,7	107,8	0,183	0,184	29	0,253308868
17,714	530,4	533,5	109,1	107,3	0,183	0,184	30	0,254723285
17,643	530,5	533,6	109,4	107,7	0,183	0,184	31	0,253714818
17,697	530,5	533,7	109,0	106,8	0,183	0,183	32	0,254723079
17,710	530,5	533,8	108,8	107,3	0,183	0,184	33	0,254722396
17,821	530,5	533,8	108,2	106,3	0,183	0,184	34	0,256497798
17,530	530,6	534,0	109,9	108,2	0,183	0,184	35	0,252296193
17,695	530,6	534,1	108,8	107,1	0,183	0,184	36	0,254723679
17,620	530,6	534,2	109,4	107,5	0,183	0,184	37	0,253729553
17,799	530,7	534,3	108,0	106,2	0,183	0,184	38	0,256534028
17,988	530,7	534,3	106,8	105,1	0,183	0,184	39	0,259316137
17,718	530,8	534,5	108,1	106,7	0,183	0,184	40	0,255531168
17,904	530,8	534,5	106,9	105,0	0,183	0,184	41	0,258525413
17,884	530,8	534,6	107,0	105,0	0,183	0,184	42	0,258524915
17,824	530,9	534,7	107,0	105,1	0,183	0,184	43	0,257927258
17,810	530,9	534,7	106,9	104,9	0,183	0,184	44	0,257927923
17,576	530,9	534,7	108,3	106,0	0,183	0,183	45	0,254724184
17,784	530,9	534,8	106,8	104,7	0,183	0,183	46	0,257928357
17,865	530,9	534,9	106,1	104,2	0,183	0,183	47	0,259317488
17,692	530,9	534,9	106,8	105,0	0,183	0,183	48	0,257137279
17,893	530,9	535,0	105,5	103,4	0,183	0,183	49	0,260305514
17,942	530,9	535,0	105,0	103,1	0,183	0,183	50	0,261290233
17,800	530,9	535,0	105,5	103,5	0,183	0,183	51	0,259544997
17,776	531,0	535,1	105,5	103,7	0,183	0,183	52	0,259317718
17,661	531,0	535,1	105,9	104,0	0,183	0,183	53	0,257929023
17,902	531,0	535,2	104,4	102,5	0,183	0,183	54	0,261682254
17,683	531,0	535,2	105,4	103,7	0,183	0,183	55	0,258571575
17,822	531,1	535,2	104,7	102,4	0,183	0,183	56	0,260909932
17,762	531,1	535,3	104,6	102,7	0,183	0,183	57	0,260306009
17,820	531,1	535,3	104,1	102,0	0,183	0,183	58	0,261291164
17,785	531,1	535,4	104,3	102,4	0,183	0,183	59	0,260896846
17,779	531,2	535,4	104,2	102,2	0,183	0,183	60	0,260896928
17,718	531,2	535,4	104,5	102,7	0,183	0,183	61	0,260306265
17,843	531,2	535,5	103,7	101,6	0,183	0,183	62	0,262272309
17,684	531,2	535,5	104,5	102,5	0,183	0,183	63	0,260111716
18,096	531,2	535,5	102,0	99,8	0,183	0,183	64	0,266347437
17,803	531,3	535,5	103,3	101,4	0,183	0,183	65	0,2622722
17,861	531,3	535,6	102,8	100,8	0,183	0,183	66	0,263298039
17,702	531,4	535,6	103,5	101,6	0,183	0,183	67	0,261234138

Particulates Calculations

17,718	531,4	535,7	103,4	101,6	0,183	0,184	68	0,261683156
17,651	531,4	535,8	103,4	101,5	0,183	0,183	69	0,26089851
17,527	531,5	535,8	103,9	101,8	0,183	0,183	70	0,259499513
17,765	531,5	535,9	102,4	100,3	0,183	0,183	71	0,263276106
17,831	531,6	535,9	101,5	99,5	0,183	0,183	72	0,264610859
17,749	531,6	535,9	101,9	100,1	0,183	0,183	73	0,26363914
17,666	531,6	535,9	102,3	100,5	0,183	0,183	74	0,262524667
17,815	531,5	535,9	101,2	99,4	0,183	0,183	75	0,264998804
17,735	531,5	535,9	101,6	99,5	0,183	0,183	76	0,264028269
17,750	531,5	535,9	101,2	99,2	0,183	0,183	77	0,264611724
17,531	531,5	535,9	102,2	100,1	0,183	0,183	78	0,261684714
17,825	531,5	535,9	100,2	98,6	0,183	0,183	79	0,266350301
17,431	531,6	535,9	102,5	100,6	0,183	0,184	80	0,260547882
17,643	531,6	535,9	101,2	99,0	0,183	0,183	81	0,263917737
17,438	531,7	536,0	102,4	100,4	0,183	0,183	82	0,2608984
17,584	531,9	536,1	101,1	99,2	0,183	0,183	83	0,263248956
17,620	532,2	536,2	100,9	99,1	0,183	0,183	84	0,263947032
17,708	532,4	536,4	100,1	98,4	0,182	0,183	85	0,265387188
17,579	532,6	536,6	100,4	98,9	0,182	0,183	86	0,263641039
17,444	532,9	536,8	101,4	99,5	0,182	0,183	87	0,261685151
17,409	533,1	536,9	101,5	99,5	0,182	0,183	88	0,261340222
17,576	533,3	537,1	100,3	98,3	0,182	0,183	89	0,264032279
17,790	533,5	537,3	98,8	97,4	0,182	0,183	90	0,267316187
17,573	533,6	537,4	100,0	98,2	0,182	0,183	91	0,264193476
17,705	533,7	537,5	99,1	97,3	0,182	0,182	92	0,266336937
17,850	533,4	537,3	98,2	96,6	0,182	0,183	93	0,268657065
18,008	533,1	537,1	97,3	95,8	0,182	0,183	94	0,271320488
17,731	532,9	536,9	98,7	96,8	0,182	0,183	95	0,267309765
17,473	532,8	536,8	100,0	98,5	0,182	0,183	96	0,263645154
17,708	532,6	536,6	98,8	97,2	0,182	0,183	97	0,267316794
17,671	532,5	536,5	98,7	96,9	0,182	0,183	98	0,266957823
17,363	532,5	536,5	100,5	98,4	0,182	0,183	99	0,262454756
17,613	532,5	536,4	98,9	97,3	0,183	0,183	100	0,266354759
17,424	532,5	536,4	99,9	97,9	0,182	0,183	101	0,263643173
17,596	532,5	536,4	98,9	97,1	0,183	0,183	102	0,266336587
17,723	532,4	536,4	98,1	96,4	0,183	0,183	103	0,268275076
17,623	532,4	536,3	98,5	96,9	0,182	0,183	104	0,266931476
17,538	532,4	536,3	98,9	97,2	0,182	0,183	105	0,265801602
17,654	532,3	536,2	98,1	96,4	0,182	0,183	106	0,267698849
17,623	532,2	536,2	98,4	96,5	0,183	0,183	107	0,267315322
17,492	532,1	536,1	99,0	97,3	0,183	0,183	108	0,265388689
17,616	532,1	536,1	98,3	96,4	0,183	0,183	109	0,267360876
17,448	532,0	536,0	99,0	97,3	0,183	0,183	110	0,265001044
17,683	532,1	536,0	97,6	96,0	0,182	0,183	111	0,268656994
17,408	532,1	536,0	99,2	97,3	0,183	0,183	112	0,264590576
17,602	532,1	536,1	97,9	96,0	0,183	0,183	113	0,267699464
17,572	532,1	536,0	98,1	96,1	0,183	0,183	114	0,267315037
17,477	532,0	536,0	98,4	96,7	0,183	0,183	115	0,265968074
17,537	532,0	535,9	98,1	96,3	0,183	0,183	116	0,266985356
17,490	531,9	535,9	98,5	96,4	0,183	0,183	117	0,266354347
17,420	531,9	535,9	98,6	97,0	0,183	0,183	118	0,265387602
17,411	531,9	535,9	98,5	96,6	0,183	0,183	119	0,265387952
17,507	531,9	535,9	98,0	96,2	0,183	0,183	120	0,266930663
17,790	531,8	535,9	96,3	94,5	0,183	0,183	121	0,271317588
17,306	531,8	535,9	98,9	97,3	0,183	0,183	122	0,264030021
17,618	531,9	535,9	97,1	95,4	0,182	0,183	123	0,268868637
17,534	531,9	536,0	97,7	95,8	0,183	0,183	124	0,267702652
17,526	531,9	535,9	97,4	95,9	0,183	0,183	125	0,267698351
17,757	531,9	535,9	96,1	94,4	0,182	0,183	126	0,27131801
17,600	531,9	536,0	96,9	95,2	0,183	0,183	127	0,269038635
17,871	531,9	535,9	95,4	93,6	0,183	0,183	128	0,273201044
17,329	531,9	535,9	98,3	96,6	0,182	0,183	129	0,264998516
17,416	531,8	535,9	97,9	96,4	0,183	0,183	130	0,266352208
17,740	531,8	535,9	96,1	94,5	0,183	0,184	131	0,271319328
17,411	531,7	535,9	97,9	95,9	0,183	0,183	132	0,266351474
17,580	531,8	535,9	96,9	95,0	0,183	0,183	133	0,269036872
17,463	531,7	535,8	97,4	95,7	0,183	0,183	134	0,267313315
17,666	531,7	535,8	96,2	94,4	0,183	0,183	135	0,270559747
17,276	531,7	535,8	98,5	96,7	0,183	0,183	136	0,264613931
17,716	531,7	535,8	96,0	94,2	0,183	0,183	137	0,271317702
17,585	531,7	535,8	96,6	94,8	0,183	0,183	138	0,269365219
17,362	531,7	535,8	97,9	96,0	0,183	0,183	139	0,265981538
17,534	531,6	535,8	96,9	95,3	0,183	0,183	140	0,26865521

Particulates Calculations

17,315	531,6	535,7	98,1	96,2	0,183	0,183	141	0,265386326
17,315	531,6	535,7	98,0	96,4	0,183	0,183	142	0,265422852
17,554	531,5	535,7	96,6	95,0	0,183	0,183	143	0,269097463
17,543	531,5	535,7	96,8	94,9	0,183	0,183	144	0,269036508
17,406	531,5	535,7	97,4	95,7	0,183	0,183	145	0,266928609
17,377	531,5	535,8	97,7	95,7	0,183	0,183	146	0,266516744
17,491	531,5	535,8	97,0	95,0	0,183	0,183	147	0,268270891
17,686	531,6	535,8	95,8	93,9	0,183	0,183	148	0,271316657
17,426	531,7	535,9	97,2	95,5	0,183	0,183	149	0,267311995
17,659	531,7	535,9	95,9	94,2	0,183	0,183	150	0,270958076
17,444	531,7	535,9	97,1	95,4	0,183	0,183	151	0,267697549
17,295	531,7	536,0	98,0	96,1	0,183	0,183	152	0,265385266
17,478	531,6	535,9	97,0	95,1	0,183	0,183	153	0,268270944
17,765	531,6	535,9	95,3	93,5	0,183	0,183	154	0,272772664
17,729	531,6	535,9	95,4	93,7	0,183	0,183	155	0,272243723
17,376	531,6	535,9	97,2	95,4	0,183	0,183	156	0,26692601
17,403	531,7	535,9	97,2	95,3	0,183	0,183	157	0,267313083
17,642	531,7	535,9	95,9	93,9	0,183	0,183	158	0,27098536
17,310	531,7	536,0	97,6	95,7	0,183	0,183	159	0,265962355
17,394	531,8	536,0	97,2	95,3	0,183	0,183	160	0,26731179
17,266	531,7	536,0	97,7	95,9	0,183	0,183	161	0,265384772
17,457	531,7	535,9	96,9	95,0	0,183	0,183	162	0,268270482
17,412	531,6	535,9	97,0	95,0	0,183	0,183	163	0,267709742
17,383	531,6	536,0	97,1	95,2	0,183	0,183	164	0,267311603
17,553	531,7	536,0	96,1	94,3	0,183	0,183	165	0,269987822
17,254	531,8	536,0	97,7	96,0	0,183	0,183	166	0,265384574
17,666	531,8	536,0	95,3	93,7	0,183	0,183	167	0,27180145
17,372	531,8	536,0	97,0	95,1	0,183	0,183	168	0,267310916
17,626	531,8	536,0	95,6	93,9	0,183	0,183	169	0,271316024

Particulates Calculations

Average	Average	Average						Average
17,12	Inlet +	Inlet +						0,27
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	101,27	101,62	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	<b>Proportional Rates</b>		Vol.Std.	Vol.Std.		Delta-P
			<b>PR1</b>	<b>PR2</b>			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
16,913	536,1	536,3			0,181	0,183	0	0,265007540081410
16,890	536,2	536,4	107,4	108,6	0,181	0,183	1	0,262610439
17,016	536,2	536,4	108,5	109,4	0,182	0,183	2	0,262408122
16,760	536,3	536,6	112,6	113,8	0,182	0,183	3	0,255541786
16,749	536,3	536,7	115,4	116,5	0,181	0,183	4	0,252306304
16,910	536,4	536,8	117,1	118,5	0,181	0,183	5	0,25171131
16,954	536,4	537,0	116,0	117,0	0,182	0,183	6	0,253320727
16,950	536,5	537,1	112,5	113,6	0,182	0,183	7	0,257140385
17,173	536,5	537,3	108,1	109,2	0,182	0,183	8	0,264037074
17,007	536,5	537,4	107,3	108,4	0,181	0,183	9	0,263681785
16,697	536,5	537,5	108,5	109,5	0,182	0,183	10	0,2599619
16,977	536,5	537,7	106,0	107,2	0,181	0,183	11	0,265007783
16,689	536,6	537,8	107,7	108,3	0,181	0,183	12	0,260907255
16,903	536,6	538,0	106,1	106,7	0,182	0,183	13	0,26462022
16,884	536,7	538,1	105,7	106,5	0,182	0,183	14	0,264619031
17,021	536,8	538,3	104,9	105,6	0,182	0,183	15	0,266905385
16,953	536,8	538,4	105,0	105,8	0,181	0,183	16	0,265973946
16,673	536,9	538,6	106,8	107,7	0,181	0,183	17	0,261695638
16,943	536,9	538,7	105,3	105,9	0,182	0,183	18	0,265997081
16,842	537,0	538,8	105,7	106,6	0,182	0,183	19	0,264429566
16,810	537,0	538,9	105,8	106,8	0,181	0,183	20	0,264036875
16,806	537,1	539,1	105,8	106,5	0,182	0,183	21	0,264037082
16,748	537,2	539,2	105,9	107,0	0,181	0,183	22	0,263223939
16,623	537,2	539,3	106,9	107,5	0,181	0,183	23	0,261298938
16,942	537,3	539,4	104,8	105,5	0,182	0,183	24	0,266361266
16,828	537,3	539,5	105,2	106,2	0,181	0,183	25	0,264620878
16,932	537,3	539,6	104,8	105,3	0,181	0,183	26	0,266267283
16,908	537,4	539,7	104,8	105,4	0,181	0,182	27	0,265975918
16,784	537,4	539,8	105,7	106,2	0,181	0,183	28	0,264038437
16,814	537,4	539,8	105,3	105,9	0,182	0,183	29	0,264621518
17,000	537,4	539,9	104,1	104,8	0,181	0,183	30	0,267555848
16,860	537,5	540,0	104,9	105,4	0,181	0,182	31	0,26539593
16,876	537,6	540,1	105,0	105,4	0,181	0,182	32	0,26569519
16,950	537,7	540,2	104,3	104,8	0,182	0,182	33	0,266918748
17,001	537,7	540,3	104,0	104,3	0,181	0,182	34	0,26770666
16,850	537,7	540,3	104,9	105,7	0,181	0,182	35	0,265396675
16,653	537,7	540,4	106,3	106,9	0,181	0,183	36	0,262256564
16,890	537,8	540,5	104,7	105,2	0,181	0,183	37	0,265976025
16,853	537,8	540,6	105,0	105,5	0,181	0,182	38	0,265397079
16,887	537,8	540,6	104,7	105,2	0,182	0,182	39	0,265976698
16,761	537,8	540,7	105,3	106,0	0,181	0,182	40	0,264039222
16,735	537,9	540,7	105,6	106,0	0,181	0,182	41	0,263666486
16,881	537,9	540,8	104,7	105,3	0,181	0,182	42	0,265977495
16,850	538,0	540,9	104,9	105,4	0,182	0,183	43	0,265523932
16,705	538,0	540,9	105,7	106,4	0,182	0,183	44	0,263263745
17,173	538,0	541,0	103,0	103,1	0,182	0,182	45	0,270570788
16,933	538,1	541,0	104,2	104,8	0,182	0,182	46	0,266877084
17,166	538,2	541,1	102,8	103,2	0,181	0,182	47	0,270598693
16,872	538,2	541,2	104,4	104,7	0,181	0,182	48	0,265978338
17,353	538,2	541,2	101,6	102,0	0,181	0,182	49	0,273591117
16,824	538,3	541,3	104,8	105,2	0,181	0,182	50	0,265274499
17,418	538,4	541,4	101,2	101,7	0,181	0,182	51	0,274671514
17,009	538,4	541,4	103,6	104,1	0,181	0,182	52	0,268278453
17,033	538,3	541,4	103,2	104,0	0,181	0,182	53	0,268666765
17,155	538,3	541,4	102,8	103,1	0,181	0,182	54	0,270632868
17,151	538,2	541,4	102,5	103,1	0,181	0,182	55	0,270573141
17,254	538,2	541,5	101,9	102,4	0,181	0,182	56	0,272274163
17,000	538,2	541,5	103,6	104,1	0,181	0,182	57	0,26820573
16,944	538,2	541,5	103,8	104,3	0,181	0,182	58	0,267323135
17,195	538,2	541,5	102,4	102,8	0,181	0,182	59	0,271330707

Particulates Calculations

17,111	538,2	541,5	103,0	103,3	0,181	0,182	60	0,27000211
17,028	538,1	541,5	103,6	103,8	0,182	0,182	61	0,268667279
17,287	538,1	541,5	101,8	102,2	0,181	0,182	62	0,27283724
17,021	538,1	541,5	103,3	103,7	0,181	0,182	63	0,268667829
17,390	538,1	541,5	101,1	101,7	0,181	0,182	64	0,274484124
17,129	538,2	541,6	102,6	103,1	0,181	0,182	65	0,270393404
16,915	538,2	541,6	104,0	104,4	0,181	0,182	66	0,266944337
17,292	538,3	541,7	101,8	102,2	0,181	0,182	67	0,272840019
16,934	538,3	541,7	104,0	104,5	0,181	0,182	68	0,267073124
17,010	538,4	541,7	103,5	103,8	0,181	0,182	69	0,268256209
17,063	538,4	541,8	103,2	103,6	0,181	0,182	70	0,269050209
16,956	538,4	541,8	103,9	104,2	0,181	0,182	71	0,267327746
17,025	538,5	541,8	103,6	103,9	0,181	0,182	72	0,268410606
16,897	538,5	541,9	104,2	104,9	0,181	0,182	73	0,266365393
17,166	538,5	541,9	102,7	102,9	0,181	0,182	74	0,270573061
16,793	538,6	542,0	105,0	105,5	0,181	0,182	75	0,264697459
17,167	538,6	542,0	102,7	102,9	0,181	0,182	76	0,270574842
17,024	538,7	542,1	103,5	104,0	0,181	0,182	77	0,268287847
16,984	538,7	542,1	103,9	104,2	0,181	0,182	78	0,267649709
16,992	538,8	542,2	103,6	104,2	0,181	0,182	79	0,267761488
17,219	538,8	542,2	102,3	102,6	0,181	0,182	80	0,271333695
16,906	538,8	542,3	104,3	104,8	0,181	0,182	81	0,266367183
17,342	538,9	542,3	101,7	102,2	0,181	0,182	82	0,273219282
17,238	538,9	542,4	102,3	102,7	0,181	0,182	83	0,27157816
16,995	538,9	542,4	103,7	104,3	0,181	0,182	84	0,267702617
16,973	539,0	542,5	103,8	104,4	0,181	0,182	85	0,267330082
17,058	539,0	542,5	103,4	103,7	0,181	0,182	86	0,268671193
16,913	539,0	542,5	104,3	104,8	0,181	0,182	87	0,266368409
17,229	539,1	542,6	102,3	102,6	0,181	0,182	88	0,271334907
17,035	539,1	542,6	103,7	103,8	0,181	0,181	89	0,268289731
16,968	539,1	542,6	104,1	104,5	0,181	0,182	90	0,26719479
17,181	539,1	542,7	102,6	103,1	0,181	0,182	91	0,27057745
17,061	539,2	542,7	103,4	103,6	0,181	0,182	92	0,268672826
17,235	539,2	542,8	102,5	102,9	0,181	0,182	93	0,271370387
17,034	539,2	542,8	103,6	103,7	0,181	0,182	94	0,268230664
17,145	539,3	542,9	103,0	103,3	0,181	0,181	95	0,270002481
17,061	539,3	542,9	103,5	103,8	0,181	0,182	96	0,268672533
17,012	539,3	542,9	103,6	104,2	0,181	0,182	97	0,267887684
17,145	539,3	542,9	102,8	103,3	0,181	0,182	98	0,270008891
16,767	539,4	543,0	105,1	105,3	0,181	0,181	99	0,264046536
16,908	539,4	543,0	104,3	104,8	0,181	0,182	100	0,266278108
17,083	539,4	543,1	103,2	103,6	0,181	0,182	101	0,269056261
16,976	539,4	543,1	104,1	104,2	0,181	0,182	102	0,267332642
17,085	539,5	543,1	103,1	103,7	0,181	0,182	103	0,269055481
17,281	539,5	543,1	102,1	102,2	0,181	0,182	104	0,272200125
16,976	539,5	543,1	103,9	104,3	0,181	0,182	105	0,26739016
17,228	539,5	543,2	102,5	102,7	0,181	0,182	106	0,271337148
16,851	539,5	543,2	104,6	104,8	0,181	0,181	107	0,265406431
17,285	539,5	543,2	101,9	102,5	0,181	0,182	108	0,272246648
17,175	539,6	543,2	102,6	102,8	0,181	0,182	109	0,270579335
16,993	539,6	543,3	103,6	103,9	0,181	0,181	110	0,267717445
16,993	539,6	543,3	103,7	104,3	0,181	0,182	111	0,267727971
17,257	539,6	543,3	102,1	102,5	0,181	0,182	112	0,271898904
17,136	539,6	543,3	102,9	103,1	0,181	0,182	113	0,270010119
17,220	539,7	543,3	102,3	102,6	0,181	0,181	114	0,27133851
17,218	539,7	543,4	102,3	102,6	0,181	0,182	115	0,271338422
17,048	539,7	543,4	103,3	103,8	0,181	0,182	116	0,268671654
16,963	539,7	543,4	103,8	104,2	0,181	0,182	117	0,267334961
17,124	539,8	543,4	102,8	103,3	0,181	0,182	118	0,269879845
17,166	539,8	543,4	102,5	103,0	0,181	0,182	119	0,270571405
16,875	539,8	543,5	104,3	104,1	0,181	0,181	120	0,265987768
17,212	539,8	543,5	102,3	102,7	0,181	0,181	121	0,271339521
17,068	539,8	543,5	103,1	103,6	0,181	0,182	122	0,269057918
17,045	539,8	543,5	103,2	103,6	0,181	0,182	123	0,268678647
16,958	539,8	543,5	103,8	103,9	0,181	0,181	124	0,267336575
17,213	539,8	543,5	102,2	102,5	0,181	0,181	125	0,271338677
17,156	539,9	543,6	102,6	102,9	0,181	0,181	126	0,270468209



Particulates Calculations

17,127	539,9	543,6	102,6	103,1	0,181	0,182	127	0,270007417
17,128	539,9	543,6	102,7	103,0	0,181	0,181	128	0,270011876
17,210	539,9	543,6	102,2	102,6	0,181	0,181	129	0,271312008
17,195	539,9	543,6	102,3	102,7	0,181	0,182	130	0,271089089
17,330	539,9	543,7	101,4	101,7	0,181	0,181	131	0,273225617
17,162	540,0	543,7	102,3	103,0	0,181	0,182	132	0,270580595
17,179	540,0	543,7	102,4	102,8	0,181	0,182	133	0,270816435
17,305	540,0	543,7	101,5	101,9	0,181	0,181	134	0,272849815
17,208	540,0	543,7	102,1	102,6	0,181	0,182	135	0,271339055
16,953	540,0	543,7	103,7	103,8	0,181	0,181	136	0,267336209
17,121	540,0	543,8	102,7	102,7	0,181	0,181	137	0,270011761
17,204	540,1	543,8	102,2	102,4	0,181	0,181	138	0,271340636
17,059	540,1	543,8	102,9	103,3	0,181	0,181	139	0,269073248
17,117	540,1	543,8	102,6	102,8	0,181	0,181	140	0,270013527
17,184	540,1	543,8	102,3	102,5	0,181	0,181	141	0,27105732
17,259	540,1	543,9	101,8	102,2	0,181	0,182	142	0,272285607
17,236	540,1	543,9	102,0	102,2	0,181	0,181	143	0,271908445
17,284	540,1	543,9	101,4	102,0	0,181	0,181	144	0,272701393
17,195	540,1	543,9	102,1	102,5	0,181	0,182	145	0,271341295
17,147	540,2	543,9	102,4	102,6	0,181	0,181	146	0,270582798
17,334	540,2	543,9	101,3	101,5	0,181	0,181	147	0,273602986
17,248	540,2	543,9	101,6	102,2	0,181	0,182	148	0,272284881
16,872	540,2	543,9	103,9	104,3	0,181	0,182	149	0,266390221
16,959	540,2	543,9	103,3	103,3	0,181	0,181	150	0,267802275
17,277	540,2	543,9	101,2	101,8	0,181	0,181	151	0,272854132
17,180	540,2	544,0	101,9	102,0	0,181	0,181	152	0,271341691
17,032	540,2	544,0	102,8	102,9	0,181	0,181	153	0,269061073
17,293	540,2	544,0	101,2	101,7	0,181	0,181	154	0,273227284
17,291	540,3	544,0	101,2	101,3	0,181	0,181	155	0,27322635
17,296	540,3	544,0	101,1	101,8	0,181	0,181	156	0,273337096
16,834	540,3	544,0	104,0	104,1	0,181	0,182	157	0,266039572
17,022	540,3	544,0	102,8	103,3	0,181	0,181	158	0,269053647
17,202	540,3	544,0	101,6	101,8	0,181	0,181	159	0,271909225
17,115	540,3	544,1	102,2	102,6	0,181	0,181	160	0,270584129
17,362	540,3	544,1	100,5	101,0	0,181	0,181	161	0,274511041
17,076	540,3	544,1	102,2	102,6	0,181	0,181	162	0,270015249
17,420	540,4	544,1	100,3	100,7	0,181	0,181	163	0,27547356
17,283	540,4	544,1	101,1	101,6	0,181	0,182	164	0,273334593
17,329	540,4	544,1	100,7	100,8	0,181	0,181	165	0,274095704
17,378	540,4	544,1	100,4	100,6	0,181	0,181	166	0,274908632
17,413	540,4	544,1	100,3	100,7	0,181	0,181	167	0,275475005
17,212	540,4	544,2	101,3	101,4	0,181	0,181	168	0,272302314
17,209	540,4	544,2	101,2	101,7	0,180	0,181	169	0,272279995
17,265	540,4	544,2	101,0	101,3	0,181	0,181	170	0,27322669
17,345	540,4	544,2	100,6	100,9	0,181	0,181	171	0,274540787
17,177	540,4	544,2	101,2	101,8	0,181	0,181	172	0,27190855
17,253	540,4	544,2	101,1	101,1	0,181	0,181	173	0,273120046
17,339	540,4	544,2	100,6	101,0	0,181	0,181	174	0,274538598
17,256	540,5	544,2	101,0	101,2	0,181	0,181	175	0,273228575
17,139	540,5	544,3	101,6	102,0	0,181	0,181	176	0,271379796
17,277	540,5	544,3	100,9	101,3	0,181	0,181	177	0,273607508
16,852	540,5	544,3	103,3	103,7	0,181	0,182	178	0,266918819
17,046	540,5	544,3	102,2	102,4	0,181	0,181	179	0,270015011
17,226	540,5	544,3	101,1	101,5	0,181	0,181	180	0,272852646
17,222	540,5	544,3	101,1	101,1	0,181	0,181	181	0,272841584
17,127	540,5	544,3	101,6	102,0	0,181	0,181	182	0,271342315
17,078	540,5	544,3	102,1	102,2	0,181	0,181	183	0,270584966
17,266	540,5	544,3	100,8	101,2	0,181	0,181	184	0,273604537
17,123	540,6	544,3	101,5	102,1	0,181	0,182	185	0,271353245
17,180	540,6	544,3	101,2	101,6	0,181	0,182	186	0,272288812
17,322	540,6	544,3	100,3	100,6	0,181	0,181	187	0,274541082
17,233	540,7	544,4	101,0	101,3	0,181	0,181	188	0,273169058
17,176	540,7	544,4	101,2	101,4	0,181	0,181	189	0,272287814
17,458	540,7	544,4	99,5	99,8	0,181	0,181	190	0,276779219
16,946	540,7	544,4	102,5	102,7	0,181	0,181	191	0,268679055
17,171	540,7	544,4	101,1	101,3	0,181	0,181	192	0,27228721
17,207	540,7	544,4	100,8	101,4	0,181	0,181	193	0,272853799

Particulates Calculations

17,230	540,7	544,4	100,7	101,1	0,181	0,181	194	0,273228252
16,931	540,7	544,5	102,5	102,8	0,181	0,181	195	0,268498876
17,336	540,7	544,4	100,2	100,5	0,181	0,181	196	0,274937709
17,228	540,7	544,5	101,0	101,1	0,181	0,181	197	0,273237807
17,104	540,7	544,5	101,5	101,9	0,181	0,181	198	0,271342455
17,054	540,9	544,5	101,8	102,0	0,181	0,181	199	0,27058397
17,102	541,0	544,6	101,3	101,8	0,181	0,181	200	0,271363507
17,302	540,9	544,6	100,1	100,5	0,180	0,181	201	0,274541751
17,232	540,8	544,5	100,8	101,2	0,181	0,181	202	0,273435774
17,278	540,7	544,5	100,4	100,6	0,181	0,181	203	0,274160021
16,962	540,7	544,5	102,1	102,8	0,181	0,181	204	0,269144673
17,195	540,7	544,4	100,8	101,1	0,180	0,181	205	0,272851335
17,195	540,7	544,4	100,9	101,4	0,181	0,181	206	0,272852847
17,278	540,7	544,4	100,4	100,9	0,181	0,182	207	0,274166883
17,071	540,7	544,4	101,7	102,0	0,181	0,182	208	0,270896889
17,190	540,8	544,5	100,8	101,3	0,181	0,182	209	0,272851956
16,756	540,9	544,5	103,4	103,6	0,181	0,181	210	0,265991927
17,413	540,9	544,5	99,6	99,7	0,181	0,181	211	0,276404928
16,983	540,9	544,5	102,2	102,2	0,181	0,181	212	0,269573679
17,271	540,8	544,5	100,3	100,8	0,181	0,181	213	0,274166543
17,189	540,7	544,5	100,9	101,3	0,181	0,182	214	0,272853275
17,046	540,7	544,4	101,8	102,0	0,181	0,181	215	0,270584296
17,290	540,7	544,4	100,1	100,7	0,181	0,181	216	0,274466526
16,818	540,7	544,4	103,1	103,4	0,181	0,181	217	0,266975202
17,151	540,6	544,4	101,0	101,9	0,181	0,182	218	0,272286982
17,043	540,7	544,4	101,8	101,7	0,181	0,182	219	0,27058538
17,152	540,7	544,4	101,0	101,4	0,181	0,181	220	0,272327371
17,080	540,7	544,4	101,4	101,6	0,181	0,181	221	0,271198466
17,125	540,7	544,5	101,1	101,7	0,181	0,181	222	0,271909926
17,148	540,7	544,4	100,9	101,4	0,181	0,182	223	0,272288033
17,088	540,7	544,5	101,5	101,6	0,181	0,181	224	0,271345636
17,278	540,7	544,4	100,4	100,5	0,181	0,181	225	0,274368723
17,121	540,7	544,5	101,2	101,4	0,181	0,181	226	0,271909979
17,001	540,7	544,5	102,0	102,1	0,181	0,181	227	0,270014693
17,179	540,8	544,5	100,9	101,2	0,181	0,181	228	0,272851606
17,343	540,8	544,5	99,8	100,3	0,181	0,181	229	0,275474295
17,224	540,8	544,5	100,5	100,8	0,181	0,181	230	0,273606541
16,938	540,8	544,5	102,3	102,8	0,181	0,182	231	0,269061144
17,081	540,8	544,5	101,4	101,5	0,181	0,181	232	0,271341489
17,080	540,8	544,5	101,3	101,8	0,181	0,181	233	0,271342174
17,256	540,8	544,5	100,3	100,7	0,181	0,182	234	0,274166091
17,078	540,8	544,5	101,3	101,9	0,181	0,182	235	0,271342332
17,115	540,8	544,5	101,1	101,5	0,181	0,182	236	0,271936037
17,277	540,8	544,5	100,3	100,3	0,181	0,181	237	0,274540248
17,170	540,8	544,5	100,7	101,2	0,181	0,181	238	0,272850697
17,195	540,8	544,5	100,6	100,9	0,181	0,181	239	0,273226682
16,927	540,8	544,5	102,3	102,4	0,181	0,181	240	0,26903019
17,305	540,9	544,6	100,0	100,2	0,181	0,181	241	0,27506479
17,296	541,0	544,6	100,0	100,4	0,181	0,181	242	0,274916593
17,165	541,0	544,7	100,7	101,1	0,181	0,181	243	0,272852218
17,295	541,1	544,7	99,8	100,2	0,180	0,181	244	0,274914078
16,928	540,9	544,7	102,2	102,5	0,181	0,181	245	0,269060523
17,024	540,8	544,6	101,6	101,8	0,181	0,181	246	0,270584984
16,929	540,8	544,6	102,1	102,6	0,181	0,181	247	0,269062632
17,144	540,7	544,5	101,0	101,0	0,181	0,181	248	0,272482761
17,148	540,8	544,5	100,8	101,3	0,181	0,181	249	0,272612009
17,067	540,9	544,6	101,3	101,3	0,181	0,181	250	0,271344169
17,127	541,0	544,6	101,0	101,2	0,181	0,181	251	0,272286711
17,165	541,0	544,7	100,6	100,9	0,181	0,181	252	0,272851431
17,295	540,8	544,6	100,1	100,1	0,181	0,181	253	0,274913531
17,296	540,7	544,5	100,0	100,2	0,181	0,181	254	0,274916307
17,246	540,7	544,5	100,4	100,8	0,181	0,182	255	0,27416697
17,102	540,8	544,5	101,0	101,3	0,181	0,182	256	0,271908199
17,212	540,9	544,6	100,2	100,6	0,181	0,181	257	0,273653462
17,195	541,0	544,6	100,4	100,9	0,180	0,181	258	0,273376868
16,985	540,9	544,6	101,8	102,2	0,181	0,181	259	0,270010966
17,246	540,8	544,6	100,0	100,4	0,181	0,181	260	0,274165335

Particulates Calculations

17,242	540,7	544,5	100,3	100,7	0,181	0,181	261	0,274115101
17,117	540,8	544,5	100,8	101,3	0,181	0,182	262	0,272176168
17,065	540,9	544,5	101,2	101,8	0,181	0,182	263	0,271340092
17,125	540,9	544,5	100,9	101,4	0,181	0,182	264	0,272286509
17,101	540,9	544,5	101,0	101,4	0,181	0,182	265	0,271853996
16,986	540,8	544,5	101,7	102,0	0,181	0,181	266	0,270057549
17,386	540,8	544,5	99,4	99,9	0,181	0,181	267	0,276404263
17,230	540,8	544,5	100,3	100,8	0,181	0,182	268	0,273974405
17,159	540,9	544,5	100,6	100,9	0,181	0,181	269	0,272850837
17,207	541,0	544,6	100,4	100,5	0,181	0,181	270	0,273603831
17,162	540,9	544,6	100,6	101,2	0,181	0,181	271	0,272853939
17,067	540,9	544,6	101,3	101,4	0,181	0,181	272	0,271341919
17,072	540,7	544,5	101,3	101,6	0,181	0,181	273	0,271422042
17,273	540,7	544,5	100,2	100,5	0,181	0,182	274	0,274610226
17,209	540,6	544,4	100,5	100,7	0,181	0,181	275	0,273609365
16,810	540,7	544,5	102,9	103,3	0,181	0,181	276	0,267336736
17,286	540,8	544,5	99,9	100,3	0,181	0,182	277	0,274900687
17,061	540,9	544,5	101,2	101,5	0,181	0,181	278	0,271341339
17,098	540,9	544,6	100,8	101,3	0,180	0,181	279	0,271909023
17,100	540,8	544,6	101,0	101,3	0,181	0,181	280	0,27190762
17,241	540,7	544,5	100,1	100,6	0,181	0,181	281	0,274165196
17,242	540,6	544,4	100,1	100,5	0,181	0,181	282	0,274165343
17,263	540,6	544,4	100,1	100,3	0,181	0,181	283	0,27451376
16,975	540,6	544,4	101,8	102,2	0,181	0,181	284	0,270012971
17,011	540,7	544,5	101,6	101,9	0,181	0,182	285	0,270581961
17,134	540,8	544,5	100,8	101,1	0,181	0,181	286	0,272532613
17,091	540,9	544,6	101,1	101,8	0,181	0,182	287	0,271883831
17,097	540,9	544,6	101,2	101,4	0,181	0,182	288	0,271907462
17,285	540,7	544,5	100,0	100,1	0,181	0,181	289	0,27491328
17,169	540,6	544,4	100,6	100,8	0,181	0,181	290	0,273040003
17,116	540,7	544,4	101,1	101,1	0,181	0,181	291	0,272285704
17,200	540,8	544,5	100,2	100,9	0,181	0,181	292	0,273604162
17,282	540,8	544,5	99,7	100,2	0,180	0,181	293	0,274913072
17,260	540,8	544,5	100,0	100,3	0,180	0,181	294	0,274539562
17,203	540,8	544,5	100,4	100,6	0,181	0,181	295	0,273599152
17,120	540,7	544,4	100,9	101,3	0,181	0,181	296	0,272284671
17,283	540,7	544,4	99,9	100,2	0,181	0,181	297	0,274913558
17,077	540,8	544,5	101,0	101,3	0,181	0,181	298	0,271684084
17,057	540,8	544,5	101,1	101,7	0,181	0,181	299	0,271341357
17,116	540,9	544,5	100,8	101,1	0,181	0,181	300	0,272283655
17,200	540,8	544,5	100,5	100,6	0,181	0,181	301	0,273602106
17,094	540,7	544,4	101,1	101,2	0,181	0,181	302	0,271907778
17,424	540,6	544,4	99,2	99,4	0,181	0,181	303	0,277136359
17,012	540,5	544,4	101,6	101,9	0,181	0,181	304	0,270582446
17,010	540,5	544,3	101,5	101,8	0,181	0,181	305	0,270581767
17,066	540,6	544,4	101,1	101,4	0,181	0,181	306	0,271542998
17,040	540,7	544,4	101,4	101,8	0,181	0,181	307	0,271105772
17,254	540,8	544,4	100,1	100,3	0,181	0,181	308	0,274540639
17,007	540,8	544,5	101,4	101,6	0,181	0,181	309	0,270582631
17,173	540,7	544,5	100,4	100,7	0,181	0,181	310	0,273203173
17,057	540,6	544,4	101,3	101,6	0,181	0,181	311	0,271340127
16,889	540,6	544,4	102,2	102,7	0,181	0,182	312	0,268672666
17,228	540,6	544,4	100,1	100,7	0,181	0,182	313	0,274164074
17,088	540,7	544,4	101,0	101,5	0,181	0,182	314	0,271906691
17,370	540,7	544,5	99,3	99,7	0,181	0,182	315	0,27640146
16,862	540,8	544,5	102,3	102,8	0,181	0,182	316	0,268298324
16,972	540,7	544,5	101,7	101,8	0,181	0,181	317	0,270012264
17,008	540,6	544,4	101,5	102,1	0,181	0,181	318	0,270581979
16,808	540,5	544,4	102,6	103,1	0,181	0,182	319	0,267465289
17,253	540,6	544,4	100,0	100,5	0,181	0,182	320	0,274574011
17,369	540,7	544,4	99,5	99,6	0,181	0,181	321	0,276402331
17,003	540,7	544,5	101,5	101,9	0,181	0,181	322	0,27058227
17,128	540,7	544,5	100,8	101,0	0,181	0,181	323	0,272518799
17,149	540,7	544,4	100,8	100,9	0,181	0,181	324	0,2728486
17,008	540,6	544,4	101,5	102,2	0,181	0,182	325	0,270582217
17,309	540,6	544,4	99,7	100,0	0,181	0,182	326	0,275471941
17,414	540,7	544,4	99,2	99,5	0,181	0,181	327	0,27714485

Particulates Calculations

17,188	540,8	544,5	100,3	100,5	0,181	0,181	328	0,273542704
17,146	540,8	544,5	100,7	100,9	0,181	0,181	329	0,272849998
17,091	540,7	544,5	101,0	101,2	0,181	0,181	330	0,271930163
16,943	540,6	544,4	101,8	102,3	0,181	0,181	331	0,269577703
17,110	540,5	544,4	100,9	101,2	0,181	0,181	332	0,272284714
17,142	540,6	544,4	100,7	100,8	0,181	0,181	333	0,272850741
17,115	540,7	544,4	101,0	101,1	0,181	0,181	334	0,272390618
17,100	540,8	544,5	100,8	101,5	0,181	0,182	335	0,272167899
17,193	540,7	544,5	100,1	100,7	0,181	0,182	336	0,273601984
17,277	540,6	544,4	99,9	100,3	0,181	0,182	337	0,274912369
17,089	540,5	544,4	101,0	101,3	0,181	0,181	338	0,271906814
17,149	540,5	544,3	100,7	100,8	0,181	0,181	339	0,272849946
17,452	540,5	544,4	99,0	99,3	0,181	0,181	340	0,277740702
17,249	540,6	544,4	100,0	100,4	0,181	0,182	341	0,27453773
17,107	540,7	544,5	100,9	101,0	0,181	0,181	342	0,272284268
17,235	540,7	544,5	99,9	100,2	0,181	0,181	343	0,27436238
17,152	540,7	544,5	100,7	101,0	0,181	0,181	344	0,27298944
17,052	540,6	544,4	101,2	101,4	0,181	0,181	345	0,271356197
17,230	540,5	544,4	100,1	100,5	0,181	0,181	346	0,274197578
17,269	540,5	544,3	100,0	100,4	0,181	0,182	347	0,274793305
17,388	540,5	544,3	99,3	99,5	0,181	0,182	348	0,276773603
17,163	540,6	544,4	100,3	100,7	0,181	0,181	349	0,273228139
17,188	540,7	544,4	100,4	100,6	0,181	0,181	350	0,273602167
17,385	540,7	544,4	99,1	99,6	0,181	0,181	351	0,276774154
17,003	540,7	544,5	101,5	101,8	0,181	0,182	352	0,270581027
17,109	540,6	544,4	100,8	101,1	0,181	0,181	353	0,272287201
17,110	540,5	544,4	100,8	100,9	0,181	0,181	354	0,272283007
17,245	540,5	544,3	100,0	100,4	0,181	0,181	355	0,27453799
17,222	540,6	544,4	100,0	100,4	0,181	0,181	356	0,274162656
17,236	540,7	544,4	100,0	100,4	0,181	0,181	357	0,274399136
16,816	540,7	544,5	102,4	102,8	0,181	0,181	358	0,267714604
17,390	540,6	544,4	99,2	99,4	0,181	0,181	359	0,276774421
17,304	540,5	544,4	99,6	99,8	0,181	0,181	360	0,275425659
17,047	540,4	544,3	101,3	101,6	0,181	0,181	361	0,271339933
17,079	540,5	544,3	100,9	101,3	0,181	0,182	362	0,271913925
17,185	540,6	544,4	100,2	100,6	0,181	0,181	363	0,273601357
17,361	540,7	544,4	99,1	99,7	0,181	0,181	364	0,276409085
16,866	540,7	544,4	102,3	102,7	0,181	0,182	365	0,268507435
17,049	540,6	544,4	101,1	101,4	0,181	0,182	366	0,271338721
17,106	540,5	544,4	100,8	101,2	0,181	0,181	367	0,272283261
17,361	540,5	544,3	99,2	99,7	0,181	0,181	368	0,276401934
17,136	540,6	544,4	100,5	101,1	0,181	0,182	369	0,272848915
17,137	540,7	544,4	100,5	100,9	0,181	0,182	370	0,2728495
17,464	540,7	544,4	98,6	99,0	0,181	0,181	371	0,278070783
17,246	540,7	544,4	99,9	100,2	0,181	0,181	372	0,274537747
17,190	540,6	544,3	100,4	100,5	0,181	0,181	373	0,273600685
17,119	540,5	544,3	100,7	101,0	0,181	0,181	374	0,272454086
17,049	540,4	544,3	101,3	101,3	0,181	0,181	375	0,271338651
17,244	540,4	544,3	100,0	100,3	0,181	0,181	376	0,274537738
17,241	540,5	544,3	99,8	100,1	0,181	0,181	377	0,274521168
17,125	540,7	544,4	100,7	101,0	0,181	0,181	378	0,27266126
17,181	540,7	544,4	100,3	100,5	0,181	0,181	379	0,273600616
17,265	540,7	544,5	99,7	100,2	0,181	0,181	380	0,274910409
17,080	540,6	544,4	101,0	101,2	0,181	0,181	381	0,271905796
17,386	540,5	544,4	99,3	99,3	0,181	0,181	382	0,276773603
17,247	540,4	544,3	100,1	100,2	0,181	0,181	383	0,274537539
17,185	540,4	544,3	100,3	100,5	0,181	0,181	384	0,273599526
17,039	540,5	544,3	101,2	101,4	0,181	0,181	385	0,271339485
17,216	540,6	544,4	100,2	100,4	0,181	0,181	386	0,27416243
17,179	540,6	544,4	100,3	100,5	0,181	0,181	387	0,273583483
17,234	540,7	544,5	99,9	100,3	0,181	0,181	388	0,27447424
16,959	540,6	544,4	101,6	102,0	0,181	0,182	389	0,27000837
17,267	540,5	544,3	99,8	100,2	0,181	0,181	390	0,274911129
17,221	540,4	544,3	100,1	100,4	0,181	0,181	391	0,274162856
17,181	540,4	544,3	100,3	100,2	0,181	0,181	392	0,273636995
17,238	540,5	544,4	99,8	100,1	0,181	0,181	393	0,274537799
17,354	540,6	544,4	99,4	99,6	0,181	0,181	394	0,276401132

Particulates Calculations

17,034	540,6	544,4	100,9	101,5	0,181	0,181	395	0,271337851
16,867	540,5	544,4	102,2	102,4	0,181	0,181	396	0,268578657
17,183	540,5	544,3	100,3	100,5	0,181	0,181	397	0,273583919
16,875	540,4	544,3	102,1	102,5	0,181	0,181	398	0,268675763
17,355	540,4	544,3	99,3	99,5	0,181	0,181	399	0,276401072
17,292	540,4	544,3	99,6	99,9	0,181	0,181	400	0,275435086
17,212	540,5	544,4	99,9	100,5	0,181	0,181	401	0,274149786
17,434	540,6	544,4	98,8	99,1	0,181	0,181	402	0,277699082
17,265	540,5	544,4	99,9	100,1	0,181	0,181	403	0,274910826
16,886	540,4	544,3	102,0	102,4	0,181	0,181	404	0,268844286
16,959	540,3	544,3	101,7	102,2	0,181	0,182	405	0,270013898
17,184	540,2	544,2	100,2	100,6	0,181	0,182	406	0,273598812
17,094	540,3	544,2	100,8	101,2	0,181	0,181	407	0,272282604
17,176	540,4	544,3	100,2	100,6	0,181	0,182	408	0,273600023
17,112	540,5	544,3	100,7	100,9	0,181	0,181	409	0,272571391
16,978	540,5	544,3	101,3	101,7	0,181	0,181	410	0,270474521
17,378	540,5	544,4	99,1	99,5	0,181	0,181	411	0,276772147
16,992	540,4	544,3	101,5	101,7	0,181	0,181	412	0,270580358
17,240	540,3	544,3	99,8	100,4	0,181	0,181	413	0,274536531
17,180	540,3	544,2	100,2	100,7	0,181	0,182	414	0,273600302
17,092	540,3	544,2	100,7	101,2	0,181	0,182	415	0,272282875
17,432	540,4	544,3	98,8	99,1	0,181	0,181	416	0,277697288
17,376	540,5	544,3	99,0	99,4	0,181	0,181	417	0,276822165
17,068	540,5	544,3	100,8	101,3	0,181	0,181	418	0,271925472
16,845	540,5	544,3	102,2	102,5	0,181	0,181	419	0,268293321
17,216	540,4	544,2	100,2	100,2	0,181	0,181	420	0,274161004
17,039	540,3	544,2	101,3	101,6	0,181	0,181	421	0,271338115
17,211	540,4	544,2	100,0	100,4	0,181	0,182	422	0,274162978
17,396	540,4	544,3	98,9	99,1	0,181	0,181	423	0,277135249
17,255	540,5	544,3	99,7	100,2	0,181	0,181	424	0,274909664
17,037	540,5	544,3	101,1	101,2	0,181	0,181	425	0,271448911
17,153	540,4	544,3	100,4	100,7	0,181	0,181	426	0,273207929
17,240	540,3	544,2	99,9	100,3	0,181	0,181	427	0,27453575
17,264	540,2	544,2	99,9	100,2	0,181	0,182	428	0,274910687
17,176	540,3	544,2	100,1	100,7	0,181	0,182	429	0,273599361
17,150	540,3	544,2	100,4	100,7	0,181	0,181	430	0,273239928
17,254	540,4	544,3	99,8	99,9	0,181	0,181	431	0,274908033
17,172	540,5	544,3	100,3	100,3	0,181	0,181	432	0,273599187
17,233	540,4	544,3	99,9	100,4	0,181	0,181	433	0,274536366
17,036	540,3	544,2	101,3	101,5	0,181	0,182	434	0,271337763
17,355	540,2	544,2	99,2	99,7	0,181	0,182	435	0,27639512
17,033	540,2	544,2	101,2	101,4	0,181	0,181	436	0,271337025
17,089	540,3	544,2	100,9	101,1	0,181	0,181	437	0,272282516
17,231	540,4	544,2	99,9	100,5	0,181	0,182	438	0,274536314
17,230	540,4	544,2	99,9	100,3	0,181	0,182	439	0,274535697
17,034	540,4	544,2	101,1	101,5	0,181	0,182	440	0,271338686
17,134	540,3	544,2	100,5	100,9	0,181	0,182	441	0,272904353
17,132	540,2	544,1	100,5	101,1	0,181	0,182	442	0,272847456
16,883	540,2	544,1	102,2	102,5	0,181	0,182	443	0,268880041
17,152	540,1	544,1	100,4	100,8	0,181	0,182	444	0,273210704
17,429	540,2	544,1	98,8	99,1	0,181	0,181	445	0,277697013
17,124	540,3	544,1	100,4	101,0	0,181	0,182	446	0,272847473
17,206	540,3	544,2	100,0	100,6	0,181	0,182	447	0,274161682
17,027	540,4	544,2	101,0	101,4	0,181	0,182	448	0,271338361
17,067	540,4	544,2	100,7	101,2	0,181	0,181	449	0,271900877
17,155	540,3	544,1	100,4	101,0	0,181	0,182	450	0,273223828
17,030	540,2	544,1	101,0	101,3	0,181	0,182	451	0,271276442
17,234	540,1	544,1	99,9	100,1	0,181	0,181	452	0,274536045
17,171	540,2	544,1	100,2	100,7	0,181	0,181	453	0,273599344
17,229	540,3	544,1	99,9	100,0	0,181	0,181	454	0,274535836
16,935	540,4	544,2	101,5	102,1	0,181	0,181	455	0,26987208
17,184	540,4	544,2	100,1	100,5	0,181	0,182	456	0,273854114
17,091	540,3	544,1	100,6	101,2	0,181	0,182	457	0,272281623
17,212	540,2	544,1	100,2	100,5	0,181	0,182	458	0,274161908
17,034	540,1	544,0	101,1	101,6	0,181	0,182	459	0,271337456
17,150	540,1	544,1	100,4	101,0	0,181	0,182	460	0,273262482
17,062	540,2	544,1	100,9	101,0	0,181	0,182	461	0,271910409



Particulates Calculations

16,979	540,3	544,1	101,4	101,8	0,181	0,181	462	0,270579115
17,366	540,3	544,1	99,1	99,4	0,181	0,182	463	0,276771544
17,209	540,3	544,1	100,0	100,2	0,181	0,181	464	0,274178527
17,070	540,3	544,1	100,9	101,3	0,181	0,181	465	0,271903403
17,351	540,1	544,0	99,3	99,6	0,181	0,182	466	0,276399027
17,256	540,1	544,0	99,7	100,1	0,181	0,182	467	0,274908632
17,174	540,1	544,0	100,2	100,5	0,181	0,181	468	0,273669544
17,026	540,2	544,1	101,1	101,5	0,181	0,182	469	0,271337684
17,203	540,3	544,1	99,9	100,4	0,181	0,182	470	0,2741607
17,249	540,3	544,1	99,8	100,1	0,181	0,182	471	0,274908536
17,150	540,3	544,1	100,5	100,9	0,181	0,182	472	0,273221987
17,397	540,2	544,1	99,2	99,2	0,181	0,181	473	0,277134269
17,256	540,1	544,0	99,7	100,2	0,181	0,181	474	0,274907478
17,125	540,0	544,0	100,6	101,0	0,181	0,182	475	0,272845358
17,276	540,1	544,0	99,6	100,2	0,181	0,182	476	0,275316845
17,202	540,2	544,0	100,0	100,4	0,181	0,182	477	0,274160447
17,226	540,2	544,1	99,9	100,2	0,181	0,181	478	0,274537113
17,165	540,3	544,1	100,1	100,6	0,181	0,181	479	0,273599099
17,124	540,3	544,1	100,4	101,0	0,181	0,182	480	0,272854219
17,152	540,2	544,0	100,4	100,9	0,181	0,182	481	0,273255066
17,234	540,1	544,0	99,9	100,7	0,181	0,182	482	0,274535289
17,128	540,1	543,9	100,4	100,9	0,181	0,182	483	0,27284666
17,134	540,0	543,9	100,6	101,0	0,181	0,182	484	0,272951455
17,291	539,9	543,9	99,7	99,9	0,181	0,182	485	0,275467614
17,257	539,9	543,9	99,9	100,3	0,181	0,182	486	0,274907643
17,372	539,9	543,9	99,1	99,4	0,181	0,182	487	0,276767401
17,249	540,0	543,9	99,8	100,0	0,181	0,181	488	0,274907964
17,248	540,1	543,9	99,8	100,0	0,181	0,181	489	0,274907929
16,978	540,1	544,0	101,2	101,6	0,181	0,181	490	0,270617777
17,140	540,2	544,0	100,2	100,6	0,181	0,181	491	0,273220896
16,878	540,2	544,0	101,9	102,3	0,181	0,181	492	0,269055012
17,385	540,3	544,1	99,0	99,1	0,181	0,181	493	0,277140317
17,155	540,3	544,1	100,2	100,8	0,181	0,181	494	0,273397153
17,288	540,1	544,0	99,6	100,0	0,181	0,182	495	0,275468678
17,090	540,0	544,0	100,7	101,1	0,181	0,182	496	0,27228122
17,124	539,9	543,9	100,5	101,0	0,181	0,182	497	0,272846407
17,096	539,9	543,9	100,7	100,9	0,181	0,182	498	0,272475997
17,223	540,0	543,9	99,8	100,3	0,181	0,182	499	0,274524381
17,362	540,2	544,0	99,1	99,6	0,181	0,182	500	0,276770829
17,338	540,2	544,0	99,2	99,6	0,181	0,182	501	0,276397759
17,137	540,3	544,0	100,5	100,6	0,181	0,181	502	0,273215774
17,088	540,2	544,0	100,7	101,1	0,181	0,181	503	0,27234003
17,087	540,2	544,0	100,8	101,1	0,181	0,182	504	0,272281685
17,147	540,0	544,0	100,3	100,8	0,181	0,182	505	0,273221184
17,149	539,9	543,9	100,5	100,7	0,181	0,181	506	0,273232519
17,024	539,9	543,9	101,1	101,5	0,181	0,182	507	0,271341295
16,830	540,0	543,9	102,1	102,4	0,181	0,181	508	0,268294903
17,281	540,1	544,0	99,6	100,0	0,181	0,181	509	0,275467666
17,080	540,2	544,0	100,6	101,0	0,181	0,182	510	0,272280791
17,079	540,2	544,0	100,6	100,9	0,181	0,181	511	0,272279951
17,170	540,2	544,0	100,2	100,7	0,181	0,181	512	0,273604694
17,169	540,0	544,0	100,1	100,8	0,181	0,182	513	0,273597548
17,206	539,9	543,9	100,1	100,5	0,181	0,182	514	0,274160082
17,299	539,9	543,9	99,4	99,8	0,181	0,182	515	0,275720424
17,080	540,0	543,9	100,7	100,8	0,181	0,181	516	0,27228073
17,056	540,1	543,9	100,8	101,2	0,181	0,181	517	0,27190378
17,154	540,2	544,0	100,4	100,8	0,181	0,182	518	0,273462977
16,939	540,2	544,0	101,6	101,9	0,181	0,182	519	0,270007293
17,201	540,1	544,0	100,1	100,2	0,181	0,181	520	0,274159282
17,251	540,0	543,9	99,7	99,8	0,181	0,181	521	0,274908024
17,145	539,9	543,8	100,6	100,7	0,181	0,181	522	0,273220696
17,169	539,8	543,8	100,3	100,4	0,181	0,181	523	0,273596764
17,085	539,8	543,8	100,8	101,2	0,181	0,181	524	0,272280126
17,117	539,8	543,8	100,5	100,9	0,181	0,182	525	0,272848906
17,079	540,0	543,8	100,8	101,1	0,181	0,182	526	0,272280958
17,038	540,1	543,9	100,9	101,3	0,181	0,182	527	0,271645074
16,970	540,2	543,9	101,4	101,5	0,181	0,181	528	0,270576692

Particulates Calculations

17,022	540,2	543,9	101,1	101,4	0,181	0,181	529	0,271335153
16,988	540,1	543,9	101,4	101,8	0,181	0,182	530	0,270759812
17,025	539,9	543,8	101,1	101,3	0,181	0,182	531	0,271336199
16,944	539,8	543,8	101,8	102,0	0,181	0,182	532	0,270002957
17,059	539,8	543,8	101,0	101,3	0,181	0,182	533	0,27190171
17,244	539,9	543,8	99,8	100,1	0,181	0,182	534	0,274908363
17,161	540,0	543,8	100,4	100,6	0,181	0,182	535	0,273597705
17,079	540,1	543,9	100,6	101,0	0,181	0,182	536	0,272304196
17,194	540,1	543,9	100,0	100,3	0,181	0,181	537	0,274158978
17,140	540,1	543,9	100,4	100,7	0,181	0,182	538	0,273220809
16,751	540,0	543,8	102,8	103,1	0,181	0,181	539	0,266947428
17,357	539,9	543,8	99,3	99,6	0,181	0,182	540	0,276591154
16,873	539,9	543,7	102,3	102,2	0,181	0,181	541	0,268894387
17,166	539,8	543,7	100,4	100,8	0,181	0,182	542	0,273597034
17,079	539,9	543,7	100,9	101,0	0,181	0,182	543	0,272280292
17,159	540,0	543,8	100,3	100,7	0,181	0,182	544	0,273584616
16,933	540,0	543,8	101,6	102,0	0,181	0,182	545	0,269988555
17,052	540,1	543,9	100,9	101,0	0,181	0,181	546	0,271902079
17,163	540,1	543,9	100,3	100,7	0,181	0,181	547	0,273597209
17,024	540,0	543,8	101,1	101,2	0,181	0,181	548	0,271336261
17,213	539,8	543,8	100,2	100,4	0,181	0,181	549	0,274354324
17,025	539,7	543,7	101,2	101,5	0,181	0,182	550	0,271334995
17,019	539,8	543,7	101,1	101,7	0,181	0,182	551	0,271337122
17,218	539,9	543,8	99,9	100,1	0,181	0,182	552	0,274533908
17,022	540,0	543,8	101,0	101,2	0,181	0,181	553	0,271412037
17,051	540,0	543,8	100,9	101,2	0,181	0,181	554	0,271903543
17,281	540,1	543,9	99,6	100,0	0,181	0,182	555	0,275466809
17,057	539,9	543,8	101,0	101,4	0,181	0,182	556	0,271852286
17,099	539,8	543,8	100,7	101,1	0,181	0,182	557	0,27253403
16,750	539,8	543,7	102,8	103,3	0,181	0,182	558	0,266948544
17,202	539,7	543,7	100,2	100,4	0,181	0,182	559	0,274151047
17,060	539,7	543,6	100,9	101,3	0,181	0,182	560	0,271901684
17,019	539,7	543,7	101,1	101,7	0,181	0,182	561	0,27133598
17,241	539,8	543,7	99,8	100,1	0,181	0,182	562	0,274907227
17,063	540,0	543,8	100,8	101,1	0,181	0,182	563	0,272083711
17,143	540,1	543,9	100,2	100,6	0,181	0,181	564	0,27336655
17,073	540,1	543,9	100,8	100,9	0,181	0,181	565	0,272279776
17,280	540,0	543,9	99,5	100,0	0,181	0,181	566	0,275469665
17,139	539,9	543,8	100,4	100,7	0,181	0,182	567	0,273186417
16,796	539,8	543,8	102,6	102,9	0,181	0,182	568	0,267715441
17,283	539,7	543,7	99,7	99,9	0,181	0,182	569	0,275466636
17,099	539,7	543,7	100,7	101,0	0,181	0,182	570	0,272630252
17,275	539,8	543,7	99,6	99,8	0,181	0,182	571	0,275469864
17,015	539,9	543,8	101,0	101,4	0,181	0,182	572	0,271335197
17,014	540,0	543,8	101,2	101,1	0,181	0,181	573	0,271334565
17,358	540,0	543,8	99,1	99,4	0,181	0,181	574	0,276768753
17,332	539,9	543,8	99,2	99,7	0,181	0,182	575	0,27628459
17,221	539,8	543,7	100,0	100,4	0,181	0,182	576	0,274488719
17,164	539,7	543,7	100,5	100,4	0,181	0,181	577	0,273595675
17,222	539,7	543,6	100,0	100,2	0,181	0,181	578	0,274493696
17,284	539,6	543,6	99,6	99,9	0,181	0,182	579	0,275550413
16,875	539,7	543,6	101,9	102,3	0,181	0,182	580	0,269089896
16,869	539,8	543,7	101,9	102,3	0,181	0,182	581	0,268999871
17,237	539,9	543,8	99,8	100,3	0,181	0,182	582	0,274906134
17,086	540,0	543,8	100,6	101,1	0,181	0,182	583	0,272517521
17,109	540,0	543,8	100,5	100,8	0,181	0,182	584	0,272827558
16,937	539,9	543,8	101,7	101,9	0,181	0,181	585	0,27000679
17,163	539,8	543,7	100,2	100,8	0,181	0,182	586	0,273596233
17,080	539,6	543,6	100,9	101,3	0,181	0,182	587	0,272279163
17,062	539,7	543,6	100,9	101,1	0,181	0,182	588	0,272050525
17,049	539,7	543,7	100,8	101,4	0,181	0,182	589	0,271900676
17,156	539,8	543,7	100,1	100,7	0,181	0,182	590	0,273595727
17,154	539,9	543,8	100,3	100,6	0,181	0,182	591	0,273596625
17,090	539,9	543,8	100,6	100,7	0,181	0,181	592	0,272581065
17,052	539,9	543,8	100,7	101,2	0,181	0,181	593	0,271903867
17,243	539,7	543,7	99,8	100,2	0,181	0,182	594	0,274906064
17,116	539,6	543,7	100,5	100,8	0,181	0,182	595	0,272844257

Particulates Calculations

16,928	539,6	543,6	101,7	102,0	0,181	0,182	596	0,269882204
17,054	539,5	543,5	101,0	101,3	0,181	0,182	597	0,271903008
17,019	539,5	543,5	101,2	101,4	0,181	0,182	598	0,271334284
17,054	539,5	543,5	101,0	101,5	0,181	0,182	599	0,271901088
17,050	539,5	543,5	100,9	101,2	0,181	0,182	600	0,271900404
17,107	539,6	543,5	100,6	100,9	0,181	0,182	601	0,272843882
17,070	539,7	543,6	100,7	101,1	0,181	0,182	602	0,272279811
17,151	539,8	543,6	100,2	100,5	0,181	0,182	603	0,273595736
16,884	539,9	543,7	101,7	102,1	0,181	0,182	604	0,269336716
17,019	539,9	543,7	101,0	101,5	0,181	0,182	605	0,271473995
17,133	539,8	543,7	100,3	100,9	0,181	0,182	606	0,273220059
17,018	539,7	543,6	101,0	101,5	0,181	0,182	607	0,27133409
17,080	539,6	543,6	100,8	101,1	0,181	0,182	608	0,272313337
17,280	539,5	543,5	99,6	99,9	0,181	0,182	609	0,275555016
17,105	539,6	543,6	100,7	100,7	0,181	0,181	610	0,272843017
17,045	539,7	543,6	100,9	101,3	0,181	0,182	611	0,271901412
17,069	539,8	543,7	100,6	101,2	0,181	0,182	612	0,272279276
17,008	539,9	543,7	100,9	101,1	0,181	0,181	613	0,271329293
17,133	539,9	543,7	100,3	100,6	0,181	0,181	614	0,273236743
17,111	539,7	543,6	100,4	101,1	0,181	0,182	615	0,272843558
17,277	539,6	543,5	99,6	99,8	0,181	0,182	616	0,275466601
16,863	539,5	543,5	102,0	102,3	0,181	0,181	617	0,268896968
17,153	539,5	543,5	100,2	100,6	0,181	0,182	618	0,273595683
17,186	539,6	543,5	100,1	100,2	0,181	0,182	619	0,274156543
16,867	539,7	543,6	102,0	102,1	0,181	0,181	620	0,269054391
16,842	539,8	543,6	102,1	102,3	0,181	0,181	621	0,268671379
17,372	539,8	543,6	98,9	99,1	0,181	0,181	622	0,277139069
17,214	539,8	543,6	99,9	100,4	0,181	0,182	623	0,274532545
17,239	539,7	543,6	99,8	100,1	0,181	0,182	624	0,274905969
17,216	539,5	543,5	99,9	100,3	0,181	0,182	625	0,27453284
17,194	539,5	543,5	100,0	100,6	0,181	0,182	626	0,274232174
17,128	539,5	543,5	100,4	100,4	0,181	0,182	627	0,273220312
17,151	539,7	543,6	100,2	100,7	0,181	0,181	628	0,273595614
17,136	539,7	543,6	100,3	101,0	0,181	0,182	629	0,273372996
17,240	539,8	543,6	99,8	100,0	0,181	0,182	630	0,275034477
17,434	539,7	543,6	98,6	98,9	0,181	0,182	631	0,278064241
17,238	539,6	543,6	99,9	100,3	0,181	0,182	632	0,274906169
16,742	539,5	543,5	102,8	103,3	0,181	0,182	633	0,266948231
16,870	539,4	543,4	101,9	102,5	0,181	0,182	634	0,268998107
16,965	539,4	543,4	101,5	101,8	0,181	0,182	635	0,270576401
17,192	539,3	543,4	100,2	100,5	0,181	0,182	636	0,274157986
17,104	539,4	543,4	100,6	101,0	0,181	0,182	637	0,27284306
17,138	539,5	543,5	100,4	100,5	0,181	0,182	638	0,273420061
17,347	539,6	543,6	99,0	99,6	0,181	0,182	639	0,276765049
17,066	539,7	543,6	100,8	101,2	0,181	0,182	640	0,272279469
17,065	539,7	543,6	100,7	100,9	0,181	0,182	641	0,272278287
17,158	539,7	543,6	100,3	100,5	0,181	0,181	642	0,273684825
17,216	539,6	543,5	100,0	100,1	0,181	0,181	643	0,274532701
17,215	539,5	543,5	99,9	100,1	0,181	0,181	644	0,274531546
16,873	539,4	543,4	102,0	102,2	0,181	0,181	645	0,269118221
17,013	539,4	543,4	101,0	101,3	0,181	0,182	646	0,271411764
17,148	539,5	543,5	100,2	100,6	0,181	0,182	647	0,273595143
17,184	539,6	543,6	99,9	100,3	0,181	0,182	648	0,274158847
17,100	539,7	543,6	100,5	100,7	0,181	0,181	649	0,27284313
17,123	539,7	543,6	100,4	100,6	0,181	0,181	650	0,273149524
17,161	539,6	543,5	100,4	100,5	0,181	0,182	651	0,273705122
17,192	539,5	543,4	100,1	100,3	0,181	0,182	652	0,274157569
17,110	539,4	543,4	100,5	101,0	0,181	0,182	653	0,272842632
17,190	539,4	543,4	100,0	100,3	0,181	0,182	654	0,274189561
17,208	539,4	543,4	99,9	100,1	0,181	0,181	655	0,274549879
17,148	539,5	543,5	100,2	100,4	0,181	0,181	656	0,273593949
17,041	539,6	543,6	101,0	101,0	0,181	0,181	657	0,271899378
17,229	539,6	543,5	99,7	100,0	0,181	0,181	658	0,274905232
17,044	539,6	543,6	100,9	101,1	0,181	0,181	659	0,271897721
17,220	539,5	543,5	99,8	100,2	0,181	0,182	660	0,274657391
17,190	539,4	543,4	100,1	100,2	0,181	0,181	661	0,27415776
17,187	539,3	543,4	100,1	100,3	0,181	0,181	662	0,27415756

Particulates Calculations

17,005	539,4	543,4	101,1	101,4	0,181	0,182	663	0,271333326
17,039	539,5	543,5	100,8	101,2	0,181	0,182	664	0,271900062
16,918	539,6	543,5	101,6	102,1	0,181	0,182	665	0,26996789
17,227	539,7	543,5	99,7	100,0	0,181	0,182	666	0,274905353
17,326	539,6	543,5	99,1	99,6	0,181	0,182	667	0,276395612
17,077	539,5	543,4	100,7	101,1	0,181	0,182	668	0,272362528
17,154	539,4	543,4	100,3	100,6	0,181	0,182	669	0,273594446
17,190	539,3	543,3	100,0	100,3	0,181	0,182	670	0,274156151
17,169	539,2	543,3	100,1	100,6	0,181	0,182	671	0,273835848
17,014	539,2	543,3	101,0	101,4	0,181	0,182	672	0,271430878
17,228	539,3	543,3	99,7	100,0	0,181	0,182	673	0,274898363
17,181	539,5	543,4	100,2	100,3	0,181	0,182	674	0,274157021
17,227	539,6	543,5	99,8	100,1	0,181	0,182	675	0,274906038
17,202	539,6	543,5	99,9	100,1	0,181	0,182	676	0,274532154
17,178	539,6	543,5	99,9	100,4	0,181	0,182	677	0,274109761
17,128	539,6	543,5	100,4	100,6	0,181	0,182	678	0,273216428
17,233	539,4	543,4	99,9	100,2	0,181	0,182	679	0,274906021
17,186	539,3	543,3	100,1	100,8	0,181	0,182	680	0,274156595
17,043	539,3	543,3	100,9	101,1	0,181	0,182	681	0,271984061
17,341	539,4	543,4	99,1	99,4	0,181	0,182	682	0,276767685
17,119	539,5	543,4	100,4	100,8	0,181	0,182	683	0,273218645
17,222	539,6	543,5	99,8	100,0	0,181	0,182	684	0,27487838
17,062	539,6	543,5	100,8	101,0	0,181	0,182	685	0,272277306
17,150	539,6	543,5	100,4	100,8	0,181	0,182	686	0,273593854
17,104	539,4	543,4	100,8	101,2	0,181	0,182	687	0,272842562
17,264	539,3	543,3	99,7	100,3	0,181	0,182	688	0,275405005
17,220	539,3	543,3	99,8	100,4	0,181	0,182	689	0,2747734
17,225	539,3	543,3	99,8	100,2	0,181	0,182	690	0,274894868
17,178	539,5	543,4	100,0	100,2	0,181	0,182	691	0,274156917
17,398	539,5	543,5	98,9	98,9	0,181	0,181	692	0,277689003
17,115	539,6	543,5	100,4	100,4	0,181	0,181	693	0,273171624
17,345	539,6	543,5	99,1	99,4	0,181	0,181	694	0,276767978
17,007	539,5	543,4	101,1	101,4	0,181	0,182	695	0,271332447
17,362	539,3	543,3	99,1	99,4	0,181	0,182	696	0,276997129
17,203	539,3	543,3	99,9	100,3	0,181	0,182	697	0,274540552
17,316	539,4	543,4	99,2	99,2	0,181	0,181	698	0,276378178
17,258	539,5	543,5	99,6	99,5	0,181	0,181	699	0,275465502
17,058	539,5	543,5	100,8	100,7	0,181	0,181	700	0,27227749
17,205	539,6	543,5	99,9	99,9	0,181	0,181	701	0,274531772
17,096	539,4	543,4	100,5	100,6	0,181	0,181	702	0,272791508
17,183	539,3	543,3	100,2	100,3	0,181	0,181	703	0,274157064
16,922	539,2	543,2	101,6	101,6	0,181	0,181	704	0,270004043
17,203	539,2	543,3	100,0	100,2	0,181	0,181	705	0,274548533
17,175	539,2	543,3	100,1	100,4	0,181	0,182	706	0,274155673
17,117	539,3	543,3	100,4	100,6	0,181	0,182	707	0,27321786
17,139	539,4	543,4	100,1	100,3	0,181	0,181	708	0,273593766
17,033	539,5	543,4	100,9	101,0	0,181	0,181	709	0,271898668
17,121	539,5	543,4	100,4	100,4	0,181	0,181	710	0,273217083
16,839	539,4	543,4	102,0	102,2	0,181	0,181	711	0,268669968
17,006	539,3	543,3	101,2	101,4	0,181	0,181	712	0,271331129
17,111	539,2	543,2	100,4	100,7	0,181	0,182	713	0,273100186
17,264	539,3	543,3	99,5	99,9	0,181	0,182	714	0,275595886
17,174	539,4	543,3	100,2	100,3	0,181	0,182	715	0,27415549
17,255	539,4	543,4	99,6	99,7	0,181	0,182	716	0,27546468
17,220	539,5	543,4	99,7	99,9	0,181	0,181	717	0,274903931
17,202	539,5	543,4	100,0	100,2	0,181	0,181	718	0,274532363
17,123	539,4	543,3	100,5	100,9	0,181	0,182	719	0,273239055
17,038	539,3	543,2	101,0	101,2	0,181	0,182	720	0,271898825
17,198	539,2	543,2	99,8	100,2	0,181	0,182	721	0,274530843
17,264	539,3	543,3	99,7	99,8	0,181	0,182	722	0,275605904
17,219	539,4	543,3	99,7	99,9	0,181	0,182	723	0,274904651
17,253	539,4	543,4	99,5	99,8	0,181	0,182	724	0,275463053
16,996	539,4	543,4	101,1	101,5	0,181	0,182	725	0,271332245
17,002	539,4	543,4	101,1	101,4	0,181	0,182	726	0,271332236
16,919	539,2	543,3	101,7	101,9	0,181	0,182	727	0,270003108
16,989	539,1	543,2	101,2	101,7	0,181	0,182	728	0,271230877
16,995	539,2	543,2	101,1	101,3	0,181	0,182	729	0,27133228

Particulates Calculations

16,995	539,3	543,3	101,0	101,5	0,181	0,182	730	0,271331762
17,325	539,3	543,4	99,2	99,3	0,181	0,182	731	0,276606497
16,995	539,4	543,4	101,0	101,5	0,181	0,182	732	0,271332017
17,117	539,4	543,4	100,4	100,6	0,181	0,182	733	0,273217319
17,203	539,3	543,3	100,0	100,3	0,181	0,182	734	0,274530278
17,226	539,2	543,2	99,9	100,2	0,181	0,182	735	0,274903627
17,209	539,1	543,2	99,9	100,0	0,181	0,182	736	0,274690775
17,114	539,1	543,2	100,4	100,7	0,181	0,182	737	0,273217205
17,053	539,2	543,3	100,9	101,0	0,181	0,182	738	0,272275949
17,088	539,3	543,3	100,5	100,9	0,181	0,182	739	0,272841321
16,993	539,4	543,3	101,0	101,5	0,181	0,182	740	0,271331718
17,087	539,4	543,4	100,5	100,6	0,181	0,182	741	0,272819274
16,916	539,3	543,3	101,6	101,7	0,181	0,181	742	0,270004379
17,060	539,1	543,2	101,0	101,1	0,181	0,182	743	0,272276133
17,118	539,0	543,1	100,6	100,7	0,181	0,182	744	0,273212449
17,259	538,9	543,1	99,7	100,1	0,181	0,182	745	0,275467017
17,136	539,0	543,1	100,2	100,7	0,181	0,182	746	0,273593862
16,850	539,1	543,2	101,9	102,2	0,181	0,182	747	0,269052132
16,955	539,2	543,2	101,4	101,6	0,181	0,182	748	0,270703513
17,133	539,2	543,3	100,3	100,3	0,181	0,182	749	0,273592799
17,168	539,2	543,3	100,0	100,3	0,181	0,182	750	0,27415309
17,086	539,2	543,3	100,7	100,8	0,181	0,182	751	0,272841461
16,996	539,3	543,3	101,0	100,9	0,181	0,181	752	0,271332043
17,033	539,2	543,2	100,8	100,7	0,181	0,181	753	0,27189815
16,911	539,0	543,1	101,5	101,8	0,181	0,181	754	0,270006437
17,191	539,1	543,1	99,8	99,9	0,181	0,181	755	0,274530487
17,084	539,2	543,2	100,4	100,9	0,181	0,182	756	0,272841479
17,130	539,2	543,3	100,0	100,5	0,181	0,182	757	0,273574917
17,353	539,2	543,3	98,9	99,0	0,181	0,181	758	0,27713839
17,129	539,3	543,3	100,0	100,3	0,181	0,181	759	0,273593017
17,113	539,2	543,3	100,3	100,8	0,181	0,182	760	0,273217397
16,855	539,1	543,2	101,9	102,0	0,181	0,182	761	0,269050608
17,249	539,0	543,1	99,7	99,6	0,181	0,181	762	0,275460387
17,305	539,0	543,1	99,1	99,7	0,181	0,182	763	0,276393179



Particulates Calculations

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	100,54	101,04	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
			PR1	PR2			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
17,393	538,2	538,3			0,181	0,183	0	0,262523641030670
17,270	538,2	538,3	105,5	106,3	0,181	0,183	1	0,261300918
17,346	538,3	538,4	103,7	104,8	0,181	0,183	2	0,264043358
17,389	538,3	538,5	103,9	104,8	0,181	0,183	3	0,264253247
17,418	538,4	538,6	104,7	106,1	0,181	0,183	4	0,263263383
17,333	538,5	538,8	106,7	108,0	0,181	0,183	5	0,260323246
17,289	538,5	538,9	108,4	109,3	0,181	0,183	6	0,257946354
17,537	538,6	539,1	108,5	109,5	0,181	0,183	7	0,259848675
17,640	538,7	539,3	109,1	109,9	0,182	0,183	8	0,259926304
17,524	538,7	539,5	110,5	111,3	0,181	0,183	9	0,257148516
17,327	538,8	539,6	112,6	113,8	0,181	0,183	10	0,253327541
17,249	538,9	539,8	106,5	107,6	0,181	0,183	11	0,259914802
17,445	539,0	540,0	103,0	103,9	0,181	0,183	12	0,265981726
17,179	539,1	540,2	103,4	104,3	0,181	0,183	13	0,263263854
16,993	539,1	540,3	103,7	104,6	0,181	0,183	14	0,261268826
17,144	539,1	540,5	102,6	103,2	0,181	0,183	15	0,26415994
17,342	539,0	540,6	101,0	101,8	0,181	0,183	16	0,267713954
17,087	539,0	540,7	102,1	103,1	0,181	0,183	17	0,264044713
17,068	539,1	540,8	102,3	102,9	0,181	0,183	18	0,264044478
16,940	539,2	540,9	102,6	103,4	0,181	0,183	19	0,26228839
17,168	539,2	541,1	101,3	102,1	0,181	0,183	20	0,265982551
17,074	539,2	541,2	101,6	102,5	0,181	0,183	21	0,264681471
17,296	539,2	541,3	100,2	101,0	0,181	0,183	22	0,268284123
17,224	539,3	541,4	100,6	101,1	0,181	0,182	23	0,267331046
17,008	539,4	541,5	101,6	102,5	0,181	0,182	24	0,264044017
17,216	539,4	541,6	100,5	101,2	0,181	0,183	25	0,267323813
17,150	539,5	541,7	100,8	101,4	0,181	0,182	26	0,26636695
16,949	539,6	541,8	102,1	102,7	0,181	0,182	27	0,26326638
17,120	539,7	541,9	100,8	101,4	0,181	0,182	28	0,26602284
17,202	539,7	542,1	100,5	101,1	0,181	0,182	29	0,26732911
17,256	539,8	542,2	100,0	100,7	0,181	0,182	30	0,268289597
17,105	539,9	542,3	100,9	101,6	0,181	0,182	31	0,265983035
17,187	540,0	542,5	100,4	100,7	0,181	0,182	32	0,267328914
16,974	540,1	542,6	101,6	102,1	0,181	0,182	33	0,264045254
17,011	540,2	542,7	101,2	101,8	0,181	0,182	34	0,264628293
16,969	540,2	542,9	101,4	102,2	0,181	0,182	35	0,264046004
17,002	540,3	543,0	100,9	101,9	0,181	0,182	36	0,264629095
16,966	540,3	543,1	101,5	101,8	0,181	0,182	37	0,264047087
17,238	540,4	543,2	99,8	100,3	0,181	0,182	38	0,268349513
17,086	540,5	543,2	100,6	100,9	0,181	0,182	39	0,265983555
17,311	540,5	543,2	99,3	99,8	0,181	0,182	40	0,269627377
17,379	540,5	543,3	98,8	99,4	0,181	0,182	41	0,27074619
17,095	540,4	543,3	100,4	100,8	0,181	0,182	42	0,266262707
17,041	540,6	543,4	100,8	101,2	0,181	0,182	43	0,265406153
17,036	540,6	543,4	100,7	101,3	0,181	0,182	44	0,265405093
17,160	540,6	543,5	100,1	100,5	0,181	0,182	45	0,267332615
17,185	540,7	543,6	99,7	100,4	0,181	0,182	46	0,267717881
17,305	540,8	543,7	98,9	99,7	0,181	0,182	47	0,269627598
16,945	540,8	543,7	101,2	101,7	0,181	0,182	48	0,264047656
17,127	540,8	543,7	100,2	100,2	0,181	0,181	49	0,266945999
17,089	540,8	543,8	100,3	100,8	0,181	0,182	50	0,266371864
17,038	540,9	543,8	100,4	101,1	0,181	0,182	51	0,265579184
17,176	540,9	543,9	99,7	100,4	0,181	0,182	52	0,267775548
16,916	540,9	543,9	101,3	101,9	0,181	0,182	53	0,263659704
17,029	540,9	543,9	100,5	101,0	0,181	0,182	54	0,265406539
17,126	541,0	544,0	99,9	100,6	0,181	0,182	55	0,266952858
17,174	541,0	544,1	99,8	100,3	0,181	0,182	56	0,267718139
16,888	541,1	544,2	101,4	101,6	0,181	0,182	57	0,26327473
17,063	541,1	544,2	100,4	100,6	0,181	0,181	58	0,265996624
17,175	541,2	544,3	99,7	100,3	0,181	0,182	59	0,267719066
17,061	541,2	544,3	100,4	101,0	0,181	0,182	60	0,26598706
17,024	541,2	544,4	100,5	101,2	0,181	0,182	61	0,265407743

Particulates Calculations

17,122	541,3	544,4	99,9	100,3	0,181	0,182	62	0,266954974
17,168	541,3	544,5	99,6	100,1	0,181	0,182	63	0,267719146
16,965	541,4	544,6	100,7	101,3	0,181	0,182	64	0,264632158
16,930	541,5	544,6	101,1	101,3	0,181	0,181	65	0,264047584
17,164	541,5	544,7	99,4	100,1	0,181	0,181	66	0,26771968
17,139	541,5	544,7	99,8	100,1	0,181	0,182	67	0,267335371
17,284	541,6	544,7	98,8	99,4	0,181	0,182	68	0,269629216
17,071	541,7	544,8	100,0	100,5	0,181	0,182	69	0,266374666
16,955	541,7	544,8	100,6	101,2	0,181	0,182	70	0,264633951
17,152	541,8	544,9	99,5	99,8	0,181	0,181	71	0,267710881
17,104	541,7	544,9	99,6	100,3	0,181	0,181	72	0,266951786
17,045	541,7	544,9	100,0	100,6	0,180	0,182	73	0,2659881
17,219	541,7	544,9	99,2	99,9	0,181	0,182	74	0,268678061
17,131	541,7	545,0	99,6	100,1	0,181	0,182	75	0,267336085
17,107	541,8	545,1	99,9	100,2	0,181	0,181	76	0,266952661
17,014	541,8	545,1	100,2	100,7	0,181	0,181	77	0,265503252
17,194	541,8	545,1	99,3	99,8	0,181	0,181	78	0,26829644
17,482	541,9	545,1	97,6	97,9	0,181	0,181	79	0,272849413
17,037	542,0	545,2	100,2	100,9	0,181	0,182	80	0,265898431
17,301	542,0	545,1	98,7	99,0	0,181	0,182	81	0,270013271
17,242	542,0	545,1	98,9	99,2	0,181	0,181	82	0,269059912
17,040	541,9	545,1	100,1	100,8	0,181	0,181	83	0,265988368
17,238	541,9	545,1	99,0	99,4	0,181	0,182	84	0,269055809
17,191	542,0	545,2	99,4	99,6	0,181	0,181	85	0,26829724
17,034	542,0	545,3	100,2	100,6	0,181	0,181	86	0,265840609
17,153	542,1	545,2	99,5	99,9	0,181	0,181	87	0,267721417
17,300	542,2	545,3	98,5	99,1	0,180	0,181	88	0,270011417
17,188	542,2	545,3	99,2	99,9	0,180	0,182	89	0,268296342
17,125	542,1	545,3	99,5	100,2	0,180	0,182	90	0,26733736
17,379	542,1	545,3	98,1	98,7	0,181	0,182	91	0,271341814
17,207	542,2	545,3	99,0	99,5	0,181	0,182	92	0,268678407
17,154	542,1	545,3	99,3	99,8	0,181	0,181	93	0,26784691
17,326	542,2	545,4	98,3	98,8	0,181	0,181	94	0,270584226
17,228	542,2	545,4	98,9	99,3	0,181	0,181	95	0,269061719
17,265	542,2	545,4	98,7	99,1	0,181	0,181	96	0,269781343
17,107	542,1	545,5	99,4	99,9	0,181	0,181	97	0,26734231
17,195	542,1	545,4	98,9	99,5	0,180	0,181	98	0,268678665
17,036	542,1	545,4	99,8	100,4	0,180	0,182	99	0,266257684
17,104	542,1	545,4	99,5	99,9	0,181	0,182	100	0,267343656
17,214	542,1	545,4	98,7	99,3	0,181	0,181	101	0,269060949
17,080	542,1	545,4	99,7	100,1	0,181	0,181	102	0,266953519
17,217	542,0	545,4	98,9	99,4	0,181	0,182	103	0,269061268
17,286	542,1	545,5	98,2	98,9	0,180	0,182	104	0,270165173
17,160	542,1	545,6	99,1	99,4	0,180	0,181	105	0,268186849
17,248	542,2	545,6	98,6	98,9	0,181	0,181	106	0,269632753
17,187	542,3	545,7	98,9	99,3	0,180	0,181	107	0,268678354
17,165	542,4	545,7	99,0	99,5	0,180	0,181	108	0,268297178
17,307	542,4	545,7	98,0	98,5	0,180	0,181	109	0,270563554
17,078	542,4	545,7	99,4	99,8	0,180	0,181	110	0,266965727
17,099	542,5	545,8	99,3	99,7	0,180	0,181	111	0,267338475
17,145	542,6	545,9	99,1	99,3	0,180	0,181	112	0,268082219
17,242	542,7	546,0	98,3	98,9	0,180	0,181	113	0,269637678
17,031	542,7	546,0	99,7	100,0	0,180	0,181	114	0,266376805
16,971	542,7	546,0	99,8	100,6	0,180	0,181	115	0,265411138
17,266	542,7	546,0	98,2	98,9	0,180	0,182	116	0,270031486
17,066	542,8	546,0	99,4	99,9	0,180	0,181	117	0,26695451
17,410	542,8	546,0	97,4	97,9	0,180	0,181	118	0,272323055
17,284	542,8	546,1	98,1	98,5	0,180	0,181	119	0,270395423
17,088	542,8	546,1	99,2	99,7	0,180	0,181	120	0,267338207
17,110	542,8	546,1	98,9	99,7	0,180	0,181	121	0,267673857
17,180	542,8	546,1	98,8	99,2	0,180	0,181	122	0,268828633
17,172	542,8	546,1	98,6	99,1	0,180	0,181	123	0,268696216
16,912	542,9	546,2	100,2	100,7	0,180	0,181	124	0,264636014
17,084	542,9	546,2	99,2	99,6	0,180	0,181	125	0,26733868
16,998	542,9	546,2	99,5	100,1	0,180	0,181	126	0,265992375
17,143	543,0	546,2	98,8	99,2	0,180	0,181	127	0,268298359
17,083	543,0	546,2	99,1	99,7	0,180	0,181	128	0,267339037

Particulates Calculations

17,257	542,9	546,2	98,3	98,6	0,180	0,181	129	0,270020626
17,083	543,0	546,2	99,2	99,7	0,180	0,181	130	0,26733876
17,231	542,9	546,2	98,3	99,0	0,180	0,181	131	0,26963468
17,226	542,8	546,2	98,5	99,1	0,180	0,182	132	0,269540653
17,192	542,9	546,2	98,5	98,9	0,180	0,181	133	0,269062641
17,249	542,9	546,3	98,2	98,5	0,180	0,181	134	0,270015752
17,310	543,0	546,3	97,7	98,5	0,180	0,181	135	0,270964613
17,302	543,0	546,3	97,8	98,2	0,180	0,181	136	0,270964138
17,161	543,0	546,2	98,5	99,2	0,180	0,181	137	0,268680093
17,050	543,0	546,2	99,4	99,7	0,180	0,181	138	0,26695568
17,163	542,9	546,2	98,7	99,2	0,180	0,181	139	0,268680519
17,220	543,0	546,2	98,3	98,9	0,180	0,181	140	0,269633902
17,309	542,9	546,2	98,0	98,4	0,181	0,181	141	0,270963988
17,163	543,0	546,3	98,7	99,0	0,181	0,181	142	0,268681327
17,157	543,0	546,3	98,6	99,2	0,180	0,181	143	0,268679303
17,164	543,1	546,5	98,6	99,1	0,180	0,181	144	0,268681167
17,318	543,2	546,5	97,8	98,3	0,180	0,181	145	0,271105517
17,430	543,2	546,6	97,1	97,6	0,180	0,181	146	0,272846722
17,248	543,3	546,7	98,1	98,8	0,180	0,181	147	0,270015346
17,121	543,3	546,7	98,9	99,5	0,180	0,181	148	0,268002077
17,082	543,4	546,7	99,1	99,4	0,180	0,181	149	0,267361403
17,142	543,4	546,7	98,8	99,3	0,180	0,181	150	0,268299257
17,325	543,3	546,7	97,7	97,9	0,180	0,181	151	0,271194782
17,242	543,3	546,7	98,1	98,6	0,180	0,181	152	0,269863625
17,053	543,4	546,7	99,0	99,7	0,180	0,181	153	0,266956555
17,139	543,5	546,8	98,8	99,3	0,180	0,181	154	0,268300386
17,080	543,5	546,8	98,9	99,3	0,180	0,181	155	0,267438073
17,159	543,5	546,9	98,6	99,2	0,180	0,181	156	0,2686813
17,280	543,5	546,9	97,8	98,3	0,180	0,181	157	0,270586367
17,299	543,5	546,9	97,6	98,5	0,180	0,181	158	0,270965467
17,383	543,6	546,9	97,2	97,8	0,180	0,181	159	0,27228904
17,150	543,6	546,9	98,4	98,9	0,180	0,181	160	0,268685258
17,124	543,6	547,0	98,5	99,2	0,180	0,181	161	0,268299693
17,495	543,6	547,1	96,3	96,7	0,180	0,181	162	0,274151168
17,457	543,7	547,1	96,5	97,0	0,180	0,181	163	0,273603927
17,082	543,6	547,1	98,7	99,2	0,180	0,181	164	0,2677257
17,172	543,6	547,0	98,1	98,8	0,180	0,181	165	0,269200617
17,198	543,6	547,0	98,2	98,5	0,180	0,181	166	0,269633416
17,367	543,5	546,9	97,3	97,5	0,180	0,181	167	0,272290353
16,999	543,4	547,0	99,2	99,4	0,180	0,181	168	0,26657204
17,071	543,5	546,9	98,7	99,2	0,180	0,181	169	0,267737829
17,358	543,5	546,9	96,9	97,5	0,180	0,181	170	0,272289014
17,073	543,5	546,9	98,7	99,0	0,180	0,181	171	0,267796835
17,367	543,5	546,9	96,9	97,4	0,180	0,181	172	0,272451207
17,148	543,4	546,9	98,2	98,6	0,180	0,181	173	0,26906327
17,120	543,4	546,9	98,5	98,5	0,180	0,181	174	0,268680901
17,280	543,4	546,9	97,4	97,5	0,180	0,180	175	0,271228214
17,287	543,4	546,9	97,4	97,6	0,180	0,181	176	0,271342736
16,967	543,4	546,9	99,1	99,3	0,180	0,181	177	0,266378049
17,127	543,4	546,9	98,2	98,9	0,180	0,181	178	0,268881548
17,259	543,5	547,0	97,6	97,7	0,180	0,181	179	0,270958093
17,377	543,5	547,0	96,8	97,2	0,180	0,181	180	0,272853738
17,089	543,5	547,0	98,4	98,9	0,180	0,181	181	0,26833671
17,424	543,5	547,0	96,6	96,9	0,180	0,181	182	0,273605827
17,374	543,4	546,9	96,8	97,3	0,180	0,181	183	0,27285338
17,279	543,4	546,9	97,3	97,6	0,180	0,181	184	0,27134443
17,261	543,3	546,8	97,5	97,8	0,180	0,181	185	0,271082352
17,045	543,4	546,9	98,6	98,8	0,180	0,181	186	0,267724489
17,274	543,5	546,9	97,4	97,8	0,180	0,181	187	0,271344239
17,246	543,5	547,0	97,5	97,5	0,180	0,181	188	0,270945422
17,364	543,6	546,9	96,9	97,1	0,180	0,181	189	0,272854429
17,218	543,5	546,9	97,6	97,8	0,180	0,181	190	0,270585926
17,093	543,5	546,9	98,4	98,6	0,180	0,181	191	0,268681735
17,211	543,5	546,9	97,5	97,7	0,180	0,181	192	0,270596685
17,150	543,5	546,9	97,9	98,2	0,180	0,181	193	0,269665565
17,351	543,6	546,9	96,7	97,1	0,180	0,181	194	0,272854568
17,203	543,5	546,9	97,5	98,0	0,180	0,181	195	0,270499845

Particulates Calculations

17,257	543,6	546,9	97,2	97,5	0,180	0,181	196	0,271342227
17,172	543,6	546,9	97,7	98,4	0,180	0,181	197	0,270015788
17,255	543,6	546,9	97,3	97,5	0,180	0,181	198	0,27134438
17,399	543,6	546,9	96,4	97,0	0,180	0,181	199	0,27363689
17,024	543,6	546,9	98,4	98,9	0,180	0,181	200	0,267724453
17,396	543,6	546,9	96,3	96,8	0,180	0,181	201	0,273605783
17,023	543,6	547,0	98,5	99,0	0,180	0,181	202	0,267723723
17,170	543,7	547,0	97,5	98,0	0,180	0,181	203	0,270014154
17,060	543,7	547,0	98,3	98,9	0,180	0,181	204	0,268298626
17,170	543,7	547,0	97,6	98,2	0,180	0,181	205	0,270017006
17,258	543,8	547,1	97,1	97,5	0,180	0,181	206	0,271399993
17,207	543,8	547,1	97,3	97,9	0,180	0,181	207	0,270586288
17,326	543,8	547,2	98,7	99,3	0,180	0,181	208	0,269635874
17,259	543,9	547,2	100,2	100,8	0,180	0,181	209	0,267339848
17,178	544,0	547,2	101,0	101,5	0,180	0,181	210	0,265365609
17,272	544,0	547,2	101,0	101,5	0,180	0,181	211	0,266313133
17,156	544,0	547,2	101,9	102,5	0,180	0,181	212	0,264062022
17,458	544,0	547,3	100,5	101,1	0,180	0,181	213	0,268276481
17,331	544,0	547,3	101,6	101,9	0,180	0,181	214	0,265991577
17,142	544,0	547,3	103,0	103,4	0,180	0,181	215	0,26268934
17,225	543,9	547,3	102,6	103,2	0,180	0,181	216	0,263667182
17,269	544,0	547,4	102,7	103,1	0,180	0,181	217	0,264054889
17,236	543,9	547,3	103,1	103,6	0,180	0,181	218	0,263276233
17,305	543,9	547,3	102,9	103,3	0,180	0,181	219	0,264054672
17,318	543,9	547,3	103,1	103,4	0,180	0,181	220	0,264055376
17,566	543,9	547,3	101,5	102,0	0,180	0,181	221	0,267724347
17,336	543,8	547,3	103,1	103,6	0,180	0,181	222	0,264055186
17,384	543,8	547,3	103,0	103,4	0,180	0,181	223	0,264638203
17,334	543,9	547,3	103,4	103,7	0,180	0,181	224	0,263666621
17,366	543,9	547,2	103,3	103,8	0,180	0,181	225	0,264055466
17,508	543,9	547,2	102,4	102,9	0,180	0,181	226	0,26609159
17,531	543,9	547,2	102,5	102,8	0,180	0,181	227	0,26638188
17,273	543,9	547,2	104,2	104,6	0,180	0,181	228	0,262299088
17,304	543,8	547,2	104,0	104,6	0,180	0,181	229	0,262690711
17,003	543,8	547,2	105,8	106,2	0,180	0,181	230	0,25813522
17,484	543,9	547,3	102,9	103,4	0,180	0,181	231	0,265425807
17,369	544,0	547,4	103,6	103,9	0,180	0,181	232	0,263666947
17,395	544,1	547,4	103,2	103,8	0,180	0,181	233	0,26405915
17,400	544,2	547,4	103,4	104,1	0,180	0,181	234	0,264055809
17,217	544,1	547,4	104,6	105,1	0,180	0,181	235	0,261319521
17,513	544,1	547,4	102,7	103,1	0,180	0,181	236	0,265832161
17,360	544,1	547,4	103,6	103,9	0,180	0,181	237	0,263546909
17,394	544,3	547,5	103,3	103,8	0,180	0,181	238	0,264056008
17,273	544,3	547,5	103,9	104,4	0,180	0,181	239	0,262301161
17,389	544,4	547,6	103,0	103,8	0,180	0,181	240	0,264056721
17,388	544,4	547,7	103,3	103,9	0,180	0,181	241	0,264068477
17,203	544,4	547,6	104,3	104,9	0,180	0,181	242	0,261320662
17,109	544,4	547,6	104,8	105,3	0,180	0,181	243	0,25994109
17,160	544,3	547,6	104,4	104,9	0,180	0,181	244	0,260764671
17,346	544,3	547,6	103,4	104,0	0,180	0,181	245	0,263668258
17,286	544,4	547,6	103,7	104,3	0,180	0,181	246	0,26274968
17,341	544,4	547,7	103,2	103,7	0,180	0,181	247	0,26368787
17,359	544,4	547,7	103,2	103,6	0,180	0,181	248	0,264041417
17,200	544,4	547,7	104,0	104,4	0,180	0,181	249	0,261714159
17,544	544,4	547,7	102,0	102,7	0,180	0,181	250	0,266959092
17,373	544,4	547,7	103,0	103,4	0,180	0,181	251	0,264348804
17,351	544,4	547,7	103,1	103,5	0,180	0,181	252	0,264054961
17,323	544,4	547,8	103,3	103,7	0,180	0,181	253	0,263668773
17,345	544,4	547,8	103,0	103,4	0,180	0,181	254	0,264057209
17,383	544,5	547,8	102,7	103,2	0,180	0,181	255	0,264640753
17,336	544,5	547,9	103,0	103,5	0,180	0,181	256	0,264057724
17,333	544,5	547,9	103,0	103,3	0,180	0,181	257	0,264057787
17,389	544,6	547,9	102,7	103,1	0,180	0,181	258	0,264914111
17,719	544,6	548,0	100,7	100,9	0,180	0,181	259	0,270018578
17,323	544,6	548,0	102,9	103,6	0,180	0,181	260	0,264058067
17,479	544,7	548,0	101,8	102,4	0,180	0,181	261	0,266438645
17,410	544,8	548,0	102,4	102,5	0,180	0,180	262	0,265417624

Particulates Calculations

17,511	544,8	548,1	101,7	102,0	0,180	0,180	263	0,266959592
17,673	544,9	548,1	100,7	101,0	0,180	0,180	264	0,269499696
17,401	544,8	548,1	102,1	102,5	0,180	0,180	265	0,265423175
17,547	544,8	548,1	101,2	101,7	0,180	0,180	266	0,267728256
17,342	544,8	548,1	102,5	103,1	0,180	0,181	267	0,264641419
17,297	544,9	548,1	102,6	103,2	0,180	0,181	268	0,264057995
17,266	544,8	548,1	102,7	103,6	0,180	0,181	269	0,26366975
17,331	544,8	548,1	102,4	103,2	0,180	0,181	270	0,264642636
17,295	544,8	548,0	102,4	103,1	0,180	0,181	271	0,264254104
17,475	544,7	547,9	101,6	101,9	0,180	0,181	272	0,26697113
17,468	544,6	547,9	101,4	102,1	0,180	0,181	273	0,266960074
17,581	544,7	547,9	100,8	101,3	0,180	0,181	274	0,268721805
17,363	544,7	548,0	102,0	102,6	0,180	0,181	275	0,265418432
17,399	544,7	548,0	101,8	102,2	0,180	0,181	276	0,265998721
17,457	544,7	548,0	101,4	101,9	0,180	0,181	277	0,26695994
17,653	544,7	548,1	100,2	100,8	0,180	0,181	278	0,270010172
17,351	544,8	548,1	101,9	102,3	0,180	0,181	279	0,265417112
17,538	544,8	548,1	100,8	101,4	0,180	0,181	280	0,268303514
17,416	544,8	548,1	101,7	102,4	0,180	0,181	281	0,266382041
17,235	544,8	548,1	102,8	102,8	0,180	0,181	282	0,263676658
17,497	544,9	548,2	101,1	101,6	0,180	0,181	283	0,267728505
17,329	545,0	548,2	102,0	102,2	0,180	0,181	284	0,265211137
17,344	545,0	548,2	102,0	102,0	0,180	0,180	285	0,265417112
17,223	544,9	548,2	102,3	102,8	0,180	0,180	286	0,263670582
17,336	544,9	548,2	101,9	102,5	0,180	0,181	287	0,26534214
17,337	545,0	548,2	101,8	102,7	0,180	0,181	288	0,26541748
17,434	545,0	548,2	101,3	101,4	0,180	0,181	289	0,266960226
17,336	544,9	548,2	101,7	102,3	0,180	0,180	290	0,265417166
17,300	544,9	548,2	102,0	102,5	0,180	0,181	291	0,26486594
17,198	545,0	548,2	102,7	103,0	0,180	0,181	292	0,263300502
17,399	545,0	548,2	101,4	101,7	0,180	0,180	293	0,266382578
17,470	545,0	548,2	100,9	101,2	0,180	0,180	294	0,267583961
17,330	545,0	548,2	101,7	102,0	0,180	0,180	295	0,265418235
17,516	544,9	548,2	100,7	101,2	0,180	0,180	296	0,268304225
17,453	545,0	548,2	101,1	101,4	0,180	0,181	297	0,267339759
17,210	545,0	548,3	102,5	102,8	0,180	0,180	298	0,263669316
17,235	545,0	548,3	102,3	102,6	0,180	0,180	299	0,264058861
17,270	545,1	548,3	101,8	102,3	0,180	0,180	300	0,264642356
17,466	545,1	548,4	100,9	101,2	0,180	0,180	301	0,267724801
17,533	545,1	548,3	100,4	100,9	0,180	0,181	302	0,268686491
17,457	545,1	548,4	100,8	101,3	0,180	0,181	303	0,267530139
17,184	545,2	548,4	102,4	102,8	0,180	0,180	304	0,263403546
17,468	545,1	548,4	100,7	101,3	0,180	0,180	305	0,267728897
17,264	545,1	548,4	101,8	102,6	0,180	0,181	306	0,264642573
17,473	545,1	548,3	100,7	101,1	0,180	0,181	307	0,267850586
17,412	545,1	548,3	100,9	101,6	0,180	0,181	308	0,26696019
17,408	545,1	548,4	101,0	101,6	0,180	0,181	309	0,266961172
17,376	545,1	548,4	101,2	101,8	0,180	0,181	310	0,266402026
17,463	545,1	548,4	100,6	101,2	0,180	0,181	311	0,267760108
17,413	545,1	548,3	101,1	101,7	0,180	0,181	312	0,266960681
17,313	545,0	548,3	101,6	102,2	0,180	0,181	313	0,265481178
17,310	545,0	548,3	101,5	102,3	0,180	0,181	314	0,26541801
17,586	545,0	548,3	100,0	100,6	0,180	0,181	315	0,269640631
17,466	545,0	548,3	100,9	101,3	0,180	0,181	316	0,267730144
17,417	545,0	548,3	101,2	101,6	0,180	0,181	317	0,266959056
17,685	545,0	548,3	99,7	99,8	0,180	0,180	318	0,270972347
17,362	545,1	548,3	101,5	102,0	0,180	0,180	319	0,265998049
17,448	545,2	548,4	101,0	101,6	0,180	0,181	320	0,267277307
17,453	545,3	548,5	100,8	101,3	0,180	0,181	321	0,267348579
17,626	545,4	548,6	99,9	100,5	0,180	0,180	322	0,27002316
17,372	545,4	548,7	101,5	101,7	0,180	0,180	323	0,266083938
17,453	545,5	548,7	100,9	101,5	0,180	0,180	324	0,267342327
17,478	545,6	548,8	100,9	101,2	0,180	0,181	325	0,267730233
17,486	545,6	548,8	100,8	101,2	0,180	0,180	326	0,267824522
17,240	545,7	548,9	102,4	102,9	0,180	0,181	327	0,264058292
17,189	545,7	548,9	102,5	102,9	0,180	0,181	328	0,263282953
17,153	545,7	549,0	102,7	103,2	0,180	0,180	329	0,262697227



Particulates Calculations

17,369	545,8	549,1	101,4	101,9	0,180	0,180	330	0,265999922
17,520	545,8	549,1	100,6	101,0	0,180	0,180	331	0,268303594
17,520	545,8	549,1	100,5	101,0	0,180	0,180	332	0,268306624
17,468	545,9	549,1	100,9	101,5	0,180	0,180	333	0,267449921
17,373	545,9	549,2	101,5	101,9	0,180	0,180	334	0,26600011
17,573	546,0	549,2	100,3	100,6	0,180	0,180	335	0,269072104
17,548	546,0	549,2	100,5	100,9	0,180	0,180	336	0,268680182
17,286	546,0	549,3	102,0	102,6	0,180	0,181	337	0,264665266
17,377	546,0	549,3	101,3	101,9	0,179	0,180	338	0,266000352
17,548	546,1	549,3	100,4	100,8	0,179	0,180	339	0,268689242
17,489	546,1	549,4	100,7	101,1	0,179	0,180	340	0,267732611
17,679	546,1	549,4	99,7	100,3	0,179	0,180	341	0,270595213
17,350	546,1	549,4	101,6	102,4	0,179	0,181	342	0,265541638
17,256	546,1	549,4	102,2	102,5	0,179	0,180	343	0,264080015
17,166	546,2	549,4	102,9	103,3	0,180	0,180	344	0,262699805
17,444	546,2	549,5	100,9	101,5	0,179	0,180	345	0,266965558
17,496	546,2	549,5	100,8	101,3	0,179	0,180	346	0,267734792
17,472	546,2	549,5	100,9	101,7	0,179	0,181	347	0,267350336
17,612	546,2	549,5	100,1	100,5	0,179	0,180	348	0,269505588
17,500	546,2	549,5	100,8	101,2	0,179	0,180	349	0,26778625
17,831	546,2	549,6	99,0	99,1	0,180	0,180	350	0,272864984
17,256	546,2	549,6	102,2	102,6	0,180	0,180	351	0,264064857
17,710	546,2	549,6	99,6	99,8	0,179	0,180	352	0,270975814
17,447	546,3	549,6	100,9	101,6	0,179	0,180	353	0,26696913
17,582	546,3	549,6	100,3	100,7	0,179	0,180	354	0,269074337
17,445	546,3	549,7	101,0	101,4	0,179	0,180	355	0,26696487
17,447	546,3	549,7	100,9	101,8	0,179	0,180	356	0,266961458
17,292	546,4	549,7	102,0	102,5	0,179	0,181	357	0,264647933
17,534	546,3	549,7	100,5	101,1	0,179	0,180	358	0,268309983
17,556	546,4	549,7	100,2	100,9	0,179	0,180	359	0,268692445
17,442	546,4	549,7	101,0	101,5	0,179	0,180	360	0,266967754
17,488	546,4	549,7	100,5	101,3	0,179	0,180	361	0,267689515
17,444	546,4	549,8	101,0	101,5	0,179	0,180	362	0,266957305
17,640	546,4	549,8	99,8	100,1	0,179	0,180	363	0,270026321
17,377	546,4	549,8	101,6	101,9	0,180	0,180	364	0,266003803
17,402	546,4	549,8	101,4	101,8	0,180	0,180	365	0,26638853
17,400	546,4	549,8	101,3	101,8	0,180	0,180	366	0,266390149
17,524	546,5	549,9	100,4	100,8	0,179	0,180	367	0,268311102
17,284	546,5	549,9	101,8	102,3	0,179	0,180	368	0,26464932
17,548	546,4	549,9	100,3	100,7	0,179	0,180	369	0,268695986
17,524	546,5	549,9	100,4	101,1	0,179	0,180	370	0,268312719
17,719	546,5	549,9	99,4	99,8	0,179	0,180	371	0,271284888
17,398	546,5	549,9	101,2	101,7	0,179	0,180	372	0,266391376
17,520	546,5	549,9	100,5	101,1	0,179	0,180	373	0,268311724
17,448	546,5	549,9	101,0	101,2	0,180	0,180	374	0,267211797
17,543	546,5	550,0	100,3	100,8	0,180	0,180	375	0,268693244
17,570	546,5	550,0	100,1	100,8	0,179	0,180	376	0,269075808
17,477	546,5	550,0	100,7	101,2	0,179	0,180	377	0,267736867
17,541	546,5	550,0	100,2	100,6	0,179	0,180	378	0,268769073
17,604	546,6	550,0	99,9	100,3	0,179	0,180	379	0,269710925
17,473	546,6	550,0	100,7	101,2	0,179	0,180	380	0,267736859
17,231	546,6	550,0	102,0	102,5	0,179	0,180	381	0,264068161
17,510	546,7	550,1	100,3	100,8	0,179	0,180	382	0,268310676
17,474	546,7	550,1	100,4	101,1	0,179	0,180	383	0,267737491
17,523	546,7	550,1	100,3	100,8	0,179	0,180	384	0,26850764
17,546	546,7	550,1	100,2	100,3	0,179	0,180	385	0,268908299

Particulates Calculations

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	100,72	100,99	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
19,143	537,6	537,8			0,181	0,183	0	0,299584737094532
19,104	537,7	537,9	105,2	106,0	0,181	0,183	1	0,297173168
19,225	537,8	538,0	105,7	106,3	0,181	0,183	2	0,297691203
19,203	537,9	538,1	107,4	108,1	0,181	0,183	3	0,295055039
19,157	537,9	538,3	110,2	111,0	0,181	0,183	4	0,290877645
19,205	538,1	538,5	112,3	112,8	0,181	0,183	5	0,28839759
19,581	538,1	538,6	109,3	110,1	0,181	0,183	6	0,295089993
19,290	538,2	538,8	108,5	109,4	0,181	0,183	7	0,293871428
18,995	538,3	539,0	106,3	106,7	0,181	0,183	8	0,294741916
18,833	538,3	539,2	105,9	106,7	0,181	0,183	9	0,293869952
18,968	538,4	539,4	104,8	105,2	0,181	0,183	10	0,296788253
19,275	538,5	539,6	102,7	103,3	0,181	0,183	11	0,302147522
19,015	538,5	539,7	103,8	104,4	0,181	0,183	12	0,298382116
18,992	538,6	539,9	103,9	104,4	0,181	0,183	13	0,298312416
19,020	538,7	540,1	103,5	104,4	0,181	0,183	14	0,298899237
19,038	538,8	540,3	103,3	104,0	0,181	0,183	15	0,299242032
19,317	538,8	540,4	101,9	102,2	0,181	0,183	16	0,303726889
18,842	538,9	540,6	104,2	104,8	0,181	0,182	17	0,296308889
18,732	539,0	540,8	104,6	105,2	0,181	0,182	18	0,294744699
18,787	539,0	540,9	104,4	105,0	0,181	0,182	19	0,295615308
18,963	539,1	541,1	103,5	103,7	0,181	0,182	20	0,29838218
19,034	539,1	541,2	103,2	103,6	0,181	0,182	21	0,299588
19,270	539,1	541,3	101,8	102,0	0,181	0,182	22	0,303337447
19,245	539,1	541,5	101,8	102,4	0,181	0,182	23	0,302999364
19,004	539,2	541,6	103,1	103,5	0,181	0,182	24	0,299242765
19,134	539,3	541,7	102,4	102,9	0,181	0,182	25	0,301298305
19,150	539,3	541,8	102,3	102,3	0,181	0,182	26	0,301638199
18,976	539,3	541,9	103,1	103,3	0,181	0,182	27	0,298934539
19,116	539,4	542,0	102,4	102,6	0,181	0,182	28	0,301155614
19,323	539,4	542,1	101,3	101,7	0,181	0,182	29	0,304520922
19,145	539,4	542,1	102,2	102,5	0,181	0,182	30	0,301655857
19,122	539,4	542,2	102,3	102,6	0,181	0,182	31	0,301297481
19,286	539,5	542,3	101,4	101,7	0,181	0,182	32	0,303946995
18,911	539,6	542,5	103,5	103,9	0,181	0,182	33	0,298039307
18,988	539,7	542,6	103,0	103,0	0,181	0,182	34	0,299250318
19,324	539,7	542,7	101,2	101,3	0,181	0,182	35	0,304521737
19,299	539,7	542,7	101,1	101,5	0,181	0,182	36	0,304181693
19,061	539,8	542,8	102,5	102,9	0,181	0,182	37	0,300443576
19,420	539,8	542,9	100,6	100,8	0,181	0,182	38	0,306067027
19,243	540,1	543,1	101,5	101,7	0,181	0,182	39	0,303338799
19,265	540,6	543,2	101,4	101,4	0,181	0,181	40	0,303678075
19,110	540,9	543,3	102,0	102,3	0,181	0,181	41	0,301298906
19,048	541,0	543,2	102,4	102,8	0,181	0,182	42	0,300272452
19,170	541,1	543,0	101,7	102,3	0,181	0,182	43	0,302147427
19,373	541,2	543,0	100,6	100,8	0,180	0,182	44	0,305365238
19,321	541,4	543,1	101,1	101,4	0,180	0,182	45	0,304522895
19,423	541,5	543,2	100,3	100,7	0,181	0,182	46	0,306197399
19,112	541,6	543,3	102,1	102,3	0,181	0,182	47	0,301308686
19,267	541,6	543,3	101,1	101,8	0,180	0,182	48	0,3036782
19,310	541,6	543,2	100,8	101,3	0,180	0,182	49	0,30452288
19,336	541,6	543,2	100,7	101,3	0,180	0,182	50	0,304852735
19,162	541,6	543,1	101,7	102,2	0,180	0,182	51	0,302151831
19,313	541,6	543,1	100,8	101,4	0,180	0,182	52	0,304522081
19,084	541,6	543,1	102,0	102,5	0,180	0,182	53	0,300957867
19,292	541,7	543,2	101,0	101,6	0,180	0,182	54	0,304185691
19,050	541,9	543,4	102,1	102,7	0,180	0,182	55	0,300443703
19,290	542,0	543,5	101,1	101,3	0,180	0,182	56	0,304185252
19,275	542,0	543,6	100,9	101,4	0,180	0,182	57	0,30397313
19,250	542,1	543,6	101,0	101,4	0,180	0,182	58	0,303678797
19,284	542,0	543,6	101,0	101,1	0,180	0,181	59	0,304186334
19,231	542,0	543,6	101,1	101,7	0,180	0,182	60	0,303339239
19,511	542,1	543,6	99,6	100,2	0,180	0,182	61	0,307659254

Particulates Calculations

19,487	542,1	543,6	99,8	100,1	0,180	0,182	62	0,307379621
18,969	542,2	543,7	102,6	103,0	0,180	0,182	63	0,299245474
18,870	542,1	543,6	103,1	103,5	0,180	0,182	64	0,297695448
19,277	542,1	543,6	100,8	101,6	0,180	0,182	65	0,30408872
19,359	542,2	543,7	100,3	100,9	0,180	0,182	66	0,305351543
19,303	542,2	543,7	100,7	101,4	0,180	0,182	67	0,304523976
19,226	542,3	543,8	101,1	101,6	0,180	0,182	68	0,303347618
19,119	542,3	543,8	101,6	102,2	0,180	0,182	69	0,301641535
19,150	542,3	543,8	101,4	102,2	0,180	0,182	70	0,302152099
18,964	542,3	543,8	102,4	103,2	0,180	0,182	71	0,299245553
19,272	542,4	543,9	100,8	101,4	0,180	0,182	72	0,304090994
19,317	542,4	544,0	100,5	100,8	0,180	0,181	73	0,30485053
19,245	542,4	543,9	101,0	101,3	0,180	0,181	74	0,303678656
19,405	542,3	543,8	100,1	100,7	0,180	0,182	75	0,306208923
19,174	542,3	543,8	101,3	102,0	0,180	0,182	76	0,302625484
19,363	542,4	543,9	100,1	100,6	0,180	0,182	77	0,305635763
19,237	542,5	544,0	100,9	101,2	0,180	0,181	78	0,303680493
19,215	542,6	544,1	101,0	101,5	0,180	0,181	79	0,303339931
19,343	542,6	544,1	100,3	100,6	0,180	0,181	80	0,30536669
18,932	542,5	544,1	102,3	103,2	0,180	0,182	81	0,298903799
19,235	542,5	544,0	100,9	101,3	0,180	0,182	82	0,30367999
19,213	542,6	544,1	101,0	101,5	0,180	0,182	83	0,303368351
19,103	542,6	544,1	101,7	102,2	0,180	0,182	84	0,301642151
19,263	542,6	544,1	100,6	101,1	0,180	0,182	85	0,30418707
19,261	542,6	544,1	100,8	101,0	0,180	0,181	86	0,304187446
19,134	542,7	544,2	101,4	101,5	0,180	0,181	87	0,302177237
19,262	542,7	544,2	100,7	101,0	0,180	0,181	88	0,304187086
19,094	542,8	544,3	101,4	102,1	0,180	0,182	89	0,301642357
19,178	542,9	544,4	101,0	101,3	0,180	0,182	90	0,303002984
19,178	542,9	544,4	101,0	101,6	0,180	0,181	91	0,303001725
19,345	543,0	544,5	99,9	100,5	0,180	0,182	92	0,305705447
19,269	542,9	544,4	100,3	101,1	0,180	0,182	93	0,304526074
18,954	543,0	544,4	102,1	102,8	0,180	0,182	94	0,299550276
19,014	543,0	544,4	101,7	102,3	0,180	0,182	95	0,30045267
19,121	543,0	544,4	101,2	101,8	0,180	0,182	96	0,302154924
19,195	543,1	544,5	100,8	101,4	0,180	0,182	97	0,303341676
19,267	543,1	544,6	100,5	100,7	0,180	0,181	98	0,304527421
19,114	543,1	544,5	101,2	101,5	0,180	0,181	99	0,302153724
19,220	543,2	544,6	100,6	101,2	0,180	0,181	100	0,303775428
19,211	543,2	544,6	100,7	101,2	0,180	0,182	101	0,303696713
19,414	543,2	544,6	99,6	100,1	0,180	0,181	102	0,306880877
19,118	543,3	544,7	101,3	101,7	0,180	0,181	103	0,302154308
19,283	543,3	544,7	100,3	100,8	0,180	0,181	104	0,304858757
19,240	543,4	544,7	100,4	101,1	0,180	0,182	105	0,304156799
19,169	543,4	544,7	100,8	101,4	0,180	0,182	106	0,303003865
19,249	543,4	544,8	100,5	101,0	0,180	0,181	107	0,304189359
19,384	543,5	544,9	99,7	100,0	0,180	0,181	108	0,306416618
19,246	543,6	545,0	100,3	101,0	0,180	0,181	109	0,304199281
19,321	543,6	544,9	99,9	100,5	0,180	0,181	110	0,305370641
19,214	543,6	545,0	100,5	101,1	0,180	0,181	111	0,303703244
19,208	543,6	545,0	100,5	101,2	0,180	0,181	112	0,303683131
19,166	543,6	545,0	100,8	101,5	0,180	0,182	113	0,303005108
19,412	543,7	545,1	99,5	99,9	0,180	0,181	114	0,306883565
19,245	543,8	545,2	100,3	100,9	0,180	0,181	115	0,304280734
19,404	543,7	545,1	99,4	99,7	0,180	0,181	116	0,306881359
18,903	543,7	545,1	102,1	102,7	0,180	0,181	117	0,298906064
19,513	543,8	545,2	98,9	99,3	0,180	0,181	118	0,30855263
19,236	543,8	545,2	100,2	100,8	0,180	0,181	119	0,304276064
19,202	543,8	545,2	100,5	100,9	0,180	0,181	120	0,303680509
19,201	543,9	545,2	100,4	100,9	0,180	0,181	121	0,303683225
19,190	543,9	545,3	100,5	101,0	0,180	0,181	122	0,303511524
19,234	544,0	545,3	100,3	100,8	0,180	0,181	123	0,304192713
19,202	544,0	545,3	100,4	101,2	0,180	0,181	124	0,303682597
19,331	544,0	545,4	99,8	100,1	0,180	0,181	125	0,305706726
19,226	544,1	545,5	100,3	100,8	0,180	0,181	126	0,304135163
19,332	544,1	545,5	99,8	100,1	0,180	0,181	127	0,305707771
19,032	544,1	545,5	101,3	101,8	0,180	0,181	128	0,300962715

Particulates Calculations

19,185	544,1	545,4	100,4	101,0	0,180	0,181	129	0,303405915
19,405	544,1	545,4	99,4	99,8	0,180	0,181	130	0,306840926
19,182	544,2	545,6	100,5	101,1	0,180	0,181	131	0,303344788
19,279	544,3	545,8	99,9	100,3	0,179	0,181	132	0,304865624
19,191	544,3	545,7	100,3	101,1	0,179	0,181	133	0,303475686
19,252	544,3	545,6	100,2	100,5	0,180	0,181	134	0,304526888
19,251	544,3	545,7	100,0	100,3	0,180	0,181	135	0,304528501
19,374	544,4	545,8	99,5	99,9	0,180	0,181	136	0,306443803
19,400	544,5	545,8	99,3	99,6	0,180	0,181	137	0,306884948
19,355	544,4	545,7	99,5	99,8	0,180	0,181	138	0,306212769
19,369	544,5	545,8	99,3	99,8	0,179	0,181	139	0,306547106
19,388	544,5	545,9	99,2	99,6	0,179	0,181	140	0,306761241
19,093	544,6	545,9	100,7	101,3	0,179	0,181	141	0,30215415
19,350	544,6	546,0	99,4	100,0	0,179	0,181	142	0,306283381
19,218	544,8	546,1	100,1	100,4	0,180	0,181	143	0,304171394
19,366	544,9	546,3	99,2	99,6	0,179	0,181	144	0,306548149
19,313	544,9	546,3	99,4	99,9	0,179	0,181	145	0,305709845
19,353	544,8	546,2	99,3	99,8	0,179	0,181	146	0,30639301
19,231	544,8	546,1	99,9	100,5	0,179	0,181	147	0,30452288
19,377	544,8	546,1	99,3	99,7	0,180	0,181	148	0,306884529
19,414	544,8	546,1	98,9	99,4	0,180	0,181	149	0,307386167
19,338	544,8	546,1	99,3	100,0	0,179	0,181	150	0,306212972
19,409	544,8	546,2	99,0	99,5	0,179	0,181	151	0,307386787
19,227	544,9	546,3	100,1	100,5	0,180	0,181	152	0,304531225
19,228	544,9	546,3	99,9	100,2	0,180	0,181	153	0,304530474
19,330	544,8	546,2	99,3	100,0	0,179	0,181	154	0,306214046
19,534	544,8	546,2	98,4	98,7	0,179	0,181	155	0,309386405
19,249	544,7	546,1	99,7	100,4	0,179	0,181	156	0,304868861
19,283	544,7	546,2	99,6	100,2	0,179	0,181	157	0,305478381
19,279	544,7	546,1	99,8	100,0	0,180	0,181	158	0,305374217
19,372	544,7	546,1	99,1	99,5	0,180	0,181	159	0,306884715
19,500	544,7	546,2	98,4	99,0	0,179	0,181	160	0,308889034
19,167	544,7	546,2	100,1	100,5	0,179	0,181	161	0,303685784
19,227	544,7	546,2	99,8	100,3	0,179	0,181	162	0,304532353
19,133	544,7	546,2	100,3	101,0	0,179	0,181	163	0,303007925
19,341	544,7	546,1	99,3	100,0	0,179	0,181	164	0,306357229
19,177	544,7	546,1	100,3	100,7	0,180	0,181	165	0,303688579
19,005	544,7	546,2	101,2	101,6	0,180	0,181	166	0,300965441
19,408	544,7	546,1	99,1	99,5	0,180	0,181	167	0,307317361
19,479	544,7	546,2	98,6	99,1	0,180	0,181	168	0,308555133
19,424	544,7	546,2	99,0	99,3	0,180	0,181	169	0,307721476
19,125	544,7	546,2	100,4	100,6	0,180	0,181	170	0,303008177
19,170	544,7	546,2	100,1	100,8	0,180	0,181	171	0,303686114
19,370	544,8	546,3	99,1	99,6	0,179	0,181	172	0,306891272
19,124	544,8	546,2	100,3	101,0	0,180	0,181	173	0,303008555
19,243	544,8	546,2	99,6	100,2	0,179	0,181	174	0,304868251
19,123	544,8	546,2	100,2	100,8	0,179	0,181	175	0,303020735
19,067	544,7	546,2	100,7	101,3	0,179	0,181	176	0,302158411
19,165	544,7	546,1	100,2	100,8	0,180	0,181	177	0,303686051
19,292	544,7	546,1	99,5	100,1	0,180	0,181	178	0,305717815
18,936	544,6	546,1	101,3	101,6	0,180	0,181	179	0,300115531
19,189	544,7	546,2	99,8	100,3	0,179	0,181	180	0,304193513
19,156	544,7	546,2	100,0	100,1	0,179	0,180	181	0,303686491
19,342	544,8	546,2	99,2	99,6	0,179	0,180	182	0,306552457
19,135	544,8	546,3	100,1	100,7	0,179	0,181	183	0,303345905
19,336	544,9	546,4	99,0	99,3	0,179	0,181	184	0,306549782
19,202	544,9	546,4	99,8	100,3	0,179	0,181	185	0,304390239
19,058	545,0	546,5	100,5	100,9	0,179	0,181	186	0,302155255
19,153	544,9	546,4	100,0	100,5	0,179	0,181	187	0,303686413
19,060	544,9	546,3	100,6	101,1	0,179	0,181	188	0,302159011
19,135	544,9	546,3	99,9	100,4	0,179	0,181	189	0,30341085
19,231	544,7	546,2	99,6	100,0	0,179	0,181	190	0,304867375
19,184	544,7	546,1	100,0	100,2	0,180	0,181	191	0,304193262
19,108	544,7	546,2	100,4	100,8	0,180	0,181	192	0,303007831
19,180	544,7	546,2	99,7	100,5	0,179	0,181	193	0,304171911
19,197	544,8	546,3	99,9	100,5	0,179	0,181	194	0,304531194
19,252	544,7	546,2	99,6	100,0	0,180	0,181	195	0,305373686

Particulates Calculations

19,256	544,8	546,3	99,6	99,9	0,180	0,181	196	0,305443773
19,399	544,8	546,3	98,7	99,2	0,180	0,181	197	0,307721461
19,176	544,8	546,3	99,8	100,4	0,179	0,181	198	0,304193309
19,147	544,8	546,2	100,1	100,6	0,180	0,181	199	0,303716731
19,048	544,7	546,1	100,6	101,1	0,180	0,181	200	0,302158538
19,376	544,7	546,2	98,7	99,3	0,179	0,181	201	0,30738778
19,501	544,8	546,2	98,1	98,6	0,179	0,181	202	0,309353051
19,174	544,9	546,3	99,8	100,3	0,179	0,181	203	0,304190394
19,318	544,9	546,3	98,9	99,5	0,179	0,181	204	0,30654874
19,296	544,9	546,3	99,1	99,5	0,179	0,181	205	0,306214747
19,243	544,9	546,3	99,5	99,7	0,179	0,181	206	0,305327134
19,300	545,0	546,4	99,1	99,7	0,179	0,181	207	0,306215588
19,096	545,0	546,5	99,8	100,5	0,179	0,181	208	0,303008382
19,246	545,1	546,6	99,2	100,0	0,179	0,181	209	0,305354292
19,242	545,2	546,7	99,4	99,7	0,179	0,181	210	0,305374638
19,261	545,2	546,7	99,1	100,0	0,179	0,181	211	0,305711343
19,517	545,2	546,7	97,9	98,3	0,179	0,181	212	0,309798811
18,985	545,3	546,7	100,6	101,2	0,179	0,181	213	0,301317121
19,009	545,3	546,8	100,7	101,1	0,179	0,181	214	0,301648886
19,149	545,3	546,8	99,7	100,3	0,179	0,181	215	0,303980377
19,111	545,3	546,8	99,8	100,2	0,179	0,181	216	0,303347068
18,983	545,4	546,8	100,5	101,3	0,179	0,181	217	0,301308069
19,330	545,5	547,0	98,7	99,1	0,179	0,181	218	0,306887092
19,236	545,6	547,1	99,1	99,9	0,179	0,181	219	0,305387473
19,262	545,5	547,0	99,1	99,6	0,179	0,181	220	0,305711733
19,328	545,5	547,0	98,5	99,2	0,179	0,181	221	0,306886098
19,174	545,5	547,0	99,6	100,1	0,179	0,181	222	0,304445987
19,167	545,5	547,0	99,7	100,0	0,179	0,181	223	0,304216822
19,131	545,5	547,0	99,7	100,4	0,179	0,181	224	0,303687386
19,114	545,4	546,9	99,9	100,2	0,179	0,181	225	0,303382308
19,204	545,5	547,0	99,5	99,9	0,179	0,180	226	0,304870644
19,290	545,5	547,1	99,0	99,4	0,179	0,181	227	0,306207646
19,292	545,5	547,0	98,9	99,6	0,179	0,181	228	0,306217534
19,133	545,6	547,0	99,8	100,2	0,179	0,181	229	0,303688014
19,445	545,6	547,0	98,3	98,4	0,179	0,180	230	0,308615196
19,296	545,5	546,9	99,0	99,5	0,179	0,180	231	0,306216756
19,443	545,5	546,9	98,4	98,8	0,179	0,181	232	0,30855725
19,285	545,6	547,1	99,2	99,3	0,179	0,180	233	0,306066014
19,135	545,6	547,1	99,9	100,3	0,179	0,180	234	0,303684183
19,293	545,6	547,1	99,0	99,4	0,179	0,181	235	0,306217052
19,317	545,6	547,0	98,8	99,5	0,179	0,181	236	0,306647172
18,955	545,6	547,1	100,7	101,0	0,179	0,181	237	0,300939472
19,524	545,7	547,2	97,8	98,2	0,179	0,181	238	0,310053103
19,168	545,6	547,1	99,5	99,9	0,179	0,181	239	0,304533167
19,150	545,6	547,1	99,6	99,8	0,179	0,180	240	0,304155686
19,121	545,6	547,1	99,7	100,3	0,179	0,180	241	0,303688077
19,303	545,6	547,1	98,8	99,1	0,179	0,181	242	0,306552535
19,234	545,6	547,1	99,3	99,6	0,179	0,180	243	0,305450657
19,356	545,7	547,2	98,6	98,9	0,179	0,180	244	0,307390898
19,361	545,7	547,3	98,8	98,9	0,179	0,180	245	0,307411358
19,173	545,8	547,3	99,4	100,1	0,179	0,181	246	0,304446535
19,321	545,7	547,3	98,7	99,1	0,179	0,181	247	0,306888335
19,118	545,7	547,3	99,8	100,1	0,179	0,180	248	0,303689019
19,165	545,8	547,3	99,5	100,1	0,179	0,181	249	0,304417652
19,227	545,7	547,1	99,2	99,7	0,179	0,181	250	0,305382446
18,916	545,7	547,1	100,8	101,4	0,179	0,181	251	0,300456685
19,171	545,6	547,1	99,5	100,1	0,179	0,181	252	0,304533903
19,333	545,7	547,2	98,8	99,2	0,179	0,181	253	0,307060928
19,243	545,6	547,1	99,0	99,6	0,179	0,181	254	0,305713136
19,072	545,6	547,1	100,1	100,4	0,179	0,181	255	0,303011623
19,170	545,6	547,1	99,3	100,3	0,179	0,181	256	0,304535093
19,296	545,7	547,2	98,8	99,4	0,179	0,181	257	0,306549564
19,367	545,7	547,2	98,4	98,9	0,179	0,181	258	0,307724405
19,240	545,7	547,3	99,0	99,5	0,179	0,181	259	0,305713776
19,375	545,8	547,3	98,5	99,0	0,179	0,181	260	0,307719446
19,249	545,8	547,4	99,1	99,4	0,179	0,181	261	0,305713105
18,966	545,8	547,4	100,4	101,0	0,179	0,180	262	0,301308528



Particulates Calculations

19,113	545,8	547,3	99,8	100,3	0,179	0,181	263	0,303583597
19,483	545,8	547,4	97,9	98,3	0,179	0,181	264	0,309391414
19,486	545,8	547,3	97,9	98,5	0,179	0,181	265	0,309389966
19,262	545,8	547,3	99,1	99,5	0,179	0,181	266	0,305827741
19,369	545,9	547,3	98,3	99,0	0,179	0,181	267	0,307546216
19,107	545,9	547,4	99,9	100,4	0,179	0,181	268	0,303350212
19,309	545,8	547,4	98,7	99,2	0,179	0,181	269	0,306553484
19,127	545,8	547,4	99,6	100,3	0,179	0,181	270	0,303689977
19,291	545,9	547,4	98,9	99,5	0,179	0,181	271	0,306217114
18,929	545,9	547,5	100,8	101,3	0,179	0,181	272	0,300456748
19,289	545,8	547,3	98,8	99,4	0,179	0,181	273	0,306218842
19,130	545,8	547,4	99,7	100,3	0,179	0,181	274	0,303690432
19,204	545,9	547,5	99,3	99,8	0,179	0,181	275	0,304869033
19,163	545,9	547,4	99,7	100,1	0,179	0,181	276	0,304197197
18,956	545,9	547,4	100,7	101,2	0,179	0,181	277	0,300891378
19,289	545,9	547,5	98,9	99,5	0,179	0,181	278	0,306188087
18,960	545,9	547,5	100,7	101,2	0,179	0,181	279	0,300968641
19,332	545,9	547,5	98,7	99,2	0,179	0,181	280	0,306889656
19,203	546,0	547,5	99,2	99,8	0,179	0,180	281	0,304790444
19,207	546,0	547,5	99,2	99,7	0,179	0,180	282	0,304872381
19,384	546,0	547,5	98,4	99,0	0,179	0,180	283	0,307725056
19,135	546,0	547,5	100,0	100,1	0,179	0,180	284	0,303682927
19,137	546,0	547,5	99,7	100,2	0,179	0,180	285	0,303688375
19,212	546,0	547,5	99,4	99,9	0,179	0,181	286	0,304872693
19,464	546,1	547,6	98,0	98,4	0,179	0,180	287	0,308885808
19,315	546,1	547,6	98,8	99,2	0,179	0,180	288	0,306552893
19,318	546,0	547,6	98,7	99,2	0,179	0,180	289	0,30655364
19,378	546,1	547,6	98,5	98,9	0,179	0,180	290	0,307450553
19,140	546,1	547,5	99,9	100,2	0,179	0,180	291	0,303692583
19,264	546,1	547,6	99,1	99,5	0,179	0,180	292	0,305715117
19,339	546,2	547,7	98,8	99,3	0,179	0,181	293	0,306890014
19,298	546,2	547,8	98,9	99,3	0,179	0,180	294	0,306213268
19,318	546,2	547,8	98,9	99,4	0,179	0,180	295	0,306556906
19,207	546,3	547,8	99,2	99,8	0,179	0,181	296	0,304872662
19,363	546,3	547,8	98,4	99,2	0,179	0,181	297	0,307390743
19,180	546,3	547,9	99,4	100,0	0,179	0,181	298	0,304538146
19,309	546,3	547,9	98,7	99,4	0,179	0,181	299	0,306554433
19,200	546,2	547,8	99,1	99,7	0,179	0,180	300	0,304783967
19,087	546,3	547,8	99,9	100,2	0,179	0,180	301	0,303017037
19,203	546,2	547,8	99,2	99,9	0,179	0,180	302	0,304872709
19,351	546,2	547,7	98,5	99,1	0,179	0,181	303	0,307193207
19,370	546,2	547,8	98,5	98,8	0,179	0,180	304	0,307448134
18,982	546,2	547,8	100,5	100,9	0,179	0,180	305	0,30131106
19,289	546,2	547,8	98,9	99,2	0,179	0,180	306	0,306217908
19,385	546,3	547,9	98,5	98,9	0,179	0,180	307	0,307724002
19,334	546,3	547,9	98,5	99,0	0,179	0,180	308	0,306889703
19,182	546,3	547,9	99,3	99,9	0,179	0,180	309	0,304535171
19,329	546,3	547,9	98,7	99,1	0,179	0,180	310	0,306888134
19,331	546,3	547,9	98,8	99,2	0,179	0,180	311	0,306889951
19,241	546,3	547,9	98,9	99,3	0,179	0,180	312	0,305462537
19,114	546,3	547,9	99,9	100,4	0,179	0,180	313	0,303460633
18,955	546,2	547,8	100,7	101,0	0,179	0,181	314	0,300972728
19,363	546,2	547,9	98,5	98,9	0,179	0,180	315	0,307449095
19,500	546,2	547,8	97,8	98,3	0,179	0,181	316	0,309591245
19,256	546,2	547,7	99,0	99,4	0,179	0,180	317	0,305717675
19,182	546,2	547,6	99,4	99,9	0,179	0,180	318	0,304534999
19,153	546,2	547,7	99,4	99,9	0,179	0,180	319	0,30408215
19,184	546,3	547,8	99,5	100,1	0,179	0,180	320	0,304536847
19,259	546,3	547,8	99,0	99,7	0,179	0,181	321	0,305715928
19,237	546,3	547,8	99,2	99,7	0,179	0,181	322	0,305377043
19,251	546,2	547,8	99,0	99,6	0,179	0,181	323	0,305639491
19,511	545,9	547,9	97,7	98,1	0,179	0,180	324	0,309727308
19,182	545,8	547,9	99,5	100,0	0,179	0,180	325	0,304535547
18,996	545,7	548,0	100,5	100,7	0,179	0,180	326	0,301649423
19,362	545,6	548,0	98,6	98,8	0,179	0,180	327	0,307392868
19,201	545,5	548,1	99,5	99,9	0,179	0,180	328	0,304873006
19,486	545,4	548,2	98,1	98,1	0,180	0,180	329	0,309420172

Particulates Calculations

19,486	545,4	548,1	98,1	98,3	0,180	0,180	330	0,30939257
19,528	545,4	548,1	97,9	98,2	0,180	0,181	331	0,310056918
19,529	545,4	548,1	97,8	97,9	0,179	0,180	332	0,310056902
19,509	545,4	548,2	97,9	98,1	0,179	0,180	333	0,309720257
19,435	545,4	548,2	98,2	98,3	0,179	0,180	334	0,30856065
19,381	545,3	548,2	98,6	98,6	0,179	0,180	335	0,307726636
19,285	545,3	548,2	98,9	99,2	0,179	0,180	336	0,306220742
19,506	545,3	548,3	97,9	97,8	0,179	0,180	337	0,3097258
19,382	545,3	548,3	98,5	98,7	0,179	0,180	338	0,307727426
19,286	545,3	548,4	98,9	99,2	0,179	0,180	339	0,306220135
19,450	545,3	548,4	98,3	98,5	0,179	0,180	340	0,308894669
19,231	545,3	548,3	99,3	99,7	0,180	0,181	341	0,30540991
19,482	545,3	548,4	98,1	98,1	0,180	0,180	342	0,309396269
19,097	545,3	548,4	100,1	100,2	0,180	0,180	343	0,303351312
19,194	545,3	548,5	99,5	99,7	0,180	0,180	344	0,304873835
19,444	545,3	548,5	98,3	98,4	0,180	0,180	345	0,308845452
19,195	545,3	548,6	99,4	99,6	0,180	0,180	346	0,304874883
19,196	545,3	548,6	99,6	99,7	0,179	0,180	347	0,304874758
19,422	545,3	548,7	98,3	98,5	0,180	0,180	348	0,308514193
19,369	545,4	548,7	98,5	98,7	0,179	0,180	349	0,307725505
19,364	545,5	548,8	98,4	98,8	0,179	0,180	350	0,307726032
19,467	545,6	548,9	98,1	97,9	0,180	0,180	351	0,309429788
19,538	545,6	548,9	97,7	97,7	0,180	0,180	352	0,310554184
19,237	545,5	548,9	99,2	99,3	0,180	0,180	353	0,305714899
19,294	545,5	548,9	98,9	98,9	0,179	0,180	354	0,306532609
19,445	545,5	548,9	98,3	98,3	0,180	0,180	355	0,308894916
19,323	545,5	548,9	99,0	99,1	0,180	0,180	356	0,306890122
19,050	545,4	548,8	100,2	100,5	0,180	0,180	357	0,302568645
19,506	545,3	548,7	97,9	97,9	0,179	0,180	358	0,309724953
19,129	545,2	548,7	99,9	100,0	0,179	0,180	359	0,303691484
19,491	545,1	548,6	98,0	98,2	0,179	0,180	360	0,30943532
19,512	545,1	548,6	98,1	98,4	0,180	0,180	361	0,309726508
19,366	545,1	548,6	99,0	98,8	0,180	0,180	362	0,307392419
19,230	545,1	548,6	99,5	99,4	0,180	0,180	363	0,305222559
19,134	545,1	548,6	100,0	100,1	0,180	0,180	364	0,303669611
19,135	545,1	548,6	100,0	100,2	0,180	0,180	365	0,30369172
19,242	545,1	548,6	99,5	99,7	0,180	0,181	366	0,305379666
19,443	545,1	548,6	98,4	98,8	0,180	0,181	367	0,308557776
19,535	545,2	548,6	98,0	98,1	0,180	0,181	368	0,310056195
19,443	545,3	548,7	98,5	98,1	0,180	0,180	369	0,308561917
19,463	545,3	548,7	98,3	98,6	0,180	0,180	370	0,308895657
19,263	545,3	548,7	99,3	99,2	0,180	0,180	371	0,305717176
19,264	545,4	548,7	99,3	99,2	0,180	0,180	372	0,305717254
19,463	545,4	548,8	98,2	98,1	0,179	0,180	373	0,308872238
19,369	545,4	548,8	98,8	98,9	0,179	0,180	374	0,307381637
19,571	545,4	548,8	97,7	97,9	0,179	0,180	375	0,31055664
19,370	545,3	548,8	98,7	98,9	0,179	0,180	376	0,307393892
19,392	545,2	548,7	98,6	98,7	0,179	0,180	377	0,307814653
19,369	545,1	548,7	98,8	98,9	0,179	0,180	378	0,307394451
19,169	545,1	548,7	99,9	100,0	0,180	0,180	379	0,304200144
19,189	545,1	548,7	99,4	99,7	0,179	0,180	380	0,304538601
19,392	545,2	548,8	98,7	98,4	0,179	0,180	381	0,307726806
19,517	545,3	548,8	98,0	98,3	0,179	0,180	382	0,309727185
19,296	545,3	548,8	99,2	99,1	0,180	0,180	383	0,306217161
19,338	545,3	548,8	99,0	99,3	0,180	0,180	384	0,306892717
19,370	545,4	548,9	98,6	98,9	0,179	0,180	385	0,307394776
19,265	545,3	548,8	99,2	99,5	0,179	0,180	386	0,305714493
19,315	545,2	548,8	98,9	99,1	0,179	0,180	387	0,306555584
19,317	545,1	548,8	99,1	99,2	0,180	0,180	388	0,30655689
19,170	545,1	548,8	99,9	99,8	0,180	0,180	389	0,304227433
19,168	545,1	548,8	99,8	99,9	0,180	0,180	390	0,304196225
19,538	545,2	548,8	97,9	98,1	0,179	0,180	391	0,310059532
19,643	545,3	548,9	97,4	97,3	0,179	0,180	392	0,311712968
19,317	545,3	548,9	99,0	99,3	0,179	0,180	393	0,306557559
19,264	545,4	548,9	99,4	99,7	0,179	0,181	394	0,305718096
19,339	545,4	548,9	98,9	99,1	0,180	0,181	395	0,306903966
19,318	545,3	548,9	98,9	99,3	0,179	0,180	396	0,306558804

Particulates Calculations

19,037	545,2	548,9	100,4	100,3	0,179	0,180	397	0,302167422
19,294	545,1	548,9	99,1	99,2	0,179	0,180	398	0,306222253
19,243	545,1	548,9	99,4	99,5	0,179	0,180	399	0,305396935
19,211	545,1	548,8	99,7	99,8	0,180	0,180	400	0,304878386
19,340	545,0	548,8	99,0	99,1	0,180	0,180	401	0,306893696
19,153	545,0	548,8	99,8	99,9	0,179	0,180	402	0,303949913
19,442	545,1	548,9	98,5	98,5	0,180	0,180	403	0,308563185
19,588	545,2	548,9	97,7	97,4	0,180	0,180	404	0,310889297
19,367	545,3	549,0	98,8	99,0	0,180	0,180	405	0,307394963
19,492	545,3	549,0	98,0	98,1	0,179	0,180	406	0,309395437
19,565	545,3	549,0	97,7	97,8	0,179	0,180	407	0,310556963
19,326	545,3	549,0	98,8	99,2	0,179	0,180	408	0,30674052
19,458	545,2	548,9	98,3	98,5	0,179	0,180	409	0,308881346
19,361	545,1	548,9	98,7	98,8	0,180	0,180	410	0,30739487
19,019	545,0	548,9	100,5	100,5	0,179	0,180	411	0,30189957
19,164	545,0	548,9	99,8	99,8	0,179	0,180	412	0,304200253
19,435	545,0	548,8	98,9	99,0	0,180	0,180	413	0,307729022
19,493	544,9	548,8	99,6	99,8	0,179	0,180	414	0,306892437
19,452	545,0	548,8	100,3	100,5	0,179	0,180	415	0,305444163
19,278	544,9	548,8	101,8	101,8	0,179	0,180	416	0,302167122
19,304	544,9	548,7	101,8	102,0	0,180	0,180	417	0,302165418
19,580	544,9	548,7	100,6	101,0	0,179	0,180	418	0,306173354
19,415	544,9	548,7	101,7	101,6	0,179	0,180	419	0,303354063
19,222	545,2	548,8	103,0	102,9	0,180	0,180	420	0,300117581
19,472	545,4	548,9	101,4	101,4	0,179	0,180	421	0,303876861
19,318	545,7	549,1	102,4	102,6	0,179	0,180	422	0,301321505
19,552	545,9	549,3	101,1	101,4	0,179	0,180	423	0,304875446
19,457	546,0	549,5	101,6	101,7	0,179	0,180	424	0,303353465
19,544	546,1	549,6	101,4	101,2	0,179	0,180	425	0,304613466
19,488	546,2	549,8	101,7	101,8	0,179	0,180	426	0,303692191
19,524	546,3	549,9	101,4	101,6	0,179	0,180	427	0,304199642
19,399	546,3	550,0	102,1	102,2	0,179	0,180	428	0,302165418
19,368	546,4	550,1	102,4	102,5	0,179	0,180	429	0,301610708
19,503	546,4	550,2	101,8	101,7	0,179	0,180	430	0,30369442
19,460	546,5	550,2	102,0	101,9	0,179	0,180	431	0,303014078
19,441	546,5	550,3	102,0	101,9	0,179	0,180	432	0,302671995
19,414	546,5	550,3	102,2	102,2	0,179	0,179	433	0,302166744
19,623	546,5	550,4	101,2	101,1	0,179	0,180	434	0,305379682
19,178	546,6	550,4	103,5	103,7	0,179	0,180	435	0,298398783
19,377	546,6	550,5	102,3	102,6	0,179	0,180	436	0,301501601
19,391	546,6	550,5	102,3	102,6	0,179	0,180	437	0,301690552
19,521	546,7	550,5	101,7	102,0	0,179	0,180	438	0,303691343
19,216	546,7	550,6	103,4	103,3	0,179	0,180	439	0,298914407
19,578	546,7	550,6	101,5	101,3	0,179	0,179	440	0,304549373
19,520	546,7	550,6	101,7	101,6	0,179	0,179	441	0,3036915
19,703	546,7	550,6	100,7	100,8	0,179	0,179	442	0,306554822
19,496	546,7	550,7	101,9	101,8	0,179	0,180	443	0,303351343
19,251	546,7	550,7	103,2	103,1	0,179	0,179	444	0,29949747
19,421	546,8	550,7	102,2	102,2	0,179	0,180	445	0,302162625
19,602	546,8	550,8	101,2	101,2	0,179	0,180	446	0,305051146
19,398	546,8	550,8	102,2	102,6	0,179	0,180	447	0,30179869
19,574	546,8	550,8	101,5	101,3	0,179	0,180	448	0,3045337
19,360	546,8	550,8	102,4	102,6	0,179	0,180	449	0,301311677
19,515	546,8	550,9	101,6	101,8	0,179	0,180	450	0,303690463
19,521	546,8	550,9	101,7	101,9	0,179	0,180	451	0,303792129
19,698	546,8	550,9	100,8	100,9	0,179	0,180	452	0,30653782
19,497	546,8	550,9	101,9	101,8	0,179	0,180	453	0,30335062
19,391	546,8	550,9	102,5	102,4	0,179	0,180	454	0,301652585
19,515	546,8	550,9	101,8	101,7	0,179	0,179	455	0,303592329
19,497	546,8	551,0	101,8	101,8	0,179	0,179	456	0,303351485
19,547	546,8	551,0	101,4	101,4	0,179	0,179	457	0,304197683
19,321	546,8	551,0	102,6	102,6	0,179	0,179	458	0,300605401
19,310	546,7	550,9	102,8	102,8	0,179	0,179	459	0,300457177
19,285	546,7	550,9	103,0	102,9	0,179	0,180	460	0,300115086
19,251	546,7	550,9	103,1	103,0	0,179	0,179	461	0,299600956
19,352	546,7	550,9	102,5	102,5	0,179	0,179	462	0,301144467
19,512	546,7	550,9	101,6	101,6	0,179	0,179	463	0,303690605

Particulates Calculations

19,296	546,7	550,9	102,9	102,9	0,179	0,180	464	0,300307879
19,520	546,7	550,9	101,6	101,7	0,179	0,180	465	0,303754644
19,339	546,7	550,9	102,7	102,5	0,179	0,180	466	0,300969496
19,128	546,7	550,9	103,8	103,7	0,179	0,180	467	0,297707413
19,322	546,7	550,9	102,7	102,8	0,179	0,180	468	0,300726377
19,471	546,7	550,9	102,0	102,0	0,179	0,180	469	0,303036077
19,410	546,6	550,9	102,1	102,2	0,179	0,180	470	0,302162925
19,360	546,7	550,9	102,6	102,3	0,179	0,179	471	0,301310538
19,234	546,7	550,9	103,1	103,1	0,179	0,179	472	0,299464129
19,129	546,7	550,8	103,6	103,7	0,179	0,180	473	0,297789969
19,278	546,6	550,8	102,9	103,0	0,179	0,180	474	0,300115055
19,277	546,6	550,8	102,9	102,9	0,179	0,180	475	0,300115151
19,239	546,6	550,9	103,0	103,2	0,179	0,180	476	0,299596786
19,081	546,6	550,9	104,0	103,6	0,179	0,180	477	0,297188635
19,288	546,5	550,8	102,6	102,8	0,179	0,179	478	0,300456034
19,278	546,6	550,8	102,9	102,9	0,179	0,180	479	0,300278661
19,362	546,6	550,8	102,3	102,1	0,179	0,180	480	0,301648048
19,225	546,5	550,8	103,0	103,1	0,179	0,180	481	0,299600446
19,284	546,5	550,8	102,7	102,6	0,179	0,180	482	0,300456209
19,353	546,5	550,8	102,4	102,3	0,179	0,180	483	0,301560982
19,173	546,5	550,8	103,1	103,0	0,179	0,180	484	0,298912334
19,308	546,5	550,8	102,4	102,6	0,179	0,180	485	0,300968799
19,381	546,5	550,8	102,1	101,9	0,179	0,180	486	0,302157275
19,303	546,4	550,8	102,5	102,4	0,179	0,179	487	0,300968166
19,475	546,4	550,8	101,5	101,5	0,179	0,180	488	0,303688501
19,208	546,5	550,8	102,7	102,7	0,179	0,180	489	0,299599555
19,313	546,5	550,8	102,2	102,2	0,179	0,179	490	0,301301454
19,332	546,4	550,8	102,2	102,1	0,179	0,180	491	0,301651083
19,418	546,4	550,7	101,8	101,7	0,179	0,180	492	0,303011041
19,199	546,4	550,7	102,9	103,1	0,179	0,180	493	0,299589751
19,283	546,4	550,7	102,4	102,3	0,179	0,180	494	0,300968958
19,325	546,4	550,7	102,0	102,0	0,179	0,180	495	0,301651115
19,224	546,3	550,7	102,5	102,6	0,179	0,180	496	0,300103535
19,244	546,3	550,7	102,6	102,4	0,179	0,179	497	0,300454765
19,317	546,3	550,7	102,0	102,0	0,179	0,179	498	0,301650609
19,319	546,3	550,7	102,0	101,9	0,179	0,179	499	0,301650656
19,215	546,3	550,7	102,6	102,5	0,179	0,179	500	0,300112068
19,401	546,2	550,6	101,6	101,3	0,179	0,179	501	0,303008964
19,080	546,2	550,6	103,2	103,2	0,179	0,179	502	0,298051003
19,186	546,2	550,6	102,7	102,8	0,179	0,180	503	0,299711534
19,019	546,2	550,6	103,6	103,5	0,179	0,180	504	0,297155838
19,392	546,2	550,6	101,6	101,5	0,179	0,180	505	0,303009499
19,181	546,2	550,6	102,7	102,6	0,179	0,179	506	0,299661795
19,259	546,1	550,6	102,4	102,2	0,179	0,179	507	0,300960497
19,123	546,1	550,5	103,0	103,0	0,179	0,180	508	0,298911281
19,226	546,1	550,5	102,3	102,4	0,179	0,180	509	0,300454892
19,166	546,1	550,5	102,7	102,6	0,179	0,180	510	0,299604011
19,198	546,1	550,5	102,6	102,5	0,179	0,180	511	0,300112179
19,067	546,1	550,4	103,2	103,2	0,179	0,180	512	0,298050443
19,009	546,0	550,4	103,5	103,4	0,179	0,180	513	0,297187336
19,139	546,0	550,4	102,9	102,8	0,179	0,180	514	0,299255082
19,136	546,0	550,4	102,8	102,9	0,179	0,180	515	0,2992536
19,241	546,0	550,3	102,2	101,9	0,179	0,180	516	0,300932199
19,417	546,0	550,3	101,2	101,3	0,179	0,179	517	0,303687873
19,265	545,9	550,3	102,0	102,0	0,179	0,180	518	0,301308829
19,261	545,9	550,3	102,0	102,2	0,179	0,180	519	0,301307879
19,309	545,9	550,3	101,7	101,6	0,179	0,180	520	0,302068856
19,029	545,9	550,3	103,4	103,2	0,179	0,180	521	0,297704385
19,052	545,9	550,3	103,1	103,0	0,179	0,180	522	0,298049419
19,130	545,8	550,2	102,9	102,6	0,179	0,180	523	0,299287363
19,126	545,8	550,2	102,9	102,6	0,179	0,179	524	0,299237283
19,128	545,8	550,2	102,8	102,8	0,179	0,180	525	0,299254126
19,387	545,8	550,1	101,4	101,3	0,179	0,180	526	0,303349143
19,252	545,8	550,1	102,0	101,8	0,179	0,179	527	0,301252184
19,144	545,8	550,1	102,6	102,6	0,179	0,180	528	0,299596706
19,100	545,8	550,1	102,9	103,1	0,179	0,180	529	0,298911313
19,239	545,8	550,1	102,1	102,3	0,179	0,180	530	0,30107387

Particulates Calculations

19,231	545,8	550,1	102,0	102,0	0,179	0,180	531	0,30096647
19,251	545,7	550,1	102,0	101,7	0,179	0,179	532	0,301307404
19,213	545,7	550,1	102,3	102,4	0,179	0,180	533	0,300701941
19,306	545,7	550,1	101,8	101,7	0,179	0,180	534	0,302159327
19,273	545,6	550,1	102,0	102,0	0,179	0,180	535	0,301648032
19,140	545,6	550,0	102,6	102,7	0,179	0,180	536	0,299596563
19,128	545,6	550,0	102,8	102,7	0,179	0,180	537	0,299450721
19,193	545,6	550,0	102,5	102,5	0,180	0,180	538	0,300456447
19,116	545,6	549,9	102,7	102,7	0,179	0,180	539	0,299253473
19,244	545,6	549,9	102,1	102,1	0,179	0,180	540	0,301307563
19,226	545,5	549,9	102,2	102,0	0,179	0,180	541	0,300971303
19,114	545,5	549,9	102,7	102,8	0,179	0,180	542	0,299259066
18,882	545,5	549,9	104,0	103,8	0,179	0,180	543	0,29562468
18,983	545,5	549,8	103,5	103,6	0,179	0,180	544	0,297184865
19,260	545,5	549,8	102,0	101,8	0,179	0,180	545	0,301506425
19,116	545,5	549,8	102,9	102,7	0,179	0,180	546	0,299256373
19,195	545,4	549,8	102,4	102,4	0,179	0,180	547	0,30045267
19,094	545,4	549,8	102,9	103,1	0,179	0,180	548	0,298909462
19,505	545,4	549,7	100,7	100,9	0,179	0,180	549	0,305334771
19,226	545,4	549,7	102,3	102,4	0,179	0,180	550	0,300966391
18,985	545,4	549,7	103,6	103,4	0,180	0,180	551	0,297185057
19,148	545,4	549,7	102,6	102,6	0,179	0,180	552	0,299781418
18,989	545,4	549,7	103,5	103,3	0,179	0,180	553	0,297253017
19,509	545,4	549,7	100,8	100,9	0,179	0,180	554	0,305372905
19,302	545,3	549,7	101,9	101,8	0,180	0,180	555	0,302158506
19,082	545,3	549,7	103,1	102,9	0,180	0,180	556	0,298722823
19,190	545,3	549,6	102,5	102,3	0,180	0,180	557	0,30045086
19,397	545,3	549,6	101,3	101,3	0,179	0,180	558	0,303686004
19,092	545,3	549,6	103,0	102,7	0,179	0,180	559	0,29890943
19,240	545,2	549,6	102,2	102,1	0,180	0,180	560	0,301257375
19,061	545,2	549,5	103,2	103,3	0,180	0,180	561	0,298391448
19,059	545,2	549,5	103,2	103,2	0,180	0,180	562	0,298392231
18,943	545,2	549,5	103,5	103,6	0,179	0,180	563	0,296592932
19,058	545,2	549,5	103,1	103,1	0,179	0,180	564	0,298392695
19,058	545,1	549,5	103,1	103,1	0,179	0,180	565	0,298391912
19,430	545,1	549,5	101,0	101,2	0,179	0,180	566	0,304207009
19,305	545,1	549,4	101,9	101,7	0,179	0,180	567	0,302233756
19,374	545,1	549,4	101,4	101,5	0,179	0,180	568	0,303346156
19,166	545,1	549,4	102,5	102,6	0,179	0,180	569	0,300110701
19,451	545,1	549,4	101,3	100,8	0,180	0,180	570	0,304510525
19,132	545,1	549,4	102,7	102,6	0,180	0,180	571	0,299610776
19,036	545,1	549,4	103,3	103,1	0,180	0,180	572	0,298047419
19,243	545,1	549,4	102,1	102,3	0,180	0,180	573	0,301306391
19,219	545,1	549,4	102,2	102,3	0,179	0,180	574	0,300968229
19,222	545,1	549,4	102,2	102,5	0,179	0,180	575	0,30096411
19,186	545,0	549,4	102,4	102,3	0,180	0,180	576	0,300452083
19,008	545,0	549,3	103,4	103,3	0,180	0,180	577	0,297702223
19,169	545,0	549,3	102,6	102,7	0,180	0,180	578	0,300110002
19,012	545,0	549,3	103,4	103,2	0,180	0,180	579	0,297702143
19,187	545,0	549,3	102,5	102,5	0,180	0,180	580	0,300451654
19,240	545,0	549,2	102,1	102,2	0,180	0,180	581	0,301304603
19,263	544,9	549,2	102,0	102,3	0,180	0,180	582	0,301648759
19,423	544,9	549,2	101,2	101,1	0,180	0,180	583	0,30419113
19,002	544,9	549,2	103,4	103,3	0,180	0,180	584	0,297595946
19,083	544,9	549,2	102,9	102,7	0,180	0,180	585	0,298908505
19,291	544,9	549,2	101,8	101,8	0,180	0,180	586	0,302158048
19,391	544,9	549,2	101,4	101,3	0,180	0,180	587	0,303684811
19,177	544,9	549,2	102,4	102,4	0,180	0,180	588	0,300447512
19,155	544,9	549,1	102,5	102,5	0,180	0,180	589	0,300108175
18,890	544,9	549,1	103,9	103,8	0,179	0,180	590	0,295970849



## **Appendix 9    Test load photographs and fuel analysis**

Run 1 August 9<sup>th</sup> 2022 maximum output

Kindling



Load



Coal bed for Load



Load in the stove





Run 2 August 10<sup>th</sup> 2022 minimum output

Kindling, preload and load



Load



Coal bed for Load



Load in the stove





**Run 3 August 15<sup>th</sup> 2022 category 3 output**

Kindling, preload and load



load



Coal bed for Load



Load in the stove





Run 4 August 17<sup>th</sup> 2022 category 2 output

Load and preload



load



Coal bed for Load



Load in the stove





Side view



Front view



Side view



Back view



## **Appendix 10 photograph of the test setup**

**Dilution picture Dia 8 no. EG-029**

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



Velocity ports at 90 degrees and tunnel temperature sensor location

Particulate sample extraction ports located 48 inches under (requirement 4D=32 inches minimum) velocity ports and 18 inches above downstream Tee. (Requirement 2D=16 inches minimum)

Adjustable damper for flow adjustments

Extraction blower





Last elbow from horizontal run

8 inches diameter stainless steel pipe

Velocity ports located 138 inches downstream of the last elbow (requirement  $8D=64$  inches minimum) and 48 inches upstream of the sampling ports (requirement  $4D=32$  inches minimum)

Total length between hood and sampling port: 23 feet.



Two 8 inches elbow with horizontal mixing section.

60 inches horizontal run between two elbows. Mixing section, No mixing baffle. 8 inches diameter pipe

Hood diameter 32 (requirement  $4D=32$  inches minimum) inches and height of 24 inches (requirement  $3D=24$  inches minimum)

All pipe joints are sealed.

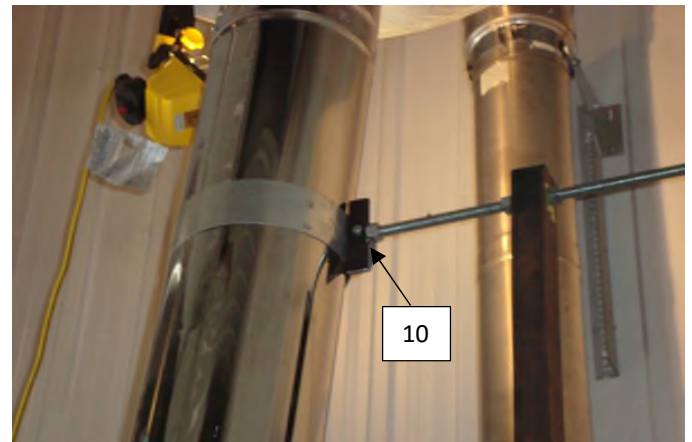
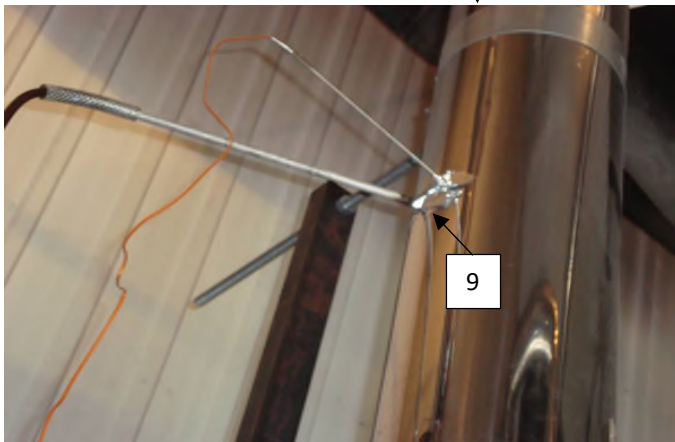


Stack sampling



Gas analysis and temperature probe

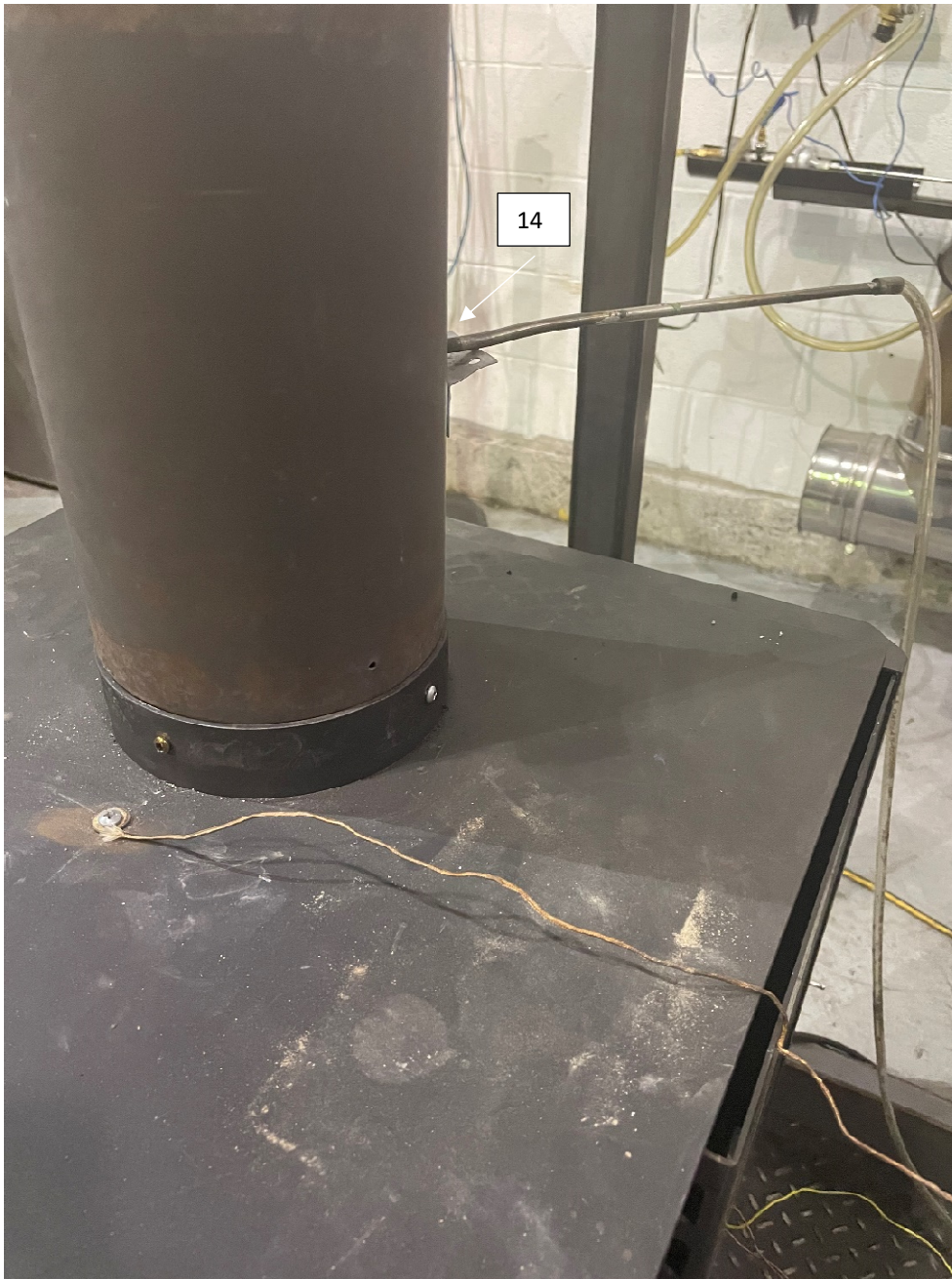
chimney support



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

**10** : Exhaust system support bracket

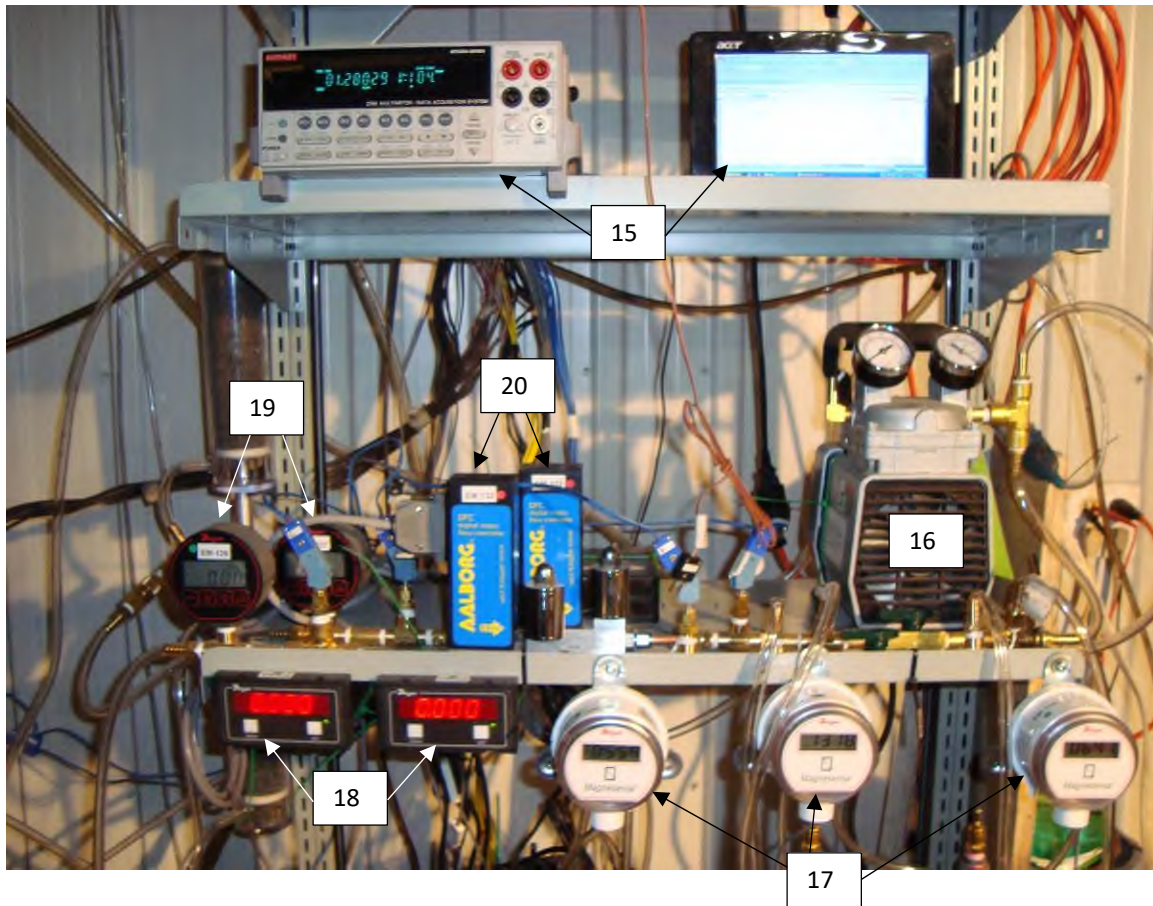
Draft sampling



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



Equipment's

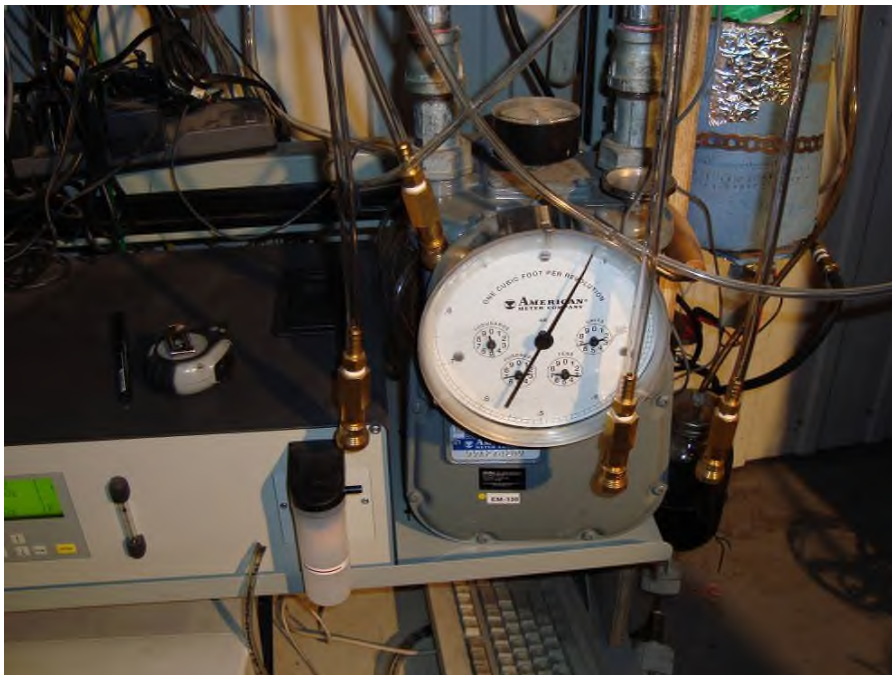


- 15 : Acquisition system
- 16 : Vacuum pump
- 17 : Digital manometer
- 18 : Digital read out for mass flow meter
- 19 : Digital vacuum gage
- 20 : Mass flow meter

Gaz analyser



Reference dry gas meter



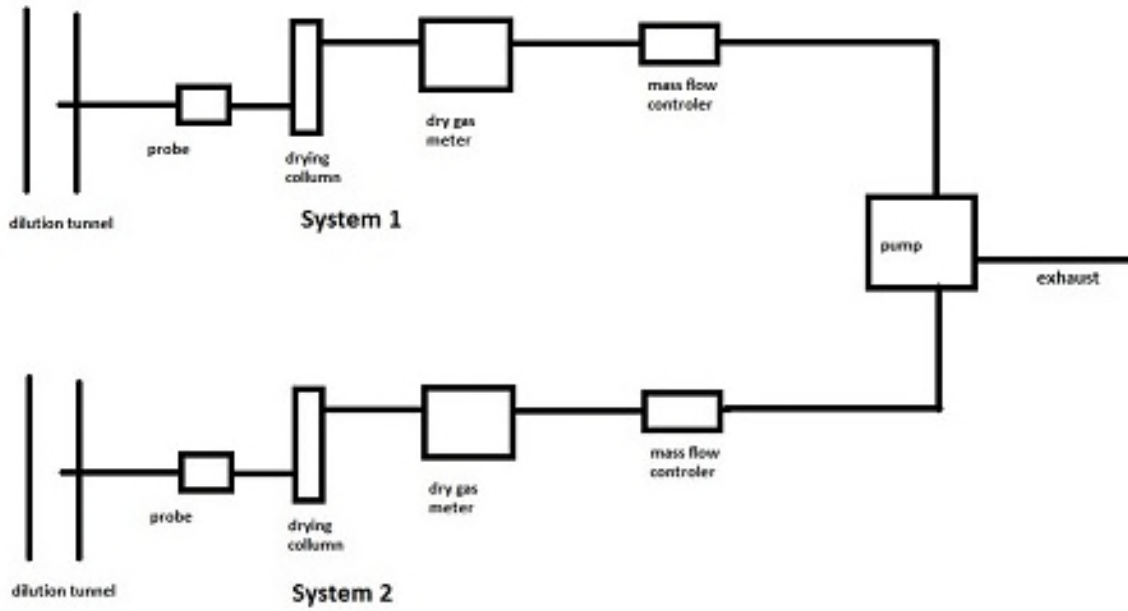


Dry gas meter for train 1, train 2 and room filter.





Dilution tunnel sample system



Dilution tunnel

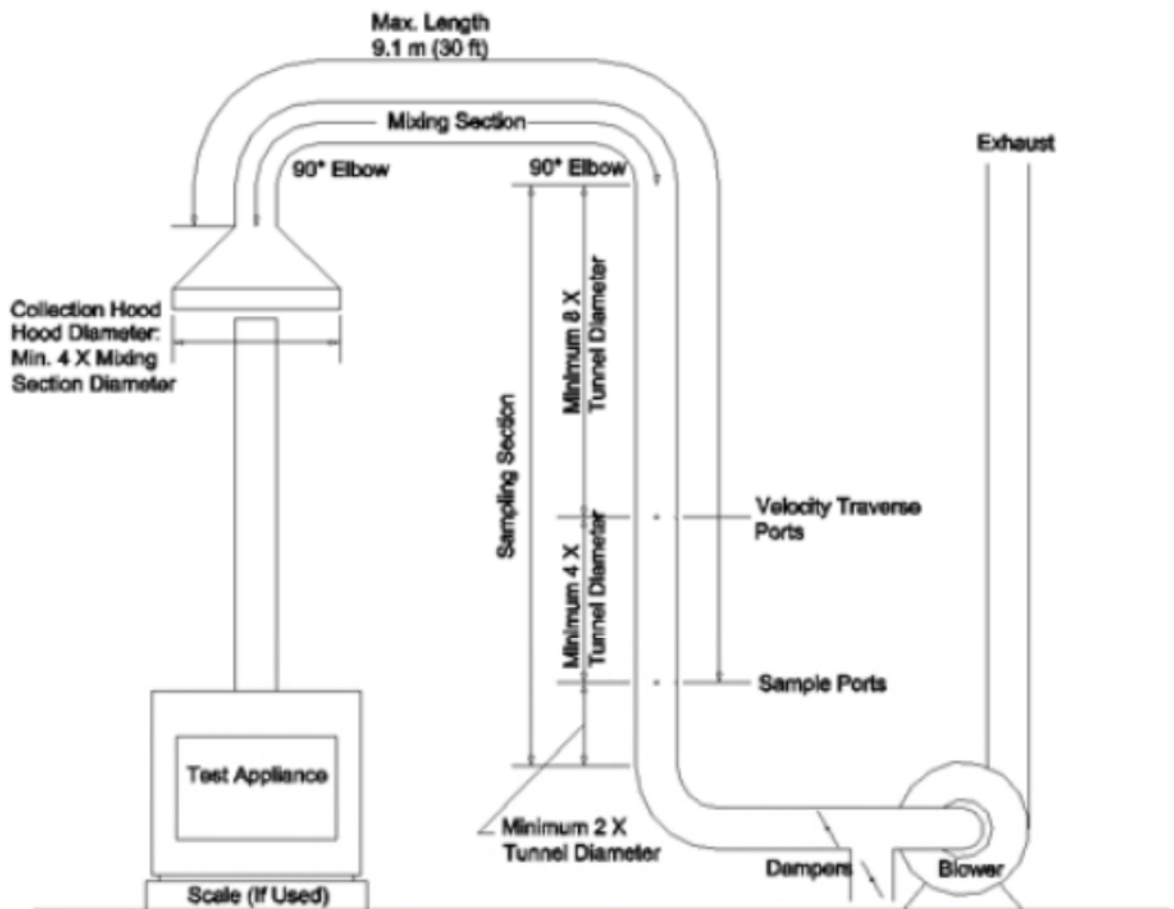


FIG. 3 Steel-Constructed Dilution Tunnel Apparatus

## **Appendix 11 Drawing of air flow pattern**

4

3

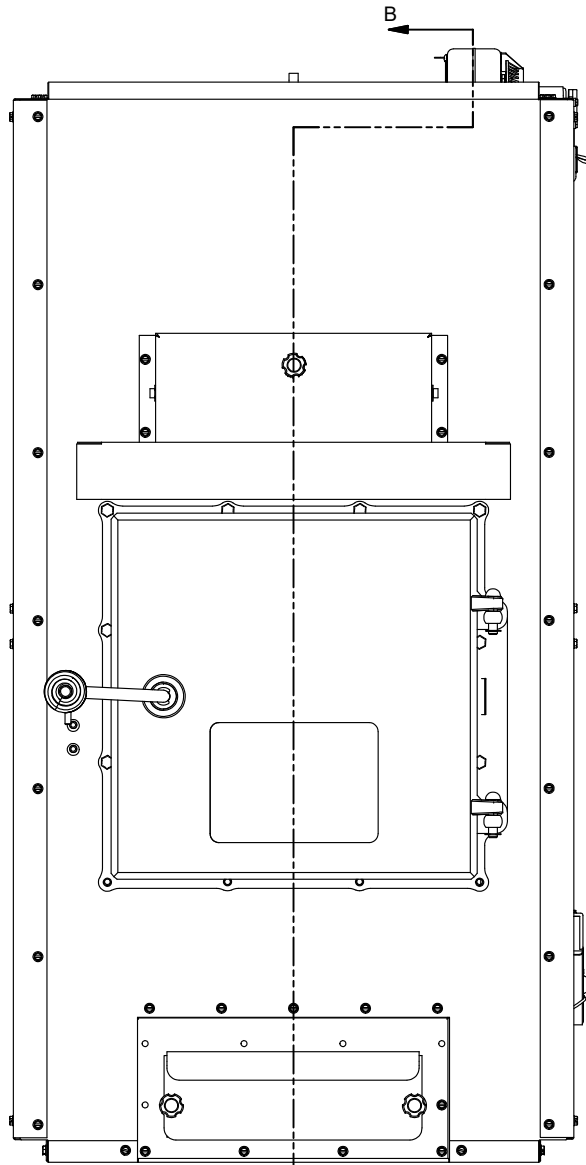
2

1

B

B

B



B

4

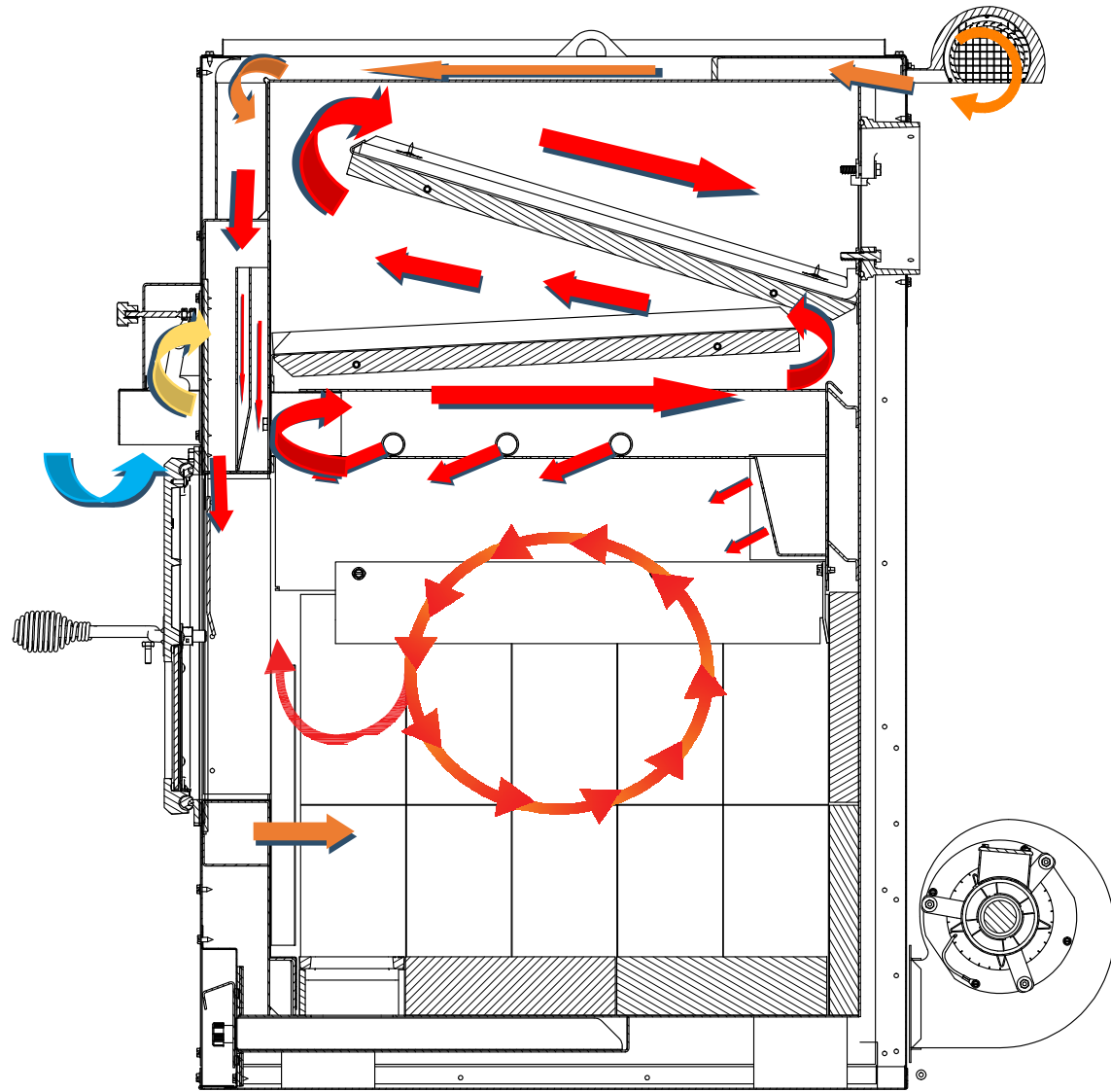
3

2

1

A

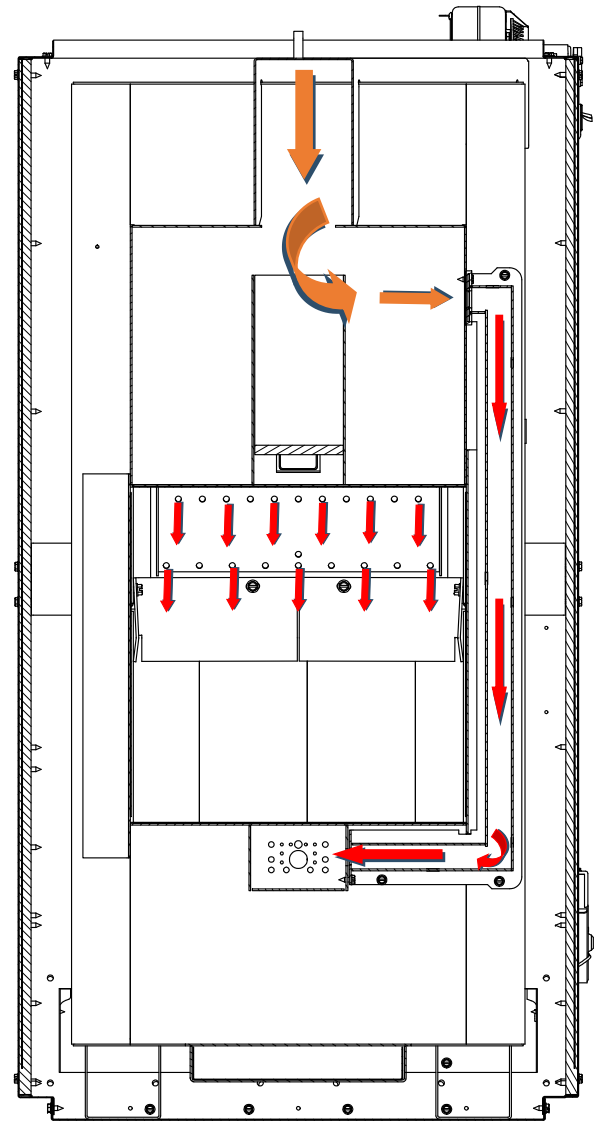
A

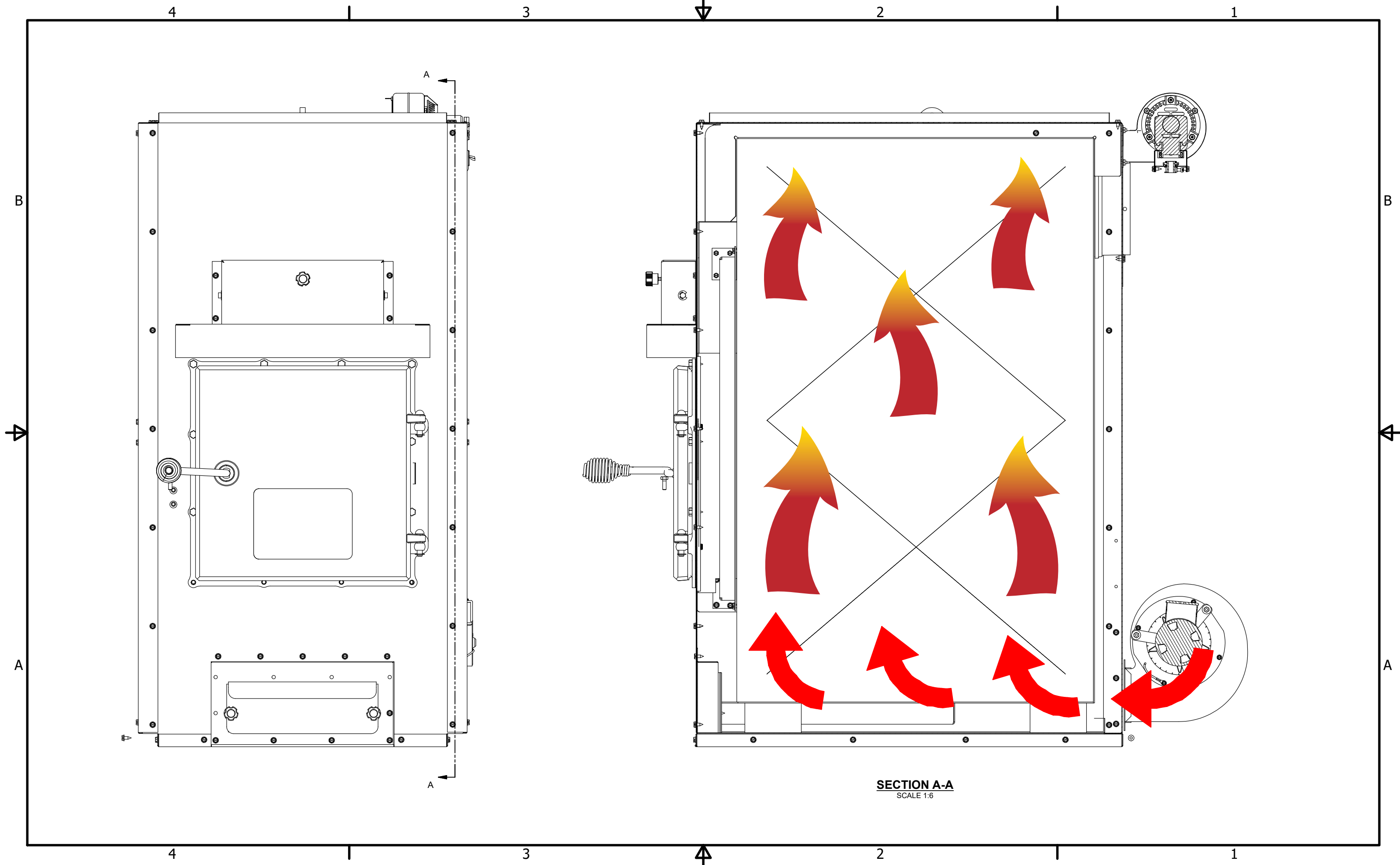


SECTION B-B  
SCALE 1:8

4

FRONT SECTION  
SCALE 1:8





**SECTION A-A**  
SCALE 1:6



## **Appendix 12    example calculation**

**Validation du fichier de calcul avec les équations provenant des normes:**

ASTM E2515-11

CSA B415.1-10

**Dry burn rate (BR)****Equation used**

B415.1, 13.4

$$BR = \left[ \frac{60W_{WD}}{\theta} \right] \left[ \frac{100 - \%M_W}{100} \right]$$

**Nomenclature**

BR	Dry wood burn rate, kg/hr (lb/hr)
$W_{WD}$	Total mass of wood burned (wet basis) during the test run, kg (lb)
$\theta$	Total time of test run, minutes
$\%M_W$	Average moisture in test fuel charge, wet basis, %
	To convert from dry basis to wet basis: % moisture wet basis =

$$\frac{100 (\% \text{ dry reading})}{(100 + \% \text{ dry reading})}$$

**Sample calculation****Data**

$W_{WD}$	40,02 lbs
$\theta$	169 min
$\%M_W$	16,69 %

**Calculation**

BR	5,371 Dry kg/hr
----	-----------------

## Volume of gas sample corrected to dry standard conditions ( $V_{m(std)}$ )

### Equation used

ASTM 2515, equation 6

$$V_{m(std)} = K_1 V_m Y \left[ \frac{P_{bar} + \left( \frac{\Delta H}{13.6} \right)}{T_m} \right]$$

### Nomenclature

$V_{m(std)}$	Volume of gas sample , corrected to standard conditions, dscm <sup>3</sup> (dscf)
$K_1$	17.64 R/in Hg
$V_m$	Volume of gas sample
$Y$	DGM calibration factor
$P_{bar}$	Barometric pressure mmHg (in Hg)
$\Delta H$	Average pressure at the outlet of the dry gas meter mm water (in. Water)
$T_m$	Absolute average dry gas meter temperature K (R)

### Sample calculation

#### Data

$V_m$	32,30 dcf
$Y$	1,014075
$P_{bar}$	29,74 in Hg
$\Delta H$	-0,8417 in Hg
$T_m$	535,0 R

#### Calculation

$V_{m(std)}$	31,20 dscf
--------------	------------

# Total amount of particulate matter collected ( $m_n$ )

## Equation used

ASTM 2515, equation 12

$$m_n = F_1 + F_2 + \Delta PF$$

## Nomenclature

$m_n$	Total amount of particulate matter collected, mg
$F_1$	Particulate matter collected on front filter, mg
$F_2$	Particulate matter collected on second filter, mg
$\Delta PF$	Post-test weight gain of probe and filter holder assembly, mg

## Sample calculation

### Data

$F_1$	0,0047 g
$F_2$	0,000 g
$\Delta PF$	0,001 g

### Calculation

$m_n$	5,200 mg
-------	----------

Calculation based of train 2 data

## Particulate concentration ( $C_s$ )

### Equation used

ASTM 2515, equation 13

$$C_s = (0,001 \text{ g/mg}) \times \left( \frac{m_n}{V_{m(\text{std})}} \right)$$

### Nomenclature

$C_s$	Concentration of particulate matter in stack gas or dilution tunnel, dry basis, corrected to standard conditions, $\text{g/dsm}^3$ (g/dscf)
$m_n$	Total amount of particulate matter collected in the sampling train, mg
$V_{m(\text{std})}$	Volume of gas sample measured corrected to dry standard conditions, $\text{dsm}^3$ (dscf)

### Sample calculation

#### Data

$m_n$	5,200 mg
$V_{m(\text{std})}$	31,20 dscf

#### Calculation

$C_s$	0,000167 g/dscf
Calculation based of train 2 data	



## Particulate concentration for room air ( $C_r$ )

### Equation used

ASTM 2515, equation 14

$$C_r = (0,001 \text{ g/mg}) \times \left( \frac{m_r}{V_{mr(std)}} \right)$$

### Nomenclature

$C_r$	Concentration of particulate matter in room air, dry basis, corrected to standard conditions, g/dsm <sup>3</sup> (g/dscf)
$m_r$	Total amount of particulate matter collected in the sampling train, mg
$V_{mr(std)}$	Volume of room air sample measured corrected to dry standard conditions, dsm <sup>3</sup> (dscf)

### Sample calculation

#### Data

$m_r$	0,000 mg
$V_{mr(std)}$	31,20 dscf

#### Calculation

$C_r$	0,000000 g/dscf
-------	-----------------

Calculation based of train 2 data

## Adjustment factor for alternative pitot tube placement ( $F_P$ )

### Equation used

ASTM 2515, equation 1

$$F_P = \frac{V_{strav}}{V_{scent}}$$

### Nomenclature

$V_{strav}$	Average gas velocity cacluated after the Pitot tube traverse
$V_{scent}$	Average gas velocity at the center of the dilution tunnel cacluated after the multi-point Pitot traverse
$F_P$	Adjustment factor for center of tunnel pitot tube placement

### Sample calculation

#### Data

$V_{strav}$	0,069375
$V_{scent}$	0,0775

#### Calculation

$F_P$	0,895161
-------	----------

## Average dilution tunnel gas velocity ( $V_S$ )

### Equation used

ASTM 2515, equation 9

$$V_S = F_p K_p C_p (\sqrt{\Delta P})_{avg} \sqrt{\frac{T_S}{P_S M_S}}$$

### Nomenclature

$V_S$	Average dilution tunnel gas velocity, m/s (ft/s)
$K_p$	Pitot tube constant For the metric units: $34.97 \text{ m/sec} \left[ \frac{\left(\frac{\text{g}}{\text{g-mole}}\right)(\text{mm Hg})}{(^{\circ}\text{K})(\text{mm H}_2\text{O})} \right]^{1/2}$ For English units: $85.49 \text{ ft/sec} \left[ \frac{\left(\frac{\text{lb}}{\text{lb-mole}}\right)(\text{in Hg})}{(^{\circ}\text{R})(\text{in H}_2\text{O})} \right]^{1/2}$
$C_p$	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
$F_p$	Pitot tube correction factor
$(\sqrt{\Delta P})_{avg}$	Average square root of each individual velocity head ( $\Delta P$ )
$P_{bar}$	Barometric pressure at measurement site, mm H <sub>2</sub> O (in. H <sub>2</sub> O)
$P_g$	Stack static pressure, mm Hg (in. Hg)
$P_S$	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{bar} + P_g$
$M_S$	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78 or 29 for CSA B415
$t_S$	Dilution tunnel temperature, °C (°F)
$T_S$	Absolute dilution tunnel temperature, °K (°R), or $273 + t_S$ for metric units, $460 + t_S$ for I

### Sample calculation

#### Data

$K_p$	85,49
$C_p$	0,99
$F_p$	0,895
$(\sqrt{\Delta P})_{avg}$	0,2633 in H <sub>2</sub> O <sup>1/2</sup>
$P_{bar}$	29,74 in Hg
$P_g$	0,26 in H <sub>2</sub> O
$P_S$	29,76 in Hg
$M_S$	29 lb/lb-mol
$t_S$	145,76 F
$T_S$	605,76 R

#### Calculation

$V_S$	16,71 ft/s
-------	------------

## Average dilution tunnel gas flow rate (Q<sub>std</sub>)

### Equation used

ASTM 2515, equation 3

$$Q_{std} = 60(1 - B_{WS})V_S A \left( \frac{T_{std}}{T_S} \right) \left( \frac{P_S}{P_{std}} \right)$$

### Nomenclature

Q <sub>std</sub>	Total gas flow rate corrected to dry standard conditions, dsm <sup>3</sup> /min (dscf/min)
60	Conversion factor minutes per hour
B <sub>WS</sub>	Water vapour in the dilution tunnel stream, proportion by volume (may be assumed to be 2%)
V <sub>S</sub>	Average dilution tunnel gas velocity, m/s (ft/s)
A	Cross-sectional area of dilution tunnel, m <sup>2</sup> (ft <sup>2</sup> )
T <sub>std</sub>	Standard absolute temperature, 293 °K (528°R)
T <sub>S</sub>	Absolute average dilution tunnel temperature, °K (°R), or 273 + t <sub>s</sub> for metric units, 460 + t <sub>s</sub> for English units
t <sub>s</sub>	Dilution tunnel temperature, °C (°F)
P <sub>S</sub>	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or P <sub>bar</sub> + P <sub>g</sub>
P <sub>bar</sub>	Barometric pressure at measurement site, mm Hg (in. Hg)
P <sub>g</sub>	Dilution tunnel static pressure, mm Hg (in. Hg)
P <sub>std</sub>	Standard absolute pressure, 760 mm Hg (29.92 in. Hg)

### Sample calculation

#### Data

B <sub>WS</sub>	0,02
V <sub>S</sub>	16,71
A	0,35 ft <sup>2</sup>
T <sub>std</sub>	528 R
T <sub>S</sub>	605,76 R
P <sub>S</sub>	29,756 in Hg
P <sub>std</sub>	29,92 in Hg

#### Calculation

Q <sub>std</sub>	297,40 dscf/min
------------------	-----------------

## Particulate emission rate (E)

### Equation used

$$E = (C_s - C_r)Q_{std}$$

### Nomenclature

E	Particulate emission rate, g/hr
$C_s$	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm <sup>3</sup> (g/dscf)
$C_r$	Concentration of particulate matter in room air, g/dscm <sup>3</sup> (g/dscf)
$Q_{std}$	Total gas flow rate, dry basis corrected to standard conditions, dsm <sup>3</sup> /min (dscf/min)

### Sample calculation

#### Data

$C_s$	0,000167 g/dscf
$C_r$	0,000000 g/dscf
$Q_{std}$	297,40 dscf/min

#### Calculation

E	0,05 g/min
E	2,97 g/h

Calculation based on train 2 data.



## Total particulate emission rate ( $E_T$ )

### Equation used

ASTM 2515, equation 15

$$E_T = (C_S - C_r)Q_{std}\theta$$

### Nomenclature

$E_T$	Total particulate emission, g
$C_S$	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm <sup>3</sup> (g/dscf)
$C_r$	Concentration of particulate matter in room air, g/dscm <sup>3</sup> (g/dscf)
$Q_{std}$	Total gas flow rate, dry basis corrected to standard conditions, dsm <sup>3</sup> /min (dscf/min)
$\theta$	Total sampling time, min

### Sample calculation

#### Data

$C_S$	0,000167 g/dscf
$C_r$	0,000000 g/dscf
$Q_{std}$	297,40 dscf/min
$\theta$	169 min

#### Calculation

E 8,38 g  
Calculation based on train 2 data.

## Average gas velocity in dilution tunnel during each min interval, i, of the test run

### Equation used

ASTM 2515, equation 10

$$v_{si} = F_p K_p C_p \sqrt{\Delta p_i} \sqrt{\frac{T_{si}}{P_s M_s}}$$

### Nomenclature

	Average gas velocity in dilution tunnel during each min interval, i of the test run
$v_{si}$	m/sec (ft/sec)
$F_p$	Pitot tube correction factor
$K_p$	Pitot tube constant
	For the metric units: $34.97 \text{ m/sec} \left[ \frac{(\frac{g}{g\text{-mole}})(\text{mm Hg})}{(^{\circ}\text{K})(\text{mm H}_2\text{O})} \right]^{1/2}$
	For English units: $85.49 \text{ ft/sec} \left[ \frac{(\frac{\text{lb}}{\text{lb-mole}})(\text{in Hg})}{(^{\circ}\text{R})(\text{in H}_2\text{O})} \right]^{1/2}$
$C_p$	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
$\Delta p_i$	Velocity pressure in the dilution tunnel as measured with the Pitot tube during each min interval, i, of the test run
$T_{si}$	Absolute average gas temperature in the dilution tunnel during the $i^{\text{th}}$ minutes interval, K (R)
$P_s$	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{\text{bar}} + P_g$
$M_s$	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78

### Sample calculation

#### Data

<b>i=1</b>		<b>i=2</b>	
$F_p$	0,895	$F_p$	0,895
$K_p$	85,49	$K_p$	85,49
$C_p$	0,99	$C_p$	0,99
$\Delta p_i$	0,069 in H <sub>2</sub> O	$\Delta p_i$	0,070 in H <sub>2</sub> O
$T_{si}$	611,0 R	$T_{si}$	617,8 R
$P_s$	29,76 in Hg	$P_s$	29,76 in Hg
$M_s$	29 lb/lb-mol	$M_s$	29 lb/lb-mol

#### Calculation

<b>i=1</b>		<b>i=2</b>	
$v_{si}$	16,78 ft/sec	$v_{si}$	16,93 ft/sec

## Percent of proportional sampling rate (PR)

### Equation used

B415, equation 13.1

$$PR = \left( \frac{\theta V_{mi(std)} V_S T_m T_{Si}}{\theta_i V_m V_{Si} T_{mi} T_S} \right) \times 100$$

### Nomenclature

PR	Percent of proportional sampling rate (%)
$\theta$	Total sampling time, min
$\theta_i$	Time of interval, 1 min
$V_m$	Volume of gas sample measured by the DGM, dsm <sup>3</sup> (dscf)
$V_{mi(std)}$	Volume of gas sample measured by the digital mass flow controller during the i <sup>th</sup> 1 minutes interval, dsm <sup>3</sup> (dscf)
$V_S$	Average gas velocity in the dilution tunnel, ft/min
$V_{Si}$	Average gas velocity in the dilution tunnel during the i <sup>th</sup> 10 minutes interval, ft/min
$T_m$	Absolute average digital mass flow controller temperature, K (R)
$T_{mi}$	Absolute average digital mass flow controller temperature during the i <sup>th</sup> 1 minutes interval, K (R)
$T_S$	Absolute average gas temperature in the dilution tunnel, K (R)
$T_{Si}$	Absolute average gas temperature in the dilution tunnel during the i <sup>th</sup> 1 minutes interval, K (R)

### Sample calculation

#### Data

train =1			train =2		
$\theta$	169	min	$\theta$	169	min
$\theta_i$	1	min	$\theta_i$	1	min
$V_m$	30,69	dcf	$V_m$	31,21	dcf
$V_{mi(std)}$	0,184	cuft	$V_{mi(std)}$	0,1835	cuft
$V_S$	17,64	ft/sec	$V_S$	17,64	ft/sec
$V_{Si}$	17,722	ft/sec	$V_{Si}$	17,722	ft/sec
$T_m$	531,4	R	$T_m$	535,0	R
$T_{mi}$	529,46	R	$T_{mi}$	530,01	R
$T_S$	605,76	R	$T_S$	605,76	R
$T_{Si}$	611,0	R	$T_{Si}$	617,8	R

#### Calculation

train=1		train=2	
PR	102,3 %	PR	101,9 %

## Filter face velocity check

### Equation used

$$FV_{max} = \frac{V_{mL}}{1} \times \frac{1}{F_A}$$

### Nomenclature

$FV_{max}$	Maximum filter face velocity during the test run, m/min (ft/min)
$V_{mL}$	Largest 1 minute interval metered gas volume value recorded during the test run, dm <sup>3</sup> (dcf)
$F_A$	Filter area exposed to gas sample during train operation, m <sup>2</sup> (ft <sup>2</sup> )

### Sample calculation

#### Data

$V_{mL}$	0,185 dcf
$F_A$	0,0116 ft <sup>2</sup>

#### Calculation

$FV_{max}$	15,99 ft/min
------------	--------------

## Dual train precision

### Equation used

$$\frac{\text{Train 1} - \text{average train 1 and train 2}}{\text{average train 1 and train 2}} \times 100 \leq 7.5\%$$

### Nomenclature

Dual train precision	Deviation between emission's train 1 and 2
Train 1	Total emission for train 1
Train 2	Total emission for train 2

### Sample calculation

#### Data

Train 1	9,32 g
Train 2	8,38 g

#### Calculation

Dual train precision	5,36 %
----------------------	--------



## Analyzer drift checks

### Equation used

$$Drift = \frac{\Delta R}{span} \times 100$$

### Nomenclature

Drift	The change in analyzer response to calibration gas over the duration of the test run relative to the instrument range, %
$\Delta R$	The difference between the analyzer response at the end of the test run and the known calibration gas value, ppmv or %
Span	The upper limit of the instrument range, ppmv or %

### Sample calculation

#### Data

$\Delta R$	0,015 %
Span	5 %

#### Calculation

Drift	0,30 %
-------	--------

Calculated with CO concentration values.

## Change in enthalpy ( $\Delta h$ )

### Equation used

B415, equation E-1

$$\Delta h = \Delta t(1.006 + 1.84x)$$

### Nomenclature

$\Delta h$	change in enthalpy, kJ/kg
$\Delta t$	temperature rise, °C
1,006	specific heat of air, kJ/kg°C
1,84	specific heat of water vapour, kJ/kg°C
x	humidity ratio, kg/kg = 0,012 as per CSA B415,1-10

### Sample calculation

#### Data

$\Delta t$	30,66 °C
x	0,012 kg/kg

dans la colonne k, c'est entré direct comme ça, ça ne vient de nulle part

#### Calculation

i=2	
$\Delta h$	31,52 kJ/kg

## Velocity (V)

### Equation used

B415, equation E-3

$$V = F_p \times C_p \times 34.97 \times \sqrt{\Delta P} \times \sqrt{\frac{T}{28.56(P_{bar} + P_s)}}$$

### Nomenclature

V	Velocity, m/s
F <sub>p</sub>	Pitot tube calibration factor
C <sub>p</sub>	Pitot factor, 0.99 for a standard Pitot tube or as determined by calibration for a Type S Pitot tube
34,97	Pitot tube constant
ΔP	velocity pressure, mm H <sub>2</sub> O
T	temperature, K
28,56	molecular weight of air
P <sub>bar</sub>	barometric pressure, mm Hg
P <sub>s</sub>	duct static pressure, mm Hg

### Sample calculation

#### Data

F <sub>p</sub>	3,09
C <sub>p</sub>	0,84
ΔP	0,61 mm H <sub>2</sub> O
T	324,34 K
P <sub>bar</sub>	755,31 mm Hg
P <sub>s</sub>	0,37 mm Hg

#### Calculation

i=2	
V	8,69 m/s

## Mass flow rate (kg/h)

### Equation used

B415, equation E-4

$$m = 3600VA\rho$$

### Nomenclature

m	mass flow rate, kg/h
Vstd	air flow velocity, m/s (standard)
3600	number of seconds per hour
A	duct cross-sectional area, m <sup>2</sup>
$\rho$	density of air at standard temperature and pressure (use 1.204 kg/m <sup>3</sup> )

### Sample calculation

#### Data

Vstd	7,80 m/s
A	0,04 m <sup>2</sup>
$\rho$	1,20 kg/m <sup>3</sup>

#### Calculation

i=2	
m	1259,67 kg/h

## Rate of heat release into the circulating air (kJ/h)

### Equation used

B415, equation E-5

$$\Delta e = \Delta h \times m$$

### Nomenclature

$\Delta e$	rate of heat release into the circulating air, kJ/h
$\Delta h$	change in enthalpy, kJ/kg
$m$	mass flow rate, kg/h

### Sample calculation

#### Data

$i=2$	
$\Delta h$	31,52 kJ/kg
$m$	1259,67 kg/h

#### Calculation

$i=2$	
$\Delta e$	39710,10 kJ/h



## Delivered heat output over any time interval (kJ)

### Equation used

B415, equation E-6

$$E_t = \sum (\Delta e \times i) \quad \text{for } i=t_1 \text{ to } t_2$$

### Nomenclature

$E_t$	delivered heat output over any time interval $t_2-t_1$ , kJ
$\Delta e$	rate of heat release into the circulating air, kJ/h
$i$	time interval for each measurement, h

### Sample calculation

#### Data

$i=2$	
$\Delta e$	39710,10 kJ/h
$i$	0,02 h

#### Calculation

$i=2 \text{ to } 3$	
$E_t$	661,84 kJ

## Heat output over a burn (Btu/h)

### Equation used

B415, equation E-8

$$E_d = \sum (E_t) \text{ for } t = t_0 \text{ to } t_{final}$$

### Nomenclature

$E_d$  heat output over a burn, kJ/h (Btu/h)  
 $E_t$  delivered heat output over any time interval  $t_2-t_1$ , kJ

### Sample calculation

#### Data

i=2

$E_t$  661,84 kJ

#### Calculation

$E_d$  158551 kJ/h  
 126324 Btu/h

## Efficiency (%)

### Equation used

B415, equation E-9

$$\text{Efficiency, \%} = 100 \times E_d/I$$

### Nomenclature

$E_d$  heat output over a burn, kJ/h (Btu/h)

$I$  Input energy (fuel calorific value as-fired times weight of fuel charge), kJ/kg (Btu/lb)

### Sample calculation

#### Data

$E_d$  150285 Btu

$I$  285134 Btu

#### Calculation

Efficiency 52,7 %

## Appendix 13 Firebox Volume

$$13.75 \times 21.25 \times 24 = 7012.5$$

$$3.25 \times 4.25 \times 13.75 = 189.9$$

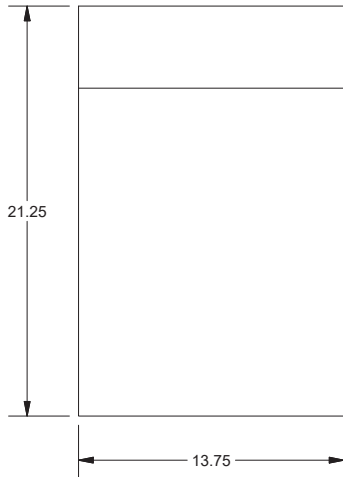
$$7012.5 - 189.9 = 6822.6$$

$$6822.6 / 1728 = 3.948 \text{ cu ft}$$

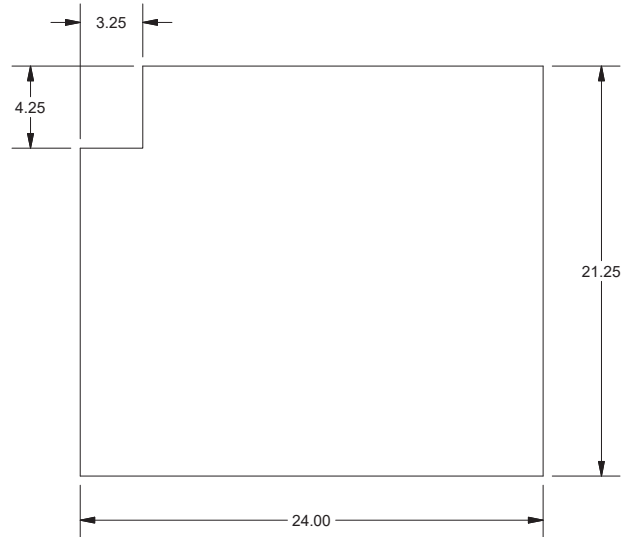
overall volume

unusable portion

usable volume



front view



side view

GENERAL NOTES:  
ALL FORMED DIMENSIONS ARE TO THE OUTSIDE OF THE PART, UNLESS SPECIFIED OTHERWISE.

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	EXCEPT AS NOTED	DECIMAL XX = 0.03 XXX = 0.010	FINISH	DWN BY	TITLE		NUMBER	SHEET	
		ANGULAR ± 2°	REFERENCE	DATE 9/15/2022	1520 VOLUME		Volume	1 OF 1	



## **Appendix 14 ALT-134 Letter, Coc, 30 days notice, WHA, others**



OMB Control No. 2060-0161  
Approval expires 03/31/2019

OMB Control No. 2060-0693  
Approval expires 03/31/2019

### 30-DAY NOTIFICATION

## 2015 CLEAN AIR ACT (CAA) STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES 40 CFR PART 60 SUBPARTS AAA AND QQQQ

The public reporting and recordkeeping burden for this collection of information is estimated to average 2 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Regulatory Support Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

**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 60.537 and 60.5479. If you have additional questions, please contact Rafael Sanchez at 202-564-7028 or via email at [sanchez.rafael@epa.gov](mailto:sanchez.rafael@epa.gov).

**Instructions:** The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to [WoodHeaterReports@epa.gov](mailto:WoodHeaterReports@epa.gov). This notice must be received by the EPA at least 30 days before the start of testing.

GENERAL INFORMATION						
<b>Manufacturer's Name:</b> United States Stove Company						
<b>Heater Type (Circle One):</b>	<input type="checkbox"/> Adjustable Burn Rate Wood Heater	<input type="checkbox"/> Pellet Stove	<input type="checkbox"/> Single Burn Rate Heater	<input type="checkbox"/> Hydronic Heater	<input checked="" type="checkbox"/> Forced Air Furnace	<input type="checkbox"/> Other:
<b>Hydronic Heater Type (Check one):</b>	<input type="checkbox"/> Full Storage	<input type="checkbox"/> Partial Storage	<input type="checkbox"/> Indoor	<input type="checkbox"/> Outdoor	<input type="checkbox"/> Other:	
<b>Forced-Air Furnace Type (Check one):</b>	<input type="checkbox"/> Small (less than 65,000 BTU/hr heat output)		<input checked="" type="checkbox"/> Large (greater than 65,000 BTU/hr heat output)			
<b>Fuel Tested (Check one):</b>	<input type="checkbox"/> Crib	<input type="checkbox"/> Pellet	<input checked="" type="checkbox"/> Cordwood	<input type="checkbox"/> Wood Chips	<input type="checkbox"/> Other:	
<b>Model Name(s) (as will appear on test report):</b> HB1520, US1520, VG1520, N35, C2235, SWF1035 SWF1035K						
<b>Model Number(s) (as will appear on test report):</b> HB1520, US1520, VG1520, N35, C2235, SWF1035 SWF1035K						
<b>Equipped with a catalytic combustor?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						
<b>Mailing Address:</b> 227 Industrial Park Rd						
<b>Street Address:</b> 227 Industrial Park Rd						



OMB Control No. 2060-0161  
Approval expires 03/31/2019

OMB Control No. 2060-0693  
Approval expires 03/31/2019

### 30-DAY NOTIFICATION

## 2015 CLEAN AIR ACT (CAA) STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES 40 CFR PART 60 SUBPARTS AAA AND QQQQ

The public reporting and recordkeeping burden for this collection of information is estimated to average 2 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Regulatory Support Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

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**Instructions:** The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to [WoodHeaterReports@epa.gov](mailto:WoodHeaterReports@epa.gov). This notice must be received by the EPA at least 30 days before the start of testing.

<b>City:</b> South Pittsburg	<b>State:</b> TN	<b>ZIP Code:</b> 37380
<b>Phone:</b> (423) 837-2100	<b>Fax:</b>	<b>Web Site:</b> www.usstove.com
<b>Address of Manufacturer:</b> 227 Industrial Park Rd		
<b>City:</b> South Pittsburg	<b>State:</b> TN	<b>ZIP Code:</b> 37380
<b>EPA APPROVED TEST LABORATORY</b>		
<b>Name and Title of Authorized Representative:</b> Danick Power v-p operation		
<b>Company:</b> Polytests Services Inc.		
<b>Phone:</b> (450) 741-3636	<b>E-mail:</b> <a href="mailto:dpower@polytests.com">dpower@polytests.com</a>	<b>Fax:</b>
<b>City:</b> St-Jean-sur-Richelieu	<b>State:</b> Québec, Canada	<b>ZIP Code:</b> J3B 7S7
<b>EPA APPROVED THIRD-PARTY CERTIFIER</b>		
<b>Name and Title of Authorized Representative:</b> John Steinert, General Manager		
<b>Company:</b> PFS-TECO		
<b>Phone:</b> 503-650-0088	<b>E-mail:</b> <a href="mailto:john.steinert@pfsteco.com">john.steinert@pfsteco.com</a>	<b>Fax:</b>



OMB Control No. 2060-0161  
Approval expires 03/31/2019

OMB Control No. 2060-0693  
Approval expires 03/31/2019

### 30-DAY NOTIFICATION

## 2015 CLEAN AIR ACT (CAA) STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES 40 CFR PART 60 SUBPARTS AAA AND QQQQ

The public reporting and recordkeeping burden for this collection of information is estimated to average 2 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Regulatory Support Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

**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 60.537 and 60.5479. If you have additional questions, please contact Rafael Sanchez at 202-564-7028 or via email at [sanchez.rafael@epa.gov](mailto:sanchez.rafael@epa.gov).

**Instructions:** The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to [WoodHeaterReports@epa.gov](mailto:WoodHeaterReports@epa.gov). This notice must be received by the EPA at least 30 days before the start of testing.

<b>City:</b> Portland	<b>State:</b> OR	<b>ZIP Code:</b> 97015
<b>COMPLIANCE TEST INFORMATION</b>		
<b>Test Method(s):</b> CSA B415.1-10, ALT-134		
<b>Date(s) of Proposed Test:</b> <del>July 25-29, 2022</del> August 8-12, 2022		
<b>Testing Location:</b> Polytests Services Inc., 695 B rue Gaudette, St-Jean-sur-Richelieu , Québec, Canada, J3B 7S7		



OMB Control No. 2060-0161  
Approval expires 03/31/2019

OMB Control No. 2060-0693  
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John D. Voorhees, VP of Compliance

\_\_\_\_\_  
**Print Name and Title of Authorized Official**

\_\_\_\_\_  
**Signature**

\_\_\_\_\_  
**Date** June 15, 2022

\_\_\_\_\_  
**Telephone Number:** 423 837-2100

\_\_\_\_\_  
**Email Address:** Johnv@usstove.com

**Remarks:**

v1





# Certificate of Conformity

Issued to: United States Stove Company  
Mr. John Voorhees  
227 Industrial Park Rd  
South Pittsburgh, TN 37380  
(423) 837-2100

Model: US1520  
AKA: HB1520, VG1520, WC1520, N35, C2235, SWF1035, SWF1035K  
Effective Date: Sept 19, 2022  
Report # Polytest # PI-20275 (PFS #F22-822)

Certification tests were performed by Services Polytests, Inc. located at: 695-B Gaudette- St-jean-sur-Richelieu, QC, J3B 7S7 CANADA.

PFS TECO certifies conformity to the following per 40 CFR Part 60 §60.533 (f) (A):


- The test report is complete and accurate.
- The instrumentation used for the test was properly calibrated.
- The representative model tested meets the applicable emission limits.
- The tests have been conducted per the appropriate guidelines.
- The manufacturer's Quality Control Plan has been reviewed to ensure that all production units are similar in all material respects that would affect emissions to the tested/certified model and that the units in the model line will meet all (other) applicable requirements.

PFS TECO certifies that the emissions levels as measured in the test report are in compliance with the 2020 PM emission limit of  $\leq 0.15$  lb/mmBTU output using cord wood per CSA B415.10 and EPA ALT-134.

The maximum emissions for the 1520 wood-fired forced air furnace is **0.148 lb/mmBTU output** with an annual efficiency of **66%**. Average CO emissions are **4.6 g/min.**

Issued by: PFS TECO  
11785 SE Highway 212  
Suite 305  
Clackamas, OR 97015

John Steinert, Vice President Hearth Products Division

	<b>EPA Quality Assurance Checksheet</b>		
	Approved By: John Voorhees	Revision: 01	Page 1 of 1
Initial Release Date: 01/17/2017	Revision: 02/09/2024		
Model:	US1520, HB1520, VG1520, WC1520, N35, C2235, SWF1035, SWF1035K, KWF1520, CGWF4000, DHWF400		
Inspection Date:			
Serial:	*Refer to N:\Engineering\Production Released Dwgs and Manuals for most up to date Print Revision Level		
Inspector:			

**EPA Quality Assurance Check Sheet**

Inspection frequency should be conducted at a rate of every 100 heaters produced

**Dimensional Checks:**

All dimensions are in milimeters unless otherwise specified. Inspection tolerances are +/-6.4mm for any linear dimension and +/-5% for any cross sectional area relating to air induction systems

	Nominal	Actual		Nominal	Actual
A	50.8 (2 plcs)		Q	25.4 (typ)	
B	81.0		R	35.1	
C	19.0		S	6.4 (21 plcs)	
D	7.9		T	233.2	
E	3.3 (8 plcs)		U	581.4	
F	5.8 (8 plcs)		V	12.7	
G	608.6		W	215.9	
H	349.3		X	101.6	
I	353.8		Y	25.4	
J	354.8		Z	85.9	
K	570.5		AA	149.4	
L	542.5		BB	25.4	
M	155.7		CC	215.9	
N	18.5 (typ)		DD	38.1	
O	6.4 (48 plcs)		EE	25.4	
P	25.4		FF	4.3	

**Door Sealing:**

Does the door (s) seal properly against the firebox? (Use appropriate gauge for testing)

Pass	Fail	N/A
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Baffle:**

Is the location of the baffle correct?

Is there any damage to the baffle?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Fans:**

Do the fans match the specifications (speed/power/performance) on the K-list?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------

**Motors:**

Do the motors match the specifications (speed/power/performance) on the K-list?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------

**Non-Conformities for Corrective Action:**

Document any non-conformities that require corrective action



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK, NC 27711

AUG 19 2019

OFFICE OF  
AIR QUALITY PLANNING  
AND STANDARDS

Mr. Sylvain Bilodeau  
President  
L.S. Bilodeau Inc.  
Steel Products Manufacturing  
281 Route 108 Est  
Saint-Ephrem QC  
Canada, GOM 1R0

Dear Mr. Bilodeau,

I am writing in response to your correspondence, dated July 9, 2019, regarding certification testing of your AirBilo PLUS brand wood-fired forced-air furnace. You are planning to use the cordwood option to obtain 2020 certification under 40 CFR 60, Subpart QQQQ - Standards of Performance for New Residential Hydronic Heaters and Forced Air Furnaces (Subpart QQQQ), Section 60.5476(e). You are requesting an alternative certification procedure to use the Canadian Standards Association (CSA) B415.1-10 test method, "Performance testing of solid-fuel-burning heating appliances," including thermostatically controlled warm air furnaces using cordwood as stated in section 7.2 of the CSA standard in lieu of the Method 28 WHH (40 CFR 60, Appendix A) procedures required by Subpart QQQQ.

In your correspondence, you are requesting the alternative certification testing procedure for your furnace because it is thermostatically-controlled and there is the potential for extreme BTU delivery to cause longer ramp down to the lowest BTU delivered. You also note, that when operating at the lowest rate preset by factory with normal operating mode for the blower, the furnace will produce more delivered BTU output than allowed for the Category 1 burn in EPA Method 28 WHH. In addition, you state that the furnace can not maintain combustion under the required Method 28 test procedure and it will force the fire to go out.

To address these issues, you are requesting to use the burn rate categories of CSA Method B415.1-10 in Section 7.2.1.2 in lieu of those in Method 28 WHH with the following modifications:

- Category IV - Operate at maximum capacity with forced combustion inducer engaged during the entire test.
- Category III - Operate with the switch for inducer "on" and "off" to meet specific output range.
- Category II - Operate with the switch for inducer "on" and "off" to meet specific output range.



- Category I - Operate at the lowest heat output below 35% of the maximum output of the furnace.

With the caveats set forth below, we are approving your alternative method request for certification testing of the AirBilo PLUS brand thermostatically-controlled forced air furnace. As required in Subpart QQQQ, Section 60.5476(c)(6), the manufacturer or approved test lab must also measure the first hour of particulate matter emissions for each test run using a separate filter in one of the two parallel sampling trains. These results must be reported separately and also included in the total particulate matter emissions per run. Also, as required in Subpart QQQQ, Section 60.5476(a), the manufacturer must have the approved test laboratory measure the efficiency, heat output, and carbon monoxide emissions of the tested wood heater using CSA Method B415.1-10. For particulate matter emission concentrations, ASTM E2515-11 "Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel" must be used; four inch filters are acceptable. Disregard Sections 8.3.1 and 8.4 in CSA Method B415.1-10 regarding the use of Douglas fir lumber in a crib wood configuration for EPA testing. However, for cordwood, you may use Douglas fir as well as any of the other species of wood listed in CSA Method B415.1-10.

The AirBilo PLUS brand forced-air furnace design incorporates a low setting on its controller which is the lowest heat output (Btu/hr) setting available to the user and corresponds to the lowest burn rate to be evaluated during certification testing; this is consistent with 40 CFR part 60, Subpart QQQQ, section 60.5476, which states "*The burn rate for the low burn 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.*"

It is reasonable that this alternative test method approval be broadly applicable to certification testing of forced air furnaces subject to the requirements of 40 CFR part 60, Subpart QQQQ. For this reason, we will post this letter as ALT-134 on our website at <http://www3.epa.gov/ttn/emc/approalt.html> for use by other interested parties. A copy of this letter must be included in each certification test report. The emission limit in the rule remains intact and time weighted averaging is not allowed. This alternative method approval is valid until such time that Subpart QQQQ is revised or replaced to require a different certification method for these units, and at such time, this alternative will be reconsidered and possibly withdrawn.

When doing the certification testing of the AirBilo PLUS, the burn rate requirements in Section 7.2.1.2 of CSA Method B415.1-10 must be followed:

1. Category 1: Operate at the lowest delivered output that the unit is able to operate at (idle mode with no heat demand from the home/thermostat), and be below 35% of the Maximum of the heat output of the furnace.
2. Category 2: Heat output shall be between 35 and 53% of the maximum heat output of furnace.
3. Category 3: Heat output shall be between 53 and 76% of the maximum heat output of furnace.

4. Category 4: Heat output shall be the maximum heat output of the furnace.


The procedures in Section 7.2.2.2 of CSA Method B415.1-10 must be followed completely regarding Category 1 through 3 heat output using the remote control switch in the on position at the beginning of the test and leaving it on until the heat output for these categories are met, at which point the on switch can be turned off, and turned back on when the average heat demand drops below the determined target percentage of maximum heat output, at this point the switch can be in the on position to meet the heat output category being tested. Allow the heat output to fall below the target rate, then switch on the heat demand, and switch that off once target is reached. This cycle should be repeated for the entire test.

The following changes to ASTM E2515-11 must be followed for the certification testing:

1. Filters must be weighed in pairs to reduce weighing error propagation. See ASTM E2515-11, section 10.2.1, Analytical Procedure.
2. Sample filters must be Pall TX-40 or equivalent Teflon-coated glass fiber filters, and 47 mm, 90 mm, 100 mm, or 110 mm in diameter.
3. Only one point is allowed outside the +/- 10 percent proportionality range per test run.

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

Sincerely,



Steffan M. Johnson, Group Leader  
Measurement Technology Group

cc: Amanda Aldridge, EPA/OAQPS/OID  
Adam Baumgart-Getz, EPA/OAQPS/OID  
Rochelle Boyd, EPA/OAQPS/SPPD  
Chuck French, EPA/OAQPS/SPPD  
Rafael Sanchez, EPA/OECA  
Michael Toney, EPA/OAQPS/AQAD



**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](mailto:sanchez.rafael@epa.gov).

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**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:**

<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>	<b>Catalyst: Yes / No</b>
-----------------------	---------------------------

**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):**

<b>Physical Address (Street number and Address, not P.O. Box):</b>	<b>Mailing Address:</b>
--	-------------------------

<b>City:</b>	<b>State:</b>	<b>ZIP Code:</b>
<b>Phone:</b>	<b>Email:</b>	<b>Website:</b>

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

**MANUFACTURER'S AUTHORIZED REPRESENTATIVE INFORMATION**

**Name:**

**Position/Title:**

**Address:**

<b>City:</b>	<b>State:</b>	<b>ZIP Code:</b>
<b>Phone:</b>	<b>E-mail:</b>	<b>Website:</b>

**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:**

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

**Position/Title:**

**Address:**

**City:**

**State:**

**ZIP Code:**

**Phone:**

**Email:**

**Website:**

**Remarks:**


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

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

**FOR EMISSIONS DATA SUMMARY TABLES SEE ATTACHMENTS**

**1. Engineering Drawings Statement**

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.

**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.

**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.**

**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).

**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.

**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.

**7. Laboratory Sealing of Unit**

A statement describing how the tested unit was sealed by the laboratory after the completion of certification testing and asserting that such unit will be stored by the manufacturer in the sealed state until 5 years after the certification test.

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

- (i) Similar in all material respects that would affect emissions as defined in § 60.531 to the wood heater submitted for certification testing, and labeled as prescribed in § 60.536 and 60.5478.
- (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.

**9. Third Party Certification Statement**

A statement that the manufacturer has entered into contracts with an approved laboratory and an approved third-party certifier that satisfy the requirements of paragraph (f) of this section.

<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>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>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>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>Print Name and Title:</b></p>	<p><b>Date:</b></p>
<p>Signature of responsible representative of the manufacturer certifying the accuracy of the above statements:</p>  <p>_____</p> <p>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.</p>	



**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.

**FORCED-AIR FURNACES**

**I. Forced-Air Furnaces**

<i>Run</i>	<i>Target Delivered Heat Output Range (BTU/hr)</i>	<i>Actual Delivered Heat Output Rate (BTU/hr)</i>	<i>Percent of Maximum Output based on the output (%)</i>	<i>First Hour Emissions Rate (lbs/mmBtu)</i>	<i>Total Emissions Rate (lbs/mmBtu output)</i>	<i>HHV Heat Input Rate (BTU/hr)</i>	<i>Delivered HHV Efficiency (%)</i>	<i>Overall HHV Efficiency (%)</i>	<i>Overall Heat Output (BTU/hr)</i>	<i>CO Emissions Rate (a/hr)</i>	<i>ASTM E2515 Emissions – First Hour (g/hr)</i>
1	55 000	53 042	96.4	0.167	0.133	101 231	52.7	64.4	65 258	502	5.70
2	15 900	15 997	30.2	0.365	0.087	21 967	73.0	74.4	16 351	148	5.93
3	35 000	29 737	56.1	0.389	0.144	46 023	64.8	70.37	32 386	260	7.46
4	23 000	21 922	41.3	0.604	0.148	30 730	71.5	71.6	22 004	198	10.75
<b>Average particulate emission: 0.13 lbs/MMBtu output</b>											
<b>Overall thermal efficiency (HHV): 70 %</b>											
<b>Overall Delivered Heat Efficiency: 66 %</b>											

MANUFACTURER:	United State Stove Company		
MODEL NUMBER:	HB 1520		
MAXIMUM OUTPUT RATING:	Q <sub>max</sub>	53 042	BTU/HR
ANNUAL EFFICIENCY RATING:	D <sub>avg</sub>	66	(Using higher heating value)
PARTICLE EMISSIONS:	E <sub>avg</sub>	1.8	GRAMS/HR (average)
		0.13	LBS/MILLION BTU OUTPUT
CARBON MONOXIDE:	COg/MIN	4.6	GRAMS/MINUTE

227 Industrial Park Road South  
Pittsburg, Tennessee 37380 USA

usstove.com  
1 800 750 2723  
sales@usstove.com



February 1, 2024

Dr. Rafael Sanchez, Ph.D.  
U.S. Environmental Protection Agency  
Office of Compliance  
1200 Pennsylvania Ave. NW MS:2227A  
Room 7149-D  
Washington, DC 20460

RE: Model additions 24FAF-22

Dear Dr. Sanchez,

This letter is to request model additions to our certificate 24FAF-22. The addition is adding the following models to this certificate: King KWF1520, Comfort Glow CGWF4000 and DuraHeat DHWF4000.

This letter further declares that these units are still being manufactured as tested and no changes have been made to these models which could affect combustion. There are no cosmetic changes other than branding to the requested additional models.

Enclosed you will find a copy of the Test reports, Certification Labels, Manuals and an updated CoC.

Further, I request that a waiver be granted for certification testing of these models since combustion of said models is that same as the base models.

Sincerely,

A handwritten signature in black ink, appearing to read "John D. Voorhees".

John D. Voorhees  
Vice President of Compliance



# Certificate of Conformity

Issued to: United States Stove Company  
Mr. John Voorhees  
227 Industrial Park Rd  
South Pittsburgh, TN 37380  
(423) 837-2100

Model: US1520  
AKA: HB 1520, VG1520, N35, C2235, SWF1035 SWF1035K, WC1520,  
KWF1520, CGWF4000, DHWF4000

Effective Date: Sept 19, 2022  
\*-Revised Date: November 21, 2022, March 19, 2024  
Report # Polytest # PI-20275 (PFS #F22-822)

\*-See revision on page 2

Certification tests were performed by Services Polytests, Inc. located at: 695-B Gaudette- St-jean-sur-Richelieu, QC, J3B 7S7 CANADA.

PFS TECO certifies conformity to the following per 40 CFR Part 60 §60.533 (f) (A):

- The test report is complete and accurate.
- The instrumentation used for the test was properly calibrated.
- The representative model tested meets the applicable emission limits.
- The tests have been conducted per the appropriate guidelines.
- The manufacturer's Quality Control Plan has been reviewed to ensure that all production units are similar in all material respects that would affect emissions to the tested/certified model and that the units in the model line will meet all (other) applicable requirements.

PFS TECO certifies that the emissions levels as measured in the test report are in compliance with the 2020 PM emission limit of  $\leq 0.15$  lb/mmBTU output using cord wood per CSA B415.10 and EPA ALT-134.

The maximum emissions for the 1520 wood-fired forced air furnace is **0.148 lb/mmBTU output** with an annual efficiency of **66%**. Average CO emissions are **4.6 g/min.**

Issued by: PFS TECO  
1507 Matt Pass  
Cottage Grove, WI 53527

Scott Drake, President and CEO

PFS TECO is accredited by IAS to ISO 17020:2012 "Criteria For Bodies Performing Inspections, by IAS to ISO 17025: 2017 "Requirements For Testing Laboratories", and by Standards Council of Canada to ISO 17065: 2012 "Requirements For Bodies Operating Product Certification Systems".





## Revision Summary

Date: September 19, 2021 – Original Issue for Polytest Report dated 9/1/22

Date: November 21, 2022 – The following changes to the report, dated 11/21/22, were reviewed:

- Appendix 13 firebox volume detail calculation updated for usable volume.
- Report P. 11 updated to include the firebox volume.
- Appendix 4 first page, additional list of equipment used for testing with calibration date due.

Date: February 23, 2024 – The following changes were made to the Report.

- Additional new name for the same appliance
- Appendix 6, updated with new manual cover sheet with new names, and additional new names on markings.
- Section 1.2, updated to include additional new names.