

Model 4WG 100-800 HP Steam and Hot Water



Table Of Contents Model 4WG

FEATURES AND BENEFITS	A3-3
Four-Pass Wetback Design:	A3-3
Hinged Burner, Front and Rear Doors:	A3-3
Natural Gas, No. 2 Oil, or Combination Burners Available:	A3-3
PRODUCT OFFERING	A3-3
DIMENSIONS AND RATINGS	A3-4
PERFORMANCE DATA	A3-14
ENGINEERING DATA	A3-15
Burner/Control Information	A3-15
Boiler Room Information	A3-17
Stack Support Capabilities	A3-17
Boiler Room Combustion Air	A3-17
Stack/Breeching Size Criteria	A3-18
Sample Specifications - Steam	A3-25
Sample Specifications - Hot Water	A3-37

List of Figures

4WG Dimensions - Steam A3-5
 4WG Dimensions - Hot Water A3-7
 4WG Low NOx Steam 100-800 HP A3-9
 4WG Low NOX Hot Water 100-800 HP A3-11
 Space Required to Open Rear Head on Model 4WG A3-13
 Model 4WG Lift Lug Locations A3-13
 Model 4WG Mounting Piers A3-14
 Typical Fuel Oil Supply Arrangement A3-23
 Boiler Room Length (Typical Layouts) A3-24
 Boiler Room Width (Typical Layout) A3-24

List of Tables

4WG Ratings Steam A3-5
 4WG Dimensions - Steam A3-6
 4WG Ratings - Hot Water A3-7
 4WG Dimensions - Hot Water A3-8
 4WG Low NOx Ratings Steam A3-9
 4WH Low NOx Dimensions Steam A3-10
 4WH Ratings Hot Water A3-11
 4WG Low NOx Dimensions Hot Water A3-12
 4WG Blowdown Tank Sizing Information A3-18
 4WG Boilers: Predicted Sound Levels (30 ppm NOx systems) @ High Fire A3-18
 Steam Volume and Disengaging Areas A3-19
 Model 4WG Steam Boiler Safety Valve Outlet Size A3-19
 Model 4WG Hot Water Relief Valve Outlet Size A3-20
 4WG Recommended Steam Nozzle Size A3-20
 4WG Recommended Non-Return Valve Size A3-21
 Altitude Correction for Gas A3-21
 Model 4WG, Standard and Low NOx, Mini. Req. Gas Pressure Standard, FM and IRI Gas Trains . . A3-22

FEATURES AND BENEFITS

The Cleaver-Brooks Model 4WG Boiler provides an integrated boiler burner package with optimized pressure vessel and furnace working in conjunction with a matching Profire gun burner. Additionally, the boiler/burner package is fully UL and cUL approved and available from 100 - 800 hp. The following features apply:

Four-Pass Wetback Design:

- Four-pass design provides high flue gas velocities and low stack temperatures to maximize efficiency.
- Five square feet of heating surface per boiler horsepower (except for the 750 and 800 hp unless otherwise specified) provides guaranteed efficiency performance and long boiler life.

Hinged Burner, Front and Rear Doors:

- Hinged burner assembly provides ease of access to the furnace.
- Large rear access plug for turnaround and furnace access.
- Rear door completely covers and insulates rear tube sheet.

Natural Gas, No. 2 Oil, or Combination Burners Available:

- Combination gas/oil burners provide quick fuel changeover without burner adjustment.

PRODUCT OFFERING

Cleaver-Brooks Model 4WG Boilers are available in low pressure steam, high pressure steam, and hot water designs. Burners are available to fire natural gas, No. 2 oil, or a combination of oil and gas.

Standard product offering is:

- 100 - 800 hp.
- 30 and 125 psig hot water.
- 15 - 250 psig steam.
- Full modulation, all sizes.

Available options include the following (contact your local Cleaver-Brooks authorized representative for option details).

Boiler Options:

- Low NOx emission levels from 75, 30, 15 - <9PPM when burning natural gas and 70 PPM on # 2 oil when the fuel bound nitrogen is at 0.02% or less.
- Drain valves.
- Additional screwed or flanged trappings.
- Blowdown valves.
- Non-return valves.
- Feedwater valves and regulators.
- Surface blowdown systems.
- Blend pump.
- Surge load baffles.
- Seismic design.

Burner/Control Options:

- Flame safeguard controllers.
- Lead/lag system.
- High altitude design.
- Special insurance and code requirements (e.g., IRI, FM, CSD-1).
- Alarm bell/silence switch.
- Special motor requirements (TEFC, high efficiency).
- Special indicating lights.
- Main disconnect.
- Elapsed time meter.
- Voltmeter/micro-ammeter.
- NEMA enclosures.
- Low-fire hold control.
- Remote emergency shut-off (115V).
- Circuit breakers.
- Day/night controls.
- Special power requirements.
- Stack thermometer.

Fuel Options:

- Air atomizing oil burner, 125 - 200 hp.
- Gas strainer.
- Gas pressure gauge.
- Future gas conversion.
- Oversized/undersized gas trains.

DIMENSIONS AND RATINGS

Dimensions and ratings for the Model 4WG Boilers are shown in the following tables and illustrations. The information is subject to change without notice.

- Table A3-1 Model 4WG Steam Boiler Ratings
- Table A3-3 Model 4WG Hot Water Boiler Ratings
- Figure A3-1 Model 4WG Steam Boiler Dimensions
- Figure A3-2 Model 4WG Hot Water Boiler Dimensions
- Figure A3-5 Model 4WG Boiler Space Requirements to Open Rear Door
- Figure A3-6 Lifting Lug Location, Model 4WG Boilers
- Figure A3-7 Model 4WG Boiler Mounting Piers

Table A3-1. 4WG Ratings - Steam

BOILER H.P.	100	125	150	200	250	300	350	400	500	600	700	800
BURNER MODEL	FP-3	FP-3	FP-3	FP-4	FP-4	FP-4	D145P	D175P	D210P	D252P	D300P	D378P
RATINGS - SEA LEVEL TO 700 FT.												
Rated Capacity (lbs-steam/hr from and at 212 OF)	3450	4313	5175	6900	8625	10350	12075	13800	17250	20700	24150	27600
Btu Output (1000 Btu/hr)	3348	4184	5021	6695	8369	10043	11716	13390	16738	20085	23433	26780
APPROXIMATE FUEL CONSUMPTION AT RATED CAPACITY BASED ON NOMINAL 82% EFFICIENCY												
Light Oil gph (140,000 Btu/gal)	29.2	36.4	43.7	58.3	72.9	87.5	102.1	116.6	145.8	175.0	204.1	233.3
Gas CFH (1000 Btu)	4082	5103	6123	8165	10206	12247	14288	16329	20412	24494	28576	32659
Gas (Therm/hr)	40.8	51.0	61.2	81.6	102.1	122.5	142.9	163.3	204.1	244.9	285.8	326.6
POWER REQUIREMENTS - SEA LEVEL TO 700 FT. (60 HZ)												
Blower Motor hp	2	3	5	5	5	7-1/2	15	20	25	30	40	75
Circulating Oil Pump Motor hp (Oil only)	1/3*	1/3*	3/4*	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1
Oil Metering Pump Motor hp (Oil only)	-	-	-	-	-	-	-	1/2	3/4	3/4	3/4	1
Integral Oil/Air Motor hp (Oil only)	-	-	-	-	-	-	2	-	-	-	-	-
Air Compressor Motor hp (Oil only)	**	**	**	3	3	3	-	5	5	7-1/2	7-1/2	15
BOILER DATA												
Heating Surface sq.-ft. (Fireside)	500	625	750	1000	1250	1500	1750	2000	2500	3000	3500	See Note "B"

* Base rail mounted oil pump will be 3-phase voltage.

** No air compressor required (pressure atomized).

NOTES:

A. All fractional hp motors will be single phase voltage except oil metering pump motor(3-phase); integral hp motors will be 3-phase voltage.

B. 800 hp boilers are available w/ 3500 or 4000 sq. ft. of heating surface

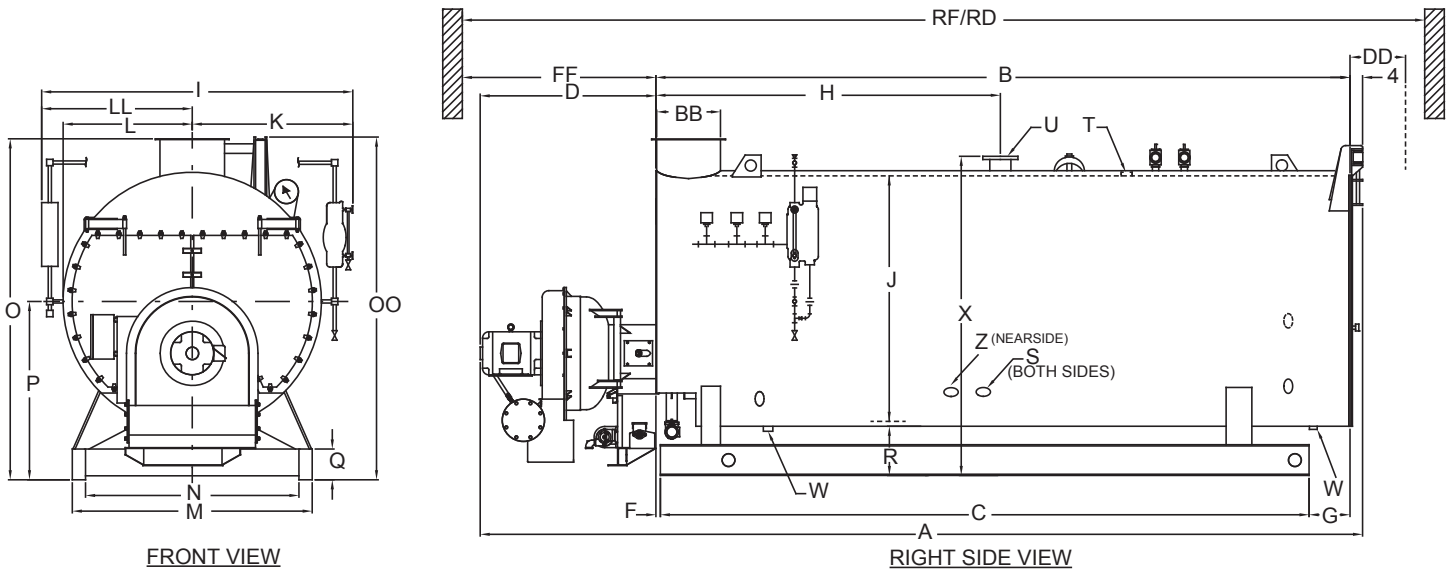


Figure A3-1. 4WG - Steam 100-800 HP

Table A3-2. 4WG Dimensions - Steam

BOILER H.P.	DIM	100	125	150	200	250	300	350	400	500	600	700	800	*800 See Note "C"
LENGTHS														
Overall Length	A	174	198	186	227.5	220.3	244.3	245.3	263.3	276.8	311.8	296.5	304	331
Shell	B	131	155	143	177	172.5	196.5	189.8	207.8	213.8	248.8	232.8	232.8	259.8
Base Frame	C	110	124	122	156	150.12	174.13	167.25	185.25	188.25	223.75	207.25	207.25	234.75
Burner Extension	D	39	39	39	46.5	43.75	43.75	51.5	51.5	59	59	59.75	67.25	67.25
Smokebox to Base	F	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Rear Ring Flange to Base	G	20.5	20.5	20.5	20.5	22	22	22	22	25	25	25	25	25
Smokebox to Steam Nozzle	H	50.88	74.88	63.88	97.88	86.25	110.3	95.63	113.6	106	141	115.6	115.6	142.6
WIDTHS														
Overall Width	I	85	85	92	92	103	103	110	110	123	123	133	133	133
I.D. Boiler	J	60	60	67	67	78	78	85	85	96	96	106	106	106
Center to Water Column	K	45	45	48.5	48.5	54	54	57.5	57.5	64	64	69	69	69
Center to Lagging	L	33	33	36.75	36.75	42	42	45.5	45.5	51	51	56	56	56
Center to Auxiliary LWCO	LL	40	40	43.5	43.5	49	49	52.5	52.5	59	59	64	64	64
Base Outside	M	52.5	52.5	51	51	64	64	60	60	71.88	71.88	74.75	74.75	74.75
Base Inside	N	44.5	44.5	43	43	56	56	47	47	58.88	58.88	61.75	61.75	61.75
HEIGHTS														
Base to Rear Davit	OO	86.12	86.12	92.75	92.75	98.88	98.88	112.8	112.8	125.1	125.1	134.3	134.3	134.3
Base to Vent Outlet	O	87	87	92.63	92.63	106	106	115	115	126	126	135.6	135.6	135.6
Base to Boiler Centerline	P	46	46	50	50	56	56	61	61	67	67	71	71	71
Height of Base Frame	Q	12	12	12	12	12	12	12	12	12	12	12	12	12
Base to Bottom of Boiler	R	15.63	15.63	16.13	16.13	16.5	16.5	18	18	18.5	18.5	17.5	17.5	17.5
Base to Steam Outlet	X	82.38	82.38	89.88	89.88	101.5	101.5	110	110	121.5	121.5	130.5	130.5	130.5
BOILER CONNECTIONS														
Feedwater Inlet (Both Sides)	S	1.25	1.5	1.5	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Surface Blowoff (150 lb only)	T	1	1	1	1	1	1	1	1	1	1	1	1	1
Steam Nozzle 15 lb (See Note "A")	U	8	8	8	10	12	12	12	12	12	12	12	12	12
Steam Nozzle 150 lb (See Note "B")	U	4	4	4	4	6	6	6	6	8	8	8	8	8
Blowdown-Front & Rear (15 lb)	W	1.5	1.5	1.5	2	2	2	2	2	2	2	2	2	2
Blowdown-Front & Rear (150 lb)	W	1.25	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2
Chemical Feed	Z	1	1	1	1	1	1	1	1	1	1	1	1	1
VENT STACK														
Vent Stack Diameter (Flanged)	BB	16	16	16	16	20	20	24	24	24	24	24	24	24
MINIMUM CLEARANCES														
Rear Door Swing	DD	36	36	40	40	46	46	50	50	55	55	60	60	60
Tube Removal - Front Only	FF	96	120	108	142	132.5	156.5	148	166	169	204	188	188	215
MINIMUM BOILER ROOM LENGTH ALLOWING FOR DOOR SWING AND TUBE REMOVAL FROM:														
Thru Window or Door	RD	234	258	261	295	307.5	331.5	337	355	377	412	411	411	438
Front of Boiler	RF	263	311	291	359	351	399	388	424	438	508	481	481	535
WEIGHTS IN LBS														
Normal Water Weight	-	5,870	7,310	7,625	9,995	12,590	14,850	16,025	17,950	21,050	25,350	28,700	28,700	32,770
Approx. Shipping Weight - (15 psig)	-	10,860	12,080	13,090	15,260	19,110	21,050	24,760	27,640	33,295	38,150	42,320	42,320	46,300
Approx. Shipping Weight - (150 psig)	-	11,320	12,920	13,980	16,620	21,620	23,970	26,850	29,650	36,190	39,560	46,290	46,290	50,830

NOTES:

Accompanying dimensions, while sufficiently accurate for layout purposes, must be confirmed for construction by certified dimension diagram/drawing. All Connections are Threaded Unless Otherwise Indicated:

NOTE "A": ANSI 150 psig Flange

NOTE "B": ANSI 300 psig Flange

NOTE "C": *800 hp w/ 4000 sq. ft. of heating surface



Table A3-3. 4WG Ratings - Hot Water

BOILER H.P.	100	125	150	200	250	300	350	400	500	600	700	800
BURNER MODEL	FP-3	FP-3	FP-3	FP-4	FP-4	FP-4	D145P	D175P	D210P	D252P	D300P	D378P
RATINGS - SEA LEVEL TO 700 FT.												
Btu Output (1000 Btu/hr)	3348	4184	5021	6695	8369	10043	11716	13390	16738	20085	23433	26780
APPROXIMATE FUEL CONSUMPTION AT RATED CAPACITY BASED ON NOMINAL 82% EFFICIENCY												
Light Oil gph (140,000 Btu/gal)	29.2	36.4	43.7	58.3	72.9	87.5	102.1	116.6	145.8	175.0	204.1	233.3
Gas CFH (1000 Btu)	4082	5103	6123	8165	10206	12247	14288	16329	20412	24494	28576	32659
Gas (Therm/hr)	40.8	51.0	61.2	81.6	102.1	122.5	142.9	163.3	204.1	244.9	285.8	326.6
POWER REQUIREMENTS - SEA LEVEL TO 700 FT. (60 HZ)												
Blower Motor hp	2	3	5	5	5	7-1/2	15	20	25	30	40	75
Circulating Oil Pump Motor hp (Oil only)	1/3*	1/3*	3/4*	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1
Oil Metering Pump Motor hp (Oil only)	-	-	-	-	-	-	-	1/2	3/4	3/4	3/4	1
Integral Oil/Air Motor hp (Oil only)	-	-	-	-	-	-	2	-	-	-	-	-
Air Compressor Motor hp (Oil only)	**	**	**	3	3	3	-	5	5	7-1/2	7-1/2	15
BOILER DATA												
Heating Surface sq-ft. (Fire-side)	500	625	750	1000	1250	1500	1750	2000	2500	3000	3500	See Note "B"

* Base rail mounted oil pump will be 3-phase voltage.

** No air compressor required (pressure atomized)

NOTES:

A. All fractional hp motors will be single phase voltage except oil metering pump motor(3-phase); integral hp motors will be 3-phase voltage.

B. 800 hp boilers are available w/ 3500 or 4000 sq. ft. of heating surface

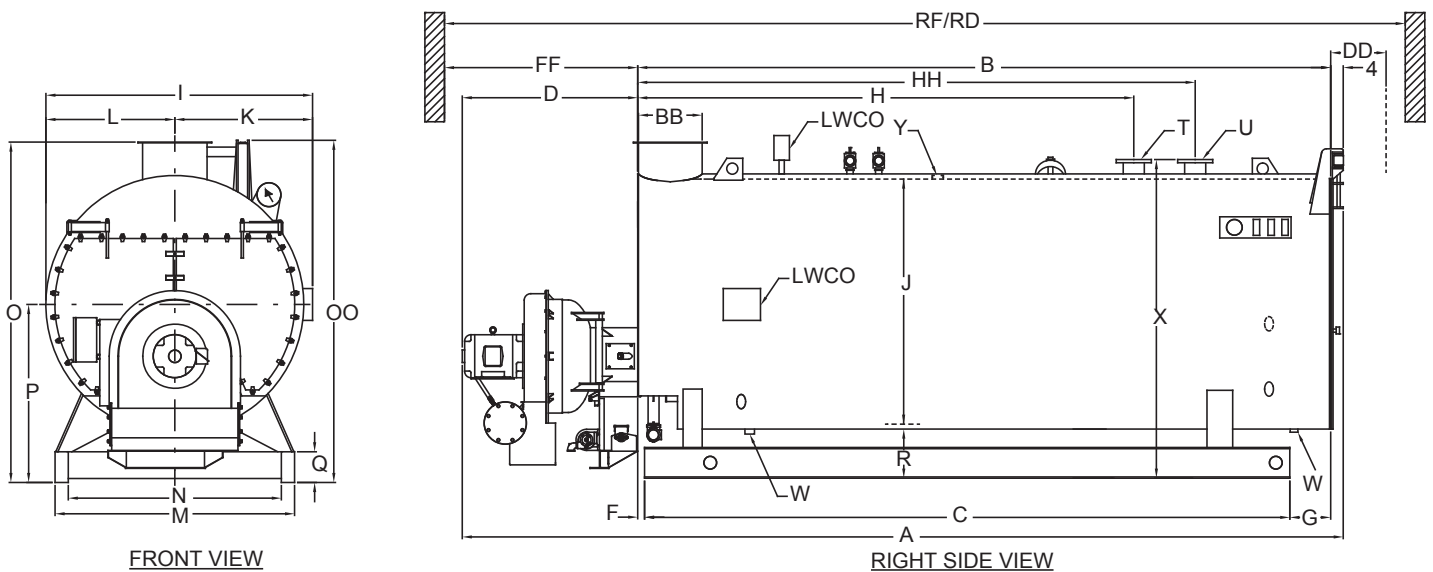


Figure A3-2. 4WG - Hot Water 100-800 HP

Table A3-4. 4WG Dimensions - Hot Water

BOILER H.P.	DIM	100	125	150	200	250	300	350	400	500	600	700	800	*800 See Note "C"
LENGTHS														
Overall Length	A	174	198	186	227.5	220.25	244.25	245.25	263.25	276.75	311.75	296.5	304	331
Shell	B	131	155	143	177	172.5	196.5	189.75	207.75	213.75	248.75	232.75	232.75	259.75
Base Frame	C	110	124	122	156	150.125	174.125	167.25	185.25	188.25	223.25	207.25	207.25	234.25
Burner Extension	D	39	39	39	46.5	43.75	43.75	51.5	51.5	59	59	59.75	67.25	67.25
Smokebox to Base	F	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Rear Ring Flange to Base	G	20.5	20.5	20.5	20.5	22	22	22	22	25	25	25	25	25
Smokebox to Return	H	78	99	87	121	113.5	137.5	130.75	148.75	143	151.75	146.25	146.75	173.75
Smokebox to Outlet	HH	103	124	112	146	139.5	163.5	156.75	174.75	179	187.75	182.25	182.75	209.75
WIDTHS														
Overall Width	I	70	70	77.5	77.5	88	88	95	95	106	106	116	116	116
I.D. Boiler	J	60	60	67	67	78	78	85	85	96	96	106	106	106
Center to LWCO Controller	K	37	37	40.75	40.75	46	46	49.5	49.5	55	55	60	60	60
Center to Lagging	L	33	33	36.75	36.75	42	42	45.5	45.5	51	51	56	56	56
Base Outside	M	52.5	52.5	51	51	64	64	60	60	71.88	71.88	74.75	74.75	74.75
Base Inside	N	44.5	44.5	43	43	56	56	47	47	58.88	58.88	61.75	61.75	61.75
HEIGHTS														
Base to Rear Davit	OO	86.12	86.12	92.75	92.75	98.88	98.88	112.75	112.75	125.12	125.12	134.25	134.25	134.25
Base to Vent Outlet	O	87	87	92.63	92.63	106	106	115	115	126	126	135.63	135.63	135.63
Base to Boiler Centerline	P	46	46	50	50	56	56	61	61	67	67	71	71	71
Height of Base Frame	Q	12	12	12	12	12	12	12	12	12	12	12	12	12
Base to Bottom of Boiler	R	15.63	15.63	16.13	16.13	16.5	16.5	18	18	18.5	18.5	17.5	17.5	17.5
Base to Return & Outlet	X	82.38	82.38	89.88	89.88	101.5	101.5	110	110	121.5	121.5	130.5	130.5	130.5
BOILER CONNECTIONS														
Water Return (See Note "A")	T	4	6	6	6	8	8	8	10	10	12	12	12	12
Water Outlet (See Notes "A & B")	U	4	6	6	6	8	8	8	10	10	12	12	12	12
Drain-Front & Rear	W	1.5	1.5	1.5	2	2	2	2	2	2	2	2	2	2
Air Vent	Y	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2
VENT STACK														
Vent Stack Diameter (Flanged)	BB	16	16	16	16	20	20	24	24	24	24	24	24	24
MINIMUM CLEARANCES														
Rear Door Swing	DD	36	36	40	40	46	46	50	50	55	55	60	60	60
Tube Removal - Front Only	FF	96	120	108	142	132.5	156.5	148	166	169	204	188	188	215
MINIMUM BOILER ROOM LENGTH ALLOWING FOR DOOR SWING AND TUBE REMOVAL FROM:														
Thru Window or Door	RD	234	258	261	295	307.5	331.5	337	355	377	412	411	411	438
Front of Boiler	RF	263	311	291	359	351	399	388	424	438	508	481	481	535
WEIGHTS IN LBS														
Normal Water Weight	-	6,890	8,580	8,870	11,600	14,760	17,380	19,220	21,520	26,260	31,580	35,900	35,900	40,930
Approx. Shipping Weight - (30 psig)	-	10,860	12,080	13,090	15,260	19,110	21,050	24,760	27,640	33,295	38,150	42,320	42,320	46,300
Approx. Shipping Weight - (125 psig)	-	11,600	12,980	14,040	16,680	20,670	23,140	26,930	30,060	35,390	40,550	45,430	45,430	49,750

NOTES:
 Accompanying dimensions, while sufficiently accurate for layout purposes, must be confirmed for construction by certified dimension diagram/drawing. All Connections are Threaded Unless Otherwise Indicated.
 NOTE "A": ANSI 150 psig Flange
 NOTE "B": Water Outlet includes 2" Dip Tube
 NOTE "C": *800 hp w/ 4000 sq. ft. of heating surface



Table A3-5. 4WG Low NOx Ratings - Steam

BOILER H.P.	100	125	150	200	250	300	350	400	500	600	700	800
BURNER MODEL	LND42S	LND54P	LND74P	LND84P	LND105S	LND125P	LND145P	LND175P	LND210P	LND252P	LND336P	LND378P
RATINGS - SEA LEVEL TO 700 FT.												
Rated Capacity (lbs-steam/hr from and at 212 OF)	3450	4313	5175	6900	8625	10350	12075	13800	17250	20700	24150	27600
Btu Output (1000 Btu/hr)	3348	4184	5021	6695	8369	10043	11716	13390	16738	20085	23433	26780
APPROXIMATE FUEL CONSUMPTION AT RATED CAPACITY BASED ON NOMINAL 82% EFFICIENCY												
Light Oil gph (140,000 Btu/gal)	29.2	36.4	43.7	58.3	72.9	87.5	102.1	116.6	145.8	175.0	204.1	233.3
Gas CFH (1000 Btu)	4082	5103	6123	8165	10206	12247	14288	16329	20412	24494	28576	32659
Gas (Therm/hr)	40.8	51.0	61.2	81.6	102.1	122.5	142.9	163.3	204.1	244.9	285.8	326.6
POWER REQUIREMENTS - SEA LEVEL TO 700 FT. (60 HZ)												
Blower Motor hp	5	5	7-1/2	10	15	15	20	25	30	40	75	75
Circulating Oil Pump Motor hp (Oil only)	1/2	1/2	1/2	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1
Oil Metering Pump Motor hp (Oil only)	-	-	-	-	-	-	1/2	1/2	3/4	3/4	1	1
Integral Oil/Air Motor hp (Oil only)	1	1	1	1	2	2	-	-	-	-	-	-
Air Compressor Motor hp (Oil only)	-	-	-	-	-	-	5	5	5	7-1/2	15	15
BOILER DATA												
Heating Surface sq-ft. (Fireside)	500	625	750	1000	1250	1500	1750	2000	2500	3000	3500	See Note "B"

- NOTES:
- A. All fractional hp motors will be single phase voltage except oil metering pump motor(3-phase); integral hp motors will be 3-phase voltage.
 - B. 800 hp boilers are available w/ 3500 or 4000 sq. ft. of heating surface

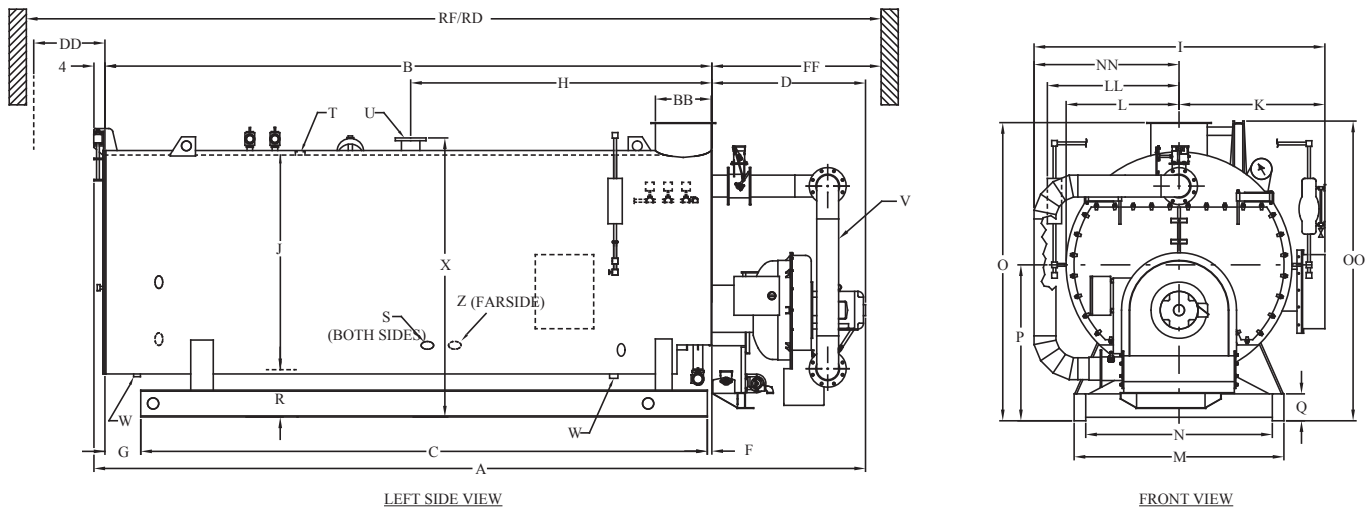


Figure A3-3. 4WG Low NOx - Steam 100-800 HP

Table A3-6. 4WG Low NOx Dimensions - Steam

BOILER H.P.	DIM	100	125	150	200	250	300	350	400	500	600	700/800	*800 See Note "C"
LENGTHS													
Overall Length	A	176	200	189.6	223.6	229.6	253.6	250	270.6	276.6	311.6	304	331
Shell	B	131	155	143	177	172.5	196.5	189.8	207.8	213.8	248.8	232.8	259.8
Base Frame	C	110	124	122	156	150.13	174.13	167.25	185.25	188.25	223.25	207.25	234.25
Burner Extension	D	41	41	42.62	42.62	53.12	53.12	56.25	58.88	58.88	58.88	67.25	67.25
Smokebox to Base	F	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Rear Ring Flange to Base	G	20.5	20.5	20.5	20.5	22	22	22	22	25	25	25	25
Smokebox to Steam Nozzle	H	50.88	74.88	63.88	97.88	86.25	110.3	95.63	113.6	106	141	115.6	142.6
WIDTHS													
Overall Width	I	90.5	85	92	92	103	103	110	110	125	126	133	133
I.D. Boiler	J	60	60	67	67	78	78	85	85	96	96	106	106
Center to Water Column	K	45	45	48.5	48.5	54	54	57.5	57.5	64	64	69	69
Center to Lagging	L	33	33	36.75	36.75	42	42	45.5	45.5	51	51	56	56
Center to Auxiliary LWCO	LL	40	40	43.5	43.5	49	49	52.5	52.5	59	59	64	64
Base Outside	M	52.5	52.5	51	51	64	64	60	60	71.88	71.88	74.75	74.75
Base Inside	N	44.5	44.5	43	43	56	56	47	47	58.88	58.88	61.75	61.75
Center to Outside of FGR Duct	NN	45.5	39.5	39.5	39.5	43.5	43.5	49.75	49.75	61	62	62.5	62.5
FGR Duct Size	V	6	6	6	6	6	8	8	8	8	10	10	10
HEIGHTS													
Base to Rear Davit	OO	86.12	86.12	92.75	92.75	98.88	98.88	112.8	112.8	125.1	125.1	134.3	134.3
Base to Vent Outlet	O	87	87	92.63	92.63	106	106	115	115	126	126	135.6	135.6
Base to Boiler Centerline	P	46	46	50	50	56	56	61	61	67	67	71	71
Height of Base Frame	Q	12	12	12	12	12	12	12	12	12	12	12	12
Base to Bottom of Boiler	R	15.63	15.63	16.13	16.13	16.5	16.5	18	18	18.5	18.5	17.5	17.5
Base to Steam Outlet	X	82.38	82.38	89.88	89.88	101.5	101.5	110	110	121.5	121.5	130.5	130.5
BOILER CONNECTIONS													
Feedwater Inlet (Both Sides)	S	1.25	1.5	1.5	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5
Surface Blowoff (150 lb only)	T	1	1	1	1	1	1	1	1	1	1	1	1
Steam Nozzle 15 lb (See Note "A")	U	8	8	8	10	10	12	12	12	12	12	12	12
Steam Nozzle 150 lb (See Note "B")	U	4	4	4	4	6	6	6	6	8	8	8	8
Blowdown-Front & Rear (15 lb)	W	1.5	1.5	1.5	2	2	2	2	2	2	2	2	2
Blowdown-Front & Rear (150 lb)	W	1.25	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2
Chemical Feed	Z	1	1	1	1	1	1	1	1	1	1	1	1
VENT STACK													
Vent Stack Diameter (Flanged)	BB	16	16	16	16	20	20	24	24	24	24	24	24
MINIMUM CLEARANCES													
Rear Door Swing	DD	36	36	40	40	46	46	50	50	55	55	60	60
Tube Removal - Front Only	FF	96	120	108	142	132.5	156.5	148	166	169	204	188	215
MINIMUM BOILER ROOM LENGTH ALLOWING FOR DOOR SWING AND TUBE REMOVAL FROM:													
Thru Window or Door	RD	234	258	261	295	307.5	331.5	337	355	377	412	411	438
Front of Boiler	RF	263	311	291	359	351	399	388	424	438	508	481	535
WEIGHTS IN LBS													
Normal Water Weight	-	5,870	7,310	7,625	9,995	12,590	14,850	16,025	17,950	21,050	25,350	28,700	32,770
Approx. Shipping Weight - (15psig)	-	10,860	12,080	13,090	15,260	19,110	21,050	24,760	27,640	33,295	38,150	42,320	46,300
Approx. Shipping Weight - (150psig)	-	11,320	12,920	13,980	16,620	21,620	23,970	26,850	29,650	36,190	39,560	46,290	50,830

NOTES:
 Accompanying dimensions, while sufficiently accurate for layout purposes, must be confirmed for construction by certified dimension diagram/drawing. All Connections are Threaded Unless Otherwise Indicated:
 NOTE "A": ANSI 150 psig Flange
 NOTE "B": ANSI 300 psig Flange
 NOTE "C": *800 hp w/ 4000 sq. ft. of heating surface



Table A3-7. 4WG Low NOx Ratings - Hot Water

BOILER H.P.	100	125	150	200	250	300	350	400	500	600	700	800
BURNER MODEL	LND42S	LND54P	LND74P	LND84P	LND105S	LND125P	LND145P	LND175P	LND210P	LND252P	LND336P	LND378P
RATINGS - SEA LEVEL TO 700 FT.												
Btu Output (1000 Btu/hr)	3348	4184	5021	6695	8369	10043	11716	13390	16738	20085	23433	26780
APPROXIMATE FUEL CONSUMPTION AT RATED CAPACITY BASED ON NOMINAL 82% EFFICIENCY												
Light Oil gph (140,000 Btu/gal)	29.2	36.4	43.7	58.3	72.9	87.5	102.1	116.6	145.8	175.0	204.1	233.3
Gas CFH (1000 Btu)	4082	5103	6123	8165	10206	12247	14288	16329	20412	24494	28576	32659
Gas (Therm/hr)	40.8	51.0	61.2	81.6	102.1	122.5	142.9	163.3	204.1	244.9	285.8	326.6
POWER REQUIREMENTS - SEA LEVEL TO 700 FT. (60 HZ)												
Blower Motor hp	5	5	7-1/2	10	15	15	20	25	30	40	75	75
Circulating Oil Pump Motor hp (Oil only)	1/2	1/2	1/2	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1
Oil Metering Pump Motor hp (Oil only)	-	-	-	-	-	-	1/2	1/2	3/4	3/4	1	1
Integral Oil/Air Motor hp (Oil only)	1	1	1	1	2	2	-	-	-	-	-	-
Air Compressor Motor hp (Oil only)	-	-	-	-	-	-	5	5	5	7-1/2	15	15
BOILER DATA												
Heating Surface sq-ft. (Fireside)	500	625	750	1000	1250	1500	1750	2000	2500	3000	3500	See Note "B"

- NOTES:
 A. All fractional hp motors will be single phase voltage except oil metering pump motor(3-phase); integral hp motors will be 3-phase voltage.
 B. 800 hp boilers are available w/ 3500 or 4000 sq. ft. of heating surface

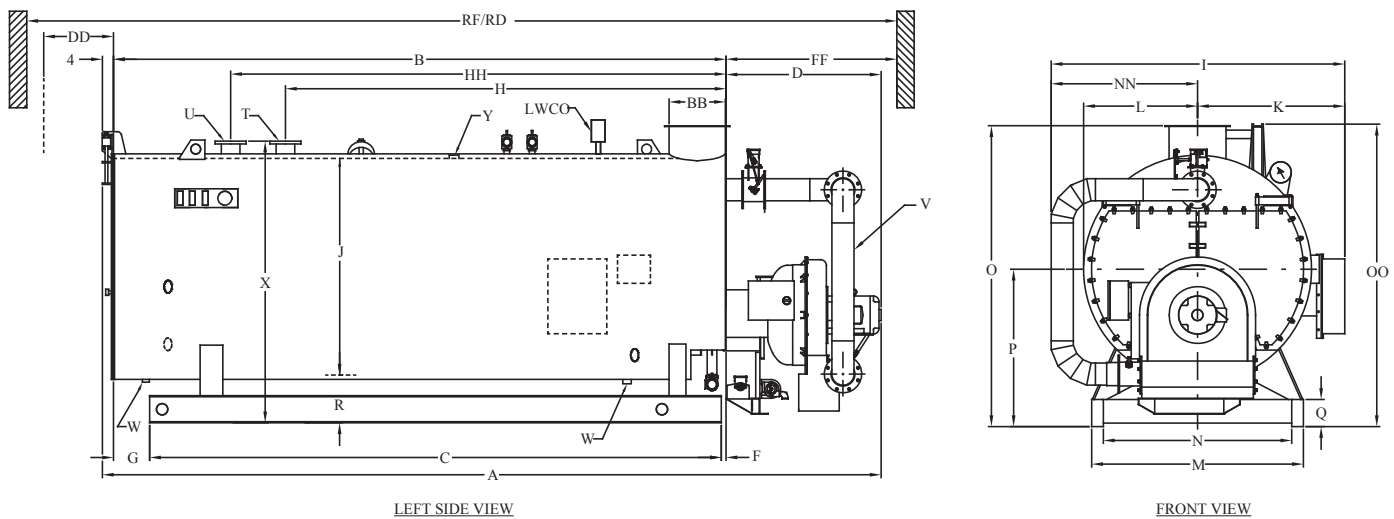


Figure A3-4. 4WG Low NOX - Hot Water 100-800 HP

Table A3-8. 4WG Low NOx Dimensions - Hot Water

BOILER H.P.	DIM	100	125	150	200	250	300	350	400	500	600	700/800	*800 See Note "C"
LENGTHS													
Overall Length	A	176	200	189.62	223.62	229.62	253.62	250	270.63	276.63	311.63	304	331
Shell	B	131	155	143	177	172.5	196.5	189.75	207.75	213.75	248.75	232.75	259.75
Base Frame	C	110	124	122	156	150.13	174.13	167.25	185.25	188.25	223.25	207.25	234.25
Burner Extension	D	41	41	42.62	42.62	53.12	53.12	56.25	58.88	58.88	58.88	67.25	67.25
Smokebox to Base	F	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Rear Ring Flange to Base	G	20.5	20.5	20.5	20.5	22	22	22	22	25	25	25	25
Smokebox to Return	H	78	99	87	121	113.5	137.5	130.75	148.75	143	151.75	146.75	173.75
Smokebox to Outlet	HH	103	124	112	146	139.5	163.5	156.75	174.75	179	187.75	182.75	209.75
WIDTHS													
Overall Width	I	82.5	76.5	80.25	80.25	89.5	89.5	99.25	99.25	116	117	122.5	122.5
I.D. Boiler	J	60	60	67	67	78	78	85	85	96	96	106	106
Center to LWCO Controller	K	37	37	40.75	40.75	46	46	49.5	49.5	55	55	60	60
Center to Lagging	L	33	33	36.75	36.75	42	42	45.5	45.5	51	51	56	56
Base Outside	M	52.5	52.5	51	51	64	64	60	60	71.88	71.88	74.75	74.75
Base Inside	N	44.5	44.5	43	43	56	56	47	47	58.88	58.88	61.75	61.75
Center to Outside of FGR Duct	NN	45.5	39.5	39.5	39.5	43.5	43.5	49.75	49.75	61	62	62.5	62.5
FGR Duct Size	V	6	6	6	6	6	8	8	8	8	10	10	10
HEIGHTS													
Base to Rear Davit	OO	86.12	86.12	92.75	92.75	98.88	98.88	112.75	112.75	125.12	125.12	134.25	134.25
Base to Vent Outlet	O	87	87	89.88	89.88	106	106	115	115	126	126	135.63	135.63
Base to Boiler Centerline	P	46	46	50	50	56	56	61	61	67	67	71	71
Height of Base Frame	Q	12	12	12	12	12	12	12	12	12	12	12	12
Base to Bottom of Boiler	R	15.63	15.63	16.13	16.13	16.5	16.5	18	18	18.5	18.5	17.5	17.5
Base to Return & Outlet	X	82.38	82.38	92.63	92.63	101.5	101.5	110	110	121.5	121.5	130.5	130.5
BOILER CONNECTIONS													
Water Return (See Note "A")	T	4	6	6	6	8	8	8	10	10	12	12	12
Water Outlet (See Notes "A & B")	U	4	6	6	6	8	8	8	10	10	12	12	12
Drain-Front & Rear	W	1.5	1.5	1.5	2	2	2	2	2	2	2	2	2
Air Vent	Y	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2
VENT STACK													
Vent Stack Diameter (Flanged)	BB	16	16	16	16	20	20	24	24	24	24	24	24
MINIMUM CLEARANCES													
Rear Door Swing	DD	36	36	40	40	46	46	50	50	55	55	60	60
Tube Removal - Front Only	FF	96	120	108	142	132.5	156.5	148	166	169	204	188	215
MINIMUM BOILER ROOM LENGTH ALLOWING FOR DOOR SWING AND TUBE REMOVAL FROM:													
Thru Window or Door	RD	234	258	261	295	307.5	331.5	337	355	377	412	411	438
Front of Boiler	RF	263	311	291	359	351	399	388	424	438	508	481	535
WEIGHTS IN LBS													
Normal Water Weight	-	6,890	8,580	8,870	11,600	14,760	17,380	19,220	21,520	26,260	31,580	35,900	40,930
Approx. Shipping Weight - (30psig)	-	10,860	12,080	13,090	15,260	19,110	21,050	24,760	27,640	33,295	38,150	42,320	46,300
Approx. Shipping Weight - (125psig)	-	11,600	12,980	14,040	16,680	20,670	23,140	26,930	30,060	35,390	40,550	45,430	49,750

NOTES:

Accompanying dimensions, while sufficiently accurate for layout purposes, must be confirmed for construction by certified dimension diagram/drawing. All Connections are Threaded Unless Otherwise Indicated:

NOTE "A": ANSI 150 psig Flange

NOTE "B": Water Outlet includes 2" Dip Tube

NOTE "C": *800 hp w/ 4000 sq. ft. of heating surface



BOILER HP	ALL DIMENSIONS IN INCHES				
	A	B	C	D	E
100-125	33	47	52	80	36
150-200	36.5	49	56	83	40
250-300	42	56	61	92	46
350-400	45.5	58	68	99	50
500-600	51	66	75	111	55
700-800	56	74	80	121	60

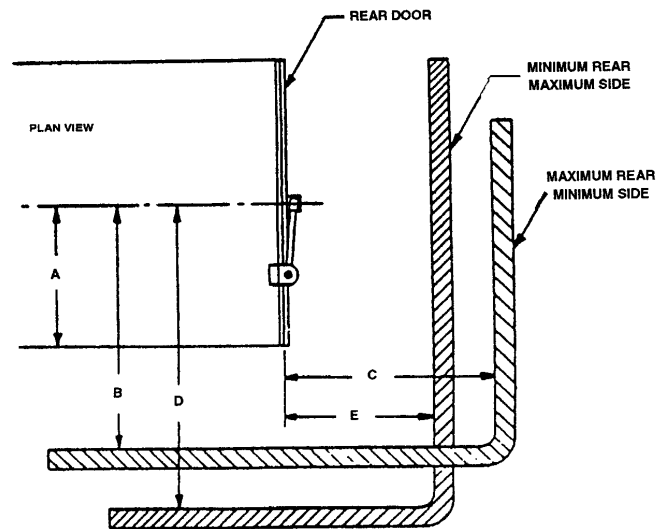
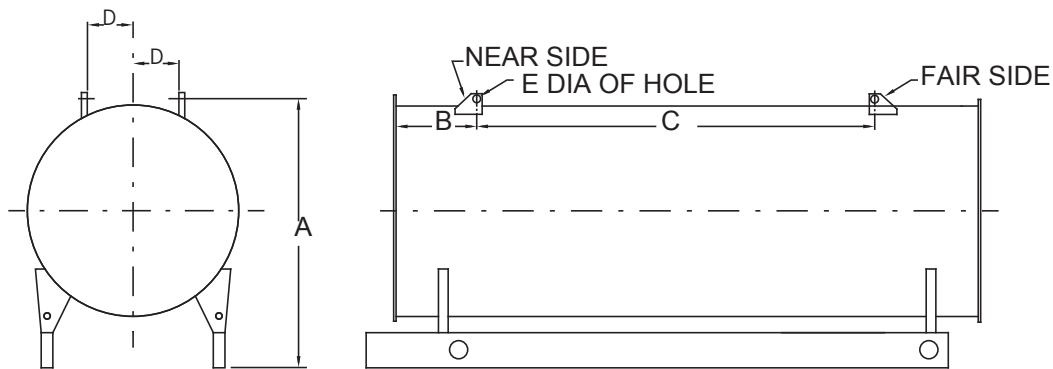


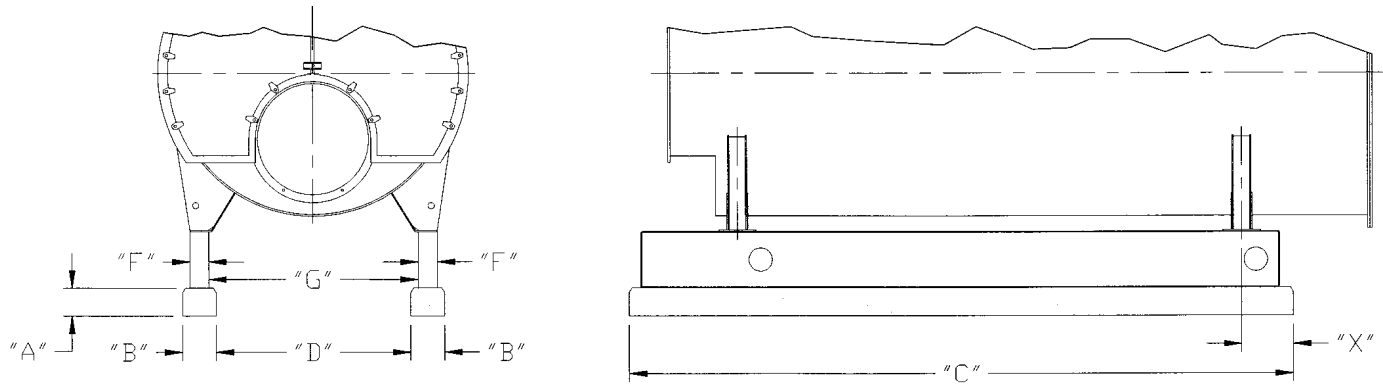
Figure A3-5. Space Required to Open Rear Head on Model 4WG



BOILER HP	ALL DIMENSIONS IN INCHES				
	A	B	C	D	E
100	79.5	21.375	84.75	10	3
125	79.5	21.375	108.75	10	3
150	87.125	21.375	96.75	10	3
200	87.125	21.375	130.75	10	3
250	99	28.75	104.25	10	3
300	99	28.75	128.25	10	3
350	107.625	33.25	126	10	3
400	107.625	33.25	144	10	3
500	125.375	34.5	145	10	3
600	125.375	34.5	180	10	3
700-800	134.5	34.5	164	10	3

NOTE: A, B, and C dimensions may vary by 1 inch.

Figure A3-6. Model 4WG Lift Lug Locations



BOILER HP	ALL DIMENSIONS IN INCHES							
	A	B	C	D	E	F	G	X
100	6	9	110	39.5	57.5	4	44.5	8
125	6	9	124	39.5	57.5	4	44.5	8
150	6	9	122	38	56	4	43	8
200	6	9	156	38	56	4	43	8
250	6	9	150.125	51	69	4	56	11.5
300	6	9	174.125	51	69	4	56	11.5
350	6	12	167.25	41.5	65.5	6.5	47	11.5
400	6	12	185.25	41.5	65.5	6.5	47	11.5
500	6	12	188.25	53.375	77.375	6.5	58.875	10.5
600	6	12	223.25	53.375	77.375	6.5	58.875	10.5
700-800	6	12	207.25	56.25	80.25	6.5	61.75	10.5

NOTE:

6-inch high mounting piers recommended for use beneath the boiler base frame. The use of these piers provides increased inspection accessibility to the boiler and added height for washing down the area beneath the boiler.

Figure A3-7. Model 4WG Mounting Piers

**PERFORMANCE
DATA**

Contact your local Cleaver-Brooks authorized representative for efficiencies.

Cleaver-Brooks 4WG boilers are available with the standard burner package, or optional model Profire LE or Profire NT if NOx reductions of between 75 and <9 PPM on natural gas are required, or 70 PPM on #2 oil with 0.02% fuel bound nitrogen.

ENGINEERING DATA

The following engineering information is provided for Model 4WG Boilers. Additional detail is available from your local Cleaver-Brooks authorized representative.

Boiler Information

- Table A3-10 shows steam volume and disengaging area for model 4WG boilers.
- Table A3-13 lists quantity and outlet size for safety valves supplied on Model 4WG steam boilers.
- Table A3-12 lists quantity and outlet size for relief valves supplied on Model 4WG hot water boilers.
- Table A3-14 gives recommended steam nozzle sizes on Model 4WG Boilers.
- Table A3-16 shows recommended non-return valve sizes for Model 4WG Boilers.

Blowdown Water Requirements

Some local codes require blowdown tanks to be constructed in accordance with recommendations of the National Board of Boiler and Pressure Vessel Inspectors.

The National Board's recommendations base the size of the blowdown tank on the removal of at least 4 inches of water from the boiler.

Table A3-9 lists the approximate quantity of water represented by 4 inches of water at normal operating level for Cleaver-Brooks Model 4WG Boilers.

Burner/Control Information

Burner Characteristics

Maximum altitude for standard burners is shown in Table A3-16. Note that altitude correction and burner changes are required for higher altitudes which may alter dimensions, motor hp and gas pressures.

Gas-Fired Burners

Table A3-16 shows correction factors for gas pressure at elevations over 700 ft. above sea level.

Table A3-17 shows minimum and maximum gas pressure requirements for Standard, FM and IRI 4WG Boiler gas trains upstream of the gas pressure regulator.

For oversized or undersized gas trains or altitude above 2,000 feet, contact your local Cleaver-Brooks authorized representative.

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.

Fuel Connections - Oil

Oil-fired burners are equipped with an oil pump, which draws fuel from a storage tank and supplies pressurized oil to the burner nozzle(s). The burner supply oil pump has a greater capacity than the burner requires for the maximum firing rate. Fuel not delivered to the nozzle is returned to the storage tank. A two-pipe (supply and return) oil system is recommended for all installations. Figure A3-8 shows a typical fuel oil supply arrangement. Oil lines must be sized for the burner and burner supply oil pump capacities.

The burner supply oil pump suction should not exceed 10" Hg. If a transfer pump is used, it must have a pumping capacity at least equal to that of the burner pump(s). Supply pressure to the burner pump should not exceed 3 psig.

A strainer must be installed in the supply piping upstream of the burner supply pump in order to prevent entry of foreign material into the pump, fuel control valves, or burner nozzle(s). The strainer must be sized for the burner supply pump capacity. A strainer mesh of 150 microns (0.005") is recommended.

Install a check valve in the line to prevent draining of the oil suction line when the burner is not in operation. Location of the check valve varies with the system, but usually it is located as close as possible to the storage tank.

Installation of a vacuum gauge in the burner supply line between the burner oil pump and the strainer is recommended. Regular observation and recording of the gauge indication will assist in determining when the strainer needs servicing.

Upon completion of the oil piping installation, the system should be checked for oil or air leakage and tight shutoff of all valves.

Boiler Room Information

Figure A3-9 shows typical boiler room length requirements.

Figure A3-10 shows typical boiler room width requirements.

Stack Support Capabilities

100 - 800 hp Model 4WG Boilers can support up to 2000 lbs without additional support.

100 - 800 hp Model 4WG Boilers can be reinforced to support up to 3000 lbs.

Boiler Room Combustion Air

When determining boiler room air requirements, the size of the room, air flow, and velocity of air must be reviewed as follows:

1. Size (area) and location of air supply openings in boiler room.

- A. Two (2) permanent air supply openings in the outer walls of the boiler room are recommended. Locate one (1) at each end of the boiler room, preferably below a height of 7 feet. This allows air to sweep the length of the boiler.
- B. Air supply openings can be louvered for weather protection, but they should not be covered with fine mesh wire, as this type of covering has poor air flow qualities and is subject to clogging by dust or dirt.
- C. A vent fan in the boiler room is not recommended, as it could create a slight vacuum under certain conditions and cause variations in the quantity of combustion air. This can result in unsatisfactory burner performance.
- D. Under no condition should the total area of the air supply openings be less than one (1) square foot.
- E. Size the openings by using the formula:

$$\text{Area (sq.-ft.)} = \text{CFM/FPM}$$

2. Amount of air required (cfm).
 - A. Combustion Air = Rated bhp x 8 cfm/bhp.
 - B. Ventilation Air = Maximum bhp x 2 cfm/bhp or a total of 10 cfm/bhp - up to 1000 feet elevation. Add 3 percent more per 1000 feet of added elevation.
3. Acceptable air velocity in Boiler Room (fpm).
 - A. From floor to (7) foot height - 250 fpm.
 - B. Above (7) foot height - 500 fpm.

Example: Determine the area of the boiler room air supply openings for (1) 300 hp boiler at 800 feet altitude. The air openings are to be 5 feet above floor level.

- Air required: $300 \times 10 = 3000$ cfm (from 2B above).
- Air velocity: Up to 7 feet = 250 fpm (from 3 above).
- Area Required: $\text{Area} = \text{cfm/fpm} = 3000/250 = 12$ Sq.-ft. total.
- Area/Opening: $12/2 = 6$ sq.-ft./opening (2 required).

NOTE: Consult local codes, which may supersede these requirements.

Stack/Breeching Size Criteria

The design of the stack and breeching must provide the required draft at each boiler flue gas outlet. Proper draft is critical to burner performance.

Although constant pressure at the flue gas outlet of the Model 4WG is not required, it is necessary to size the stack/ breeching to limit flue gas pressure variation. The allowable pressure range is -0.25" W.C. to +0.25" W.C.

For additional information, please review Section I4, General Engineering Data (Stacks) and Section F, Stacks. Stack and breeching sizes should always be provided by a reputable stack supplier who will design the stack and breeching system based on the above criteria. Your local Cleaver-Brooks authorized representative is capable of assisting in your evaluation of the stack/breeching design.

Table A3-9. 4WG Blowdown Tank Sizing Information

BOILER HP	WATER (GAL)
100	85
125	104
150	102
200	131
250	145
300	169
350	178
400	198
500	233
600	278
700	286
800	286

NOTE: Quantity of water removed from boiler by lowering normal water line 4".

Table A3-10. 4WG Boilers: Predicted Sound Levels (30 ppm NOx systems) @ High Fire

BHP	Sound Level-dbA
100	81
125	83.5
150	89.5
200	88.6
250	88.5
300	91
350	94
400	91.5
500	93.5
600	93.5
700	93.7
800	93.5

Table A3-11. Steam Volume and Disengaging Areas

BOILER HP	STEAM VOLUME CU-FT		STEAM RELIEVING AREA SQ-IN	
	HIGH PRESSURE	LOW PRESSURE	HIGH PRESSURE	LOW PRESSURE
	(A)	(B)	(A)	(B)
100	16.5	22.3	4565	4954
125	20.3	27.4	5587	6077
150	19.9	26.8	5443	5918
200	25.7	34.6	7013	7632
250	34.8	49.5	7790	8597
300	40.6	57.9	9115	10051
350	51.3	69.6	9734	10570
400	57.2	77.5	10843	11779
500	83.6	107.6	12874	13781
600	100	128.6	15394	16474
700	115.6	144.9	15826	16819
800	115.6	144.9	15826	16819

NOTES:

- 1. Based on normal water level.
- A. Based on 150 psig design pressure.
- B. Based on 15 psig design pressure.

Table A3-12. Model 4WG Steam Boiler Safety Valve Outlet Size

VALVE SETTING	15 PSIG STEAM		150 PSIG STEAM		200 PSIG STEAM		250 PSIG STEAM		300 PSIG STEAM	
	NO. OF VALVES REQ'D	OUTLET SIZE (IN.)	NO. OF VALVES REQ'D	OUTLET SIZE (IN.)	NO. OF VALVES REQ'D	OUTLET SIZE (IN.)	NO. OF VALVES REQ'D	OUTLET SIZE (IN.)	NO. OF VALVES REQ'D	OUTLET SIZE (IN.)
100	1	2-1/2	1	1-1/2	1	1-1/2	1	1-1/4	1	1-1/4
125	1	3	2	(1) 1-1/2 (1) 1-1/4	2	(1) 1-1/4 (1) 1	2	1	2	1
150	1	3	2	(1) 1-1/2 (1) 1-1/4	2	(1) 1 (1) 1-1/4	2	1	2	1
200	2	2-1/2	2	1-1/2	2	(1) 1-1/2 (1) 1-1/4	2	1-1/4	2	(1) 1 (1) 1-1/4
250	2	(1) 2-1/2 (1) 3	2	(1) 2 (1) 1-1/2	2	1-1/4	2	(1) 1-1/2 (1) 1-1/4	2	1-1/4
300	2	3	2	(1) 2 (1) 1-1/2	2	1-1/2	2	1-1/4	2	(1) 1-1/2 (1) 1-1/4
350	3	(1) 2 (2) 3	2	2	2	(1) 1-1/2 (1) 2	2	1-1/2	2	(1) 1-1/2 (1) 1-1/4
400	3	(2) 3 (1) 2-1/2	2	(1) 2-1/2 (1) 2	2	(1) 1-1/2 (1) 2	2	(1) 1-1/2 (1) 2	2	1-1/2
500	3	3	2	(1) 2-1/2 (1) 2	2	(1) 2-1/2 (1) 2	2	(1) 1-1/2 (1) 2	2	(1) 1-1/2 (1) 2
600	4	(3) 3 (1) 2-1/2	2	2-1/2	2	(1) 2 (1) 2-1/2	2	2	2	2
700	5	(3) 3 (2) 2-1/2	3	(2) 2-1/2 (1) 2	2	2-1/2	2	(1) 2 (1) 2-1/2	2	2
800	5	(3) 3 (2) 2-1/2	3	(2) 2-1/2 (1) 2	2	2-1/2	2	(1) 2 (1) 2-1/2	2	(1) 2 (1) 2-1/2

NOTE: Valve manufacturers are Kunkle, Consolidated or Conbraco, depending on availability. This table revised 04/2012



Table A3-13. Model 4WG Hot Water Relief Valve Outlet Size

VALVE SETTING	30 PSIG HW		125 PSIG HW		150 PSIG HTHW	
BOILER HP	NO. OF VALVES REQ'D	OUTLET SIZE (IN.)	NO. OF VALVES REQ'D	OUTLET SIZE (IN.)	NO. OF VALVES REQ'D	OUTLET SIZE (IN.)
100	1	2-1/2	1	1-1/4	1	2
125	1	2-1/2	1	1-1/4	2	(1) 1-1/2 (1) 2
150	1	2-1/2	1	2	2	(1) 1-1/2 (1) 2
200	2	(1) 2-1/2 (1) 1-1/4	1	2	2	2
250	2	(1) 2 (1) 2-1/2	1	2	2	(1) 2 (1) 2-1/2
300	2	2-1/2	1	2-1/2	2	2-1/2
350	3	(2) 2-1/2 (1) 1	1	2-1/2	2	(1) 2-1/2 (1) 3
400	3	(1) 2 (2) 2-1/2	1	2-1/2	2	(1) 2-1/2 (1) 3
500	4	(1) 1 (3) 2-1/2	2	(1) 1 (1) 2-1/2	2	3
600	4	(3) 2-1/2 (1) 2	2	(1) 1-1/4 (1) 2-1/2	3	(2) 3 (1) 2-1/2
700, 800	5	(1) 1 (4) 2-1/2	2	(1) 2-1/2 (1) 2	3	3

NOTE: Relief valve is Kunkle #537 for 30# & 125#(Section IV) boiler and is Kunkle #927 for 150# HTHW(Section I) boiler.

Table A3-14. 4WG Recommended Steam Nozzle Size

OPERATING PRESSURE PSIG	BOILER HP											
	100	125	150	200	250	300	350	400	500	600	700	800
15	8	8	8	10	10	12	12	12	12	12	12	12
30	6	6	6	8	8	8	10	10	10	12	12	12
40	6	6	6	6	8	8	8	10	10	10	12	12
50	4	6	6	6	6	8	8	8	10	10	10	12
75	4	4	4	6	6	6	8	8	8	8	10	10
100	4	4	4	6	6	6	6	6	8	8	8	10
125	4	4	4	4	6	6	6	6	8	8	8	8
150	2.5	3	3	4	4	6	6	6	6	6	8	8
200	2.5	2.5	3	4	4	4	4	6	6	6	6	6
250	2	2.5	3	3	4	4	4	4	6	6	6	6

NOTES:

1. Steam nozzle sizes given in inches.
2. Recommended steam nozzle sizes based on 4000 to 5000 fpm steam velocity.
3. All standard steam nozzle sizes for 150 psig design pressure or greater are the same as 125 psig operating pressure on the above table. To increase or decrease the standard size, request the change with your local Cleaver-Brooks authorized representative.
4. Shaded area denotes special surge load baffles must be installed to avoid possible water carryover.
5. For incremental operating pressure, see Table I3-1 Steam System Fundamentals.

Table A3-15. 4WG Recommended Non-Return Valve Size

BOILER HP	BOILER CAPACITY (LBS/HR)	OPERATING PRESSURE (PSIG)							
		50	75	100	125	150	175	200	250
100	3450	2-1/2	2-1/2	NA	NA	NA	NA	NA	NA
125	4313	3	2-1/2	2-1/2	2-1/2	NA	NA	NA	NA
150	5175	3	3	2-1/2	2-1/2	2-1/2	2-1/2	NA	NA
200	6900	3*	3	3	3	3	2-1/2	2-1/2	2-1/2
250	8625	4	3*	3	3	3	3	3	3
300	10350	4	4	4	3*	3	3	3	3
350	12025	4	4	4	4	4	3*	3	3
400	13800	5	4	4	4	4	4	4	3*
500	17210	6	5	5	4	4	4	4	4
600	20700	6	6	5	5	5	4	4	4
700	24150	6	6	6	5	5	5	5	4
800	27600	6	6	6	6	6	5	5	5

NOTE: Valve sizes (300 # Flanges) given in inches. Standard Non-Return valve selections limited to a maximum 2 to 1 turndown (50% of full load); selections based on typical non-return valve sizing recommendations. For final valve selection contact your C-B authorized representative. For high turndown applications see Boiler Book Section I3, Table I3-3.
 * Indicates pressure drop of less than 7.5 psig. All other selections are less than 6 psig pressure drop.

Table A3-16. Altitude Correction for Gas

ALTITUDE (FT)	CORRECTION FACTOR	ALTITUDE (FT)	CORRECTION FACTOR
1000	1.04	6000	1.25
2000	1.07	7000	1.3
3000	1.11	8000	1.35
4000	1.16	9000	1.4
5000	1.21	-	-

To obtain minimum required gas pressure at altitudes above 700 feet, multiply the pressure by the listed factors:
 Inches WC x 0.577 = oz/sq-in.
 oz/sq-in x 1.732 = inches WC.
 Inches WC x 0.0361 = psig.
 oz/sq-in x 0.0625 = psig.
 psig x 27.71 = Inches WC.
 psig x 16.0 = oz/sq-in.

Table A3-17. Model 4WG, Standard and Low NOx (30 ppm), Min. Req. Gas Pressure at Entrance to Standard, FM and IRI Gas Trains (Upstream of Gas Pressure Regulator)

BOILER HP	STD PIPE SIZE (Inches)	PRESSURE REQUIRED-STD ("WC)			PRESSURE REQUIRED-30 PPM ("WC)		
		GPR*	Minimum	Maximum	GPR*	Minimum	Maximum
100	2	RV91	9	27.7	RV91	12.3	27.7
125	2	RV91	16.6	27.7	RV91	21.6	27.7
150	2	RV91	23.2	27.7	RV91	21.9	27.7
200	2.5	210G	20.7	277	210G	28.5	277
250	2.5	210G	29.9	277	210G	29	277
300	2.5	210G	40.8	277	210G	39.5	277
350	3	210G	42.7	277	210G	40.7	277
400	1.5-2	S	130	208	S	130	208
	2-2.5	S	89	130	S	89	130
	2.5	S	64	89	S	64	89
	3	S	39	64	S	39	64
500	1.5-2.5	S	183	277	S	175	277
	2-2.5	S	130	183	S	125	175
	2.5	S	89	130	S	83	125
	3	S	50	89	S	44	83
600	2-1.5-2.5	S	233	277	S	241	277
	2-2.5	S	177	233	S	186	241
	2.5	S	119	177	S	127	186
	2.5-3	S	100	119	S	108	127
	3	S	61	100	S	69	108
700	2-3	S	222	277	S	213	277
	2.5-3	S	133	222	S	125	213
	3	S	83	133	S	75	125
	4	S	55	83	S	44	75
800	2-3	S	255	277	S	260	277
	2.5-3	S	152	255	S	155	260
	3	S	94	152	S	94	155
	4	S	53	94	S	55	94

NOTE: Where multiple gas train sizes are shown, the shaded row indicates standard size. For altitudes above 700 feet, contact your local Cleaver-Brooks authorized representative.

* GPR Gas Pressure Regulator
 S-Siemens regulating actuator.

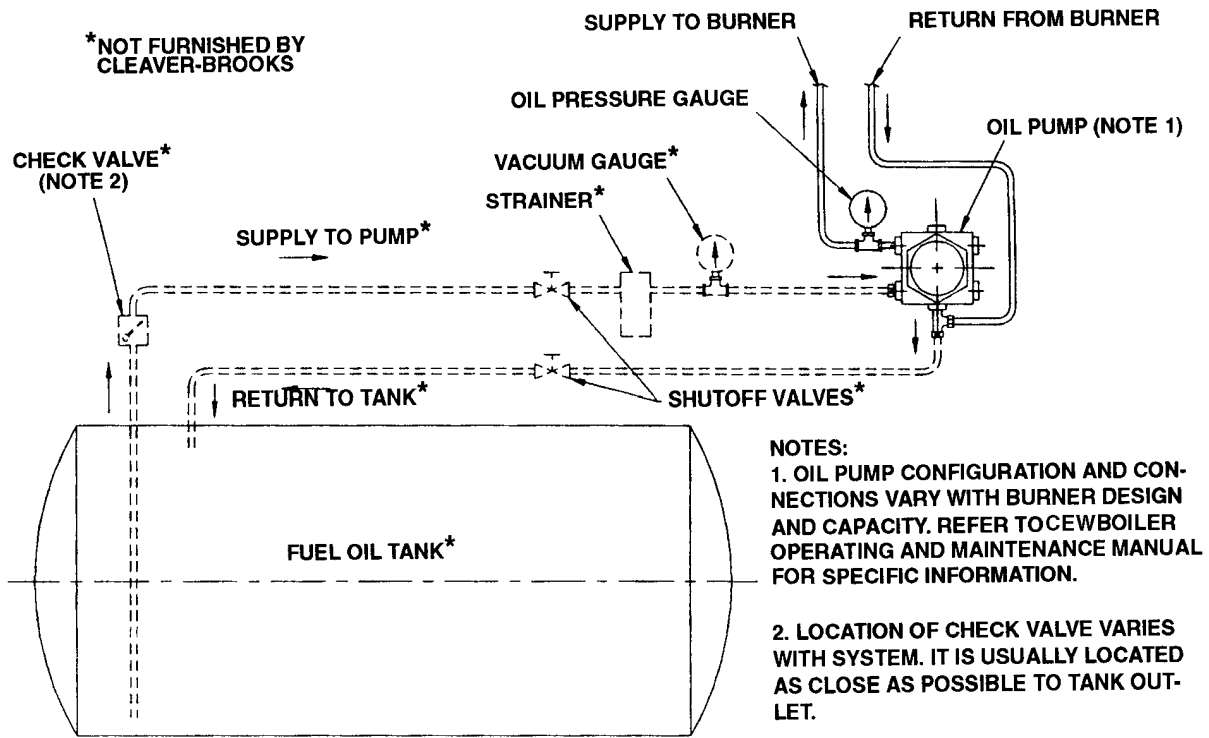
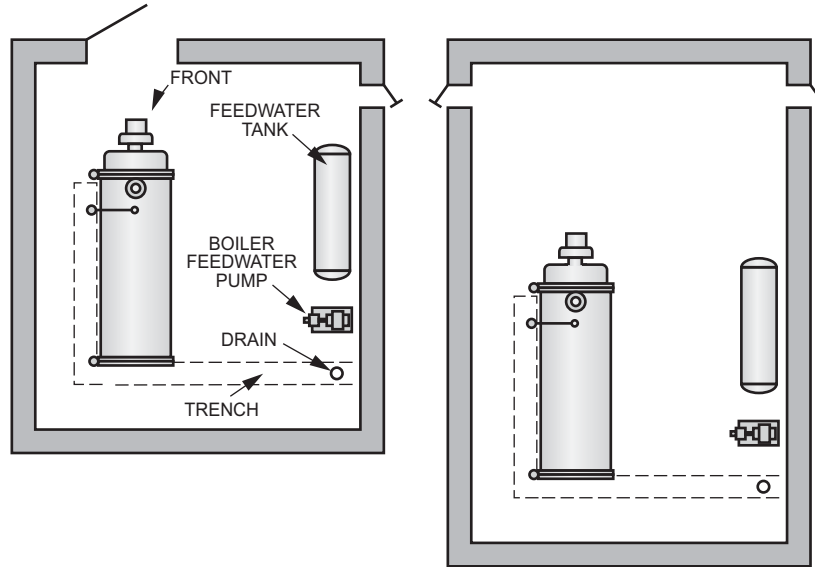


Figure A3-8. Typical Fuel Oil Supply Arrangement



1. Shortest boiler room length (Dwg A) is obtained by allowing for possible future tube replacement (from front or rear of boiler) through a window or doorway. Allowance is only made for minimum door swing at each end of the boiler. This arrangement provides sufficient aisle space at the front of the boiler but a "tight" space condition at the rear.

If space permits, approximately 1.5 additional feet should be allowed at the rear for additional aisle and working space.

2. Next shortest boiler room length (Dwg B) is obtained by allowing for possible future tube replacement from the front of the boiler. Allowance is only made for minimum door swing at the rear.

If space permits, approximately 1.5 additional feet should be allowed at the rear for additional aisle and working space.

Figure A3-9. Boiler Room Length (Typical Layouts)

BOILER HP	100-125	150-200	250-300	350-400	500-600	700-800
DIM. "A"	87	91	96	100	105	110
DIM. "B"	120	127	144	151	174	184

NOTES:

1. Recommended Minimum Distance Between Boiler and Wall. Dimension "A" allows for a "clear" 42" aisle between the water column on the boiler and the wall. If space permits, this aisle should be widened.

2. Recommended Minimum Distance Between Boilers. Dimension "B" between boilers allows for a "clear" aisle of:

- 42" - 100-200 HP
- 48" - 250-400 HP
- 60" - 500-800 HP

If space permits, this aisle should be widened.

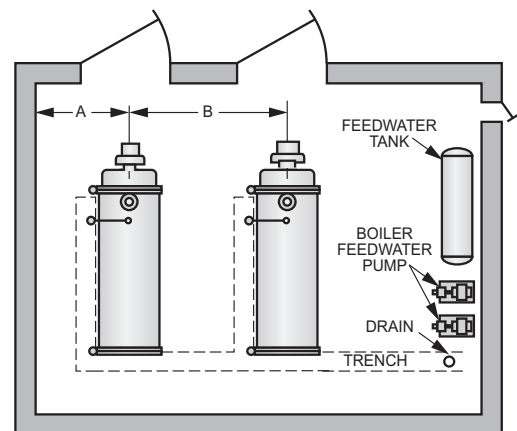


Figure A3-10. Boiler Room Width (Typical Layouts)