POLYTESTS
TESTING THROUGH YOUR REALITY

TEST REPORT

TEST OF A NON CATALYTIC SINGLE BURN RATE WOOD STOVE FOR EMISSIONS AND EFFICIENCY

PER EPA Method 28R, ASTM E2515 and ASTM E2780, MAY 2015

Client: Wolf Steel
Model tested: Napoleon NZ 3000H

Attention: Rafaël Sanchez

TESTED BY:

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

TEST DATES:
REPORT DATE: November 20th 2015
Project number: PI-20116

Tested:

Danick power P. Eng & Maxime Martin

written by:

Danick Power, P. Eng

Verified (Third party certifier):

Intertek Representative

Claude Pelland, Eng.
Intertek Project Engineer

1 INTRODUCTION

1.1 GENERAL

Laboratory

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

Test program

- Purpose: unit qualification NSPS 2015 wood stove (emission limit 4.5gr/hr)
- Test dates: November 9th to 12th 2015
- Test methods used:
  - Particulate emissions: ASTM E2780 ; ASTM E2515 methods 28R and ASTM E2515 as referred into 40 CFR Part 60 Subpart AAA
  - CO emission & Efficiency: CSA B415.1-10

1.2 TEST UNIT INFORMATION

General

- Manufacturer: Wolf Steel
- Product type: Hybrid Catalytic freestanding single burn rate wood fireplace
- Combustion system: Hybrid Catalytic Wood fireplace
- Unit tested: NZ 3000 H
- Vent : 7 inch single wall pipe

Particularities

- Options: Blower fan
- Product line similarities: na

1.3 RESULTS

Emission results obtained

- Average emission rate: 3.25 grams/hour
- Maximum rate cap: 4.6 grams/hour at run 3

Conformity: NSPS Phase 2015

1.4 PRETEST INFORMATION

Unit condition: The unit was received by carrier in July 2015. The 48hrs of aging is made in months of August to October 2015 during preliminary testing.

Set up

- Venting system type: 7 inch steel pipe and insulated chimney
- System height from floor: 15 feet
- Particularities: none

Break in period

- Duration: the unit was received from the manufacturer and run for at least 48 hours at a category 2 burn rate with adequate documentation of fuel additions and flue and unit temperatures during the months of August to October 2015.
- Fuel: Crib wood

2 SUMMARY OF TEST RESULTS

2.1 EMISSIONS

Run Number	Test Date	Burn Rate (kg/hr)	Emission Rate (g/hr)	Heating Efficiency (% Overall)	1st hour Emission Rate (g/hr)	CSA B415.1 CO emission Gr/hr
1	9-11-2015	1,942	3,21	63,4%	6.32	48
2	10-11-2015	1,266	2,15	62,7%	8.05	24.6
3	11-11-2015	1,108	4,56	62,1%	14.1	32
4	12-11-2015	0,731	3,24	67,2%	10.26	38

2.2 AVERAGE CALCULATION

Test No.	Burn Rate	(E) Ave. Emission Rate g/hr	(OHE) %	Heat Output (BTU/HR)	Prob	Weighting Factor
4	0,73	3,200	67,16	9200	0,1710	0,4660
3	1,11	4,600	59,60	12200	0,4660	0,4106
2	1,26	2,100	62,07	12700	0,5816	0,4378
1	1,94	3,200	63,40	22400	0,9038	0,4184
Average		3.25	63.17			

Average Emissions Rate: 3.25 g/hr
Average Overall Efficiency: 63.17%

2.3 TEST FACILITY CONDITIONS

Run Number	Room Temperature		Barometric pressure		Relative humidity		Air Velocity	
	Before (F)	After (F)	Before (in.Hg)	After (in.Hg)	Before (%)	After (%)	Before (ft/min)	After (ft/min)
1	72	76	30,357	30,298	36,2	29,8	21	19
2	73	77	30,268	30,121	32,4	29,4	19	22
3	73	75	29,973	29,825	31,9	29	24	22
4	73	73	29,796	29,766	38,7	42,1	50	30

2.4 FUEL QUALITIES

Run	Pre-test Load			Test Load					
Number	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 2X4's	Number of 4x4's
1	14,93	21,90	3,7	14,95	6,795	20,39	13,75	3	2
2	14,04	22,00	3,4	14,11	6,414	19,44	13,625	3	2
3	14,03	22,00	3,3	14,00	6,364	22,81	14	3	2
4	16,80	21,71	3,7	14,07	6,395	23,26	12,875	3	2

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

Average dilution tunnel measurements				Sample Data			
Run Number	Burn Rate (Min)	Volumetric Flow Rate (dscf/min)	Total Temperatures (°R)	Volume sampled (DSCF)		Particulate catch (mg)	
				1	2	1	2
1	174	300,67	563,89	30,613	29,543	5,50	5,20
2	254	278,71	558,42	44,854	43,145	6,00	5,30
3	280	284,21	556,73	49,079	47,171	13,30	12,60
4	425	313,54	548,55	75,330	72,849	13,50	12,10

2.6 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number	Sample Ratio		Total Emission (g)		
	Train 1	Train 2	Train 1	Train 2	% Deviation
1	1708,97	1770,86	9,40	9,21	1,03%
2	1578,28	1640,80	9,47	8,70	4,26%
3	1621,42	1686,99	21,42	21,15	0,65%
4	1768,98	1829,21	23,85	22,10	3,79%

2.7 GENERAL SUMMARY OF RESULTS

Run Number	Burn Rate (kg/hr)	Average Surface Temperature (F)	Change in surface Temperature (F)	Initial Draft (in. H^2O)	static pressure tunnel (in. H^2O)	Primary Air Setting	Run Time (min)
1	1,942	320,07	5,4	0,014	0,210	Fully open	174
2	1,266	390,53	-22,7	0,016	0,210	Fully closed	254
3	1,108	380,06	-12,3	0,065	0,220	Fully closed	280
4	0,731	-55,82	-55,8	0,000	0,210	Fully closed	425