



This is the third-party efficiency test report HY-C® Company commissioned to qualify for the Section 25D (now Section 25C) tax credit. HY-C® believes that the “Heat Transfer Efficiency” listed on Page 1 of the Intertek report is the best measurement for “Thermal Efficiency” as required for the Section 25D (now Section 25C) tax credit. You should consult with your own tax advisor in making a personal tax credit determination.

NOTE: AS OF JANUARY 1, 2025, THE IRS IS IN A RULEMAKING PROCESS FOR RULES THAT WERE EXPECTED TO BE EFFECTIVE AS OF 1/1/25. THE FINAL RESULT OF THAT PROCESS IS UNKNOWN AT THIS TIME.

THE RULES ARE INTENDED TO CLARIFY REQUIREMENTS FOR ALL FURNACE MANUFACTURERS REGARDING HOW THEIR PRODUCTS REGISTER FOR THE ENERGY EFFICIENT HOME IMPROVEMENT (Section 25C) CREDIT. IN ORDER FOR A MANUFACTURER TO SUBMIT PRODUCTS FOR APPROVAL, IT HAS TO ENTER INTO AN AGREEMENT WITH THE IRS.

HOWEVER, AS OF JANUARY 1, 2025, THE IRS ECO PORTAL IS STILL LISTED AS “COMING SOON” ON THE IRS WEBSITE. THEREFORE CONSUMERS MAY NOT BE ABLE TO COUNT ON THIS PRODUCT QUALIFYING FOR THE TAX CREDIT AFTER 1/1/25, PENDING ADDITIONAL DEVELOPMENTS IN THE RULE-MAKING PROCESS.

*We will post updates as the rule-making process moves forward. Please register **HERE** if you'd like to have this updated information emailed to you directly.*

H O M E S O L U T I O N S B U I L T B E T T E R



HOME SOLUTIONS BUILT BETTER

MANUFACTURER'S CERTIFICATE OF QUALIFICATION

The following models of biomass burning appliances have at least a 75% thermal efficiency per the higher heating value (HHV) and therefore meet the requirements as Qualified Energy Property as defined in Section 25(C) of the U.S. Internal Revenue Code. The data for this qualification is based upon the CSA B415.1 test method and performed by an independent EPA accredited laboratory. Consult with your Tax Advisor to confirm your eligibility for this Tax Credit.

Qualifying Products - Wood Burning Furnaces FC1000E, SF1000E, X1020, L1020

CERTIFICATION STATEMENT

Under penalties of perjury, I declare that I have examined this certification statement, and to the best of my knowledge and belief, the facts are true, correct, and complete.

David Walters
President, HY-C Company LLC

OVERVIEW OF TAX CREDIT

Product qualifying under this tax credit must be purchased and installed between January 1, 2023 and December 31, 2032. Consumers may claim 30% of the purchase and installation costs (including installation labor) as a tax credit (\$2,000 annual cap). There is no lifetime limit.

DATES	CREDIT AMOUNT
01/01/2023 THRU 12/31/2032	30%



Issue Date: March 25, 2021

Letter Report No: 104565232MID-001R1

Danny Haynes
HY-C Company LLC
10950 Linpage Place
ST Louis, MO 63132
USA

Phone: 314-241-1214
Email: dhaynes@hy-c.com

Subject: R&D stack loss efficiency testing on model SF1000E Wood Fired Furnace

Dear Mr. Haynes,

Intertek Testing has conducted R&D testing on Model SF1000E Wood Fired Furnace to determine efficiency rating. The standards used are as follows:

CSA B415.1-10 – Performance Testing of Solid-Fuel-Burning Heating Appliances.

Results are as follows:

Model SF1000E

CSA B415.1 STACK LOSS RESULTS

	HHV Basis	LHV Basis
Overall Efficiency	74.5%	80.2%
Combustion Efficiency	94.0%	94.0%
Heat Transfer Efficiency	79%	85.4%

The testing performed on the model SF1000E Wood Fired Furnace was for R&D purposes only.



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If you have any questions regarding this letter report, please do not hesitate to contact the undersigned.

Sincerely,

INTERTEK TESTING SERVICES NA, INC.

Reported by:

Reviewed by:

Ken Slater

Ken Slater
Associate Engineer - Hearth

Brian Ziegler
Technical Team Leader - Hearth

REVISION SUMMARY

REVISION #	DATE	PAGES	REVISION
1	25/03/2021	1	Test data showed fluctuation in the test load weight as the unit cycled on and off, data changed from 1 minute readings to the maximum allowed, 10 minute readings.





	CLIENT: HY-C		PERFORMED BY: Ken Slater		
	PROJECT #: G104565232		REVIEWED BY:		
	PRODUCT: Wood Fired Furnace		MODEL: SF1000E		
SAMPLE ID #:			DATE: 2/26/21		
STANDARD(S): CSA B.415.1	VERSION YEAR: 2010	LOCATION: Middleton			
EQUIPMENT					
ASSET # - DESCRIPTION: See Equipment Tab			CALIBRATION DUE: See Equipment Tab		
CONDITIONING					
SAMPLE CONDITIONING (IF APPLICABLE): NA					
AMBIENT TEMPERATURE (°F): 70					
RESULTS					
PASS		FAIL		NO PASS/FAIL	X

Run: 1
Test Duration: 329
Output Category:

	HHV Basis	LHV Basis
Overall Efficiency	74.5%	80.2%
Combustion Efficiency	94.0%	94.0%
Heat Transfer Efficiency	79%	85.4%

Output Rate (kJ/h)	31,076	29,479	(Btu/h)
Burn Rate (kg/h)	2.10	4.62	(lb/h)
Input (kJ/h)	41,716	39,572	(Btu/h)

Test Load Weight (dry kg)	11.50	25.35	dry lb
MC wet (%)	16.96		
MC dry (%)	20.42		
Particulate (g)	0		
CO (g)	966		
Test Duration (h)	5.48		

Emissions	Particulate	CO		
g/MJ Output	0.00	5.67		
g/kg Dry Fuel	0.00	84.02		
g/h	0.00	176.25	2.94	g/min
lb/MM Btu Output	0.00	13.18		

Air/Fuel Ratio (A/F)	12.28
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VERSION: 2.2

12/14/09

Manufacturer: HY-C
Model: SF1000E
Date: 2/26/21
Run: 1
Control #: G104565232
Test Duration: 329
Output Category:

Appliance Type: Non-Cat (Cat, Non-Cat, Pellet)

Temp. Units F (F or C)
Weight Units lb (kg or lb)

Default Fuel Values
D. Fir Oak
HHV (kJ/kg) 19,810 19,887
%C 48.73 50
%H 6.87 6.6
%O 43.9 42.9
%Ash 0.5 0.5

Wood Moisture (% wet): 16.96
Load Weight (lb wet): 30.53
Burn Rate (dry kg/h): 2.10
Total Particulate Emissions: g

Fuel Data
D. Fir
HHV 19,887 kJ/kg
%C 50
%H 6.6
%O 42.9
%Ash 0.5

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Elapsed Time (min)	Fuel Weight Remaining (lb)	Averages			Flue Gas	Room Temp (°F)
		0.61	9.34	10.58		
		Flue Gas Composition (%)				
		CO	CO ₂	O ₂		
0	30.53	0.58	7.24	13.04	410.1	70.2
10	26.63	1.50	13.55	5.98	515.0	71.0
20	23.03	1.22	14.66	5.63	509.5	71.5
30	20.52	2.83	12.75	7.08	345.1	70.9
40	17.32	0.79	14.35	5.75	508.2	73.0
50	14.60	0.00	12.360563	8.17668	466.939	71.8523
60	12.20	2.20	13.693792	6.23827	356.861	73.3019
70	10.20	0.00	11.556207	8.492854	467.561	75.1831
80	8.49	1.15	13.145443	6.783018	332.451	75.9814
90	7.21	0.14	12.387691	8.077527	312.547	74.5884
100	6.19	0.33	11.791122	8.050643	294.841	74.6172
110	5.30	0.16	11.340647	8.527967	279.085	74.1556
120	4.79	0.094722	9.6499691	10.43111	246.47	73.5556
130	4.39	0.508918	8.5727482	11.18496	223.245	73.2235
140	3.98	0.500701	7.5038791	11.39795	232.32	71.9718
150	3.78	0.583182	7.8128624	11.85458	201.49	70.9171
160	3.59	0.48696	7.8782134	11.9221	191.368	71.3206
170	3.28	0.473548	7.7781148	12.03533	185.703	71.242
180	3.09	0.446677	7.7914953	12.02177	179.577	71.2175
190	2.88	0.47072	7.8186231	12.06292	175.769	71.2412
200	2.68	0.481522	7.7197437	12.28171	171.661	71.1407
210	2.48	0.516685	7.5704794	12.26839	167.817	70.7095
220	2.18	0.500676	7.5299702	12.30158	166.08	70.8839
230	2.08	0.478803	7.5299401	12.33508	165.145	70.2605
240	1.79	0.436082	7.5631948	12.32911	163.062	70.0607
250	1.58	0.396042	7.6244307	12.30164	162.314	70.3175
260	1.38	0.41216	7.665031	12.24809	161.414	70.2161
270	1.19	0.470732	7.4224339	12.48968	160.688	70.265
280	0.98	0.463222	7.3895149	12.50812	159.313	70.1293
290	0.79	0.492312	7.5038791	12.40942	159.155	70.4598
300	0.59	0.388202	7.2635384	12.87711	157.461	70.1242
310	0.37	0.351162	6.9747329	13.05101	153.538	70.0342
320	0.18	0.367037	7.0489225	12.92406	153.3	69.9808
329	0.00	0.361635	7.1281729	12.80692	151.763	70.2674

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurrence and the next reading showing a decrease in weight.

Manufacturer: HY-C
Model: SF1000E
Date: 02/26/21
Run: 1
Control #: G104565232
Test Duration: 329 min

	HHV	LHV
Eff	74.49%	80.24%
Comb Eff	93.98%	93.98%
HT Eff	79.26%	85.37%
Output	31,076	kJ/h
Burn Rate	2.10	kg/h
Grams CO	966	g
Input	41,716	kJ/h
MC wet	16.96	
Averages	0.61	9.34

Note: In the "Input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3 to 13.7.5.

Ultimate CO₂
 CO_{2-ult} 19.80
 F₀
 1.053

Overall Heating Efficiency: 74.49%
 Combustion Efficiency: 93.98%
 Heat Transfer Efficiency: 79.26%

Air Fuel Ratio (A/F)
Dry Molecular Weight (M _a)
Dry Moles Exhaust Gas (N _r):
Air Fuel Ratio (A/F)

Heat Output: 29,479 Btu/h 31,076 kJ/h
 Heat Input: 39,572 Btu/h 41,716 kJ/h

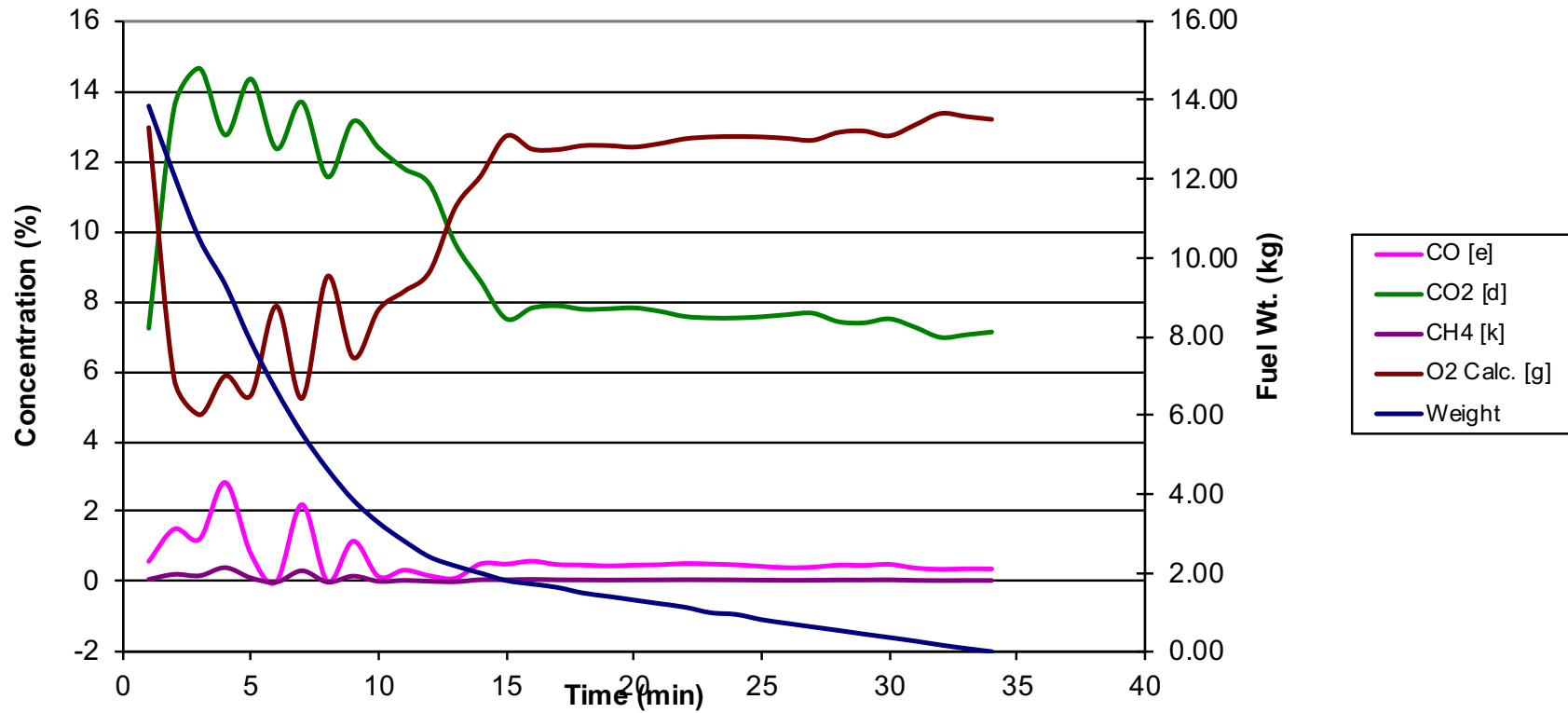
Burn Duration: 5.48 h

Burn Rate: 4.62 lb/h 2.098 kg/h

Stack Temp: 250.8 Deg. F 121.6 Deg. C

Elapsed Time	INPUT DATA			Oxygen Calculation			Input Data		Combust Eff %	Heat Transfer %	Net Eff %	Air Fuel Ratio	Wet Wt Now	% Wet Consumed
	Weight Remaining (kg)	% CO [e]	% CO ₂ [d]	Excess Air EA	Total O ₂	Calc. % O ₂ [g]	Flue Gas (°C)	Room Temp (°C)						
0	13.85	0.58	7.24	153.4%	20.49	12.97	210.0	21.2	94.1%	72.0%	67.8%	15.4	13.85	0.00
10	12.08	1.50	13.55	31.6%	20.08	5.77	268.4	21.7	91.6%	75.9%	69.5%	7.9	12.08	12.76
20	10.45	1.22	14.66	24.7%	20.03	4.76	265.3	22.0	93.5%	77.0%	72.0%	7.6	10.45	24.55
30	9.31	2.83	12.75	27.1%	20.04	5.88	173.9	21.6	84.8%	80.3%	68.1%	7.5	9.31	32.78
40	7.86	0.79	14.35	30.8%	20.07	5.32	264.6	22.8	95.6%	77.0%	73.6%	8.0	7.86	43.26
50	6.63	0.00	12.36	60.2%	20.23	7.87	241.6	22.1	100.2%	76.9%	77.1%	9.9	6.63	52.16
60	5.54	2.20	13.69	24.6%	20.03	5.23	180.5	22.9	88.3%	80.8%	71.4%	7.4	5.54	60.03
70	4.63	0.00	11.56	71.4%	20.28	8.72	242.0	24.0	100.2%	76.3%	76.4%	10.6	4.63	66.59
80	3.85	1.15	13.15	38.5%	20.12	6.40	166.9	24.4	93.2%	81.7%	76.1%	8.4	3.85	72.20
90	3.27	0.14	12.39	58.1%	20.22	7.76	155.9	23.7	99.2%	82.3%	81.6%	9.7	3.27	76.40
100	2.81	0.33	11.79	63.4%	20.24	8.29	146.0	23.7	97.9%	82.5%	80.7%	10.0	2.81	79.73
110	2.40	0.16	11.34	72.1%	20.28	8.86	137.3	23.4	99.0%	82.8%	82.0%	10.6	2.40	82.66
120	2.18	0.09	9.65	103.2%	20.38	10.68	119.1	23.1	99.5%	83.1%	82.7%	12.5	2.18	84.30
130	1.99	0.51	8.57	118.0%	20.42	11.59	106.2	22.9	95.6%	83.2%	79.5%	13.3	1.99	85.63
140	1.80	0.50	7.50	147.4%	20.48	12.73	111.3	22.2	95.1%	81.8%	77.8%	15.0	1.80	86.97
150	1.72	0.58	7.81	135.9%	20.46	12.35	94.2	21.6	94.5%	83.5%	78.9%	14.3	1.72	87.61
160	1.63	0.49	7.88	136.7%	20.46	12.34	88.5	21.8	95.4%	84.1%	80.2%	14.4	1.63	88.24
170	1.49	0.47	7.78	140.0%	20.47	12.45	85.4	21.8	95.5%	84.3%	80.5%	14.6	1.49	89.26
180	1.40	0.45	7.79	140.4%	20.47	12.45	82.0	21.8	95.8%	84.6%	81.0%	14.6	1.40	89.88
190	1.31	0.47	7.82	138.9%	20.46	12.41	79.9	21.8	95.6%	84.8%	81.0%	14.5	1.31	90.55
200	1.22	0.48	7.72	141.5%	20.47	12.51	77.6	21.7	95.4%	84.9%	81.0%	14.7	1.22	91.21
210	1.13	0.52	7.57	144.9%	20.48	12.65	75.5	21.5	95.0%	85.0%	80.7%	14.9	1.13	91.86
220	0.99	0.50	7.53	146.6%	20.48	12.70	74.5	21.6	95.1%	85.1%	80.9%	15.0	0.99	92.88
230	0.94	0.48	7.53	147.3%	20.48	12.71	74.0	21.3	95.3%	85.1%	81.1%	15.0	0.94	93.19
240	0.81	0.44	7.56	147.6%	20.48	12.70	72.8	21.1	95.8%	85.2%	81.6%	15.1	0.81	94.15
250	0.72	0.40	7.62	146.9%	20.48	12.66	72.4	21.3	96.2%	85.4%	82.1%	15.0	0.72	94.83
260	0.63	0.41	7.67	145.2%	20.48	12.60	71.9	21.2	96.1%	85.4%	82.0%	14.9	0.63	95.48
270	0.54	0.47	7.42	150.9%	20.49	12.83	71.5	21.3	95.3%	85.3%	81.3%	15.3	0.54	96.12
280	0.45	0.46	7.39	152.2%	20.49	12.87	70.7	21.2	95.4%	85.3%	81.4%	15.3	0.45	96.78
290	0.36	0.49	7.50	147.6%	20.48	12.73	70.6	21.4	95.2%	85.4%	81.3%	15.1	0.36	97.42
300	0.27	0.39	7.26	158.8%	20.50	13.04	69.7	21.2	96.1%	85.4%	82.1%	15.8	0.27	98.07
310	0.17	0.35	6.97	170.3%	20.52	13.37	67.5	21.1	96.4%	85.4%	82.4%	16.5	0.17	98.79
320	0.08	0.37	7.05	167.0%	20.51	13.28	67.4	21.1	96.3%	85.5%	82.3%	16.3	0.08	99.42
329	0.00	0.36	7.13	164.4%	20.51	13.20	66.5	21.3	96.4%	85.6%	82.5%	16.1	0.00	100.00

Run: 1



Note: In the legend, [d], [e], [g], and [k] refer to their respective variables in Clauses 13.7.3 and 13.7.5

This Excel spreadsheet calculates solid fuel appliance efficiency and heat output in accordance with the procedure specified in CSA B415.1-09. In general the column headings correspond to the variables used in the Standard.

All data from a test run are entered on the "Data" sheet. The cells requiring data entry are highlighted. Please note that input data can be entered in either yard/pound or SI units. Select the units in cells F4 and F5 of the "Data" sheet.

Particulate emissions determined using the dilution tunnel method should be entered in cell C13 of the "Data" sheet as total grams of emissions.

Since oxygen concentrations are calculated for the efficiency determination, entry of measured oxygen data is optional. However, it might be useful to include the measured oxygen values for comparison to the calculated values for diagnostic purposes. A deviation of more than 1 or 2 percentage points can indicate inaccurate CO, CO₂, or fuel composition input data.

Selection of an appliance type in cell F2 of the "Data" sheet is needed for the air/fuel ratio calculation in accordance with Clause 16.3.5 of the Standard.

The "CSA B415.1 Calculations" and "Report" sheets include calculation of efficiencies based on the Lower Heating Value (LHV) of the fuel, which is not required in CSA B415.1-09. The LHV is calculated from the Higher Heating Value (HHV) and fuel composition data in accordance with ASTM E711.

The "CSA B415.1 Calculations" sheet is locked and password protected to prevent inadvertent modifications.

The "Chart" sheet includes a chart of flue gas composition data and fuel consumption. The range of cells in the "CSA B415.1 Calculations" sheet to be charted or plotted might need to be adjusted to correspond to the number of data points entered.

Please report any errors or problems to Tony Joseph at CSA.

Tony Joseph
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Spreadsheet created by: Rick Curkeet, PE, Intertek Testing Services, NA Inc.
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