Three Pass Firetube Boiler

Water Back Design

Burner And Controls By Others

309 SERIES™

Sales Bulletin and Technical Data

Bulletin: 309-1T

Standard Design - Quick Delivery - Competitively Priced

February 2015

STEAM BOILER PERFORMANCE/Design DATA											
Boiler Horsepower	**100**	**125**	**150**	**200**	**250**	**300**	**350**	**400**	**500**	**600**	**750**
Lbs. Steam/Hr.	3,450*	4,312*	5,175*	6,900*	8,625*	10,350*	12,075*	13,800*	17,250*	20,700*	24,150*
Output (1,000 BTU/Hr.)	3,348	4,184	5,021	6,695	8,369	10,042	11,716	13,390	16,735	20,085	25,106
Heating Surface (Sq. Ft.)	507	643	754	982	1,247	1,539	1,769	2,060	2,560	3,003	3,760
Steam Storage (Cu. Ft.)	13.26	16.70	19.52	25.13	37.16	66.54	75.93	99.29	120.61	107.23	132.60
Steam Release Area (Sq. Ft.)	25.90	32.57	35.67	45.94	56.51	71.31	81.38	84.70	102.89	98.32	121.58
Water Content N.W.L. (Gal.)	391	509	562	751	1009	1665	1921	2336	2876	2419	3040
Estimated Shipping Weight Less Burner *Based on 150# D.P. Consult factory for actual operating weights*	7,284 lbs	8,694 lbs	10,204 lbs	12,241 lbs	15,841 lbs	21,394lbs	25,540 lbs	25,800 lbs	30,031 lbs	33,429 lbs	41,162 lbs

*Note: Ratings based on 150 psi design pressure from and at 212°F (0 psig) and elevations up to 2,000'. Consult factory for elevations above 2,000'

STEAM BOILER
STANDARD EQUIPMENT

309 Series painting and markings
2" thick insulation and galvannealed jacketing
Custom design burner mounting flange (Burner details required)
ASME Code design pressure vessel
Handholes
Manhole (Note: Standard on 60" diameter pressure vessels and larger)
Lifting lugs
Control Voltage: 115-1-60
Water level control piping assembly (Left hand side only):
- Pump control/low water cutoff
- Chain operated gauge glass valves, red line gauge glass, and guard rods
- Auxiliary low water cut off (ASME Section 1 design only)
- Ball style drain valves

Steam pressure control piping assembly (Left hand side only):
- Operating limit steam pressure switch
- High limit steam pressure switch
- Steam pressure controller

Low fire hold control with thermowell
Rear burner sight port
Two blowdown connections (bottom centerline)
One feedwater connection (Left hand side only)
One surface blowoff connection with dip tube (Top centerline)
One main steam outlet connection
<u>Shipped loose items:</u>
- Steam pressure gauge with shutoff valve
- Stack thermometer
- Safety valves - Quantity as required by ASME Code
- Flue brush (Oil only)

Standard Approvals: ASME, CSD-1
Note: 300 HP boilers and above are also FM, IRI and NFPA-85 approved

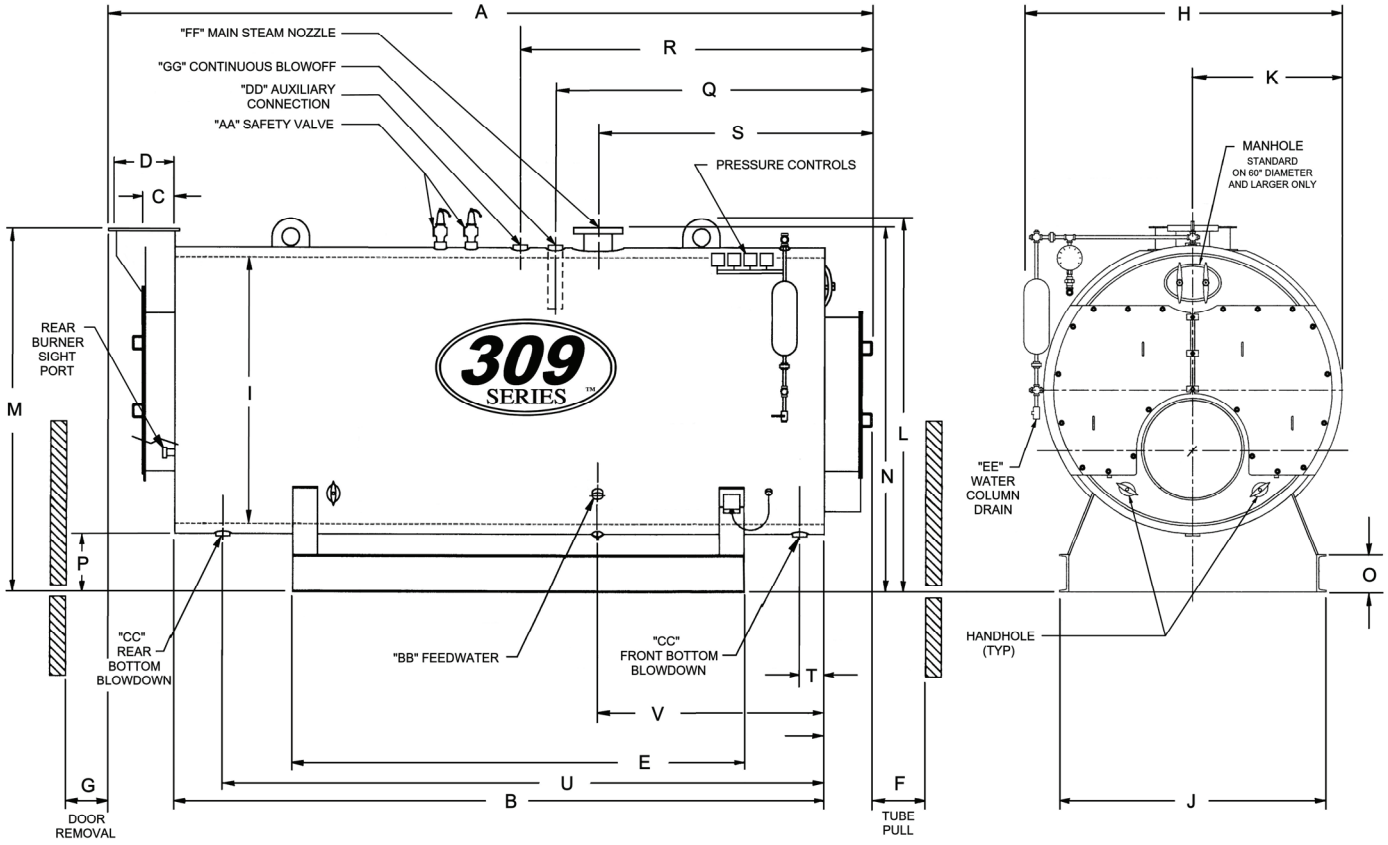
Boiler Horsepower		100	125	150	200	250	300	350	400	500	600	750
Dimensions												
Overall Length	**A**	118.88	144.88	148.13	184.38	198.38	200.63	227.12	207.38	244.38	234.38	280.38
Shell Length	**B**	95.00	119.00	119.00	153.00	165.00	165.00	188.00	165.00	200.00	188.00	232.00
Flue Outlet Centerline	**C**	7.00	8.00	8.00	9.00	10.00	10.00	11.00	12.00	13.00	14.00	15.00
Flue Outlet Inside Diameter	**D**	12.00	14.00	14.00	16.00	18.00	18.00	20.00	22.00	24.00	26.00	28.00
Base Length	**E**	68.00	92.00	92.00	116.00	114.00	124.00	132.00	113.00	148.00	137.00	181.00
Tube Pull	**F**	94.13	118.38	115.38	150.13	162.88	160.63	183.63	160.63	196.38	185.13	230.38
Door Removal	**G**	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00
Overall Width	**H**	69.50	69.50	76.00	76.00	81.50	94.00	94.00	106.00	106.00	112.00	112.00
Shell Inside Diameter	**I**	54.00	54.00	60.00	60.00	66.00	78.00	78.00	90.00	90.00	96.00	96.00
Base Width	**J**	52.50	52.50	58.50	58.50	60.50	75.88	75.88	78.88	78.88	90.88	90.88
Centerline to Jacket	**K**	30.00	30.00	33.50	33.50	36.00	42.50	42.50	48.50	48.50	51.50	51.50
Overall Height	**L**	76.63	76.63	82.63	82.63	88.63	101.13	101.13	113.25	113.25	119.25	119.75
Floor to Flue Outlet	**M**	74.25	74.25	80.25	80.25	86.25	98.75	98.75	110.75	110.75	116.75	116.75
Floor to Main Steam Outlet	**N**	74.88	74.88	80.88	80.88	86.88	99.38	99.38	111.50	111.50	117.50	117.50
Base Height	**O**	8.00	8.00	8.00	8.00	8.00	12.00	12.00	12.00	12.00	15.00	15.00
Floor to Bottom of Boiler	**P**	12.13	12.13	12.13	12.13	12.13	12.50	12.50	12.50	12.50	12.50	12.50
Continuous Blowoff Connection	**Q**	39.13	39.13	42.38	74.63	74.63	76.88	78.38	79.63	79.63	79.63	79.63
Auxiliary Connection	**R**	33.13	33.13	36.38	68.63	68.63	70.88	72.38	73.63	73.63	73.63	73.63
Main Steam Connection	**S**	53.13	67.13	70.38	92.63	94.63	96.88	100.38	100.63	117.63	102.63	144.63
Front Blowdown	**T**	8.00	8.00	8.00	8.00	8.00	8.00	15.00	15.00	15.00	15.00	15.00
Rear Blowdown	**U**	87.00	111.00	111.00	145.00	157.00	157.00	176.00	153.00	188.00	178.00	222.00
Feedwater Connection	**V**	46.00	58.00	58.00	80.00	82.00	82.00	84.00	83.00	100.00	185.00	127.00
Connection Sizes												
Safety Valve Discharge* - NPT	**AA**	1-1/4”	1-1/4”	1-1/2”	1-1/2”	2”	2”	2”	2-1/2”	2-1/2”	2-1/2”	2-1/2”
Feedwater - NPT	**BB**	1”	1-1/2”	1-1/2”	1-1/2”	1-1/2”	1-1/2”	1-1/2”	2”	2”	2”	2”
Bottom Blowdown - NPT	**CC**	1-1/2”	1-1/2”	1-1/2”	2”	2”	2”	2”	2”	2”	2”	2”
Auxiliary Connection - NPT	**DD**	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”
Water Column Drain - NPT	**EE**	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”
Main Steam Nozzle** (150# / 15# DP)	**FF**	4” / 8”	4” / 8”	6” / 8”	6” / 10”	6” / 10”	6” / 10”	6” / 10”	8” / 10”	8” / 12”	8” / 12”	10” / 12”
Continuous Blowoff - NPT	**GG**	1”	1”	1”	1”	1”	1”	1”	1”	1”	1”	1”

*Based on 150# design pressure

**300# ASA Flange on 150# design pressures and 150# ASA Flange on 15# design pressures

Note: Dimensions, specifications, and sizes are subject to change without notice or liability

STEAM BOILER



HOT WATER UNIT PERFORMANCE DATA											
Boiler Horsepower	**100**	**125**	**150**	**200**	**250**	**300**	**350**	**400**	**500**	**600**	**750**
Output (1,000 BTU/Hr.)	3,348	4,185	5,021	6,695	8,369	10,043	11,716	13,390	16,738	20,085	25,106
Fireside Heating Surface (Sq. Ft.)	507	643	754	982	1,247	1,539	1,769	2,060	2,560	3,003	3,760
Water Content Flooded (Gal.)	551.75	712.35	861.87	1,138	1,462	2,072	2,386	2,730	3,356	3,413	4,272
Estimated Shipping Weight Less Burner *Based on 125# D.P. Consult factory for actual operating weights*	7,384 lbs	8,794 lbs	10,204 lbs	12,241 lbs	15,707 lbs	23,043lbs	25,735 lbs	25,995 lbs	30,226 lbs	35,684 lbs	43,882 lbs

*Note: Ratings based on 125 psi design pressure, 180°F operating temperature, and elevations up to 2,000'. Consult factory for elevations above 2,000'

HOT WATER UNIT
STANDARD EQUIPMENT

309 Series painting and markings
2" thick insulation and galvannealed jacketing
Custom design burner mounting flange (Burner details required)
ASME Code design pressure vessel
Handholes
Manhole (Note: Standard on 60" diameter pressure vessels and larger)
Lifting lugs
Control Voltage: 115-1-60
Water level control piping assembly (Left hand side only):
- Low water cutout
- Ball style drain valve

Temperature controls (Left hand side only):
- Operating temperature limit switch with thermowell
- High limit temperature switch with thermowell
- Temperature sensor

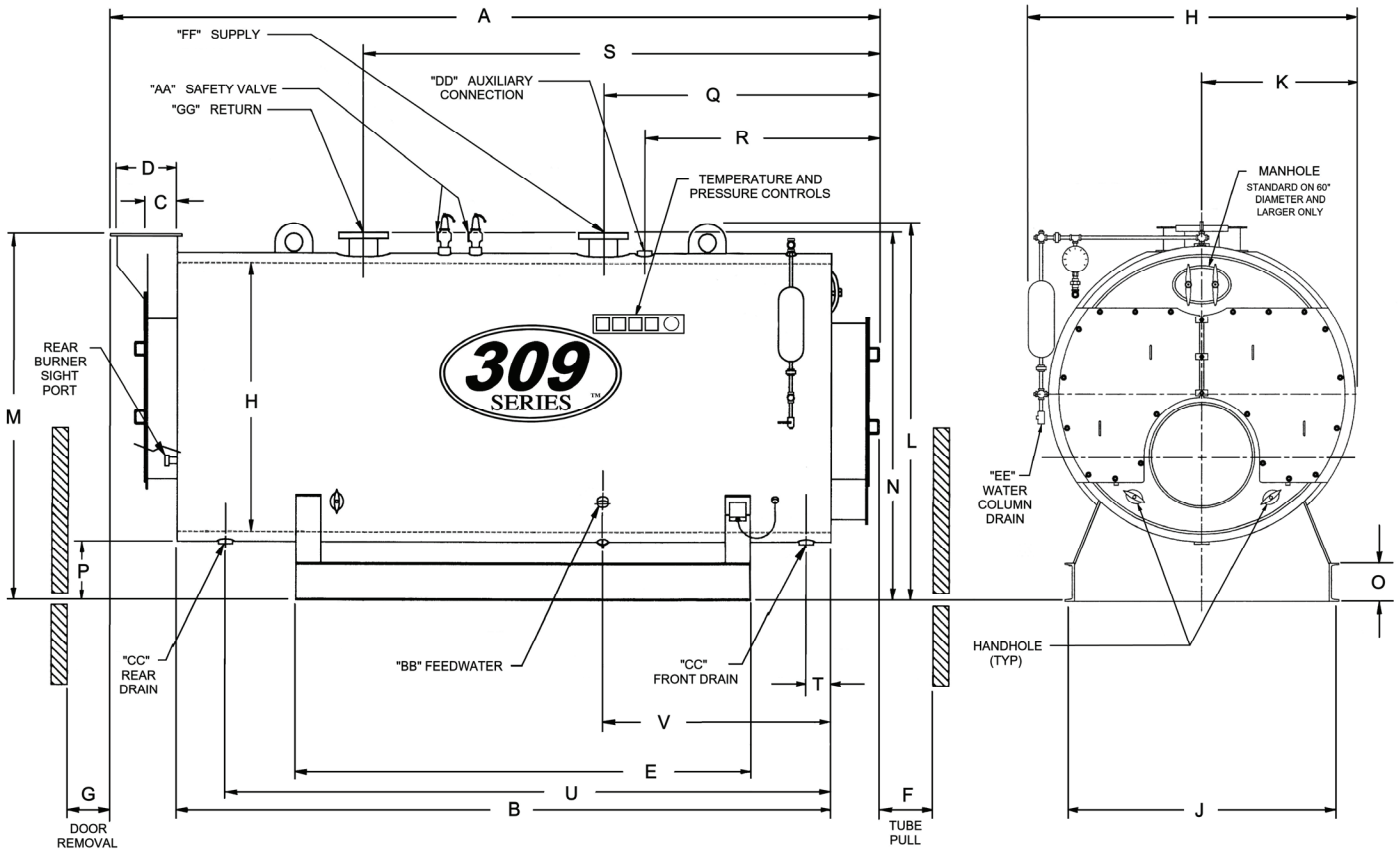
Low fire hold control with thermal well
Rear burner sight port
Two drain connections (bottom centerline)
Manual fill connection (Left hand side only)
One hot water outlet connection
One hot water return connection
<u>Shipped loose items:</u>
- Pressure/Altitude gauge with shutoff valve
- Stack thermometer
- Water thermometer with thermowell
- Relief valves - Quantity as required by ASME Code
- Flue brush (Oil only)

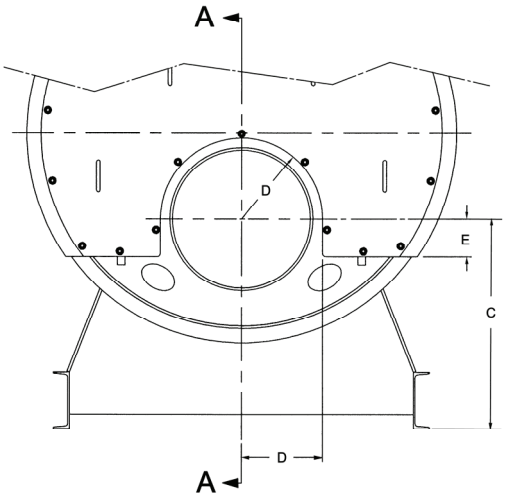
Standard Approvals: ASME, CSD-1
Note: 300 HP boilers and above are also FM, IRI and NFPA-85 approved

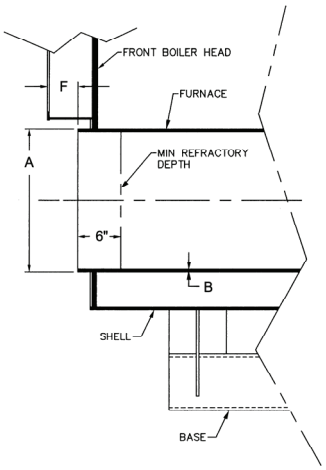
Boiler Horsepower		100	125	150	200	250	300	350	400	500	600	750
Dimensions												
Overall Length	**A**	118.88	144.88	148.13	184.38	198.38	200.63	227.13	207.38	244.38	234.38	280.38
Shell Length	**B**	95.00	119.00	119.00	153.00	165.00	165.00	188.00	165.00	200.00	188.00	232.00
Flue Outlet Centerline	**C**	7.00	8.00	8.00	9.00	10.00	10.00	11.00	12.00	13.00	14.00	15.00
Flue Outlet ID	**D**	12.00	14.00	14.00	16.00	18.00	18.00	20.00	22.00	24.00	26.00	28.00
Base Length	**E**	68.00	92.00	92.00	116.00	114.00	124.00	132.00	113.00	148.00	137.00	181.00
Tube Pull	**F**	94.13	118.38	115.38	150.13	162.63	160.63	183.63	160.63	196.63	185.13	230.38
Door Removal	**G**	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00
Overall Width	**H**	65.38	65.38	71.88	71.88	77.38	90.00	90.00	102.00	102.00	108.00	108.00
Shell ID	**I**	54.00	54.00	60.00	60.00	66.00	78.00	78.00	90.00	90.00	96.00	96.00
Base Width	**J**	52.50	52.50	58.50	58.50	60.50	75.8	75.88	78.88	78.88	90.88	90.88
Centerline to Jacket	**K**	30.00	30.00	33.50	33.50	36.00	42.50	42.50	48.50	48.50	51.50	51.50
Overall Height	**L**	76.63	76.63	82.63	82.63	88.63	101.25	101.25	113.25	113.25	119.38	119.88
Floor to Flue Outlet	**M**	74.25	74.25	80.25	80.25	86.25	98.75	98.75	110.75	110.75	116.75	116.75
Floor to Supply and Return Outlet	**N**	74.88	74.88	80.88	80.88	86.88	99.50	99.50	111.50	111.50	117.38	117.38
Base Height	**O**	8.00	8.00	8.00	8.00	8.00	12.00	12.00	12.00	12.00	15.00	15.00
Floor to Bottom of Boiler	**P**	12.13	12.13	12.13	12.13	12.13	12.50	12.50	12.50	12.50	12.38	12.38
Supply Connection	**Q**	43.13	43.13	46.38	48.63	48.63	52.88	66.38	55.63	55.63	67.63	67.63
Auxiliary Connection	**R**	33.13	33.13	36.38	38.63	38.63	40.88	42.38	43.63	43.63	43.63	43.63
Return Connection	**S**	83.13	107.13	106.38	116.63	140.63	140.88	165.38	143.63	178.63	155.63	199.63
Front Drain	**T**	8.00	8.00	8.00	8.00	8.00	8.00	15.00	15.00	15.00	15.00	15.00
Rear Drain	**U**	87.00	111.00	111.00	145.00	157.00	157.00	176.00	153.00	188.00	178.00	222.00
Water Fill Connection	**V**	34.00	34.00	34.00	36.00	60.00	62.00	76.00	62.00	62.00	75.00	126.00
Connection Sizes												
Relief Valve Discharge* - NPT	**AA**	1”	1-1/2”	1-1/2”	1-1/2”	2”	2”	2”	2”	1-1/2”	2”	2”
Water Fill Connection- NPT	**BB**	1”	1-1/2”	1-1/2”	1-1/2”	1-1/2”	1-1/2”	1-1/2”	2”	2”	2”	2”
Drain - NPT	**CC**	1-1/2”	1-1/2”	1-1/2”	2”	2”	2”	2”	2”	2”	2”	2”
Auxiliary Connection - NPT	**DD**	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”
Water Column Drain - NPT	**EE**	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”	3/4”
Supply - 150# Flange	**FF**	4”	4”	6”	6”	6”	8”	8”	8”	10”	10”	10”
Return - 150# Flanged	**GG**	4”	4”	6”	6”	6”	8”	8”	8”	10”	10”	10”

***Based on 125# design pressure

HOT WATER UNIT







Section A-A

Furnace Design Data		Boiler HP											
		100				125				150			
Design Pressure		15# S	30# W	125# W	150# S	15# S	30# W	125# W	150# S	15# S	30# W	125# W	150# S
Furnace Outside Diameter	A	20				20				24			
Furnace Thickness	B	.38	.38	.38	.38	.38	.38	.50	.38	.38	.38	.50	.50
Furnace Height From Floor	C	29.50				29.50				31.50			
Burner Clearance To Fluebox	D	11.31				11.31				13.50			
Bottom Of Fluebox	E	5.25				5.25				5.75			
Fluebox Depth From Furnace	F	4.63				4.63				6.63			
Furnace Length		69.50				93.50				93.50			
Gas Side Pressure Drop (" wc) *		1.27				1.93				1.99			

Furnace Design Data		Boiler HP											
		200				250				300			
Design Pressure		15# S	30# W	125# W	150# S	15# S	30# W	125# W	150# S	15# S	30# W	125# W	150# S
Furnace Outside Diameter	A	24				28				30			
Furnace Thickness	B	.38	.38	.50	.50	.38	.38	.50	.50	.38	.38	.50	.50
Furnace Height From Floor	C	31.50				33.50				35.00			
Burner Clearance To Fluebox	D	13.50				14.50				16.50			
Bottom Of Fluebox	E	5.75				6.13				2.50			
Fluebox Depth From Furnace	F	6.88				8.13				9.13			
Furnace Length		127.50				136.50				134.50			
Gas Side Pressure Drop (" wc) *		3.53				3.70				2.38			

Furnace Design Data		Boiler HP											
		350				400				500			
Design Pressure		15# S	30# W	125# W	150# S	15# S	30# W	125# W	150# S	15# S	30# W	125# W	150# S
Furnace Outside Diameter	A	30				35				35			
Furnace Thickness	B	.38	.38	.63	.63	.38	.38	.63	.63	.38	.38	.63	.63
Furnace Height From Floor	C	35.00				37.50				37.50			
Burner Clearance To Fluebox	D	16.50				19.00				19.00			
Bottom Of Fluebox	E	2.50				3.25				3.25			
Fluebox Depth From Furnace	F	10.63				11.88				11.88			
Furnace Length		157.50				134.50				169.50			
Gas Side Pressure Drop (" wc) *		3.24				2.36				3.67			

Furnace Design Data		Boiler HP							
		600				750			
Design Pressure		15# S	30# W	125# W	150# S	15# S	30# W	125# W	150# S
Furnace Outside Diameter	A	38				38			
Furnace Thickness	B	.38	.38	.63	.63	.38	.38	.75	.75
Furnace Height From Floor	C	39.00				39.00			
Burner Clearance To Fluebox	D	21.25				21.25			
Bottom Of Fluebox	E	12.00				12.00			
Fluebox Depth From Furnace	F	11.88				11.88			
Furnace Length		155.50				199.50			
Gas Side Pressure Drop (" wc) *		3.37				5.29			

***NOTE:** Gas side pressure drop listed is based on no FGR and 3% O_2. Burner design must be adjusted if FGR and O_2 levels are other than specified

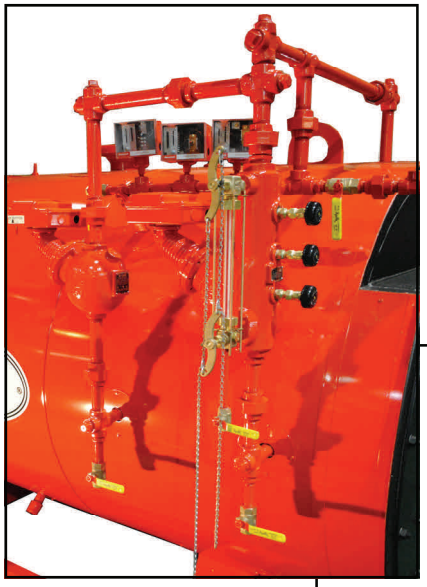
Burner Details

The following data are required for boiler construction purposes

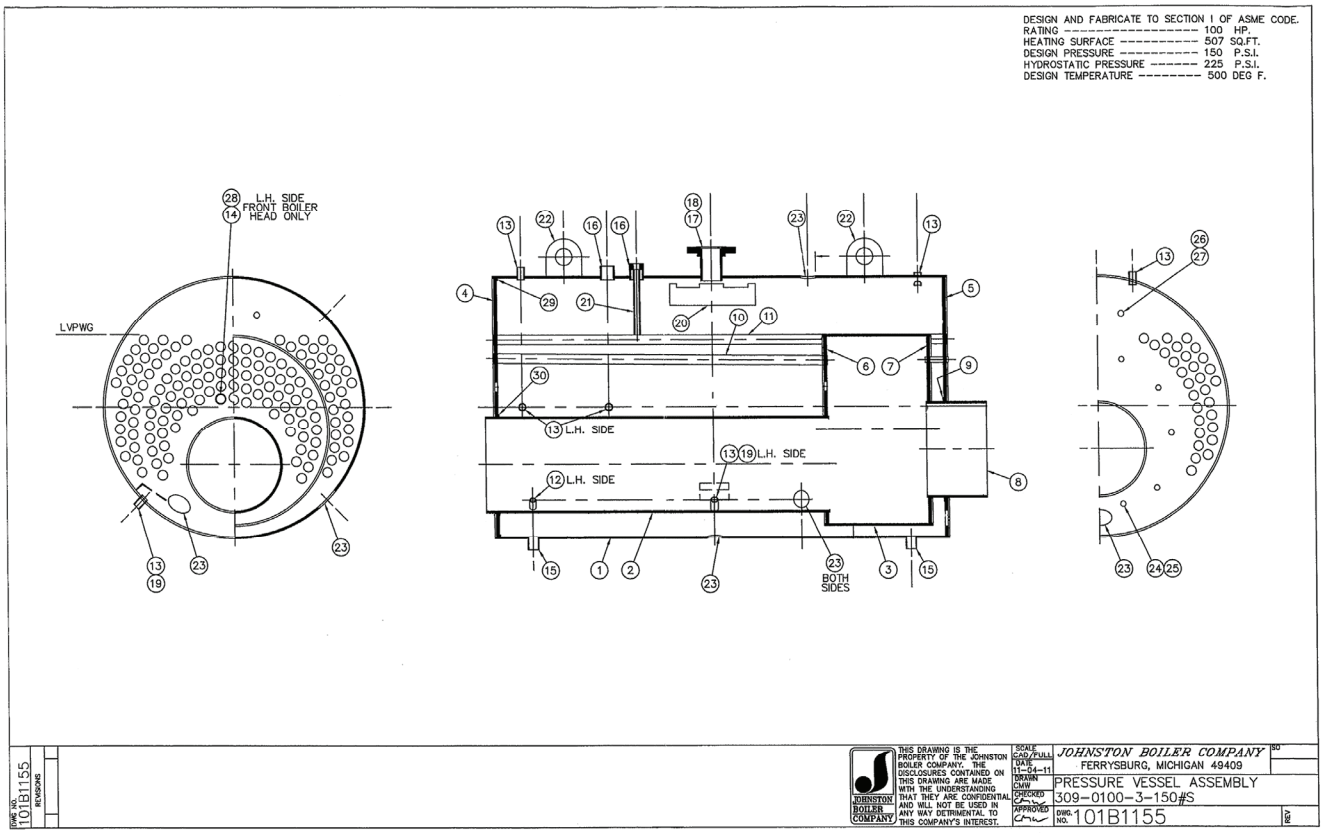
Burner manufacturer: _____
Burner model number: _____
Burner firing head: _____ Refractory ____ Non-refractory
Control panel data: _____ Integral to burner or _____ Remote _____ Primary voltage
Fuel (s): _____
Low NOx Requirements: ____ Yes ____No
Is FGR required: ____ Yes ____No (Note: FGR piping by others)
NOx requirements: Less than _____ PPM

Notes to burner manufacturer:

1. Burner must come complete with wiring diagrams, piping diagrams, and all appropriate literature to facilitate burner installation.
2. Non-typical hardware such as flanges and special wire types (IE: shielded cable) must be supplied with the burner to allow for proper installation.
3. Programmable components such as combustion controls, VFD's, etc... must be pre-programed. Any and all programming will be the responsibility of the burner manufacturer.
4. Burner manufacturer must provide adapter plate and refractory firing head. Reference page 6 of this bulletin for furnace design details.



Typical Pressure Vessel Design



Since 1864 **Johnston Boiler Company** has built its reputation on producing dependable, efficient, durable boilers. This tradition continues with Johnston's **309 Series**:

100 thru 750 HP..... 3,347,500 btu/hr thru 25,106,250 btu/hr
Steam.....15 or 150# Steam
Hot Water.....30 or 125# Hot Water
Standard trim package.....Steam
Standard trim package.....Hot Water

The **309 Series** is specifically designed to match your burner with our boiler. Simply complete the burner details included in this bulletin and send the information to us. Our sales team will provide you with a detailed proposal based on your specific design requirements.

Tools available to you when specifying Johnston's **309 Series** boiler

- ► Dimensional drawings
- ► Sample specifications
- ► Operation and maintenance data
- ► Submittal data
- ► Expert technical assistance

Contact your local **Johnston Boiler Company** representative for details

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