



**Environmental Functional Area**

**Water, Air, Monitoring & Analysis**

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LLNL-TR-470811

# **Combustion Gas Analysis Data for 8 Registered Natural Gas Boilers**

**Source Numbers: S-1146, S-1634, S-1679, S-1680, S-  
1681, S-1682, S-1683, and S-1684**

**February 4, 2011**



**Lawrence Livermore  
National Laboratory**

**This work performed under the auspices of the U.S. Department of Energy by  
Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.**

**COMBUSTION GAS ANALYSIS DATA  
FOR 8 REGISTERED  
NATURAL GAS BOILERS**

**SOURCE NUMBERS:**

**S-1146, S-1634, S-1679, S-1680,  
S-1681, S-1682, S-1683, AND S-1684**

**LAWRENCE LIVERMORE  
NATIONAL LABORATORY  
(2-4-11)**

**LIST OF BOILERS REGISTERED WITH THE BAAQMD  
LAWRENCE LIVERMORE NATIONAL LABORATORY  
(2/4/11)**

ITEM	SOURCE NUMBER	DEVICE TYPE (BOILER)	EQUIPMENT MANUFACTURER	MODEL NAME	ORIGINAL MANUFACTURE DATE	SERIAL NUMBER	HEAT RATING (MM BTU/hr)	PRIMARY FUEL TYPE
1	S-1054	HOT WATER	RITE CORP	250WG	01/01/1990	S-1054 (9021836)	2.10	NATURAL GAS
2	S-1058	HOT WATER	BRYAN	CL210WGI	01/01/1989	S-1058 (67075)	2.10	NATURAL GAS
3	S-1059	HOT WATER	BRYAN	CL210WGI	01/01/1989	S-1059 (67080)	2.10	NATURAL GAS
4	S-1064	HOT WATER	CLEAVER BROOKS	CBH70060	01/01/1988	S-1064 (L-83696)	2.51	NATURAL GAS
5	S-1065	HOT WATER	CLEAVER BROOKS	CBH70060	01/01/1988	S-1065 (L-83695)	2.51	NATURAL GAS
6	S-1132	HOT WATER	CLEAVER BROOKS	CB-700-150	01/01/1989	S-1132 (L86873)	6.28	NATURAL GAS
7	S-1133	HOT WATER	CLEAVER BROOKS	CB-700-150	01/01/1989	S-1133 (L86874)	6.28	NATURAL GAS
8	S-1140	HOT WATER	CLEAVER BROOKS	CB-700-150	01/01/1984	S-1140 (L79216)	6.28	NATURAL GAS
9	S-1141	HOT WATER	CLEAVER BROOKS	CB-700-150	01/01/1984	S-1141 (L79215)	6.28	NATURAL GAS
10	S-1146	HOT WATER	BURNHAM	PF512	01/01/1986	S-1146 (7583824)	2.37	NATURAL GAS
11	S-1149	HOT WATER	CLEAVER BROOKS	CB-700-200-125	01/01/2008	S-1149 (OL090155)	8.16	NATURAL GAS
12	S-1150	HOT WATER	CLEAVER BROOKS	CB-700-200-125	01/01/2008	S-1150 (OL090156)	8.16	NATURAL GAS
13	S-1600	HOT WATER	JOHNSTON BOILER	PFTJ60-4G125W (CAT)	01/01/2000	S-1600 (10004-02)	2.51	NATURAL GAS
14	S-1601	HOT WATER	JOHNSTON BOILER	PFTJ60-4G125W (CAT)	01/01/2000	S-1601 (10004-01)	2.51	NATURAL GAS
15	S-1602	HOT WATER	JOHNSTON BOILER	PFTJ50-4G15S (CAT)	01/01/2000	S-1602 (10003-01)	2.08	NATURAL GAS
16	S-1604	HOT WATER	JOHNSTON BOILER	PFTJ80-4G30W	01/01/1999	S-1604 (9878-01)	3.33	NATURAL GAS
17	S-1605	HOT WATER	JOHNSTON BOILER	PFTJ80-4G30W	01/01/1999	S-1605 (9878-02)	3.33	NATURAL GAS
18	S-1611	HOT WATER	JOHNSTON BOILER	PFXF250-2G125W	01/01/2005	S-1611 (10509-01)	9.00	NATURAL GAS
19	S-1612	HOT WATER	JOHNSTON BOILER	PFXF250-2G125W	01/01/2005	S-1612 (10509-02)	9.00	NATURAL GAS
20	S-1615	HOT WATER	KEWANEE	M235KG (CAT)	01/01/1999	S-1615 (886711)	2.35	NATURAL GAS
21	S-1617	HOT WATER	CLEAVER BROOKS	ICB 700-200	01/01/2004	S-1617 (OL103676)	8.17	NATURAL GAS
22	S-1618	HOT WATER	CLEAVER BROOKS	ICB 700-200	01/01/2004	S-1618 (OL1036752B)	8.17	NATURAL GAS
23	S-1633	HOT WATER	JOHNSTON BOILER	PFTJ60-4G125W	01/01/1999	S-1633 (9879-01)	2.08	NATURAL GAS
24	S-1634	HOT WATER	KEWANEE	M-205-G	01/01/1997	S-1634 (21282)	2.56	NATURAL GAS
25	S-1639	HOT WATER	JOHNSTON BOILER	PFTJ100-4G125W	01/01/2005	S-1639 (10467-02)	4.14	NATURAL GAS
26	S-1640	HOT WATER	JOHNSTON BOILER	PFTJ100-4G125W	01/01/2005	S-1640 (10467-01)	4.14	NATURAL GAS
27	S-1641	HOT WATER	JOHNSTON BOILER	PFTJ60-4G125W	01/01/2004	S-1641 (10400-01)	2.40	NATURAL GAS
28	S-1659	HOT WATER	CLEAVER BROOKS	FLX 700	01/01/1998	S-1659 (BT6060)	8.00	NATURAL GAS
29	S-1662	HOT WATER	FULTON ELECTRIC	FT-0240C	09/27/2002	S-1662 (3293C)	2.40	NATURAL GAS
30	S-1663	HOT WATER	FULTON ELECTRIC	FT-0240C	09/27/2002	S-1663 (3309C)	2.40	NATURAL GAS
31	S-1668	HOT WATER	KEWANEE	M-205-KG	01/01/1999	S-1668 (886701)	2.56	NATURAL GAS
32	S-1677	HOT WATER	AERCO	BENCHMARK 3.0 LN	01/01/2007	S-1677 (G-07-1556)	3.00	NATURAL GAS
33	S-1679	HOT WATER	FULTON	VTG3000LE	01/01/2010	S-1679 (2262)	3.00	NATURAL GAS
34	S-1680	HOT WATER	FULTON	VTG3000LE	01/01/2010	S-1680 (2263)	3.00	NATURAL GAS
35	S-1681	HOT WATER	CLEAVER BROOKS	CFC-700-2500-125HW	01/01/2009	S-1681 (16010250110000)	2.50	NATURAL GAS
36	S-1682	HOT WATER	CLEAVER BROOKS	CFC-700-2500-60HW	01/01/2009	S-1682 (02174-1-1)	2.50	NATURAL GAS
37	S-1683	HOT WATER	CLEAVER BROOKS	CFC-700-2500-60HW	01/01/2009	S-1683 (02174-1-2)	2.50	NATURAL GAS
38	S-1684	HOT WATER	CLEAVER BROOKS	CFC-700-2500-60HW	01/01/2009	S-1684 (02174-1-3)	2.50	NATURAL GAS

**COMBUSTION GAS ANALYSIS DATA  
FOR NATURAL GAS BOILER  
SOURCE NUMBER:  
S-1146**

**LAWRENCE LIVERMORE  
NATIONAL LABORATORY  
(2-4-11)**

Tom Honour  
Rob Swanson

BACHARACH, INC. *Source No: S-1146*  
ECA 450  
SN: NU1056

=====

TIME 05:18:53 pm  
DATE 01/27/2011

FUEL  
Natural Gas

O2	7.1	%
CO	98	ppm
EFF	85.7	%
CO2	7.8	%
T-STACK	235	°F
T-AIR	72.5	°F (1)
EA	45	%
NO	29	ppm
NO2	10	ppm
NOX	39	ppm
SO2	0	ppm
HC	0.13	%
CO( 0)	149	ppm
NO( 3)	38	ppm
NO2( 3)	13	ppm
NOX( 3)	51	ppm
SO2( 0)	0	ppm

-----  
COMMENTS:

800  
551 w  
BHW

1 OF 2

Tom Honour  
Rob Swanson

BACHARACH, INC.  
ECA 450  
SN: NU1056  
=====

Source No: S-1146

TIME 05:18:53 pm  
DATE 01/27/2011

FUEL  
Natural Gas

O2	7.1 %
CO	98 ppm
EFF	85.7 %
CO2	7.8 %
T-STACK	235 °F
T-AIR	72.5 °F (1)
EA	45 %
NO	29 ppm
NO2	10 ppm
NOX	39 ppm
SO2	0 ppm
HC	0.13 %
CO( 0)	149 ppm
NO( 3)	38 ppm
NO2( 3)	13 ppm
NOX( 3)	51 ppm
SO2( 0)	0 ppm

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COMMENTS:

80 °  
551 w  
BHW |

**COMBUSTION GAS ANALYSIS DATA  
FOR NATURAL GAS BOILER  
SOURCE NUMBER:  
S-1634**

**LAWRENCE LIVERMORE  
NATIONAL LABORATORY  
(2-4-11)**



Source No: S-1634

**BOILER TEST REPORT**

PM # PW00393226 DATE 9-4-10  
BLDG. 311 ROOM 1230 PRESS. 15 TEMP. 180  
BOILER # BHW-1 TYPE HW

	EQUIPMENT	TEST	ALARM	REMARKS
1.	LQW WATER CUT OFF	✓	AUX 1	Gasket size? 4 Hole
2.	LOW LOW WATER CUT OFF	✓	290	Gasket size? probe
3.	LOW GAS PRESSURE SWITCH	✓	290	
4.	HIGH GAS PRESSURE SWITCH	✓	290	
5.	AIR SWITCH	✓	29	
6.	AIR SWITCH #2	N/A	---	
7.	OPERATOR		-----	
8.	HIGH LIMIT			
9.	MODULATING CONTROL	✓	-----	
10.	LOW/HIGH FIRE SWITCHES	✓	-----	
11.	FLAME SENSOR	✓	28	(circle one) IR (UV) FR TC
12.	RELIEF VALVE #1	✓	-----	Relieved at 30 psi
13.	RELIEF VALVE #2	N/A	-----	Relieved at psi
14.	GAS VALVE POC SWITCH	✓	V/C	
15.	FLOW SWITCH	N/A		

**COMBUSTION ANALYSIS**

	NOx	CO	O2
LOW	<u>66</u>	<u>21</u>	<u>2.6</u>
MED	_____	_____	_____
HIGH	_____	_____	_____

Source No: S-11634

Rob Swanson  
Tom Honour

9

BACHARACH, INC.  
ECA: 450  
SN: KP1068

TIME 01:12:13 pm  
DATE 09/04/2010

FUEL  
Natural Gas

O2	7.8 %
CO	21 ppm
EFF	88.0 %
CO2	7.5 %
T-STACK	167 °F
T-AIR	78.2 °F (1)
EA	51 %
NO	46.0 ppm
NO2	2.8 ppm
NOX	48.9 ppm
SO2	0 ppm
HC	0.07 %
CO( 3)	28 ppm
NO( 3)	62 ppm
NO2( 3)	4 ppm
NOX( 3)	66 ppm
SO2( 3)	0 ppm

COMMENTS:

L.F. Only

~~BWA~~

BHWI

2 of 2

**COMBUSTION GAS ANALYSIS DATA  
FOR NATURAL GAS BOILER  
SOURCE NUMBER:  
S-1679**

**LAWRENCE LIVERMORE  
NATIONAL LABORATORY  
(2-4-11)**

**VTG 3000 LE WR 281.2**

Lawrence Livermore National Laboratory

Bekaert burner

Natural Gas Testing



NB #	2262 Boiler no. 1
Test Date	9/22-23/2010
Injector DWG	
Burner Assy DWG	
Control	LMV37, Air servo, gas servo, VFD

Eng/Tech  
Fan Size/Motor  
H/F Amp Draw

Mike Allen	
Eclipse Size 5/13 HP 460v 3ph	2.9
	2.9

Source No: S-1679

	Input (CFH)	Incoming Gas Pressure (Wc)	Last Elbow Gas Pressure (Wc)	CO <sub>2</sub> (%)	CO (ppm)	O <sub>2</sub> (%)	No (ppm)	Nox 3% O <sub>2</sub> (ppm)	Fuel Servo Open (°)	Air Servo Open (°)	Ambient (°F)	Flue (°F)	H <sub>2</sub> O (°F)	Air Pressure (Wc)	Frequency VFD (Hz)	Flame Signal (%)
P0	940	24.1	0.9	8.1	0.0	6.5	15.0	18.9	24.8	13.0	80	137.0	168.0	2.4	60.5	100.0
P1	600	24.3	0.4	8.0	0.0	6.7	12.0	15.3	20.0	6.4	86	138.0	172.0	1.6	61.1	100.0
P2	877	24.1	0.8	8.0	0.0	6.7	14.0	17.9	24.0	12.0	82	136.0	176.0	2.1	60.7	100.0
P3	1,180	23.9	1.4	8.0	0.0	6.7	13.0	16.6	27.5	16.7	80	214.0	190.0	3.3	60.5	100.0
P4	1,485	22.8	2.3	8.0	0.0	6.6	12.5	16.0	31.0	20.8	69	220.0	177.0	4.7	59.5	100.0
P5	1,800	22.5	3.5	8.0	0.0	6.6	11.8	15.1	34.2	25.0	68	244.0	177.0	6.4	59.4	100.0
P6	2,075	22.0	4.6	8.0	0.0	6.6	11.6	14.8	36.8	28.5	68	268.0	192.0	8.0	59.4	100.0
P7	2,295	20.9	5.5	8.0	0.0	6.6	10.8	13.8	39.0	31.5	68	268.0	185.0	9.3	59.4	100.0
P8	2,660	19.9	7.5	8.2	0.0	6.3	13.0	16.2	46.0	38.5	68	296.0	197.0	11.8	59.4	100.0
P9	2,960	20.8	9.2	8.2	0.0	6.2	15.0	18.7	70.0	50.0	69	313.0	199.0	14.2	59.5	100.0

Notes: Removed burner, looks good, cleaned and reinstalled. Installed new pilot tube assembly. Installed new scanner tube assembly. Modified refractory donut to accept the new pilot tube and scanner sight tube. Pilot gas pressure = 2.6"wc, pilot flame signal = 100%, 1.2% CO<sub>2</sub>, 134ppm CO, 19.0% O<sub>2</sub>, 1.2ppm NO. Standing supply gas pressure = 24.4"wc. With boiler no. 2 operating at 45% 1,377,000. With both boilers running at 100% High Fire supply gas pressure drops to 16.3"wc. And both boilers still run good. Purge pressure at High = 14.3"wc. Fan discharge and 4.3"wc. LE. Purge pressure at Low (P0) = 1.9"wc. Fan discharge and 0.35"wc. LE. At 60 Hz.

**COMBUSTION GAS ANALYSIS DATA  
FOR NATURAL GAS BOILER  
SOURCE NUMBER:  
S-1680**

**LAWRENCE LIVERMORE  
NATIONAL LABORATORY  
(2-4-11)**

Source No: S-1680



**VTG 3000 LE WR 281.2**  
**Lawrence Livermore National Laboratory**

**Natural Gas Testing**

Test Date	9/22/10
Injector DWG	
Burner Assy DWG	
Control	

Eng/Tech	Mike Allen
Fan Size/Motor	Eclipse Size 5 / 3 HP 460v 3ph.
HIF Amp Draw	2.9
	2.9

Input (GFH)	Incoming Gas Pressure (\"wc)	Last Elbow Gas Pressure (\"wc)	CO <sub>2</sub> (%)	CO (ppm)	O <sub>2</sub> (%)	NO (ppm)	NOx 3% O <sub>2</sub> (ppm)	Fuel Servo Open (\")	Air Servo Open (\")	Ambient (\"F)	Flue (\"F)	H <sub>2</sub> O (\"F)	Air Pressure (\"wc)	Frequency VFD (Hz)	Flame Signal (%)
P0	1,068	23.9	1.1	8.0	0.0	13.0	16.6	11.7	15.0	77	186.0	172.0	2.7	60.2	90-100
P1	620	24.6	0.4	8.0	0.0	13.0	16.6	5.4	8.3	82	171.0	167.0	1.3	60.7	79-100
P2	855	23.9	0.7	8.0	0.0	13.5	17.3	9.0	12.0	78	181.0	172.0	2.1	60.3	83-100
P3	1,220	24.1	1.4	8.1	0.0	14.1	17.8	13.5	17.0	75	210.0	185.0	3.2	60.0	100.0
P4	1,520	23.9	2.2	8.1	0.0	13.0	16.4	16.9	20.8	71	211.0	176.0	4.5	59.7	100.0
P5	1,833	23.1	3.3	8.2	0.0	14.5	18.1	20.0	24.5	71	233.0	185.0	6.0	59.7	100.0
P6	2,131	20.8	4.5	8.1	0.0	11.8	14.9	23.0	28.5	73	251.0	185.0	7.9	59.9	100.0
P7	2,351	20.9	5.7	8.0	0.0	10.4	13.3	26.0	32.5	71	272.0	190.0	9.4	59.7	100.0
P8	2,728	19.5	7.7	8.0	0.0	9.5	12.1	35.0	41.0	71	286.0	192.0	12.3	59.7	100.0
P9	3,000	20.4	9.2	8.1	1.0	11.5	14.5	59.0	52.0	73	301.0	195.0	14.3	59.9	100.0

Notes: Removed burner, looks good, cleaned and reinstalled. Installed new pilot tube assembly. Installed new scanner tube assembly. Modified refractory donut to accept the new pilot tube and scanner sight tube. Pilot gas pressure = 2.5\"wc, pilot flame signal = 100%, 0.9% CO<sub>2</sub>, 93ppm CO, 19.3% O<sub>2</sub>, 1.6ppm NO. Standing supply gas pressure = 24.7\"wc. With boiler no. 1 operating at 45% 1,320,000. With both boilers running at 100% High Fire supply gas pressure drops to 16.3\"wc. And both boilers still run good. Purge pressure at High = 14.2\"wc. Fan discharge and 4.3\"wc. LE. Purge pressure at Low (PO) = 2.3\"wc. Fan discharge and 0.5\"wc. LE. At 60 Hz.

**COMBUSTION GAS ANALYSIS DATA  
FOR NATURAL GAS BOILER  
SOURCE NUMBER:  
S-1681**

**LAWRENCE LIVERMORE  
NATIONAL LABORATORY  
(2-4-11)**

Source No: S-1681



Clearfire - Condensing Start-up Report

Date 10/21/10 Serial No. 101025010000

THIS FORM IS FOR MODEL CFC CLEARFIRE BOILERS

Customer's Name LLNL B #381 Location LIVERMORE, CA Model No. PFC-2500 Design Pressure 125 Working Pressure 40 Rated input [Nameplate rating] 2.5 MMBTU's/hr This unit is fueled by: Nat. Gas [X] LP Gas [ ] BTU Value of the gas: 1020 Btu/cf Gas Company PG&E Burner Voltage: 120 Control Circuit Voltage: 120 How many boilers are tied into the same system? 4 Boiler Water Treatment Discussed with [Name]: JENNIE DUZAN Has the boiler been Hydro tested in the field? If so, what pressure? NO Was the water level control explained and procedure for testing demonstrated? Yes [X] No [ ] Was setting and adjusting the temperature controls demonstrated and explained? Yes [ ] No [ ] Has the operator been instructed on troubleshooting and maintenance? Yes [X] No [ ]

BOILER ROOM INSTALLATION & CONDITIONS

- 1. What is the general condition of the Boiler Room at Start-up? New construction [X] Damp [ ] Dusty [ ] Clean [ ] Other [ ]
2. What is the approximate altitude of the boiler installation? 100'
3. Was the boiler used for heat during construction [before actual start-up]? Yes [ ] No [X]
4. Are electrical supply, wires, fuses, circuit breakers or disconnects supplied and sized per the boiler drawings and specifications? Yes [X] No [ ]
5. Are all external limits and controls connected [flow switch,alarms,circuits,outdoor resets]? Yes [X] No [ ]
6. Has any wiring been modified or changed prior to start-up or during Start-up? Yes [X] No [ ]
7. Is the boiler level? Yes [X] No [ ]
8. Have the casing panels been installed properly and without damage? Yes [X] No [ ]
9. Is the safety relief valve piping properly supported to prevent distortion? Yes [X] No [ ]
10. Relief valve manufacturer KUNKLE Serial No? 0537-EOI-HW
11. Relief Valve Set point 60 PSI Valve Discharge Size 1 1/4"
12. Relief valve capacity 2.7 mpm BTU's/hr
13. Is the bottom drain line piped to a safe point of discharge? Yes [X] No [ ]
14. Is the optional Condensate Collection Pan Installed? Yes [X] No [ ] If no, has The Condensate line been trapped and piped to drain? Yes [X] No [ ]
15. Is the air vent line piped to the expansion tank? Yes [ ] No [X] If no, please explain ON EACH BOILER
16. What is the source for water make-up? CITY
17. Is a water softener employed? Yes [ ] No [X] Other methods employed for water conditioning



Source No: S-1681

18. What type of hot water system is employed? Three-Way Valve  Primary-Secondary   
Reverse Return  Other PRIMARY ONLY
19. What is the size of the system pump? 300 gpm
20. Temperature: Inlet [return] 162 °F Outlet [Supply] 180 °F
21. What is the system operating pressure? 30 PSI and temperature 180 °F
22. Is there a Stack Thermometer? Yes  No
23. Is the unit tied into the lead-lag system? Yes  No  If yes, how many Boilers are on the lead-lag system? 1
24. Is this unit tied into an Energy Management System? Yes  No
25. Gas Piping:
- a) The length of pipe from regulator to gas train is 6' and the size is 1 1/2"
- b) The size of the Cleaver Brooks supplied gas train is 1 1/2"
- c) Has the gas line been tested for leaks? Yes  No  If no, explain: \_\_\_\_\_
- d) Has a gas line filter been provided? Yes  No
- e) Has a gas line drip leg been installed upstream of the regulator? Yes  No
- NOTE: CLEAVER-BROOKS RECOMMENDS A GAS LINE DRIP LEG**
- f) Has the gas line been cleaned, or purged prior to starting? Yes  No
- g) Has the Cleaver Brooks supplied gas train been checked for internal cleanliness? Yes  No
- THE GAS LINES MUST BE CLEANED/PURGED PRIOR TO INITIAL START-UP FOR SAFE, RELIABLE OPERATION!**
- 26) Gas meter manufacturer? ROTS capacity 3000 CFH size 2"
- 27) What is the inlet gas pressure to the meter? 2 PSI
- 28) Does the gas meter feed gas to any other equipment? Yes  No   
If Yes, explain. \_\_\_\_\_
- 29) If multiple boilers, does each have its own regulator? Yes  No   
If Yes, explain. AMERICAN METER 1800 REG.
- 30) Gas booster Mfr. N/A capacity N/A size N/A
- 31) What is the booster inlet pressure N/A and outlet pressure \_\_\_\_\_
- 32) Does the booster run continuously? N/A Or simultaneously with burner? \_\_\_\_\_
- 33) Is the Unit set-up for Sealed Combustion? Yes  No   
If Yes, explain hook up and size and type piping. \_\_\_\_\_
- 34) Are adequate openings provided for combustion air if sealed combustion is not utilized? Yes  No   
How many? 1 Size? 100
- 35) What controls the combustion air supply? \_\_\_\_\_ Outside air damper \_\_\_\_\_ Fan \_\_\_\_\_  
Open Ventilation.  If other, explain \_\_\_\_\_
- 36) What type of stack and overall height is used? 12"/12" AL29C DOUGLASS, 30'
- 37) If multiple boiler, is a stack draft control employed? Yes  No

Source No: S-1681

**PROCEDURES**

- 1) Was the burner door refractory and burner inspected? Yes  No
- 2) What is the setting of the High Gas Pressure Switch? 14 "W.C.
- 3) What is the setting of the Low Gas Pressure Switch? 6 "W.C.
- 4) What is the gas pressure at the gas train inlet, downstream of the regulator, at low fire 13.6 "W.C. and at high fire 9.2 "W.C.
- 5) What is the setting of the Combustion Air Proving Switch? 1 "W.C.
- 6) What is the setting of the High Air Pressure Switch? 5.25 "W.C.

PLEASE PROVIDE THE SETTINGS AS NOTED IN THE TABLE BELOW:

Parameter No.	Description	Lower Limit	Upper Limit	Default Setting
4	T1 Top CH			
5	T1 Foot CH			
6	T4 Max			
7	T4 Min			
13	Max Fan Speed			
15	Max Fan Speed			
17	Min. Fan Speed			
19	Ignition Fan Speed			
22	CH Mod Hysterisis On			
23	CH Mod Hysterisis Off			
31	Diff. T1-T2 for Mod.Back			
34	CH Type			

8 USE THIS TABLE TO PROVIDE COMBUSTION ANALYSIS DATA:

Firing Rate	Low	High
% O2	6.5	5.9
%CO2	8.1	8.4
CO PPM	0	19
NOx PPM	19 (18.5)	26.5
Ambient Temperature	99	99
Stack temperature ° F	160	174
Stack Draft		
Water Temperature	180	180
Operating Pressure	30	30
Flame Signal	11v	26v
Gas Pressure at Burner		
Gas Pressure at Regulator	13.6"	9.2"

Source No: S-1681

9) Electrical characteristics at high fire:

Blower Motor voltage	<u>120</u>	Blower rated amps	<u>13A</u>
Blower Motor actual voltage	<u>122</u>	Blower actual amps	<u>13.0A</u>
Control Circuit Voltage	<u>122</u>	Control Circuit amps	<u>0.4A</u>
Control Circuit Fuse Size	<u>5A</u>		

COMMENTS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

This report was completed by:

CB Authorized Service Company:

This report was reviewed with:

And all questions were answered? Yes  No

Please return one copy to Cleaver-Brooks Service Department for Warranty Registration.

Source No: S-1681

BAJ-1A 414H

\*\*\*\*\*  
\* ECOM - J2KN \*  
\*\*\*\*\*  
Date Time  
10.14.10 02:51 PM

Gas analysis

Fuel type  
Natural gas

---

T.Air	99	%F
T.Gas	174	%F
T.Sensor	91	%F
O2	5.9	%
CO 3%O2	19	PPM
NO 3%O2	21.2	PPM
NO2 3%O2	5.2	PPM
NOx 3%O2	26.5	PPM
CO2	8.4	%
Eff.	88.2	%
Losses	11.8	%
Exc. air	1.39	

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GAS  
9.2"

low

\*\*\*\*\*  
\* ECOM - J2KN \*  
\*\*\*\*\*  
Date Time  
10.14.10 02:52 PM

Gas analysis

Fuel type  
Natural gas

---

T.Air	99	%F
T.Gas	160	%F
T.Sensor	91	%F
O2	6.5	%
CO 3%O2	0	PPM
NO 3%O2	17.4	PPM
NO2 3%O2	1.1	PPM
NOx 3%O2	18.5	PPM
CO2	8.1	%
Eff.	88.5	%
Losses	11.5	%
Exc. air	1.45	

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GAS  
13.6"

**COMBUSTION GAS ANALYSIS DATA  
FOR NATURAL GAS BOILER  
SOURCE NUMBER:  
S-1682**

**LAWRENCE LIVERMORE  
NATIONAL LABORATORY  
(2-4-11)**

Source No: S-1682



Clearfire - Condensing Start-up Report

Date 10/21/10 Serial No. 02174-1-1

THIS FORM IS FOR MODEL CFC CLEARFIRE BOILERS

Customer's Name LLNL B4324 Location? LIVERMORE, CA Model No. CFC-2570 Design Pressure 60 Working Pressure 40 Rated input [Nameplate rating] 2.5MM BTU's/hr This unit is fueled by: Nat. Gas [X] LP Gas [ ] BTU Value of the gas: 1020 BTU/cf Gas Company FUE Burner Voltage: 120 Control Circuit Voltage: 120 How many boilers are tied into the same system? 2 Boiler Water Treatment Discussed with [Name]: JEREMIE DUZAN Has the boiler been Hydro tested in the field? If so, what pressure? NO Was the water level control explained and procedure for testing demonstrated? Yes [X] No [ ] Was setting and adjusting the temperature controls demonstrated and explained? Yes [X] No [ ] Has the operator been instructed on troubleshooting and maintenance? Yes [X] No [ ]

BOILER ROOM INSTALLATION & CONDITIONS

1. What is the general condition of the Boiler Room at Start-up? New construction [X] Damp [ ] Dusty [ ] Clean [ ] Other [ ] 2. What is the approximate altitude of the boiler installation? 100' 3. Was the boiler used for heat during construction [before actual start-up]? Yes [ ] No [X] If yes, how long? And who operated this unit? 4. Are electrical supply, wires, fuses, circuit breakers or disconnects supplied and sized per the boiler drawings and specifications? Yes [X] No [ ] If no, please explain 5. Are all external limits and controls connected [flow switch,alarms,circuits,outdoor resets]? Yes [X] No [ ] 6. Has any wiring been modified or changed prior to start-up or during Start-up? Yes [X] No [ ] If yes, provide a marked-up wiring diagram of the changes. 7. Is the boiler level? Yes [X] No [ ] 8. Have the casing panels been installed properly and without damage? Yes [X] No [ ] If no, explain 9. Is the safety relief valve piping properly supported to prevent distortion? Yes [X] No [ ] 10. Relief valve manufacturer KUNNLE Serial No? DS37-EE1-HM 11. Relief Valve Set point 60 PSI Valve Discharge Size 1 1/2" 12. Relief valve capacity 2.7 MM BTU's /hr 13. Is the bottom drain line piped to a safe point of discharge? Yes [X] No [ ] 14. Is the optional Condensate Collection Pan Installed? Yes [X] No [ ] If no, has The Condensate line been trapped and piped to drain? Yes [X] No [ ] 15. Is the air vent line piped to the expansion tank? Yes [ ] No [X] If no, please explain IN EACH BOILER 16. What is the source for water make-up? LHM 17. Is a water softener employed? Yes [ ] No [X] Other methods employed for water conditioning

Source No: S-1682

18. What type of hot water system is employed? Three-Way Valve  Primary-Secondary   
Reverse Return  Other PRIMARY ONLY
19. What is the size of the system pump? 300 gpm
20. Temperature: Inlet [return] 160 °F Outlet [Supply] 180 °F
21. What is the system operating pressure? 30 PSI and temperature 180 °F
22. Is there a Stack Thermometer? Yes  No
23. Is the unit tied into the lead-lag system? Yes  No  If yes, how many Boilers are on the lead-lag system? 4
24. Is this unit tied into an Energy Management System? Yes  No
25. Gas Piping:
- a) The length of pipe from regulator to gas train is 6' and the size is 1 1/2"
- b) The size of the Cleaver Brooks supplied gas train is 1 1/2"
- c) Has the gas line been tested for leaks? Yes  No  If no, explain: \_\_\_\_\_
- d) Has a gas line filter been provided? Yes  No
- e) Has a gas line drip leg been installed upstream of the regulator? Yes  No
- NOTE: CLEAVER-BROOKS RECOMMENDS A GAS LINE DRIP LEG**
- f) Has the gas line been cleaned, or purged prior to starting? Yes  No
- g) Has the Cleaver Brooks supplied gas train been checked for internal cleanliness? Yes  No
- THE GAS LINES MUST BE CLEANED/PURGED PRIOR TO INITIAL START-UP FOR SAFE, RELIABLE OPERATION!**
- 26) Gas meter manufacturer? ROUTS capacity 3000 CFH size 2"
- 27) What is the inlet gas pressure to the meter? 2 PSI
- 28) Does the gas meter feed gas to any other equipment? Yes  No   
If Yes, explain. \_\_\_\_\_
- 29) If multiple boilers, does each have its own regulator? Yes  No   
If Yes, explain. AMERICAN METER 1800 REG.
- 30) Gas booster Mfr. N/A capacity N/A size N/A
- 31) What is the booster inlet pressure N/A and outlet pressure \_\_\_\_\_
- 32) Does the booster run continuously? N/A Or simultaneously with burner? \_\_\_\_\_
- 33) Is the Unit set-up for Sealed Combustion? Yes  No   
If Yes, explain hook up and size and type piping. \_\_\_\_\_
- 34) Are adequate openings provided for combustion air if sealed combustion is not utilized? Yes  No   
How many? 1 Size? 100 #
- 35) What controls the combustion air supply? \_\_\_\_\_ Outside air damper \_\_\_\_\_ Fan \_\_\_\_\_  
Open Ventilation.  If other, explain \_\_\_\_\_
- 36) What type of stack and overall height is used? 12"/22" AL 29C DWELGALL, 30'
- 37) If multiple boiler, is a stack draft control employed? Yes  No

Source No: S-1682

**PROCEDURES**

- 1) Was the burner door refractory and burner inspected? Yes  No
- 2) What is the setting of the High Gas Pressure Switch? 14 "W.C.
- 3) What is the setting of the Low Gas Pressure Switch? 6 "W.C.
- 4) What is the gas pressure at the gas train inlet, downstream of the regulator, at low fire 13.7 "W.C. and at high fire 9.6 "W.C.
- 5) What is the setting of the Combustion Air Proving Switch? 1 "W.C.
- 6) What is the setting of the High Air Pressure Switch? 5.25 "W.C.

PLEASE PROVIDE THE SETTINGS AS NOTED IN THE TABLE BELOW:

Parameter No.	Description	Lower Limit	Upper Limit	Default Setting
4	T1 Top CH			
5	T1 Foot CH			
6	T4 Max			
7	T4 Min			
13	Max Fan Speed			
15	Max Fan Speed			
17	Min. Fan Speed			
19	Ignition Fan Speed			
22	CH Mod Hysterisis On			
23	CH Mod Hysterisis Off			
31	Diff. T1-T2 for Mod.Back			
34	CH Type			

8 USE THIS TABLE TO PROVIDE COMBUSTION ANALYSIS DATA:

Firing Rate	Low	High
% O2	6.7	5.9
%CO2	8.0	8.4
CO PPM	1	17
NOx PPM	18 (17.6)	24 (23.7)
Ambient Temperature	98	98
Stack temperature ° F	165	179
Stack Draft		
Water Temperature	180	180
Operating Pressure	30	30
Flame Signal	12v	25v
Gas Pressure at Burner		
Gas Pressure at Regulator	13.7 <del>9.6</del>	13.7 <del>9.6</del>

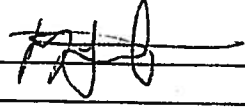


Source No: S-1682

9) Electrical characteristics at high fire:

Blower Motor voltage	<u>126</u>	Blower rated amps	<u>13A</u>
Blower Motor actual voltage	<u>122</u>	Blower actual amps	<u>13.1A</u>
Control Circuit Voltage	<u>122</u>	Control Circuit amps	<u>0.9A</u>
Control Circuit Fuse Size	<u>5A</u>		

COMMENTS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

This report was completed by: TROY LEVERTON   
CB Authorized Service Company: R. MACDONALD  
This report was reviewed with: \_\_\_\_\_  
And all questions were answered? Yes  No

Please return one copy to Cleaver-Brooks Service Department for Warranty Registration.

Source No: S-1682

BHW-2A HIGH

\*\*\*\*\*  
\* ECOM - J2KN \*  
\*\*\*\*\*

Date Time  
10.14.10 02:27 PM

Gas analysis

Fuel type  
Natural gas

T.Air	98	°F
T.Gas	179	°F
T.Sensor	90	°F
O2	5.9	%
CO 3%O2	17	PPM
NO 3%O2	20.3	PPM
NO2 3%O2	3.5	PPM
NOx 3%O2	23.7	PPM
CO2	8.4	%
Eff.	88.1	%
Losses	11.9	%
Exc. air	1.39	

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GAS 9.6"

Low

\*\*\*\*\*  
\* ECOM - J2KN \*  
\*\*\*\*\*

Date Time  
10.14.10 02:29 PM

Gas analysis

Fuel type  
Natural gas

T.Air	98	°F
T.Gas	165	°F
T.Sensor	90	°F
O2	6.7	%
CO 3%O2	1	PPM
NO 3%O2	16.9	PPM
NO2 3%O2	0.8	PPM
NOx 3%O2	17.6	PPM
CO2	8.0	%
Eff.	88.3	%
Losses	11.7	%
Exc. air	1.47	

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GAS 13.7"

**COMBUSTION GAS ANALYSIS DATA  
FOR NATURAL GAS BOILER  
SOURCE NUMBER:  
S-1683**

**LAWRENCE LIVERMORE  
NATIONAL LABORATORY  
(2-4-11)**

SOURCE No: S-1683



Clearfire - Condensing Start-up Report

Date 10/21/10

Serial No. 02174-1-2

THIS FORM IS FOR MODEL CFC CLEARFIRE BOILERS

Customer's Name LLNL B#381
Location? LIVERMORE, CA
Model No. CFC-2500 Design Pressure 60 Working Pressure 40
Rated input [Nameplate rating] 2.5mm BTU's/hr
This unit is fueled by: Nat. Gas [X] LP Gas [ ]
BTU Value of the gas: 1000 BTU/ft Gas Company PG&E
Burner Voltage: 120 Control Circuit Voltage: 120
How many boilers are tied into the same system? 4
Boiler Water Treatment Discussed with [Name]: JENNIE DIZAN
Has the boiler been Hydro tested in the field? If so, what pressure? NO
Was the water level control explained and procedure for testing demonstrated? Yes [X] No [ ]
Was setting and adjusting the temperature controls demonstrated and explained? Yes [X] No [ ]
Has the operator been instructed on troubleshooting and maintenance? Yes [X] No [ ]

BOILER ROOM INSTALLATION & CONDITIONS

- 1. What is the general condition of the Boiler Room at Start-up? New construction [X] Damp [ ] Dusty [ ] Clean [ ] Other [ ]
2. What is the approximate altitude of the boiler installation? 100
3. Was the boiler used for heat during construction [before actual start-up]? Yes [ ] No [X]
4. Are electrical supply, wires, fuses, circuit breakers or disconnects supplied and sized per the boiler drawings and specifications? Yes [X] No [ ]
5. Are all external limits and controls connected [flow switch,alarms,circuits,outdoor resets? Yes [X] No [ ]
6. Has any wiring been modified or changed prior to start-up or during Start-up? Yes [X] No [ ]
7. Is the boiler level? Yes [X] No [ ]
8. Have the casing panels been installed properly and without damage? Yes [X] No [ ]
9. Is the safety relief valve piping properly supported to prevent distortion? Yes [X] No [ ]
10. Relief valve manufacturer KUNKLE Serial No? 0537-EDT-4M
11. Relief Valve Set point 60 PSI Valve Discharge Size 1 1/4"
12. Relief valve capacity 2.7 mm BTU's /hr
13. Is the bottom drain line piped to a safe point of discharge? Yes [X] No [ ]
14. Is the optional Condensate Collection Pan Installed? Yes [X] No [ ] If no, has The Condensate line been trapped and piped to drain? Yes [X] No [ ]
15. Is the air vent line piped to the expansion tank? Yes [ ] No [X] If no, please explain ON EACH BOILER
16. What is the source for water make-up? CITY
17. Is a water softener employed? Yes [ ] No [X]
Other methods employed for water conditioning

Source No: S-1683

18. What type of hot water system is employed? Three-Way Valve  Primary-Secondary   
Reverse Return  Other PRIMARY ONLY
19. What is the size of the system pump? 300 gpm
20. Temperature: Inlet [return] 180 °F Outlet [Supply] 180 °F
21. What is the system operating pressure? 30 PSI and temperature 180 °F
22. Is there a Stack Thermometer? Yes  No
23. Is the unit tied into the lead-lag system? Yes  No  If yes, how many  
Boilers are on the lead-lag system? 4
24. Is this unit tied into an Energy Management System? Yes  No
25. Gas Piping:
- a) The length of pipe from regulator to gas train is 6' and the size is 1 1/2"
- b) The size of the Cleaver Brooks supplied gas train is 1 1/2"
- c) Has the gas line been tested for leaks? Yes  No  If no, explain: \_\_\_\_\_
- d) Has a gas line filter been provided? Yes  No
- e) Has a gas line drip leg been installed upstream of the regulator? Yes  No
- NOTE: CLEAVER-BROOKS RECOMMENDS A GAS LINE DRIP LEG**
- f) Has the gas line been cleaned, or purged prior to starting? Yes  No
- g) Has the Cleaver Brooks supplied gas train been checked for internal cleanliness? Yes  No
- THE GAS LINES MUST BE CLEANED/PURGED PRIOR TO INITIAL START-UP  
FOR SAFE, RELIABLE OPERATION!**
- 26) Gas meter manufacturer? ROOTS capacity 3000 CFH size 2"
- 27) What is the Inlet gas pressure to the meter? 2 PSI
- 28) Does the gas meter feed gas to any other equipment? Yes  No   
If Yes, explain. \_\_\_\_\_
- 29) If multiple boilers, does each have its own regulator? Yes  No   
If Yes, explain. AMERICAN METER 1800 REG
- 30) Gas booster Mfr. N/A capacity N/A size N/A
- 31) What is the booster inlet pressure N/A and outlet pressure \_\_\_\_\_
- 32) Does the booster run continuously? N/A Or simultaneously with burner? \_\_\_\_\_
- 33) Is the Unit set-up for Sealed Combustion? Yes  No   
If Yes, explain hook up and size and type piping. \_\_\_\_\_
- 34) Are adequate openings provided for combustion air if sealed combustion is not utilized? Yes  No   
How many? 1 Size? 100 #
- 35) What controls the combustion air supply? \_\_\_\_\_ Outside air damper \_\_\_\_\_ Fan \_\_\_\_\_  
Open Ventilation.  If other, explain \_\_\_\_\_
- 36) What type of stack and overall height is used? 12"/22" AL29C DOUBLEWALL, 30'
- 37) If multiple boiler, is a stack draft control employed? Yes  No

Source No: S-1683

**PROCEDURES**

- 1) Was the burner door refractory and burner inspected? Yes  No
- 2) What is the setting of the High Gas Pressure Switch? 14 "W.C.
- 3) What is the setting of the Low Gas Pressure Switch? 6 "W.C.
- 4) What is the gas pressure at the gas train inlet, downstream of the regulator, at low fire 10.2 "W.C. and at high fire 13.7 "W.C.
- 5) What is the setting of the Combustion Air Proving Switch? 1 "W.C.
- 6) What is the setting of the High Air Pressure Switch? 5.25 "W.C.

PLEASE PROVIDE THE SETTINGS AS NOTED IN THE TABLE BELOW:

Parameter No.	Description	Lower Limit	Upper Limit	Default Setting
4	T1 Top CH			
5	T1 Foot CH			
6	T4 Max			
7	T4 Min			
13	Max Fan Speed			
15	Max Fan Speed			
17	Min. Fan Speed			
19	Ignition Fan Speed			
22	CH Mod Hysterisis On			
23	CH Mod Hysterisis Off			
31	Diff. T1-T2 for Mod.Back			
34	CH Type			

8 USE THIS TABLE TO PROVIDE COMBUSTION ANALYSIS DATA:

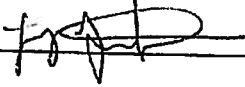
Firing Rate	Low	High
% O2	6.3	5.8
%CO2	8.2	8.5
CO PPM	5	9
NOx PPM	22 (21.6)	25 (24.6)
Ambient Temperature	100	100
Stack temperature ° F	173	182
Stack Draft		
Water Temperature	180	180
Operating Pressure	30	30
Flame Signal	10V	26V
Gas Pressure at Burner		
Gas Pressure at Regulator	<del>10.2</del> 13.7	<del>10.2</del> 10.2

Source No: S-1683

9) Electrical characteristics at high fire:

Blower Motor voltage	<u>120</u>	Blower rated amps	<u>13A</u>
Blower Motor actual voltage	<u>122</u>	Blower actual amps	<u>12.9A</u>
Control Circuit Voltage	<u>122</u>	Control Circuit amps	<u>0.4A</u>
Control Circuit Fuse Size	<u>5A</u>		

COMMENTS

This report was completed by: TROY LEVISTON   
CB Authorized Service Company: KE MACDONALD  
This report was reviewed with: \_\_\_\_\_  
And all questions were answered? Yes  No

Please return one copy to Cleaver-Brooks Service Department for Warranty Registration.

Source No: S-1683

BHW-03A High

\*\*\*\*\*  
\* ECOM - J2KN \*  
\*\*\*\*\*

Date Time  
10.14.10 03:31 PM

Gas analysis

Fuel type  
Natural gas

T.Air	100	°F
T.Gas	182	°F
T.Sensor	91	°F
O2	5.8	%
CO 3%O2	9	PPM
NO 3%O2	21.4	PPM
NO2 3%O2	3.2	PPM
NOx 3%O2	24.6	PPM
CO2	8.5	%
Eff.	88.0	%
Losses	12.0	%
Exc. air	1.38	

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GAS  
10.2"

Low

\*\*\*\*\*  
\* ECOM - J2KN \*  
\*\*\*\*\*

Date Time  
10.14.10 03:32 PM

Gas analysis

Fuel type  
Natural gas

T.Air	100	°F
T.Gas	173	°F
T.Sensor	91	°F
O2	6.3	%
CO 3%O2	5	PPM
NO 3%O2	19.3	PPM
NO2 3%O2	2.2	PPM
NOx 3%O2	21.6	PPM
CO2	8.2	%
Eff.	88.2	%
Losses	11.8	%
Exc. air	1.43	

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GAS  
13.7"



**COMBUSTION GAS ANALYSIS DATA  
FOR NATURAL GAS BOILER  
SOURCE NUMBER:  
S-1684**

**LAWRENCE LIVERMORE  
NATIONAL LABORATORY  
(2-4-11)**

Source No: S-1684



Clearfire - Condensing Start-up Report

Date 10/21/10 Serial No. 02174-1-3

THIS FORM IS FOR MODEL CFC CLEARFIRE BOILERS

Customer's Name LLNL #381 Location LIVERMORE, CA Model No. CFC-2500 Design Pressure 60 Working Pressure 40 Rated Input [Nameplate rating] 2.5 MM BTU's/hr This unit is fueled by: Nat. Gas [X] LP Gas [ ] BTU Value of the gas: 1020 BTU/cf Gas Company PG&E Burner Voltage: 120 Control Circuit Voltage: 120 How many boilers are tied into the same system? 4 Boiler Water Treatment Discussed with [Name]: JEROME DUZAN Has the boiler been Hydro tested in the field? If so, what pressure? NO Was the water level control explained and procedure for testing demonstrated? Yes [X] No [ ] Was setting and adjusting the temperature controls demonstrated and explained? Yes [X] No [ ] Has the operator been instructed on troubleshooting and maintenance? Yes [X] No [ ]

BOILER ROOM INSTALLATION & CONDITIONS

- 1. What is the general condition of the Boiler Room at Start-up? New construction [X] Damp [ ] Dusty [ ] Clean [ ] Other [ ]
2. What is the approximate altitude of the boiler installation? 160'
3. Was the boiler used for heat during construction [before actual start-up]? Yes [ ] No [X]
4. Are electrical supply, wires, fuses, circuit breakers or disconnects supplied and sized per the boiler drawings and specifications? Yes [X] No [ ]
5. Are all external limits and controls connected [flow switch,alarms,circuits,outdoor resets]? Yes [X] No [ ]
6. Has any wiring been modified or changed prior to start-up or during Start-up? Yes [X] No [ ]
7. Is the boiler level? Yes [X] No [ ]
8. Have the casing panels been installed properly and without damage? Yes [ ] No [ ]
9. Is the safety relief valve piping properly supported to prevent distortion? Yes [X] No [ ]
10. Relief valve manufacturer KUNKLE Serial No? 0537-F01-11M
11. Relief Valve Set point 60 PSI Valve Discharge Size 1 1/4"
12. Relief valve capacity 2.7 MM BTU's /hr
13. Is the bottom drain line piped to a safe point of discharge? Yes [X] No [ ]
14. Is the optional Condensate Collection Pan Installed? Yes [X] No [ ] If no, has The Condensate line been trapped and piped to drain? Yes [X] No [ ]
15. Is the air vent line piped to the expansion tank? Yes [ ] No [X] If no, please explain ON EACH BOILER
16. What is the source for water make-up? CITY
17. Is a water softener employed? Yes [ ] No [X]
Other methods employed for water conditioning

Source No: S-1684

18. What type of hot water system is employed? Three-Way Valve  Primary-Secondary   
Reverse Return  Other PRIMARY ONLY
19. What is the size of the system pump? 300 gpm
20. Temperature: Inlet [return] 160 °F Outlet [Supply] 180 °F
21. What is the system operating pressure? 30 PSI and temperature 180 °F
22. Is there a Stack Thermometer? Yes  No
23. Is the unit tied into the lead-lag system? Yes  No  If yes, how many Boilers are on the lead-lag system? 4
24. Is this unit tied into an Energy Management System? Yes  No
25. Gas Piping:
- a) The length of pipe from regulator to gas train is 6' and the size is 1 1/2"
- b) The size of the Cleaver Brooks supplied gas train is 1 1/2"
- c) Has the gas line been tested for leaks? Yes  No  If no, explain: \_\_\_\_\_
- d) Has a gas line filter been provided? Yes  No
- e) Has a gas line drip leg been installed upstream of the regulator? Yes  No
- NOTE: CLEAVER-BROOKS RECOMMENDS A GAS LINE DRIP LEG**
- f) Has the gas line been cleaned, or purged prior to starting? Yes  No
- g) Has the Cleaver Brooks supplied gas train been checked for internal cleanliness? Yes  No
- THE GAS LINES MUST BE CLEANED/PURGED PRIOR TO INITIAL START-UP FOR SAFE, RELIABLE OPERATION!**
- 26) Gas meter manufacturer? ROOS capacity 3000 CFH size 2"
- 27) What is the inlet gas pressure to the meter? 2 PSI
- 28) Does the gas meter feed gas to any other equipment? Yes  No   
If Yes, explain. \_\_\_\_\_
- 29) If multiple boilers, does each have its own regulator? Yes  No   
If Yes, explain. AMERICAN METER 1500 REG.
- 30) Gas booster Mfr. N/A capacity N/A size N/A
- 31) What is the booster inlet pressure N/A and outlet pressure \_\_\_\_\_
- 32) Does the booster run continuously? N/A Or simultaneously with burner? \_\_\_\_\_
- 33) Is the Unit set-up for Sealed Combustion? Yes  No   
If Yes, explain hook up and size and type piping. \_\_\_\_\_
- 34) Are adequate openings provided for combustion air if sealed combustion is not utilized? Yes  No   
How many? 1 Size? 100#
- 35) What controls the combustion air supply? \_\_\_\_\_ Outside air damper \_\_\_\_\_ Fan \_\_\_\_\_  
Open Ventilation. \_\_\_\_\_ If other, explain \_\_\_\_\_
- 36) What type of stack and overall height is used? 12"/22" ALPAC BRICK WALL, 30'
- 37) If multiple boiler, is a stack draft control employed? Yes  No

Source No: S-1684

**PROCEDURES**

- 1) Was the burner door refractory and burner inspected? Yes  No
- 2) What is the setting of the High Gas Pressure Switch? 14 "W.C.
- 3) What is the setting of the Low Gas Pressure Switch? 6 "W.C.
- 4) What is the gas pressure at the gas train inlet, downstream of the regulator, at low fire 9.2 "W.C. and at high fire 13.5 "W.C.
- 5) What is the setting of the Combustion Air Proving Switch? 1 "W.C.
- 6) What is the setting of the High Air Pressure Switch? 5.25 "W.C.

PLEASE PROVIDE THE SETTINGS AS NOTED IN THE TABLE BELOW:

Parameter No.	Description	Lower Limit	Upper Limit	Default Setting
4	T1 Top CH			
5	T1 Foot CH			
6	T4 Max			
7	T4 Min			
13	Max Fan Speed			
15	Max Fan Speed			
17	Min. Fan Speed			
19	Ignition Fan Speed			
22	CH Mod Hysterisis On			
23	CH Mod Hysterisis Off			
31	Diff. T1-T2 for Mod.Back			
34	CH Type			

8 USE THIS TABLE TO PROVIDE COMBUSTION ANALYSIS DATA:

Firing Rate	Low	High
% O <sub>2</sub>	6.6	5.9
% CO <sub>2</sub>	8.0	8.4
CO PPM	1	18
NOx PPM	19 (19.1)	26 (26.2)
Ambient Temperature	88	88
Stack temperature ° F	168	185
Stack Draft	<del>1.2</del>	
Water Temperature	180	180
Operating Pressure	30	30
Flame Signal	12V	26V
Gas Pressure at Burner		
Gas Pressure at Regulator	13.5	9.2

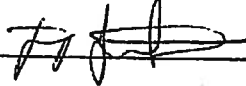
Source No: S-1684

9) Electrical characteristics at high fire:

Blower Motor voltage	<u>120</u>	Blower rated amps	<u>13A</u>
Blower Motor actual voltage	<u>122</u>	Blower actual amps	<u>13.1A</u>
Control Circuit Voltage	<u>122</u>	Control Circuit amps	<u>0.5A</u>
Control Circuit Fuse Size	<u>5A</u>		

COMMENTS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

This report was completed by:

TROY LEVERTON 

CB Authorized Service Company:

RE MACDONALD

This report was reviewed with: \_\_\_\_\_

And all questions were answered? Yes  No

Please return one copy to Cleaver-Brooks Service Department for Warranty Registration.

Source No: S-1684

BHW-4A H/H

\*\*\*\*\*  
\* E C O M - J 2 K N \*  
\*\*\*\*\*

Date Time  
10.13.10 12:10 PM

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Gas analysis  
-----

Fuel type  
Natural gas

T.Air	98	°F
T.Gas	185	°F
T.Sensor	81	°F
O2	5.9	%
CO 3%O2	18	PPM
NO 3%O2	22.1	PPM
NO2 3%O2	4.2	PPM
NOx 3%O2	26.2	PPM
CO2	8.4	%
Eff.	87.6	%
Losses	12.4	%
Exc. air	1.39	

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ECOM America Ltd.  
1628 Oakbrook Drive  
Gainesville NC ~~GA~~  
Georgia 30507 9.2"  
Tel. 770-532-3280  
Fax: 770-532-3620  
Toll-Free 877-326-6411  
www.ecomusa.com

Low

\*\*\*\*\*  
\* E C O M - J 2 K N \*  
\*\*\*\*\*

Date Time  
10.13.10 12:12 PM

-----  
Gas analysis  
-----

Fuel type  
Natural gas

T.Air	88	°F
T.Gas	168	°F
T.Sensor	81	°F
O2	6.6	%
CO 3%O2	1	PPM
NO 3%O2	17.5	PPM
NO2 3%O2	1.6	PPM
NOx 3%O2	19.1	PPM
CO2	8.0	%
Eff.	88.0	%
Losses	12.0	%
Exc. air	1.46	

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