FLX$_{PM}$

Flexible Watertube Boiler

3.15 - 10.5 MMBTU/H; 75 - 250 HP

Steam and Hot Water

Boiler Book
09/2017

CONTENTS

ATTRIBUTES

ASME Construction:

- Built in accordance with the ASME Code, ensures design integrity for long life.
- Ensures safety and reliability with third party inspection of standards compliance.

Underwriters Package Label [UL/cUL]:

- Ensures the complete package [burner/boiler] has been tested and certified to the UL standards of safety and controls requirements.

High Turndown Burner:

- Up to 5:1 turndown on Gas firing, reduces inefficient on/off operation, reducing fuel consumption.
- Boiler stays on line during low load conditions for optimum efficiency and performance.
- Boiler/burner built by Cleaver-Brooks, eliminating divided responsibility.
- Premix design; air leads fuel throughout the modulation range.

Hinged Burner Design:

- Burner assembly is attached to the front boiler wall with integral hinges, permits burner swing out for ease of service, maintenance, and inspection.

Swedge-Fitted Tube Attachment:

- Eliminates welded tube attachment to each drum providing ease of tube replacement.
- Eliminates rolling or welding of tube replacement, reduces maintenance costs.

Thermal Stress Protection:

- 25 Year Thermal Shock Warranty ensures tube integrity against thermal stress, associated with hydronic heating systems.
- Bent tube design provides ability to withstand thermal stress of tubes during rapid load swings and cold water returns.

Removable Side Panel Casing:

- Sectional side panels easily remove to provide access to each tube eliminates total casing removal for tube access.
- Reduces maintenance time and costs.

Field Assembly Option:

- Boiler can be erected on the project site where access space is minimized.
- Pressure vessel parts, tubes, burner and controls can fit through a standard doorway, elevator shaft or reduced side wall opening or window.

PRODUCT OFFERING

Information in this section applies to steam and hot water boiler sizes ranging from 3.15 to 10.5 MMBTU/hr input.

The Model FLX_{PM} Flexible Watertube Boiler is a five-pass steel boiler with flexible tubes formed and arranged to direct the flow of combustion gases through the boiler. The pressure vessel conforms to Section I or Section IV of the ASME Code, and consists of the formed tubes and the external downcomer connected to the top and bottom drums. The heated area of the pressure vessel is contained within a gas-tight, insulated casing that is composed of removable, formed-steel panels. The boiler/burner package is manufactured by Cleaver-Brooks and is UL/cUL approved as a package.

Table 1. Model FLX_{PM} Boiler Sizes

MODEL	CAPACITY INPUT BTU/HR	HEAT OUTPUT BTU/HR	EQUIVALENT HP
FLXPM-315	3,150,000	2,510,625	75
FLXPM-420	4,200,000	3,347,500	100
FLXPM-540	5,400,000	4,184,375	125
FLXPM-630	6,300,000	5,021,250	150
FLXPM-840	8,400,000	6,695,000	200
FLXPM-1050	10,500,000	8,368,750	250

NOTES:

1. Design Pressure: 160 psig Hot Water, 15 psig Steam, 150 psig Steam (available in higher design pressures).
2. Also available in field erectable model.

Benchmark

Equipment described below is for the standard factory package offering.

1. Boiler:
   A. All boilers are designed and constructed in accordance with the ASME Code.
   B. Each vessel is mounted on an integral base frame; refractories for the boiler and burner are installed.
   C. Each vessel receives a factory hydro test with third party witness.
   D. ASME Code Stamped and National Board Registered.
   E. For Canadian installations, appropriate CRN Stamping.

Hot water boilers with design pressures up to 160 psig, and with design temperatures less than 250 °F, are constructed under Section IV of the ASME Code, and 'H' stamped for low- pressure heating boilers.

Steam boilers with design pressure of 30 psig, and maximum allowable operating pressure of 15 psig, are constructed under Section IV of the ASME Code, and 'H' stamped for low pressure heating boilers.

Steam boilers with design pressure of 150 psig are constructed under Section I of the ASME code and "S" stamped for high pressure steam boilers.

2. Premix Burner
   A. Cylindrical gas burner with mesh element.
   B. Burner assembly - comprising the canister, blower and motor, and air inlet components - attaches to the hinged dry oven door by a bolted connection.
3. Burner Controls
   A. Control panel is mounted at the side of the boiler and houses the flame safeguard, modulating control, and variable frequency drive.
4. Water/Steam Controls:
   A. ASME safety relief valve(s).
   B. Pressure and temperature gauges for hot water boilers.
   C. Pressure gauge for steam boilers.
   D. Operating and limit controls:
   E. High limit control - manual reset.
   F. Operating limit control - automatic reset.
   G. Low water cutoff:
      - Probe type - hot water.
      - Float type main and probe type auxiliary for steam.
   H. Pump Control - steam boilers.
5. Altitude: Standard boilers attain full ratings at altitudes up to 2,000 feet. Altitude compensation based on a derate above 2,000 feet.

Elective Equipment

For option details, contact your local Cleaver-Brooks authorized representative. Available electives include the following:

1. Boiler Equipment
   - Auxiliary low water cut-off (hot water)
   - Stack thermometer
   - Drain valves
   - Additional screwed tappings
   - Packaged for field erection
   - Bottom Blowdown Valves
   - Surface Blowdown Valves
   - Feedwater Control Valves
   - Steam Stop Valves
   - Non-return Valves
2. Burner/Control Equipment
   - 9ppm emissions
   - Lead/lag system
   - Special insurance and code requirements (e.g., XL-GAPS, FM, ASME CSD-1)
   - Alarm bell/silence switch
   - Special motor requirements (TEFC, high efficiency)
   - Remote contacts
   - Additional relay points and indicator lights
   - Main disconnect (fusible/circuit breaker)
   - Optional NEMA enclosures
   - Key lock panel
   - System pump interlock
   - Low fire hold controls
   - Assured low fire cut-off
   - Flow switches
   - High stack temperature cut-off/alarm
   - Remote emergency shutoff (115V)
3. Fuel equipment
   - Propane fuel
   - Oversized gas trains
   - Gas strainer
   - Special fuel shut-off valves
4. Accessories
   - Feedwater tank
   - Deaerator
   - Blowdown separator
   - Chemical feed
   - Heat recovery - stack economizer

DIMENSIONS AND RATINGS

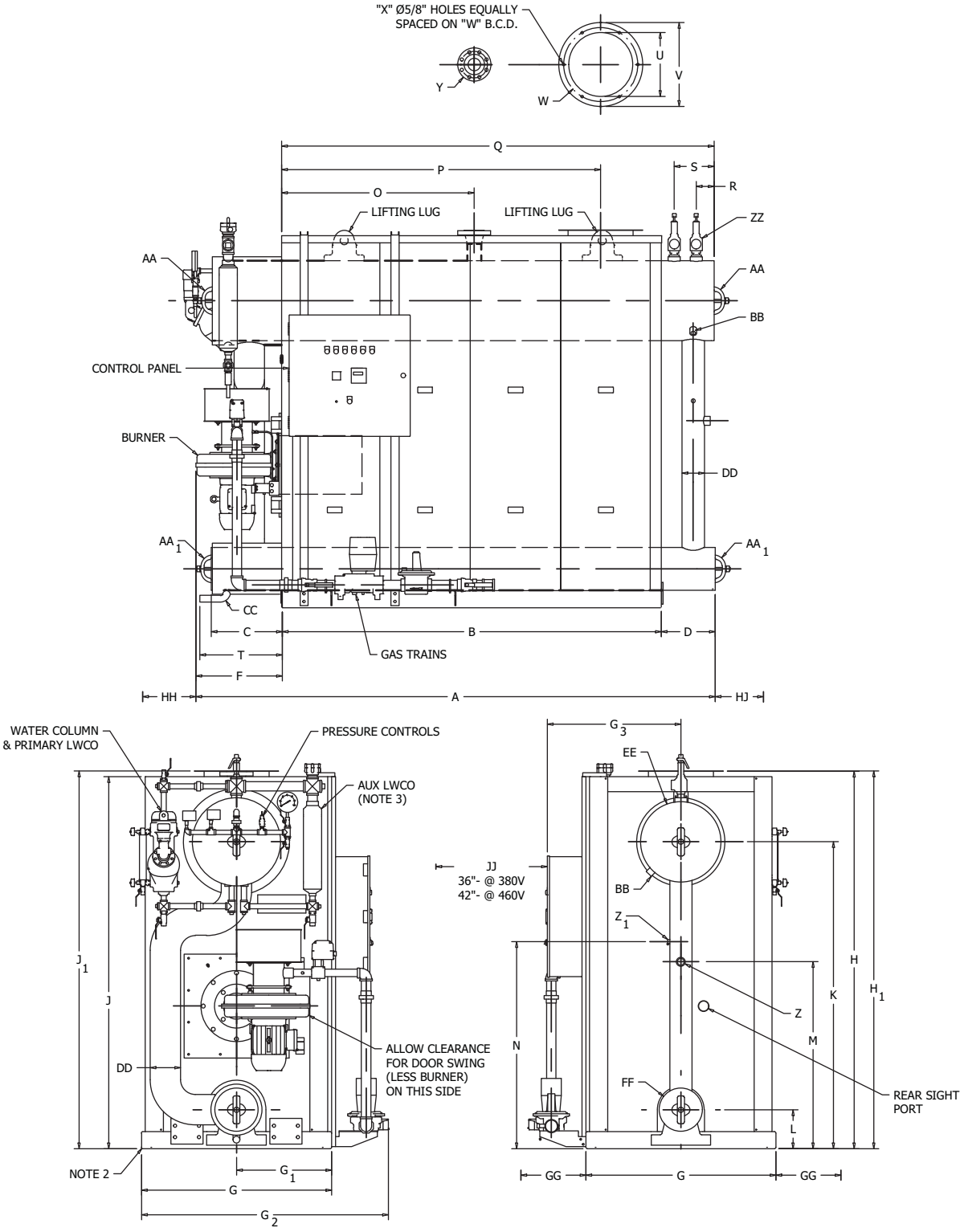


Figure 1. FLX$_{PM}$ Dimension Diagram Steam

Table 2. FLX_{PM} Dimensions Steam

		BOILER SIZE					
	Dimension	315	420	540	630	840	1050
LENGTHS Inches							
Overall	**A**	107	130	134	157	157	189
Boiler Base Frame	**B**	74	94	94	116	116	140
Front Extension Lower Drum	**C**	15	17	17	17	17	19
Rear Extension Lower Drum	**D**	13	13	13	15	15	23
Burner Extension	**F**	20	22	26	26	26	26
WIDTHS Inches							
Boiler Base Frame [See Note 1]	**G**	46	48	48	54	54	54
Centerline to Casing	**G_1**	23	24	24	27	27	27
Width to outside of Gas Train	**G_2**	58	60	60	66	66	66
Centerline to Control Panel Door	**G_3**	33	34	34	37	37	37
HEIGHTS Inches							
Base to Stack Flange	**H**	90	95	95	109	109	109
Base to Steam Nozzle	**H_1**	91	95	95	109	109	109
Base to Top of Casing	**J**	89	93	93	107	107	107
Base to Lifting Lug	**J_1**	90	95	95	109	109	109
Base to Upper Drum Centerline	**K**	73	77	77	89	89	89
Base to Lower Drum Centerline	**L**	9	10	10	12	12	12
Base to Feedwater Connection	**M**	43	47	47	59	59	59
Base to Chemical Feed	**N**	48	52	52	64	64	64
LOCATIONS Inches							
Front Casing to Steam Nozzle	**O**	37	47	47	58	58	58
Flue Outlet Centerline	**P**	61	80	80	100	100	124
Front Casing to Upper Drum Rear	**Q**	87	108	108	131	131	163
Safety Valves **15 PSIG Setpoint**	**R**	4	4	4	4	4	4
Safety Valves **15 PSIG Setpoint**	**S**	N/A	N/A	N/A	10-1/2	10-1/2	10-1/2
Safety Valves **150 PSIG Setpoint**	**R**	4	4	4	4	4	4
Safety Valves **150 PSIG Setpoint**	**S**	N/A	9-1/2	9-1/2	10-1/2	10-1/2	10-1/2
Bottom Drain/Blowdown	**T**	21	23	23	22	22	22
PIPING CONNECTIONS Inches							
Flue Gas ID	**U**	12	16	16	18	18	24
Flue Gas Outlet Flange	**V**	17	21	21	23	23	29
Flange Bolt Circle Diameter	**W**	14-1/2	18-1/2	18-1/2	20-1/2	20-1/2	26-1/2
Number of Bolt Holes	**X**	4	6	6	8	8	8
Steam Nozzle 15 PSIG Design Boiler	**Y**	6 flg.	6 flg.	6 flg.	8 flg.	8 flg.	10 flg.
Steam Nozzle 150 PSIG Design Boiler	**Y**	2½ mpt	3 flg.	3 flg.	4 flg.	4 flg.	6 flg.
Feedwater Makeup	**Z**	1¼	1¼	1¼	1½	1½	2
Chemical Feed	**Z_1**	½	½	½	½	½	½
Surface Blowff	**BB**	1	1	1	1	1	1
Bottom Drain/Blowdown 15 PSIG Design	**CC**	1½	2	2	2	2	2
Bottom Drain/Blowdown 150 PSIG Design	**CC**	1¼	1¼	1¼	1¼	1¼	1¼
Safety Valves, 15 psig [Note 3]	**ZZ**	1 @ 2½	1 @ 3	1 @ 3	2 @ 2½	2 @ 2½	2 @ 3
Safety Valves, 150 psig [Note 3]	**ZZ**	1 @ 1½	2 @ 1¼	2 @ 1¼	2 @ 1½	2 @ 1½	2 @ 2
GENERAL DATA							
Handhole Upper Drum	**AA**	4 x 6	4 x 6	4 x 6	4 x 6	4 x 6	4 x 6
Handhole Lower Drum	**AA_1**	4 x 5	4 x 5	4 x 5	4 x 5	4 x 5	4 x 5
Downcomer OD	**DD**	4	5	5	6	6	6
Upper Drum OD	**EE**	20	20	20	24	24	24
Lower Drum OD	**FF**	8-5/8	10-3/4	10-3/4	10-3/4	10-3/4	10-3/4
MINIMUM SERVICE CLEARANCES							
Tube removal each side	**GG**	32	34	34	40	40	40
Rear service area	**HJ**	24	24	24	24	24	24
Front service area	**HH**	24	22	26	29	36	44
Control Panel service area	**JJ**	42	42	42	42	42	42

Dimension letters E and I are not used.

NOTES:

1. Add 4 inches to each side of the base frame dimension to account for optional seismic anchor pads on each side.
2. For unit sizes below 840, the ALWCO [auxiliary low water cutoff] is a probe device in lieu of the column.
3. Connections shown are for valve outlet connection at the standard set point, do not reduce outlet pipe size.

Table 3. FLXPM Steam Ratings

Boiler SIZE	315	420	540	630	840	1050
Ratings [Note A]						
Steam Capacity (lbs. steam/hr from & at 212° F.)	2,588	3,450	4,313	5,175	6,900	8,625
Steam Capacity [kg/hr from and at 100 C]	1,174	1,565	1,956	2,348	3,130	3,913
Output Btu/hr	2,510,625	3,347,500	4,184,375	5,021,250	6,695,000	8,368,750
Output Kcal/Hr	632,700	843,600	1,054,500	1,265,400	1,687,200	2,109,000
Output kW	736	981	1,226	1,472	1,962	2,453
Output Boiler Horsepower	75	100	125	150	200	250
Approximate Fuel Consumption [Input - Note B]						
Natural Gas [ft^3/hr] - 15 PSI Steam	3,025	4,033	5,072	6,199	8,265	10,332
Natural Gas Therms/Hour - 15 PSI Steam	30.2	40.3	50.7	62.0	82.7	103.3
Natural Gas [m^3/hr] - 1.03 Bar	85.7	114.2	143.6	175.5	234.1	292.6
Natural Gas [ft^3/hr] - 150 PSI Steam	3,138	4,184	5,166	6,277	8,369	10,461
Natural Gas Therms/Hour - 150 PSI Steam	31.4	41.8	51.7	62.8	83.7	104.6
Natural Gas [m^3/hr] - 10.34 Bar	88.9	118.5	146.3	177.7	237.0	296.2
Propane Gas [ft^3/hr] - 15 PSI Steam	1,210	1,613	2,029	2,480	3,246	4,133
Propane Gas [ft^3/hr] - 150 PSI Steam	1,240	1,653	2,066	2,511	3,348	4,184
Propane Gas [m^3/hr] - 1.03 Bar	34.3	45.7	57.4	70.2	91.9	117.0
Propane Gas [m^3/hr] -10.34 Bar	35.1	46.8	58.5	71.1	94.8	118.5
Power Requirements - 20 PPM NOx Emissions						
Blower Motor HP	3	5	5	7.5	7.5	15
Blower Motor kW	2.238	3.73	3.73	5.595	5.595	11.19
Power Requirements - 9 PPM NOx Emissions						
Blower Motor HP	3	5	7.5	7.5	7.5	15
Blower Motor kW	2.238	3.73	5.595	5.595	5.595	11.19
Minimum Ampacity - Standard						
Blower Motor - 230/3/60	7.4	12.4	12.4	18.4	18.4	36
Blower Motor - 460/3/60	3.7	6.2	6.2	9.2	9.2	18
Blower Motor - 575/3/60	3.1	6	6	8.9	8.9	17.5
Control Circuit @115/1/60	1.9	1.9	1.9	1.9	1.9	1.9
Control Circuit @115/1/60	1.9	2.4	2.4	1.9	1.9	2.4
Weights						
Operating Weight, lbs.	7,200	9,200	9,200	12,500	12,500	14,100
Operating Weight, kg	3,266	4,173	4,173	5,670	5,670	6,396
Water Content Normal, gallons	121	157	157	277	277	289
Water Content Normal, liters	458	594	594	1,048	1,048	1,094
Water Content Flooded, gallons	215	293	293	464	464	562
Water Content Flooded, liters	814	1109	1,109	1,756	1,756	2,127
Shipping Weight, approximate lbs.	6,200	7,900	7,900	10,200	10,200	12000
Shipping Weight, approximate kg	2,812	3,583	3,583	4,627	4,627	5,443

Notes:

A. Steam ratings are for operating pressure of 10 psig and 125 psig with water at 180° F supply.

B. Input calculated with Nat. Gas @ 1000 Btu/ft^3, and Propane @ 2500 Btu/ft^3,

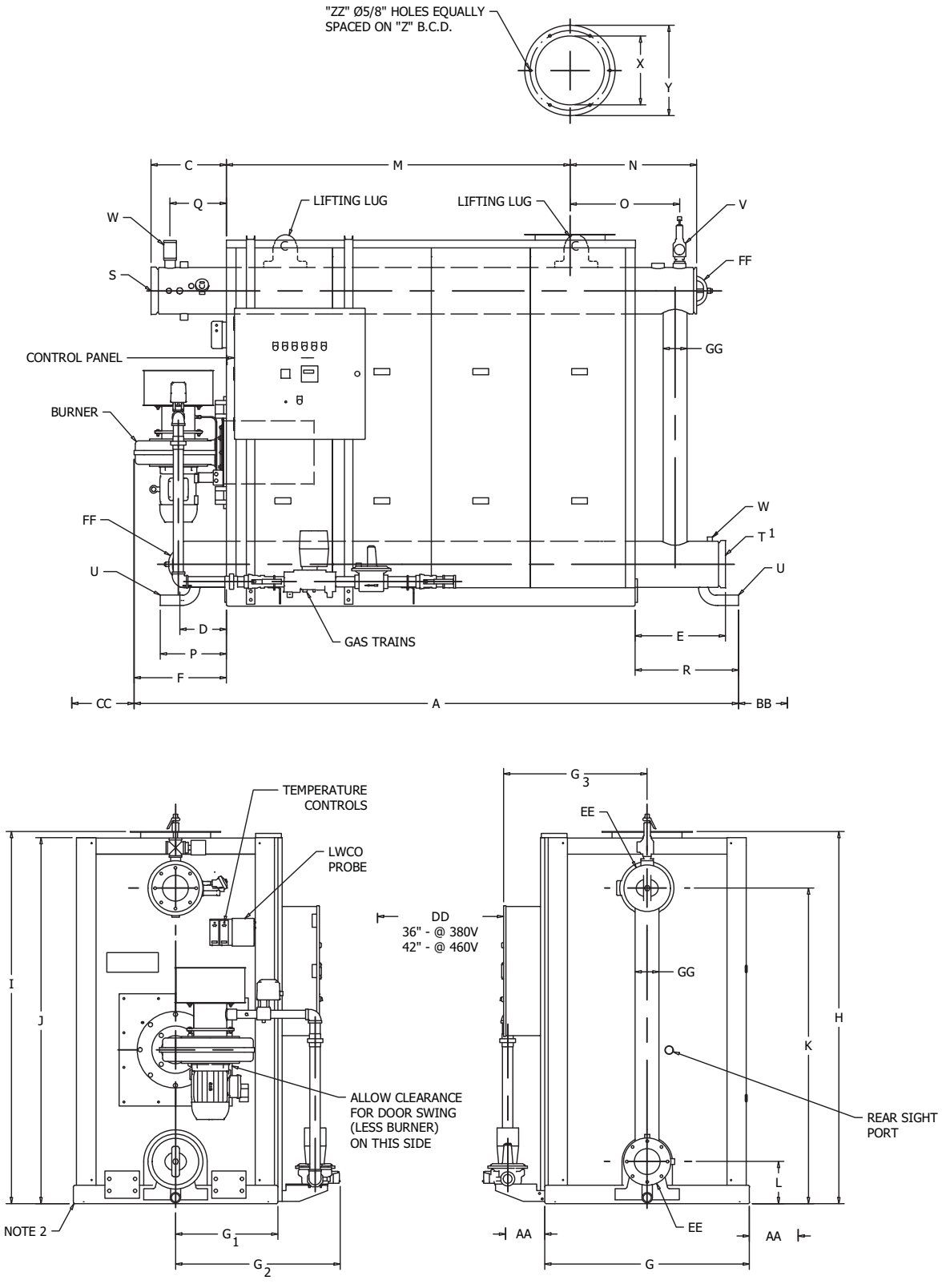


Figure 2. FLX$_{PM}$ Dimension Diagram Hot Water

Table 4. FLX_{PM} Dimensions Hot Water

		BOILER SIZE					
	Dimension	315	420	540	630	840	1050
LENGTHS Inches							
Overall Length of Boiler Package	**A**	113	137	144	163	163	195
Boiler Base Frame	**B**	74	95	95	116	116	140
Front Extension Upper Drum	**C**	17	17	17	17	17	17
Front Extension Lower Drum	**D**	11	11	11	11	11	12
Rear Extension Lower Drum	**E**	20	21	21	21	21	22
Burner Extension	**F**	20	22	26	26	26	26
WIDTHS Inches							
Boiler Base Frame [Note 1]	**G**	46	48	48	54	54	54
Centerline to Casing	**G_1**	23	24	24	27	27	27
Centerline to outside Gas Train	**G_2**	35	36	36	39	39	39
Centerline to Control Panel Door	**G_3**	33	34	34	37	37	37
HEIGHTS Inches							
Base to Stack Flange [overall]	**H**	82	86	86	95	95	95
Base to Lifting Lug	**I**	82	86	86	95	95	95
Base to Top of Casing	**J**	80	85	85	94	94	94
Base to Supply Nozzle	**K**	69	73	73	81	81	81
Base to Return Nozzle	**L**	9	10	10	10	10	12
LOCATIONS Inches							
Flue Outlet Centerline	**M**	62	81	81	102	102	122
Rear Extension Upper Drum	**N**	26	28	28	28	28	33
Safety Valves	**O**	22	24	24	24	24	29
Bottom Drain see Note 2	**P**	15	15	15	15	15	15
Boiler Air Vent	**Q**	13	13	13	13	13	7
Bottom Drain Rear see Note 2	**R**	N/A	24	24	24	24	19
PIPING CONNECTIONS Inches							
Supply Nozzle [Note 3]	**S**	4 FLG	6 FLG	6 FLG	6 FLG	6 FLG	8 FLG
Return Nozzle [Note 3]	**T**	4 FLG	6 FLG	6 FLG	6 FLG	6 FLG	8 FLG
Bottom Drain see Note 2	**U**	1½	2 @ 2	2 @ 2	2 @ 2	2 @ 2	2 @ 2
Safety Valves, 30 psig [Note 4]	**V**	2	2½	2½	2 @ 2½	2 @ 2½	2 @ 2½
Safety Valves, 60 psig [Note 4]	**V**	1½	2	2	2½	2½	2½
Safety Valves, 125 psig [Note 4]	**V**	1¼	1½	1½	1½	1½	1½
Safety Valves, 160 psig [Note 4]	**V**	¾	1¼	1¼	1½	1½	1½
Boiler Air Vent	**W**	1	1	1	1	1	1
Tapping for optional temp sensor.	**W_1**	1/2	1/2	1/2	1/2	1/2	1/2
Flue Gas ID	**X**	12	16	16	18	18	24
Flue Gas Outlet Flange	**Y**	17	21	21	23	23	29
Flange Bolt Circle Diameter	**Z**	14½	18½	18½	20½	20½	26½
Number of holes in bolt circle.	**ZZ**	4	6	6	8	8	8
MINIMUM SERVICE CLEARANCES							
Tube removal each side	**AA**	32	34	34	40	40	40
Rear service area	**BB**	24	24	24	24	24	24
Front service area - burner removal	**CC**	24	22	26	29	36	44
Control Panel service area	**DD**	42	42	42	42	42	42
PERIPHERAL DATA							
Upper/Lower Drum OD	**EE**	8-5/8"	10-3/4"	10-3/4"	10-3/4"	10-3/4"	10-3/4"
Handhole Inspection	**FF**	4"x 5"	4"x 5"	4" x 5"	4" x 5"	4" x 5"	4" x 5"
Rear Downcomer (NPS) Size	**GG**	4	5	5	5	5	5

NOTES:

1. Add 4" to each side of the base frame dimension to account for optional seismic anchor pads.

2. For Models 500 and greater, a second drain tapping is located at the rear of the lower drum.

3. Supply and return nozzle flanges are 150# Flat Face.

4. Standard safety valve setting is 160 psig and options for reduced settings are noted.

Table 5. FLXPM HW Ratings

Boiler SIZE	315	420	540	630	840	1050
Ratings						
Output Btu/hr	2,510,625	3,347,500	4,184,375	5,021,250	6,695,000	8,368,750
Output Kcal/Hr	632,700	843,600	1,054,500	1,265,400	1,687,200	2,109,000
Output kW	736	981	1,226	1,472	1,962	2,453
Output Boiler Horsepower	75	100	125	150	200	250
Approximate Fuel Consumption [Input - Note A]						
Natural Gas [ft^3/hr] - 180°F Supply Water	3,025	3,985	4,981	6,050	8,066	10,083
Natural Gas Therms/Hour - 180°F Supply Water	30.2	39.9	49.8	60.5	80.7	100.8
Natural Gas [m^3/hr] - 82°C Water Supply	8,565.4	11,284.6	14,105.8	17,130.8	22,841.1	28,551.4
Propane Gas [ft^3/hr] - 180°F Supply Water	1,210	1,594	1,993	2,420	3,227	4,033
Propane Gas [m^3/hr] - 82°C Water Supply	3426.2	4513.8	5642.3	6852.3	9136.4	11420.6
Power Requirements - 20 PPM NOx Emissions						
Blower Motor HP	3	5	5	7.5	7.5	15
Blower Motor kW	2.238	3.73	3.73	5.595	5.595	11.19
Power Requirements - 9 PPM NOx Emissions						
Blower Motor HP	3	5	7.5	7.5	7.5	15
Blower Motor kW	2.238	3.73	5.595	5.595	5.595	11.19
Minimum Ampacity - Standard						
Blower Motor - 230/3/60	7.4	12.4	12.4	18.4	18.4	36
Blower Motor - 460/3/60	3.7	6.2	6.2	9.2	9.2	18
Blower Motor - 575/3/60	3.1	6	6	8.9	8.9	17.5
Control Circuit @115/1/60	1.9	1.9	1.9	1.9	1.9	1.9
Weights						
Operating Weight, lbs.	5,900	7,600	7,600	10,500	10,500	12,300
Operating Weight, kg	2,676	3,447	3,447	4,763	4,763	5,579
Water Content Normal, gallons	108	180	180	240	240	276
Water Content Normal, liters	409	681	681	908	908	1,045
Water Content Flooded, gallons	108	180	180	240	240	276
Water Content Flooded, liters	409	681	681	908	908	1045
Shipping Weight, approximate lbs.	5,000	6,100	6,100	8,500	8,500	10,000
Shipping Weight, approximate kg	2,268	2,767	2,767	3,856	3,856	4,536

Notes:

A. Input calculated with Nat. Gas @ 1000 Btu/ft^3, and Propane @ 2500 Btu/ft^3,

PERFORMANCE DATA

Efficiency

Fuel-to-steam (fuel-to-water) efficiency is based on specific operating conditions (fuel, pressure, temperature). Contact your local Cleaver-Brooks representative for expected efficiencies.

ENGINEERING DATA

Hot Water Boiler Flow Rates

Table 6. Model FLX$_{PM}$ Flow Rates

MODEL NO.	SYSTEM TEMPERATURE DROP °F									
	10	20	30	40	50	60	70	80	90	100
FLX	MAXIMUM CIRCULATION RATE - GPM									
315	512	256	170	128	102	85	74	64	57	51
420	680	340	227	170	137	113	98	85	76	68
540	877	438	292	219	175	146	125	110	97	87
630	1022	511	341	256	204	170	146	128	113	103
840	1365	683	455	341	273	227	194	170	151	137
1050	1703	852	568	426	340	284	244	213	189	172

NOTE: To avoid fireside condensation, return water temperature must be >140ºF.

System Operating Parameters (Hot Water)

System over pressure requirements are shown below.

Table 7. Minimum Over Pressure Requirements

MAXIMUM OUTLET TEMPERATURE (°F)	MINIMUM SYSTEM PRESSURE (PSIG)
180	12
190	15
200	18
210	21
220	24
230	27
240	30

Minimum return water temperature is 140 °F; minimum supply (boiler outlet) water temperature is 150 °F in order to prevent fireside corrosion.

System Operating Parameters (Steam Boilers)

The following operating limitations must be observed for optimum operation of the boiler:

- Minimum make-up temperature 60 °F.
- Maximum make-up rate (for on/off make-up control) 2.0 times the evaporation rate.

- Minimum operating pressure 6 psig. on low pressure steam.
- Maximum operating pressure 12 psig. on low pressure steam.

Maximum load tracking rate 0 - 100% load or 100% - 0 load, 30 seconds on low pressure steam and 20% per minute on high pressure steam.

Maximum boiler water chemistry parameters: Silica: 150 ppm; specific conductance: 3500 μmho/cm un-neutralized; total alkalinity: 300 ppm as CaCO3; hardness: 0; oxygen: 7 ppb; pH: 7 - 10; total iron: 0.05 ppm; oil matter: 1 ppm.

Boiler Heat Release

Table 8. Model FLXPM Furnace Heat Release Information

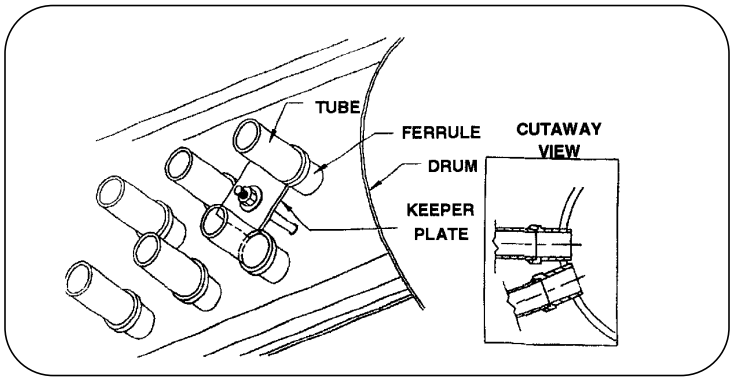
MODEL NO.	FURNACE PROJECTED AREA (FT^2)	FURNACE VOLUME (FT^3)	FURNACE HEAT RELEASE (BTU/HR FT^2)	FURNACE HEAT RELEASE (BTU/HR FT^2)
FLX-315	48.7	34.9	90,258	64,682
FLX-420	70.6	54.7	76,782	59,490
FLX-540	70.6	54.7	98,720	76,487
FLX-630	104.6	94.6	66,596	60,229
FLX-840	104.6	94.6	88,795	80,306
FLX-1050	128.9	116.5	90,129	81,458

Tube Attachment

Construction of the Flexible Watertube Boiler includes a special tube-to-drum attachment that requires no welding or rolling (see Figure 3). The tube is fitted with a tapered ferrule, which is press-fit into the tube hole in the drum. The ferrule is welded to the tube at the factory for both new and replacement tubes, so no field welding is required. The tube is held in place with a keeper plate.

This tube attachment design reduces repair and maintenance costs, and also reduces the cost of field erection of new units.

Figure 3. Model FLXPM Tube Attachment



Minimum Required Gas Pressures

Approximate gas pressure required at rated input is shown below. For oversized gas trains or altitudes above 1,000 feet, contact your local Cleaver-Brooks authorized representative.

FLX Model	Manifold Pressure (in. WC)		
	20ppm	9ppm	Propane
315	4.2	4.1	4.5
420	5.0	5.0	8.0
540	4.0	9.7	3.0
630	10.4	4.0	13.3
840	9.9	10.1	14.4
1050	5.9	8.2	14.8

Fuel Connections - Gas

The local gas company should be consulted for requirements and authorization for installation and inspection of gas supply piping. Installation of gas supply piping and venting must be in accordance with all applicable engineering guidelines and regulatory codes. All connections made to the boiler should be arranged so that all components remain accessible for inspection, cleaning and maintenance.

A drip leg should be installed in the supply piping before the connection to the gas pressure regulator. The drip leg should be at least as large as the inlet fitting supplied with the boiler. Consideration must be given to both volume and pressure requirements when choosing gas supply piping size. Refer to the boiler dimension diagram provided by Cleaver-Brooks for the particular installation. Connections to the burner gas train should be made with a union, so that gas train components or the burner may be easily disconnected for inspection or service. Upon completion of the gas piping installation, the system should be checked for gas leakage and tight shutoff of all valves.

Boiler Room Information

The boiler must be installed on a non-combustible floor. If the floor is not level, piers, or a raised pad, slightly larger in length and width than the boiler base dimensions, will make boiler installations and leveling easier. Installation on a raised pad or piers will make boiler drain connections more accessible. The floor, pad, or piers must be of sufficient load bearing strength to safely support the operating weight of the boiler and any additional equipment installed with it. Approximate operating weights for Model FLX series steam and hot water boilers are shown in Dimensions and Ratings.

After the boiler is in place it must be leveled. Both side-to-side and front-to-back level can be verified using the vertical connection between the upper and lower drums at the back of the boiler. If shims are required to level the boiler, the weight of the boiler must be evenly distributed at all points of support.

The boiler must be installed so that all components remain accessible for inspection, cleaning, or maintenance. Field- installed piping and electrical connections to the burner and boiler must be arranged to allow removal of the casing panels, and swinging of the burner.

Maintain minimum clearances to walls or other obstructions and combustible materials as directed. See illustration below for clearances.

A positive means of supplying a volume of outside air for complete fuel combustion is required. Proper ventilation of the boiler room must be provided. The amount of air required, and the required duct and air supply opening areas, are determined by the maximum fuel input rating of the burner and the altitude of the installation. Air inlets must be sized in accordance with applicable engineering guidelines and regulatory code.

Outdoor Reset Control

Cleaver-Brooks does not recommend the use of outdoor controls which reset the boiler water outlet temperature below 150 °F, or the utilization of the boiler as a system thermostat.

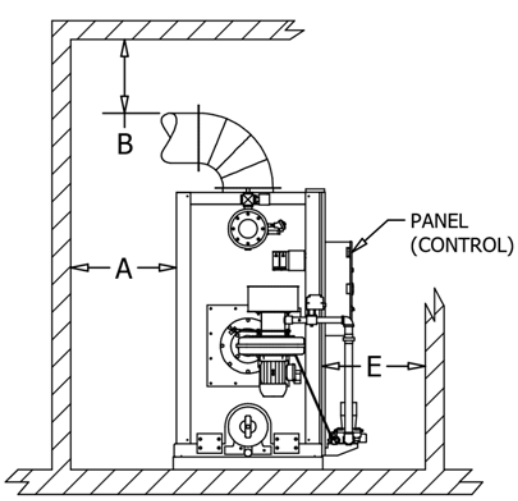
Breechings

For single boiler installations, use breeching of the same diameter as the vent outlet on the boiler. For multiple boiler installations, and when a number of boilers of the same size (input) are to be connected to a common breeching, sections should be sized appropriately to accommodate the total flue gas volume.

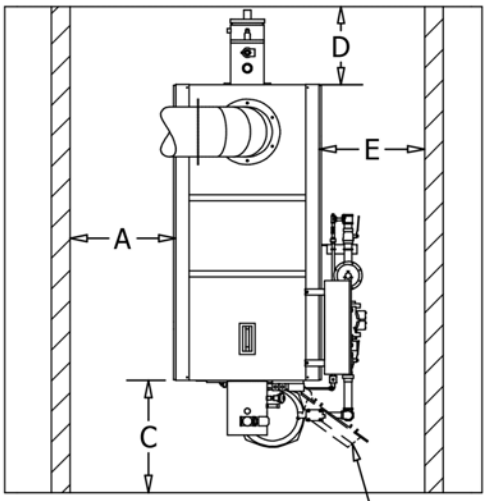
Stack Support Capabilities

Flextube boilers can support up to 200 lbs without additional support.

Clearance Requirements



FRONT VIEW



TOP VIEW

FRONT DOOR
(LESS BURNER)
SWUNG OPEN

MODEL NO.	SIDE W/O PANEL A	TOP B	FRONT C	REAR D	SIDE W/ PANEL E
FLX-350	32	18	48	24	53
FLX-500	34	18	48	24	53
FLX-600	34	18	60	24	53
FLX-800	40	18	60	24	53
FLX-900	40	18	60	24	53
FLX-1100	40	18	60	24	53

NOTE: Top Dimension From Boiler to Top of Stack Based on Stack Selection

Figure 4. Model FLX$_{PM}$ Clearances

e-mail: info@cleaverbrooks.com
Web Address: http://www.cleaverbrooks.com