Header Information			
Manufacturer:	GE	Date Tested:	07-17-2020
Model Number:	40T-12BXR01	Date Sample Rec.:	06-17-2020
Serial Number:	PROTO	Test Station #:	Cleveland - 3
Test Procedure:	DOE UEF 24h (Storage)	Heating Medium:	Nat/LP gas
Software Version	2.15.1031.19	Operator:	Ashley Cocita
Data File Name:	UEFSIMgasST-3-GE3-1105_Report.csv		
Report File Name:	UEFSIMgasST-3-GE3-1105_Report.xlsx		

24-Hour Test Data Inputs

Draw	1	2	3	4	5	6	7
Draw duration [hh:mm:ss]	0:08:54	0:01:58	0:00:58	0:05:12	0:04:54	0:02:52	0:00:58
Volume Drawn [gal.]	26.93	1.98	0.98	8.96	14.93	4.97	0.98
Minimum Flow Rate [GPM]	2.97	0.94	0.93	1.66	2.95	1.66	0.94
Maximum Flow Rate [GPM]	3.04	1.02	1.03	1.73	3.05	1.74	1.03
Inlet water temperature min. [°F]	57.66	57.89	57.97	57.77	57.63	57.72	57.83
Inlet water temperature max. [°F]	57.75	57.92	58.00	57.85	57.70	57.77	57.87
Inlet water temperature avg. [°F]	57.69	57.91	57.98	57.81	57.67	57.74	57.85
Minimum outlet temp.[°F]	97.94	110.20	121.93	106.10	112.25	111.29	117.81
Maximum outlet temp. [°F]	125.17	137.88	129.01	131.21	131.24	139.84	140.55
Average outlet temp. [°F]	123.88	132.91	128.33	129.54	130.55	138.64	138.35
Average temp. delta [°F]	66.19	75.01	70.35	71.73	72.88	80.89	80.50
Density of Water at point where Vol is measured, ρ_i [lbs/gal]	8.24	8.22	8.23	8.23	8.23	8.21	8.21
Mass of Water Drawn, M_i [lbs]	221.96	16.28	8.07	73.74	122.84	40.80	8.05
Specific Heat of Water Drawn at (Tdel,i + Tin,i/2) C_{pi} [Btu/lb-°F]	0.9986	0.9985	0.9986	0.9985	0.9985	0.9985	0.9985

Cut out to cut out data	1	2	3	4	5	6	7
Duration [hh:mm:ss]	0:28:39	0:06:03	0:08:19	1:10:37	8:54:56	0:49:24	0:24:53
Corrected Gas Consumption [cu ft]	17.48	2.12	1.26	8.55	15.03	4.90	1.26
Electrical Consumption [Whr]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gas Meter CF Avg	0.9832	0.9809	0.9818	0.9824	0.9840	0.9838	0.9841
Dry Heating Value [Btu/ft3]	1081.9	1081.5	1081.2	1081.0	1081.7	1081.8	1081.9
Barometer [In. Hg]	29.19	29.19	29.19	29.19	29.18	29.18	29.19
Gas Meter Pressure [in w.c.]	10.39	9.88	10.40	10.56	10.77	10.64	10.68
Gas Temp [°F]	68.12	68.70	68.90	68.78	67.94	67.98	68.01
Uncorrected Gas Cons. [cu ft]	17.83	2.16	1.28	8.71	15.30	4.99	1.28
Meter Correction Factor (saturated to dry)	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
HHV [Btu/ft^3 @ 60 °F, 30 in. Hg, dry]	1082	1082	1081	1081	1082	1082	1082
Q Gas [Btu]	18912	2293	1362	9243	16257	5301	1363
Q Electrical [Btu]	0	0	0	0	0	0	0
Q Total [Btu]	18912	2293	1362	9243	16257	5301	1363

Draw	8	9	10	11	12	13	14	Total
Draw duration [hh:mm:ss]	0:00:57	0:00:58	0:01:57	0:01:58	0:01:08	0:01:08	0:04:34	0:38:26
Water Consumed [gal.]	0.98	0.98	1.97	1.98	1.96	1.96	13.92	
Min. Flow Rate [GPM]	0.95	0.91	0.94	0.93	1.63	1.64	2.96	
Max. Flow Rate [GPM]	1.02	1.04	1.03	1.03	1.73	1.75	3.05	
Inlet water temperature min. [°F]	57.86	57.93	57.77	57.89	57.80	57.78	57.72	
Inlet water temperature max. [°F]	57.88	57.95	57.83	57.94	57.82	57.81	57.77	
Inlet water temperature avg. [°F]	57.87	57.95	57.80	57.92	57.81	57.79	57.74	
Min. outlet temp. [°F]	108.62	135.85	86.99	127.55	57.81	131.59	136.57	
Max. outlet temp. [°F]	139.74	140.89	137.76	139.89	141.80	143.29	144.70	
Avg. outlet temp. [°F]	136.50	140.41	135.08	139.24	141.14	142.48	143.06	
Avg. temp. delta [°F]	78.63	82.46	77.28	81.32	83.33	84.69	85.32	
Density of Water at point where Vol is measured, ρ_i [lbs/gal]	8.21	8.20	8.22	8.21	8.20	8.20	8.20	
Mass of Water Drawn, M_i [lbs]	8.05	8.04	16.19	16.25	16.08	16.07	114.11	
Specific Heat of Water Drawn, C_{pi} [Btu/lb-°F]	0.9985	0.9985	0.9985	0.9985	0.9985	0.9985	0.9985	

Cut out to cut out data	8	9	10	11	12	13	14	15	16
Duration [hh:mm:ss]	0:44:51	0:05:05	3:11:09	0:15:17	0:14:26	0:14:59	0:29:02	6:42:11	
Corrected Gas Consumption [ft^3]	1.39	1.10	3.18	2.11	1.97	1.99	10.78	2.94	0.00
Electrical Consumption [Whr]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Gas Meter CF Avg	0.9850	0.9843	0.9861	0.9870	0.9869	0.9870	0.9856	0.9877	
Dry Heating Value [Btu/ft3]	1082.0	1081.8	1082.5	1083.0	1083.2	1083.3	1083.3	1083.5	
Barometer [in h.g]	29.21	29.21	29.24	29.27	29.27	29.27	29.27	29.29	
Gas Meter Pressure [in w.c.]	10.75	10.17	10.80	10.53	10.50	10.59	10.09	10.82	
Gas Temp [°F]	67.83	67.62	67.87	67.61	67.61	67.66	67.84	67.99	
Uncorrected Gas Cons. [ft3]	1.41	1.12	3.22	2.14	2.00	2.02	10.94	2.98	
Meter Correction Factor (saturated to dry)	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
HHV [Btu/ft^3 @ 60 °F, 30 in. Hg, dry]	1082	1082	1082	1083	1083	1083	1083	1083	0
Q Gas [Btu]	1503	1192	3437	2287	2138	2160	11680	3189	0
Q Electrical [Btu]	0	0	0	0	0	0	0	0	0
Q Total [Btu]	1503	1192	3437	2287	2138	2160	11680	3189	0

24hr Test Conditions

	Measurement			Min.	Max.	Check	Unit
	Min.	Max.	Avg.				
Inlet temperature	57.63	58.00	n/a	56.00	60.00	TRUE	° F
Total water withdrawn			83.48	83.00	85.00	TRUE	gall.
Relative Humidity(Heat Pump Only)	0.00	0.00	0.00	48.00	52.00	N/A	%
Ambient Room	67.17	69.03	67.67	65.00	70.00	TRUE	° F

SIMUSAGE UEF STORAGE WATER HEATER

Draw Pattern: High-Usage **Heat** 123.592 P gas

18918.18

6.3.1 Storage Tank Capacity		
Measured Storage Volume, V_{st}	38.35	gall.
6.3.2 Recovery Efficiency		
Draw # that the first recovery period ended, **frp**	1	
Mean tank temperature at the start of the 24hr test, **T_0**	123.89	°F
Max Mean Tank Temp after Cut-out following 1st recovery period, **$T_{max,1}$**	123.51	°F
Density of stored hot water, **rho_2**	8.24	lbs/gall.
Specific heat of stored water, **C_{p_2}**	0.9989	Btu/lb·°F
Total Energy Used from the start of the 24hr test and following first recovery period, **Q_r**	18910	Btu
Mass removed during the first recovery period, **M_{1_sum}**	221.96	lbs
Specific Heat of withdrawn water during the first recovery period, **CP1_avg**	0.9986	Btu/lb·°F
average water outlet temperature from the start of the 24hr test to the end of the first recovery period, **Tdel_1avg**	123.88	°F
average water inlet temperature from the start of the 24hr test to the end of the first recovery period, **Tin_1avg**	57.69	°F

$$\eta_r = \left(\frac{M_1 C_{p1}\left(\overline{T}_{del,1} - \overline{T}_{in,1}\right)}{Q_r}\right) + \left(\frac{V_{st}\rho_2 C_{p2}\left(\overline{T}_{max,1} - \overline{T}_0\right)}{Q_r}\right)$$

Recovery Efficiency, **η_r**	0.77	
6.3.3 Hourly Standby Loss		
Cumulative energy consumption from the start of the 24-hour test to the time the maximum mean tank temperature is achieved 5 minutes after recovery of the first draw cluster, **Q_suo**	32018	Btu
Cumulative energy consumption from the start of the 24-hour test to the minute prior to the start of the draw following the end of the first draw cluster or the minute prior to a recovery occurring at the start of the draw following the end of the first draw cluster, **Q_suf**	35871	Btu
Energy Consumed as part of the standby test, **Q_stby**	3854	
Mean tank temperature at the minute prior to the start of the draw following the first draw cluster or the minute prior to a recovery occurring at the start of the draw following the end of the first draw cluster, **T_suf**	130.01	°F
Maximum mean tank temperature observed first recovery following the final draw of the first draw cluster, **T_suo**	132.97	°F
Density of stored hot water, **ρ**	8.23	lbs/gall.
Specific heat of stored hot water, **Cp**	0.9992	Btu/lb·°F
Elapsed time between the time at which the maximum mean tank temperature is observed starting 5 minutes after the recovery from the first draw cluster and the minute prior to the start of the first draw following the first draw cluster, **$\tau_{stby,1}$**	8.09	hrs

$$Q_{hr} = \frac{Q_{stby} - \frac{V_{st}\rho C_p\left(\overline{T}_{su,f} - \overline{T}_{su,0}\right)}{\eta_r}}{\tau_{stby,1}}$$

Hourly Standby Losses, **Q_{hr}**	626	Btu/hr
Average ambient temperature between the time when the maximum mean tank temperature is observed starting five minutes after cut-out following the first draw cluster and the minute prior to commencement of the next draw following the first draw cluster, **$T_{a,stby,1}$**	67.44	°F
Average storage tank temperature between the time when the maximum mean tank temperature is observed starting five minutes after cut-out following the first draw cluster and the minute prior to commencement of the next draw following the first draw cluster, **$T_{t,stby,1}$**	131.45	°F

$$UA = \frac{Q_{hr}}{\left(\overline{T}_{t,\,stby} - \overline{T}_{a,\,stby}\right)}$$

Standby Heat Loss Coefficient, **UA**	9.78	Btu/hr·°F
6.3.4 Daily Water Heating Energy Consumption		

Total fossil fuel energy used by the water heater during the 24-hour simulated-use test, **Qf**	82257	Btu
Total electrical energy used during the 24-hour simulated-use test, **Qe**	0	Btu
Total energy used by the water heater during the 24-hour simulated-use test, including auxiliary energy such as pilot lights, pumps, fans, etc, **Q**	82257	Btu
Mean tank temperature at the end of the 24-hour simulated-use test, **T24**	133.23	°F
Density of stored hot water, **ρ**	8.23	lbs/gall.
Specific heat of the stored water, **C_p**	1.00	Btu/lb·°F

$$Q_d = Q - \frac{V_{st}\rho C_p(\overline{T}_{24} - \overline{T}_0)}{\eta_r}$$

The daily water heating energy consumption, **Qd**	78428	Btu

6.3.5 Adjusted Daily Water Heater Consumption

number of hours during the 24-hour simulated-use test when water is not being withdrawn from the water heater, **t_stdby2**	23.36	hrs.
average ambient temperature during the total standby portion of the 24-hour simulated-use test, **Ta_stdby2**	67.67	°F

$$Q_{da} = Q_d - (67.5°\text{F} - \overline{T}_{a,stby,2})UA\ \tau_{stby,2}$$

adjusted daily water heating energy consumption, **Qda**	78467	Btu

$$Q_{HW} = \sum_{i=1}^{6}\left(\frac{M_i C_{p,i}(\overline{T}_{del,i} - \overline{T}_{in,i})}{\eta_r}\right)$$

Energy used to heat the water, **Qhw**	66148	Btu/day

$$Q_{HW,67°\text{F}} = \sum_{i=1}^{N}\frac{M_i C_{pi}(125°\text{F} - 58°\text{F})}{\eta_r}$$

Energy for Same Quantity with 67 °F Rise, **$Q_{HW,67}$**	59688	Btu/day

$$Q_{HWD} = Q_{HW,67\ °F} - Q_{HW}$$

Q_{HWD}	-6460	Btu

$$Q_{dm} = Q_{da} + Q_{HWD}$$

Q_dm	72007	Btu

6.3.6 Uniform Energy Factor

Cp determined at 91.5F	0.9983	Btu/lb·°F

$$UEF = \sum_{i=1}^{N}\frac{M_i C_{pi}(125°\text{F} - 58°\text{F})}{Q_{dm}}$$

Uniform Energy Factor, **UEF**	0.638	

6.3.7 Annual Energy Consumption

Volume of water drawn during the applicable draw pattern, **V**	84.00	gall.
Density constant,**p**	8.24	lbs/gall.
Specific heat constant, **Cp**	1.0000	Btu/lb·°F

$$E_{annual} = 365\ x\ \frac{(V)(\rho)(C_P)(67)}{UEF}$$

Annual Energy Consumption, **E_{annual}**	26544741	Btu
Annual Fossil fuel Energy Consumption, **$E_{annual,therms}$**	262.82	Therms

6.3.8 Annual Electrical Energy Consumption

$$E_{annual,e} = E_{annual}*(Q_e/Q)/3412$$

Annual Electrical Energy Consumption, **$E_{annual,e}$**	0	kWh

6.3.9 Annual Fossil Fuel Energy Consumption

$$E_{annual,f} = E_{annual}*(E_{annual,e}\ x\ 3412)$$

Annual Fossil fuel Energy Consumption, **$E_{annual,f}$**	26544741	Btu

Setup (This table should include instrumentation, sensors, and all equipment used during testing)

Instrument Type	Brand	Model #	Accuracy	Date of Last	Deadline for Next Calibration

Thermocouple 1	Z00007616	TJ180-CPSS-18U-	+/-0.5°F	7/8/2020	1/8/2021
Thermocouple 2	Z00005566	TJ180-CPSS-18U-	+/-0.5°F	7/8/2020	1/8/2021
Thermocouple 3	Z00007590	TJ180-CPSS-18U-	+/-0.5°F	7/8/2020	1/8/2021
Thermocouple 4	Z00005567	TJ180-CPSS-18U-	+/-0.5°F	7/8/2020	1/8/2021
Thermocouple 5	Z00005563	TJ-180CPSS-18U-	+/-0.5°F	7/8/2020	1/8/2021
Thermocouple 6	Z00004877	TJ180-CPSS-18U-	+/-0.5°F	7/8/2020	1/8/2021
RTD Inlet	Z00009715	3SSDXK6BZZZZ	+/-0.2°F	4/17/2020	7/17/2020
RTD Outlet	Z00007877	3SSDXK6BZZZZ	+/-0.2°F	4/17/2020	7/17/2020
Ambient RTD	Z00017274	3SSBRK6BZZZZ	+/-0.2°F	4/27/2020	7/27/2020
Power Meter	Z00001528	WT310HC	+/- 0.1% of	5/6/2020	5/6/2021
Water Flow	9389	ACM-3000	+/- 0.5% of	5/8/2020	8/8/2020
Water Pressure	Z00009189	ZM1500-DI0300	±0.125%FS	5/6/2020	5/6/2021
Gas Meter	Z00005027	ZM1500-DN0028	±0.125%FS	5/6/2020	5/6/2021
Gas Meter	Z00001497	AC-250	+/-1% of reading	5/6/2020	5/6/2021
as Meter Temperatu	Z00015424	3SSBRK6BZZZZ	+/-0.2°F	5/6/2020	5/6/2021
Manifold Pressure	Z00013657	ZM1500-DM0028	±0.125%FS	5/6/2020	5/6/2021

Notes/Comments (Please clarify any pertinent details, unusual events, etc.)

Test Report Sign-Off Block

By signing in the space below, we certify that the information and data in this report: (1) were obtained from the specific test unit under test; (2) were obtained during the specific test being reported; (3) were not copied from any other source, except where instructed to do so; and (4) were not altered or modified in any way.

Role	Date	Entity
Test Completion	07-17-2020	Ashley Cocita
Template Completion	07-17-2020	Ashley Cocita
Report Review by Test Lab	07-20-2020	Jim Neyman