BUILT TO OUTPERFORM

BOILER OPERATION & MAINTENANCE MANUAL

Superior Boiler Project No. XX-XXX

(1X) - Model No. XXX-XX-XXX

714 Corey Rd, Hutchinson, KS 67501
Phone: 620-662-6693
www.superiorboiler.com

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OPERATION INSTRUCTION

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OPERATION INSTRUCTION

I. RECOMMENDED START-UP PROCEDURE

INITIAL START-UP

Shop assembled boilers are cleaned internally of all foreign material before they are shipped. If the manhole covers have not been removed, it will not be necessary to make an internal waterside inspection.

A water-soluble lubricant was used with the expanding equipment when the tubes were expanded into the drum, so the following procedure is recommended to prepare the boiler for the initial start-up.

If the feedwater pump is not available, open the manhole cover in the top drum and fill the boiler with soft water (if obtainable) to 2 or 3 inches below the manhole. If the feedwater system is operating, use the feedwater pump.

Thoroughly dissolve in containers of water the chemical combinations of twenty (20) pounds of Trisodium Phosphate, and two and one-half (2.5) pounds of Caustic Soda to each eight thousand (8,000) pounds of water and pour into the boiler through the open manhole or add through the normal chemical feed system.

Close the manhole, open the drum vent, and raise the water level to slightly above normal using the feedwater pump.

BEFORE LIGHTING THE FIRE, IT IS IMPORTANT TO TAKE THE FOLLOWING PRECAUTIONS:

- Make sure that connections are installed so that all blowoff and drain valves can be used effectively and without danger to the construction or operating personnel.

- Make sure the vertical safety valve discharge pipe is free from the valve outlet connection and will not touch it when the unit expands upward when heated.
- Make sure that the gage glass and other means of indicating the water level are in good working order.
- Make sure that the fuel burning equipment, temporary or otherwise, is in such condition that it can be operated in strict accordance with all the rules of safety applying to the particular type of fuel to be used for the boiling out process.

BEFORE LIGHTING ANY FIRES, COMPLETELY PURGE THE SETTING OF ALL COMBUSTIBLE GAS BY BLOWING AIR THROUGH THE SETTING WITH THE FORCED DRAFT FAN FOR AT LEAST FIVE MINUTES AT THE RATE OF AT LEAST ONE-FOURTH OF THE REQUIRED MAXIMUM CAPACITY OF THE UNIT.

Light the burner and adjust it to the minimum firing rate as described in the burner operating instructions. **IF BURNER IGNITION SHOULD BE LOST, IT IS ABSOLUTELY NECESSARY, FOR SAFETY, TO COMPLETELY PURGE THE SETTING FOR FIVE MINUTES BEFORE RELIGHTING.**

Leave drum vent open until steam blows out at a steady rate, at about 5 psig pressure, to vent air from the boiler and reduce corrosion possibilities.

Close the vent and continue firing at the minimum rate until 30 psi pressure is reached, at which point the burner should be shut off for 15 minutes to allow the temperature to equalize.

Relight the burner and continue firing at the minimum rate so that about one hour will be required to reach 75% of line pressure or 100 psi, whichever is higher. If the unit is rated at less than 100 psi pressure, bring it up to the operating pressure. Blow down the water column and gage glass for a few seconds to warm it evenly and to make sure all lines are clear. Also open the continuous blow down and lower drum blow down for a couple of seconds to make sure all lines are clear.

Shut off the burner and fire again as necessary to hold this pressure for four hours. During this period the continuous blow down lines should be cracked slightly open. Care should be taken not to let the safety valves pop, since the highly concentrated water may damage the seats.

Fill the boiler 3/4 of the gauge glass and blow down the boiler through the lower drum blow off valves to 1/4 gauge glass. This procedure should be repeated once every hour during the four-hour period when holding the pressure. Blow down the gauge glass, water column, and continuous blow down lines also.

Fill the boiler to near the top of the gauge glass and fire as necessary to maintain the boiler at 75 percent of line pressure or 100 psi, and again blow down the boiler to ½ gauge glass. This is done to reduce the concentration of the chemical solution to approximately a normal operating amount.

Restore the water level to normal, raise pressure, set the safety valves at their nameplate pressure, and place the boiler online.

Load should be increased gradually to not more than 1/2 load* and after four hours of operation, again blow down the boiler until the boiler water concentration is below the recommended limits discussed in "Water Treatment," Section III A.

Inspect the gauge glass for signs of oil on top of the water level. If there is an indication of oil present, continue blowing down the gauge glass, water column, feedwater regulator, and continuous blowdown line until clean.

Special precautions must be taken to protect the superheater metals if a superheater is provided with the boiler.

* In case the 1/2 load steam flow cannot be attained because of limited steam demand, the four-hour period given above should be increased to 12 hours before blowing down.

II. NORMAL START-UP

When the boiler is to be started-up from the cold condition after the initial start-up as described in Section I, the following procedure is recommended:

Close the boiler stop valve, open the drum vent, and establish the water level slightly below normal.

Light the burner and fire at the minimum firing rate. On boilers with superheaters, the safe firing rate will be determined by thermocouples. For future start-ups, the same fuel and air setting can be used. See the burner and control operating instructions for a list of specific steps to take in placing the burner and controls in operation.

When there is a steady flow of steam from the vent at about 5 psi, close the drum vent valve and continue firing until 30 psi is reached.

Shut the burner off for 15 minutes to allow the temperature to equalize.

Relight the burner and continue firing at the minimum rate so that it will take 45 minutes to one hour to reach line pressure. Place water level regulator on automatic and start feed pump.

After line pressure is reached, open the boiler stop valve and bleed steam as the load dictates, increasing combustion air and fuel to maintain steam pressure. With automatic controls, it is easier to carry out this operation after control has been placed on automatic.

III. OPERATION

A. Water Treatment

The quality of water treatment determines the length of time the boiler can be operated between cleans and the troubles that may occur. Improper boiler water treatment can result in three major difficulties, which may cause interruptions to service and costly repairs. These difficulties are:

1. Internal Deposits:

Results in furnace and boiler tube failures. Reason - Since the furnace wall tubes are closer to the high temperature, they circulate more water and will collect more deposits, if scale forming matter or sludge is in the boiler water. They are more vulnerable to overheating from internal deposits than the tubes in the cooler gas temperature zone.

Preventative Measures consist of external treatment of makeup water and/or internal treatment of boiler water. If the makeup is greater than 30%, external treatment is recommended since it will result in the least amount of foreign material entering the boiler. The following systems are in use today:

a. Hot Lime Soda or Zeolite softeners to remove scale forming calcium and magnesium salts.

b. Demineralizers to condition the water to a point of being virtually free of scale forming compounds. These processes eliminate soluble silica but not suspended silica. Such silica as it reaches the boiler through softeners or demineralizers must have its concentration kept within limits by blowdown. Recommended limits are given in Section III B.

c. Evaporators to provide makeup water free of virtually all suspended and dissolved solids. Normal operating conditions do not require the high quality makeup furnished by evaporators or demineralizers, so the use of internal treatment plus softeners on high makeup jobs is normally adequate.

2. Internal Corrosion:

Results in pitting of tubes or drum. Any evidence of pitting or more general corrosion should immediately be followed by prompt investigation as to the cause, and action taken to prevent further attack.

The reason for corrosion usually is oxygen in the feedwater to the boiler. Preventative measures consist of adequate deaeration and supplementary treatment. The pH value shown in Section III B should also be maintained.

3. Carry-Over:

Results in plugged steam lines, superheaters, traps, damage to reciprocating or rotating machinery, or contamination of the product in process work.

The reason for carry-over is foaming from high boiler water concentration, drum baffle leakage or high water level.

Preventative Measures consist of maintaining solids in the boiler water within limits given in Section III B and keeping drum baffles tight, where baffles are furnished. Proper feedwater regulator adjustment and maintenance will prevent high water level.

Reliable manufacturers of water treating equipment and competent water treating consultants are better prepared than the boiler manufacturers to assist operating companies in the handling of water treatment. The services of such consultants should be retained prior to and during operation of any boiler equipment.

B. Recommended Feed water and Boiler Water Conditions

Feed Water:

1.	Dissolved Oxygen:	Preferably ZERO, and not over 0.007 ppm (0.005 cc per liter)
2.	Hydrogen Ion Value (pH):	Not less than 7
3.	Hardness:	Zero temporary maximum of 17 ppm in terms of calcium carbonate.
4.	Total Solids:	Reduce to minimum
5.	Suspended Solids:	None
6.	Oil & Organic Matter:	Zero

Boiler Water:

1.	Alkalinity:	Between 100 and 250 ppm total alkalini expressed as sodium carbonate.
2.	Sodium Phosphate:	With residual hardness in the makeup, 30 to 60 ppm excess phosphate expressed as disodium phosphate.
3.	Chloride:	Not over 500 ppm expressed as chlorine. Preferably as low as possible.
4.	Hydrogen Ion Value (pH):	Not less than 10.8, preferably 11.0 to 11.5.
5.	Oil and Organic Matter:	Preferable zero.
6.	Total Solids:	To prevent carry-over, the following values should not be exceeded:

Operating Pressure	TDS @ Steady Load
0 – 300	3500 ppm
301 - 450	3000 ppm
451 - 600	2500 ppm
601 - 750	2000 ppm

7. Silica Concentration:

Drum Pressure	Maximum Silica Concentration pp
Below 600	50
600 – 750	25

In addition, silica concentration should not exceed 1% of the total solids concentration.

C. Operation & Maintenance

1. Daily

- Blow down gauge glass
- Test boiler water concentration
- Check functioning of water cut out by blowing down gauge glass, the water column, and the auxiliary Low Water Cut Out.

IV. SHUTTING DOWN

A. Normal Shutdown

When load demand is such that it requires a firing rate below minimum stop of the last burner in service, fuel shutoff and control valves to this burner should be closed and the fan removed from service. On single burner units with programmed automatic control, operating reverts to "on-off" until the unit is desired out of service, then it is shutdown following control equipment instructions.

After the burners and fan are out of service, dampers should be closed and on an oil-fired unit with its own oil pumping and heating equipment, this equipment should be removed from service.

When the non-return steam valve has closed and the boiler no longer requires water, stop the feed pump, close the feed regulator isolation valves when more than one boiler is being served by a feed pump, as a control valve is not a shut-off valve. The pressure should be allowed to drop naturally with all blowdown and vent valves closed.
NOTE:
If more than one boiler is being used and running into a common header or piping and one of the boilers is shut down for a period of time, then the (NRV), Non-Return valve must be manually closed to prevent back flow, until the boiler is brought back on line.

After the furnace brickwork has lost its color, dampers may be opened to speed cooling but the fan should not be run.

When the steam pressure has dropped to 25 psi, the steam drum vent valve should be opened to prevent the formation of a vacuum, and superheater drains when furnished, should be opened to drain moisture formed from condensation of steam. THE BOILER

SHOULD NOT BE EMPTIED UNTIL THE FURNACE HAS COOLED TO A TEMPERATURE AT WHICH ONE CAN ENTER AND REMAIN IN THE FURNACE.

B. EMERGENCY SHUT-DOWNS

1. Low Water

IF WATER GOES OUT OF THE BOTTOM OF THE GAUGE GLASS, FOR ANY REASON, ALL FUEL SHOULD BE SHUT-OFF. ANY DECISION TO KEEP THE BOILER IN OPERATION, EVEN FOR A BRIEF PERIOD, SHOULD BE MADE BY THE PERSON WHO IS IN RESPONSIBLE CHARGE AND WHO SHOULD BE FULLY AWARE OF THE CONDITIONS EXISTING AT THE TIME. IF WATER REMAINS OUT OF SIGHT IN THE GAUGE GLASS AFTER TRIPPING THE FIRE, WATER SHOULD NOT BE ADDED UNTIL THE BOILER HAS COOLED WITHIN 100° F OF INLET WATER TEMPERATURE.

2. Boiler Tube Failures

If a tube rupture occurs, and low water follows, the procedure in paragraph 1 should be followed. If loss of burner ignition occurs, fuel flow must be stopped immediately. Cooling should then follow the procedure give in Section V. A. Where tube failure does not cause flame failure and it is possible to maintain water level, operation may be continued and normal procedures followed until a more convenient shut-down time. It should be recognized that the presence of moisture from leaks, plus a high sulfur fuel, can cause external corrosion of tubes and drums.

V. INSPECTION AND CLEANING

A boiler unit should be taken out of service periodically for routine inspection and cleaning, the interval between these outages to be determined by observing cleanliness at each outage and gradually extending the time interval until an acceptable interval consistent with proper cleanliness is reached. The initial inspection should be made after one or two month operation.

A. Internal

1. **PRIOR TO ENTERING THE BOILER FOR INSPECTION OR CLEANING, PARTICULAR CARE MUST BE TAKEN TO GUARD AGAINST ACCIDENTS.**

The following precautionary action is suggested:

- Fan motor breakers should be opened and tagged.
- Make sure steam or hot water cannot enter the unit through open drains or blowdown valves connected to other units under pressure at the time. Valves should be locked, closed, and tagged with warning tags.
- Make sure all steam and feed valves are locked and tagged closed.
- Make sure all temporary electric lines will not short circuit or ground.
- **OPERATING AND MAINTENANCE PERSONNEL SHOULD KNOW WHEN SOMEONE IS IN THE BOILER.**

2. Drum: Look for signs of corrosion, chemical deposits, oil or other potential sources of trouble attributable to water conditions. Severe operating upsets, such as low water, may cause internal cracking or signs of overheating as indicated by out-of roundness, sagging or severe discoloration.

A) Drum Internals: Look for heavy sludge deposits, leaks and loose baffles, sludge in feed pipes, blowdown pipes and water column connections. Baffles should be tightened and internals cleaned before returning to service.

B) Tubes: Look for signs of corrosion, chemical deposits, oil or other potential sources of trouble attributable to water conditions. Internal deposit or low water may cause tube bowing, swelling, cracking, discoloration or seat leakage.

3. Removal of deposits should be done by water washing, turbining, or acid cleaning, depending on recommendations of water consultant and nature of deposit. If acid cleaning is required, experienced chemical cleaning firms can be retained to perform the operation without hazard to personnel or equipment.

4. Particular care should be taken to see that the connections to the water column, gauge glass, pressure gauge, safety valves, and blowdowns are clear.

B. External

1. Tubes and drums should be inspected for signs of overheating, leakage, or corrosion.

2. Fuel burning equipment, especially those parts which are not accessible when the unit is in service, should be checked and repairs or replacement should be made to ensure the proper functioning of the equipment as well as to reduce the possibility of interruptions during subsequent operation. Refer to instructions pertaining to the type of equipment furnished for details.

3. Settings - Inspect casing for tightness. Evidence of "hot-spots" indicates the need for repair of furnace refractory, which should be checked as routine in any case, particularly in the burner area.

4. Miscellaneous

   Doors should be inspected for cracks and the refractory liners or gaskets repaired or replaced when required.

   Ducts should be inspected for ash deposits and should be cleaned before returning to service.

   Fan blades and dampers should be cleaned as required, since dirty inlet vanes affect minimum air flow setting.

   Water Column and Gauge Glass should be inspected to make sure drain lines are open and that the glass and control components are in operating condition.

   Valves which are leaking should be lapped or repacked whichever is necessary before returning to service. Instruments and Controls should be inspected, cleaned, and recalibrated if necessary.

5. Cleaning of the boiler heating surface is done as is necessary. This cleaning can be accomplished by brushing, scraping, air lancing, or water washing. Cleaning refractors or refractory-faced surfaces should be minimized. Clearing of slag from a refractory surface too often will eventually tear away the refractory surface.

VI. BOILER STORAGE

Boilers to be held out of service must be carefully prepared for the idle period and closely watched during the outage to reduce the possibility of corrosion. The following recommendations should be followed during these idle periods:

A. Protection of Internal Surfaces

1. Dry Storage

When it is known that a boiler will be stored for a considerable length of time and allowance can be made for a brief period of preparation for demanded service, the dry storage method is recommended. In this method the unit is emptied, thoroughly cleaned internally and externally, and then closed to exclude both moisture and air. Trays of lime, silica gel, or other moisture absorbent may be placed in the drums to absorb the remaining moisture.

The pans should not be more than three-quarters full of the dry absorbent so that there will be no overflow of corrosive liquid after the moisture has been absorbed. Particular care must be taken to prevent water, steam, or air leakage into the unit. Periodic inspections should be made to ensure that no corrosive action is taking place, and at those times the absorbent should be replenished as required.

2. Wet Storage

Wet storage is not normally recommended, but if the boiler must be available on very short notice, the following procedure should be followed:

The boiler should be steamed in service in order that boiler water conditions may be stabilized and all oxygen driven out of the water.

The boiler should be brought down in rating slowly and the water level raised as high in the glass as is consistent with safe operation while still unloading some steam to the line. Adding sodium sulfite in the feedwater will aid in preventing oxygen corrosion when the unit is cold.

When the pressure has practically disappeared but before a vacuum due to cooling off is produced, open the boiler vent and slowly fill the boiler completely full, then close the valve. The drain on the boiler side of the main steam stop valve should be wide open so that any water getting past the non-return valve will not accumulate on the boiler side of the stop valve.

Filling should be continued until a pressure of at least ten (10) psi against the non-return valve is reached.

Operators should keep close watch to guard against the increase of undue pressure against the non-return valve due to leaking feedwater valves. The boiler connections should also be checked periodically for leakage. Level in the boiler should be checked periodically to be sure that water has not been lost through drain or blowdown valves. This can be done by adding water until it spills out the drum vent line, or some point higher than the top of the steam drum.

B. Protection of External Surfaces

The external surfaces of all pressure parts and other metallic surfaces should be completely cleaned of all ash and soot deposits.

The setting should then be closed and kept closed, but periodic inspections should be made regularly to guard against sweating and corrosion of the external surfaces of the pressure parts, particularly when the wet storage method is used. It may be necessary to use coke stoves, or similar heating devices, at convenient points to keep all metal surfaces above the dew point, particularly during prolonged spells of damp weather accompanied by rising temperature.

RIGGING & OFFLOADING

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RIGGING AND OFFLOADING INFORMATION FOR SUPERIOR BOILER DS-TYPE BOILERS

Superior Boiler DS-Type boilers are designed and built as modular units to be delivered to a jobsite by either flatbed tractor-trailer or railcar. Rigging and offloading of boilers is not the responsibility of Superior Boiler except when under contract to perform. The following information is NOT all-inclusive and should not be used in lieu of common sense and safety. Care should be taken by crane operators and riggers to ensure all jobsite safety regulations are met. Only qualified individuals should attempt to rig or offload boilers or additional equipment received from Superior Boiler. Any damage resulting from improper rigging or offloading is not the responsibility of the manufacturer.

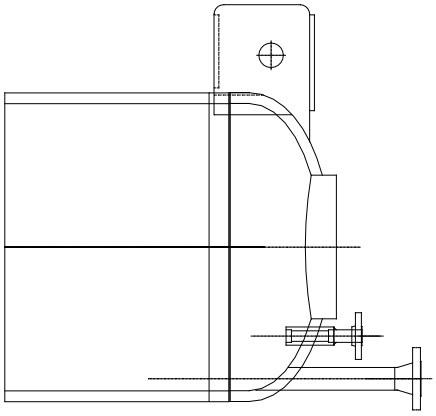
SAMPLE

Superior Boiler Disclaimer

THIS DOCUMENT IS FOR REFERENCE ONLY AND DOES NOT INCLUDE ALL INFORMATION NEEDED TO PROPERLY AND SAFELY RIG AND UNLOAD AN SUPERIOR BOILER. ADDITIONAL INFORMATION SHOULD BE PROVIDED BY THE RIGGING AND UNLOADING COMPANY ONSITE. THE FOLLOWING INFORMATION IS TO BE USED BY QUALIFIED INDIVIDUALS WHO ARE PROPERLY TRAINED AND CERTIFIED TO DO THIS TYPE OF WORK. SUPERIOR BOILER WILL NOT BE HELD RESPONSIBLE FOR ANY DAMAGE OR INJURY, DIRECT OR INDIRECT, RESULTING FROM RIGGING OR UNLOADING OF SUPERIOR BOILERS.

The Superior Boiler "DS"-Type boiler is built on a base made of S12 x 31.8 carbon steel beams running the length of the boiler. These beams are cut at an angle at each end to serve as jacking points. The lifting lugs have been welded to each boiler drum end (see Detail A). For additional

information, refer to the Boiler General Arrangement layout which is included in the Operation and Maintenance manual.



DETAIL "A"

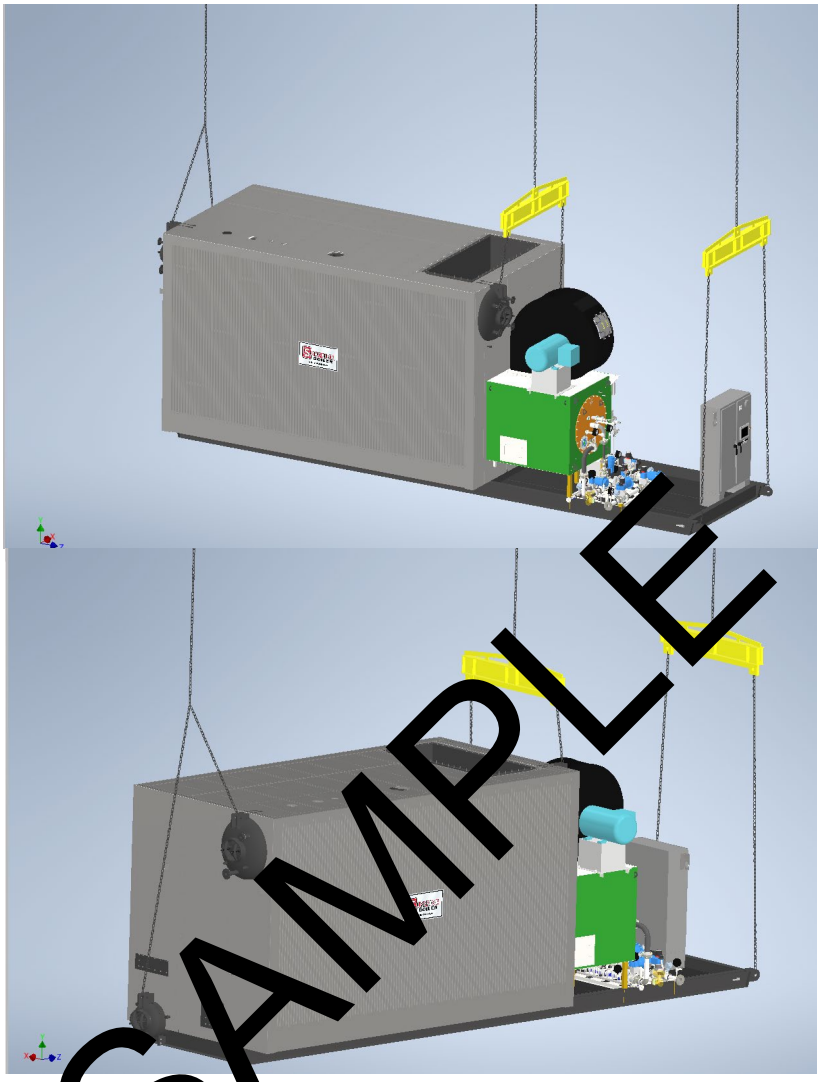
TYPICAL BOILER DRUM MOUNTED LIFTING LUG

SAMPLE

Rigging of the boilers should be done at each lifting lug using appropriate shackles and lifting straps. Chains are not recommended as they can cause damage to the boiler casing. Straps and shackles should be selected so that they provide proper lifting strength, based on boiler shipping weight. This information is supplied in the Boiler Foundation Layout and Loading drawing and confirmed by the shipping company upon arrival to the jobsite. In the event of a discrepancy between the drawing shipping weight and the shipping company weight, use the higher weight of the two. The following method is suggested:

Ideally, the safest method of lifting a large piece of industrial equipment of this size is with the use of three cranes, each rated to lift the boiler's weight. Each crane should be positioned such that adequate clearance is given for each boom to swing from the trailer/railcar to the offloading

location. Each crane should use two lifting straps of varying length in a V-formation, one crane near the front of the boiler and one crane near the back, as shown in Detail B.



DETAIL “B”

END OF DOCUMENT

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LONG TERM BOILER STORAGE PROCEDURE

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Long Term Boiler Storage Procedure

The boiler and equipment are designed to be put into service as soon as installation, start-up and testing can be accomplished, generally within six to ten weeks after delivery of boiler to the job site. Boilers to be held out of service for extended periods must be properly prepared for the storage period and closely watched during the outage to reduce the possibility of corrosion. Even if the boiler was designed as an outdoor unit, it is not impervious to prolonged exposure to the elements and must be protected from moisture incursion.

It is in the customer's best interest to provide the maximum protection possible for this equipment. SB will not be held responsible for the storage method or problems resulting from the storage. The actual procedure is the complete responsibility of the customer, who shall determine the extent of the protection. It is necessary to provide on-going inspection of the equipment to determine if additional efforts will be needed. The warranty for the boiler and all accessories becomes effective on day of shipment.

Obviously, the best method of storage would be to move the boiler and water treatment skid to an indoor environment that would provide shelter and temperature control. With that not being feasible, the following procedure is suggested and recommended to lay-up the boiler and equipment for storage:

Objective Evidence:

1. Provide photographs of the boiler from all angles and views, as it exists, before protection is applied.

2. Provide a written report of any unusual or adverse conditions that may be noted to exist.

3. Maintain a maintenance book, recording inspections, date and condition of notable items.

Application of Nitrogen Blanket Tube Side Protection:

The assumption is made that the boiler has not gone through boil-out procedure and is not ready for start-up.

1. Drain and blank off openings to the drums. Use rubber gaskets on all manways and blind flanges.

2. Attempt to remove all water from tubes and drums through heating and / or partially pulling a vacuum on the water side of the drums and tubes. Purge the drum of all oxygen and water vapor using dry nitrogen and install a continuous positive pressure nitrogen blanket on the interior surfaces. Use a pressure gauge to verify that a positive pressure (about 5 psig) above atmospheric pressure is maintained at all times. Nitrogen purges long enough to displace all oxygen, thus precluding oxidation from occurring within the waterside of the boiler.

3. Inspection of the boiler for adequate nitrogen positive pressure should be performed weekly to ensure that continuous pressurization of the nitrogen is taking place at all times. Readings and date should be logged in the maintenance book.

Furnace Protection:

1. Seal all openings to the boiler furnace side. Tape polyethylene over the burner opening to prevent air from entering the furnace area. Seal the gas outlet with plywood and apply a rubber or plastic gasket between plywood and gas outlet frame. Close off any damper if ductwork has been installed.

2. As a minimum degree of protection, trays of desiccant, silica gel, calcium chloride, or other absorbent should be placed inside the furnace area to assist in absorbing any remaining moisture that may be present in the furnace area.

3. The pans should not be more than three quarters full of the dry absorbent to be sure that there will be no overflow of corrosive liquid after the moisture has been absorbed. Particular care must be taken to prevent water, steam, or air leakage into the unit.

4. Periodic inspections should be made to ensure that no corrosive action is taking place, and at those times the absorbent should be replenished as required. Inspections should be made every other week and recorded in the maintenance logbook.

Rear and External Surface of Boiler:

1. Shrink wrap trim on rear of boiler to protect valves from oxidizing.

2. Cover entire exterior surface of boiler with an adequate tarp or tarps.

Temperature Protection:

If electrical service has been connected, on or before the first freeze, it would be optional but desirable to have an electrical space heater operating on thermostat inside the boiler furnace in order to maintain temperatures a few degrees (3 to 5 deg F) above freezing.

Storage of loose shipped Item:

1. Loose shipped items must be stored in a safe, dry and temperature-controlled environment such as a warehouse to ensure that vendor supplied items are protected against the exposure to the outside elements and condensation. Damage to items such as safety relief valves, non return valve, motorized isolation valves, and other miscellaneous valves: as well as, instrumentation, pressure gages and pressure transmitters, may affect their warranty due to lack of proper care and storage.

Taking Boiler Equipment Out of Storage:

1. Remove shrink-wrap from boiler, burner, fuel train, boiler trim and controls and rear of boiler trim.

2. Remove all tarpaulins

3. Remove all trays of desiccant from the boiler and control panels. Particular care must be taken to prevent spillage of corrosive water from the absorptive element.

4. Remove taped gasketing over the burner opening and replace rubber gaskets with operating gaskets.

Comparative Evidence:

1. Provide after protection photos of boiler and equipment to compare with pre-protection photos.

2. Any needed repairs and / or corrective action to the boiler as a result of the storage should be verified by SB and should be made prior to start-up of the boiler, in order to preserve the remaining portion of the warranty, if any remains.

3. No cost of the protection and materials for the boiler consumed during storage, nor subsequent corrective action that may be deemed necessary shall be borne by SB.

4. Some touch up paint and rework may be necessary after prolonged storage and will be part of the protection cost and maintenance.

5. Due to expansion and shrinkage of the exterior casing, it may be necessary to apply additional caulking along roof trim line to prevent moisture from entering the boiler casing.

6. It would be desirable to conduct an electrical inspection prior to start-up to ensure that damage has not occurred within the control panel.

While the storage method outlined here is a minimum requirement, the actual success of good dry storage depends on the implementation of this procedure as well as the quality of implementation and preventive maintenance given to the units while in storage. SB will not be held responsible for the storage method or the problems resulting from the storage.

SB Project No. XX-XXX

(X) - Model No. XXX-XX-XXX

SECTION 2 BOILER PRESTART-UP AND SET-UP DOCUMENTS

1. **PRESTART-UP INSTALLATION & SYSTEM READINESS CHECKLIST**
   (Above to be filled out & returned to Superior Boiler prior to start-up)

2. **OPERATIONAL TEST DATA SHEET**

3. **BURNER/COMBUSTION CONTROLS SET-UP DATA SHEET** (Natural Gas)

4. **BOILER FUEL EFFICIENCY SET-UP DATA SHEET** (Natural Gas)

5. **PERFORMANCE TESTING CHECK-LIST AND DATA SHEETS**

6. **BOILER PREDICTED PERFORMANCE SUMMARY**

7. **ASME DATA PAPERS**

BUILT TO OUTPERFORM

PRESTART-UP INSTALLATION
&
SYSTEM READINESS
CHECKLIST

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BUILT TO OUTPERFORM

PRE-START UP INSTALLATION AND SYSTEM READINESS CHECK LIST

Complete the following checklist and return to Superior Boiler prior to scheduling start-up services. All items on the list must be signed off as complete. The customers review of and adherence to the inspections prescribed in this list will not only eliminate additional start-up costs, but also assure timely completion of commissioning activities.

1. Is the boiler and auxiliary equipment installation completed in accordance with specifications and job requirements? The following systems must be in service as a minimum:

☒ Boiler feed pumps are in service.

SYSTEM START-UP

A. After the equipment has been completely installed, the following procedures should be followed.

A-1 - Inspect all pipe connections to be sure they are correctly and securely connected. Examine all controls and valves to assure that each is operating freely and properly lubricated where necessary.

A-2 - Thoroughly flush vessel and all associated piping until there is no indication of rust or foreign material. Spray valves and vessel nozzles should be freed of all large pieces of mill scale or debris.

A-3 - Ascertain that all instruments and gauges are operating and indicating correctly.

Verified: _____ **Date:** _____

☒ Water Softeners and other boiler feedwater treatment systems are in service.

Verified: _____ **Date:** _____

☒ Feedwater distribution system is tested and energized. The feedwater regulator is operational with all instrument air, and control wiring complete as required for operation. Final adjustment of the valve positioner may be performed during start up only if this service is included in the scope of Superior Boiler.

Verified: _____ **Date:** _____

☒ Fuel Oil distribution system is tested and energized. The oil pressure is regulated to the burner at the pressure noted in the burner manufacturer's submittal literature.

Verified: _____ **Date:** _____

☒ Natural gas distribution system is tested and energized, and the gas pressure shall be regulated to the burner at the pressure noted in the burner manufacturer's submittal literature. The gas vents shall be run out of the building to safe locations as required.

Verified: _____ **Date:** _____

☒ Steam distribution piping is completed and tested.

Verified: _____ **Date:** _____

☒ Boiler safety valve vent and drain piping is be installed per the manufacturer's recommendations.

Verified: _____ **Date:** _____

☒ Blowdown piping, blowdown separators heat recovery units, or aftercoolers are complete and operational such that the boiler may be blown down and drained as needed.

Verified: _____ **Date:** _____

☒ Chemical treatment systems are complete and operational.

Verified: _____ **Date:** _____

☒ Steam vent piping is in place to allow full capacity testing of the boiler.

Verified: _____ **Date:** _____

2. Is the electrical system complete and tested?
Service power has been wired to the blower motor in accordance with applicable electrical codes, and motor nameplate readings.

Verified: _____ **Date:** _____

☒ The blower motor has been bumped to verify proper rotation.
Rotation _____(CW/CCW)

Verified: _____ **Date:** _____

☒ Control power has been provided to all devices.

Verified: _____ **Date:** _____

☒ All ship loose control and flame safeguard limit devices have been installed and wired.
Verified:_____ **Date:**_____

3. Are the fuel and atomizing steam lines tested, clean and free of any debris?

☒ Purging and pressure testing of the piping is complete and any certifications required have been completed.

Verified: _____ **Date:** _____

☒ Strainers and dirt legs are provided in the fuel lines to prevent entrance of foreign materials into control valves and safety devices?

Verified: _____ **Date:** _____

☒ The atomizing steam line is trapped to atmospheric drain to assure dry steam to the atomizer.

Verified: _____ **Date:** _____

4. Have provisions been made for full load testing?

☒ Steam vent piping has been installed including a globe valve and a muffler, sized as required to exhaust full boiler capacity. The system shall be sized to pass the full boiler capacity safely to atmosphere. OR The steam demand is sufficient such that the new boiler may be run to full load at any time during the day, for any length of time without disrupting the plant, or causing over-pressure to the system.

Verified: _____ **Date:** _____

☒ Flow measuring devices are calibrated and in service. Note: One of the following meters is mandatory, although all are recommended. All additional meters required for testing shall be installed in according with job requirements.

1) Steam flow meter (if provided)
2) Feed water flow meter (if provided)
3) Fuel flow meters, for each fuel. (If provided)

Verified: _____ **Date:** _____

5. There is ample fuel supply to operate the burner and the pilot burner through the start up period.

Verified: _____ **Date:** _____

6. Any damaged, defective, or missing items have been repaired, replaced, or installed. If any of the products supplied by Superior Boiler were damaged, has Superior Boiler been notified and purchase order issued for the replacement parts. If parts supplied by Superior Boiler are thought to be defective, has Superior Boiler been notified so the parts may be replaced prior to, or during the start up period?

Verified: _____ **Date:** _____

7. Has the facility complied with all emissions regulations?

☒ The facility has applied for and received an emissions permit.

Verified: _____ **Date:** _____

☒ Superior Boiler has been given a copy of the emissions permit.

Verified: _____ **Date:** _____

8. Have the appropriate authorities been notified of the scheduled events?

☒ The owner, resident engineer, construction manager, and/ or general contractor has been notified.

☒ The emissions enforcement authority (state, municipality ...etc) has been notified.

Verified: _____ **Date:** _____

9. Are qualified operators available to operate the boilers during non-work hours?

☒ Are these operators scheduled for training? (Circle one) Yes / No

☒ When is the training class scheduled? (Mo/day/yr) ___/___/_____

☒ How many operators will attend? _____

Verified: _____ **Date:** _____

10. If any of the above items are not complete, state the estimated date when the above items will be completed, allow sufficient time for unexpected delays.

Completion Date: ___/___/_____

11. State the desired start date based on item 8 above. Please allow adequate service scheduling time (min. 2 weeks notice, max. 4 weeks notice).

Start Date: ___/___/_____

BUILT TO OUTPERFORM

If the above items are not completed prior arrival of our serviceman, all down time, travel, lodging, and expenses caused by the delay will be charged at the current rate per Technician per 8-hour day pre-diem rate. Travel and subsistence are not included in the daily rate and would be billed at time service is rendered. Each site trip shall require one day of travel time each way.

Agreed:

_____
Signature

_____
Print Name

_____
Title

_____
Company Name

Return To:

Superior Boiler LLC,
Attention: Project Manager
6701 Janway Rd
Henrico, VA 23228

OPERATIONAL TESTS DATA SHEET

714 Corey Rd, Hutchinson, KS 67501
Phone: 620-662-6693
www.superiorboiler.com

SUPERIOR BOILER

BUILT TO OUTPERFORM

OPERATIONAL TESTS DATA SHEET

Project:

Boiler S/N:

Performed By:_____ Date:_____

Where applicable the following safety limit systems are suggested. If additional safety limits are supplied, perform the tests necessary to ensure proper operation of the safety limit and document these tests accordingly.

Operating Limit Tests: The following tests shall cause the burner to shut down. The burner shall automatically recycle when the limit condition is restored.

- Burner On/Off Switch: Verified:_____
- Local Emergency Shut Off Button Test: Verified:_____
- Remote Emergency Shut Off Button Test: Verified:_____
- Operating Pressure Limit Test: cut-out @_____ psig. Verified:_____

Running Interlock Tests: The following tests shall produce a shut down and flame safeguard lock out. It shall not be possible to relight the burner without reset of the flame safeguard controls, or manual reset of the limit device.

- Low Water Cut-Out Test: cut out @_____in. drum level Verified:_____
- Aux. Low Water Cut-Out Test: cut out @_____in. drum level Verified:_____
- High Steam Pressure Limit Test: cut out @_____ psig. Verified:_____
- Gas Proof of Closure Switch Test: Verified:_____
- Oil Proof of Closure Switch Test: Verified:_____
- High Gas Pressure Switch Test: cut out @_____ psig. Verified:_____
- Low Gas Pressure Switch Test: cut-out @_____ psig Verified: _____
- Blower Interlock Test: Verified:_____
- Low Oil Pressure Test: Verified:_____
- Low Atomizing Steam Test: Verified:_____
- Low Oil Steam Flow Test: Verified:_____
- Purge Air Flow Switch Test: Verified:_____
- Combustion Air Flow Switch: Verified:_____

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Flame Scanner Tests: The following tests shall be conducted to assure the flame scanner system is operational. The system shall lock out if the following conditions are made to exist.

- Flame Failure: Verified:_____
- False Flame: Verified:_____

Water Level Alarm Tests: Verify proper alarm operation.

High Water Alarm Test: alarm @_____ in. drum level Verified:_____
Low Water Alarm Test: alarm @_____ in. drum level Verified:_____

Additional Limits: Additional limits tested.

_____ Verified:_____

_____ Verified:_____

_____ Verified:_____

SUPERIOR BOILER

BUILT TO OUTPERFORM

OPERATIONAL TESTS DATA SHEET

Project:

Boiler S/N:

Performed By:_____ Date:_____

Where applicable the following safety limit systems are suggested. If additional safety limits are supplied, perform the tests necessary to ensure proper operation of the safety limit and document these tests accordingly.

Operating Limit Tests: The following tests shall cause the burner to shut down. The burner shall automatically recycle when the limit condition is restored.

- Burner On/Off Switch: Verified:_____
- Local Emergency Shut Off Button Test: Verified:_____
- Remote Emergency Shut Off Button Test: Verified:_____
- Operating Pressure Limit Test: cut-out @_____ psig. Verified:_____

Running Interlock Tests: The following tests shall produce a shut down and flame safeguard lock out. It shall not be possible to relight the burner without reset of the flame safeguard controls, or manual reset of the limit device.

- Low Water Cut-Out Test: cut out @_____in. drum level Verified:_____
- Aux. Low Water Cut-Out Test: cut out @_____in. drum level Verified:_____
- High Steam Pressure Limit Test: cut out @_____ psig. Verified:_____
- Gas Proof of Closure Switch Test: Verified:_____
- Oil Proof of Closure Switch Test: Verified:_____
- High Gas Pressure Switch Test: cut out @_____ psig. Verified:_____
- Low Gas Pressure Switch Test: cut-out @_____ psig Verified: _____
- Blower Interlock Test: Verified:_____
- Low Oil Pressure Test: Verified:_____
- Low Atomizing Steam Test: Verified:_____
- Low Oil Steam Flow Test: Verified:_____
- Purge Air Flow Switch Test: Verified:_____
- Combustion Air Flow Switch: Verified:_____

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Flame Scanner Tests: The following tests shall be conducted to assure the flame scanner system is operational. The system shall lock out if the following conditions are made to exist.

- Flame Failure: Verified:_____
- False Flame: Verified:_____

Water Level Alarm Tests: Verify proper alarm operation.

High Water Alarm Test: alarm @_____ in. drum level Verified:_____
Low Water Alarm Test: alarm @_____ in. drum level Verified:_____

Additional Limits: Additional limits tested.

_____ Verified:_____

_____ Verified:_____

_____ Verified:_____

BURNER/COMBUSTION CONTROLS SET-UP DATA SHEET

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BURNER AND COMBUSTION CONTROLS SET UP DATA

PROJECT: xx-xxx
LOCATION:
BOILER NUMBER: xx-x-xxx
FUEL:

BOILER:
BURNER:
CONTROLS:

FIRING RATE												
Percent Firing (%)	100	90	80	70	60	50	40	30	20	10		MIN
FLOW RATES												
Steam Flow (lb/hr)												
Gas Flow (scfh)												
FUEL/AIR/O2 CONTROL SET POINTS												
Fuel Valve Position (% Open)												
FD Fan Damper Position (%Open)												
% Oxygen (In-Situ Analyzer)												
PRESSURES @ BURNER												
Gas Main Pressure (psig)												
Gas Pressure to Fuel Train (psig)												
Gas Pressure @ Burner (psig)												
EXHAUST GAS ANALYZER READINGS												
% Oxygen (% Vol)												
%Excess Air												
Carbon Monoxide (ppm)												
Carbon Dioxide (% Vol)												
Nitrogen Oxides (ppm)												
TEMPERATURE PROFILE												
BFW Temp @ Econ Inlet (F)												
BFW Temp @ Econ Out (F)												
Flue Temp @ Econ In (F)												
Flue Temp @ Econ Out (F)												
STATIC PRESSURE SUMMARY												
Windbox Pressure (inH2O)												
Furnace Pressure (inH2O)												
Blr Outlet Pressure (inH2O)												
Econ Out Pressure (inH2O)												

Analyzer Used:	COMMENTS:
Calibration Date:_____	
Calibration Due:_____	

BOILER FUEL EFFICIENCY SET-UP DATA SHEET

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www.superiorboiler.com

SUPERIOR BOILER FUEL EFFICIENCY SET-UP DATA SHEET

PROJECT: XX-XXX
LOCATION:
BOILER NUMBER: XX-X-XXX
FUEL: NG

BOILER:
BURNER:
TEST NO.:
TEST DATE:

Time								
Firing Rate (%)								
Steam Drum Pressure (psig)								
Steam Flow (lb/hr)								
Gas Flow (ft/hr)								
Blowdown Flow Rate (lb/hr)								
Steam Conductivity (uMho)								
Drum Water Conductivity (uMho)								
BFW Temp @ Econ Inlet (F)								
BFW Temp @ Econ Out (F)								
Flue Temp @ Econ In (F)								
Flue Temp @ Econ Out (F)								
Oil Temperature (F)								
Ambient Air Temperature (F)								
COMBUSTION ANALYZER READINGS								
% Oxygen (% Vol)								
%Excess Air								
Carbon Monoxide (ppm)								
Carbon Dioxide (% Vol)								
Nitrogen Oxides (ppm)								

Analyzer Used:

Calibration Date:_____

Calibration Due:_____

% Fuel Valve _____
% Fuel Flow _____
% Air Damper _____
% Air Flow _____
% Oxygen

COMMENTS:

Performed By:_____
Customer Signature:_____

PERFORMANCE TESTING CHECK-LIST AND DATA SHEET

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www.superiorboiler.com

BUILT TO OUTPERFORM

Performance Testing Checklist and Data Sheets

Hydrostatic Test:

The boiler was hydrostatically tested at the factory in accordance with ASME Section Boiler and Pressure Vessel Code, Section I. The signature of the Authorized Inspector on the ASME Data Report certifies the boiler, accepting the shop hydrostatic test.

The boiler hydrostatic test has been completed (see also ASME Form P-3).

Verified:_____ **Date:**_____

Inner Casing Air Test:

Prior to applying the boiler insulation and casing, the boiler was subject to an inner casing air test. The boiler was pressurized to 10 inches of water and subject to the following inspection under pressure:

1. Soap and Bubble Test: Acceptance Criteria, no continuous bubble formation.

2. Pressure Decay Test: Acceptance Criteria, less than 5 in H2O loss in 10 minutes.

The Air Casing Test was performed with acceptable results.

Verified:_____ **Date:**_____

Start-Up and System Readiness Check-List:

Service personnel shall be on site to put the boiler into service. The steam plant and auxiliary equipment shall be in service, fully operational, and the system ready to be commissioned. The System Readiness Checklist must be completed and returned prior to scheduling service personnel. All items on this checklist shall be verified complete. Should service work be rescheduled or delayed due to circumstances outside of our control, the standard per diem rates shall apply.
The System Start Up and Readiness Checklist has been reviewed.

Verified:_____ Date:_____

Boil-Out:

Once the unit is initially checked out and minimum fire established, boil-out may begin. Follow the instructions in the Operation and Maintenance Manual.
When boil out is completed, the boiler shall be completely drained, cleaned and the manway gaskets replaced.

The boiler has been cleaned in accordance with contract requirements.

Verified:_____ **Date:**_____

Burner and Combustion Control System Set-Up and Adjustment:

Service personnel shall set up the burner throughout the firing range. The contractor shall supply the necessary labor and manpower to support the facility during these efforts. Provisions shall be made to assure the system demand will support full capacity testing. Further, the system shall not delay the work of the service engineers. The installation of a controlled steam vent system, sized for full boiler capacity, will assure no delays due insufficient steam demands. The burner service engineer shall make the necessary adjustments to the burner to achieve the required heat input and burner performance throughout the firing range, for each fuel. The system parameters shall be recorded on the **Burner Set Up Data Sheet**. The burner and control system service engineers shall verify the setting of all safety limit devices. Each device shall be tested. Each acceptable test shall be recorded on the **Operational Tests Data Sheet** with limit device setting noted. The controls system service engineer shall work closely with the burner service engineer setting the combustion control system parameters. The control system shall repeat this combustion settings for normal operation. Once the burner and controls system set up is complete, the service engineers shall call for acceptance testing.

The system is ready for acceptance testing.

Verified:_____ **Date:**_____

Capacity, Efficiency and Operating Tests:

Boiler Operation and Test Performance:

The boiler shall be operated in steady state conditions in accordance with Table 1. During this period, measurements shall be taken from the newly installed and calibrated plant instrumentation system. A portable combustion analyzer shall be used to determine the products of combustion. The parameters listed on the **SB ASME PTC 4.1 Test Data Sheet** shall be measured and recorded during the test.

TABLE 1: Efficiency Test Operating Levels

Percent Capacity	Steaming Rate	Duration	Measurement Intervals
50	27,500	**2 Hours**	**15 Minutes**
75	41,250	**2 Hours**	**15 Minutes**
100	55,000	**2 Hours**	**15 Minutes**

Natural Gas Properties:

An as-burned analysis of the natural gas burned during testing shall be supplied to Superior Boiler. This analysis is typically available from the natural gas public service company. This analysis shall include items 41, 54, 55, 56, 57, 58, 59, 60, 61, 62, and 63 as a minimum.

Steam Quality Testing:

During efficiency testing, the boiler steam quality shall be determined by the customer. A steam sample shall be taken from a convenient location in the steam distribution system. The sample shall be condensed and the conductivity of the condensation shall be measured. The boiler water shall also be sampled and measured for conductivity. Steam quality will be calculated from the relationship of the steam conductivity and boiler water conductivity. Steam quality shall be reported on form **PTC 4.1-a**, item 9.

Calculations and Report Generation:

The boiler efficiency shall be calculated from the averaged measurements at each operating condition. The calculations shall be performed in accordance with **ASME PTC 4.1** using the **Heat Loss Method**. The results shall be reported on form **PTC 4.1a, ASME Test Form for Abbreviated Efficiency Test.** A sample of this form is included.

Water Level Stability Test:

The operation of the feedwater regulator, its bypass valve and the associated control system shall be tested during capacity and efficiency testing, as follows. The boiler shall be fired to 100% capacity with the feedwater controls in automatic. The system shall maintain the drum level as viewed from the site glass within plus or minus one inch of normal operation. The bypass valve shall then be opened and the isolation valve at the regulator closed to prove the bypass valve capable to pass the full boiler capacity. Note: The amplitude of drum level fluctuations will depend greatly upon the operator. This test is only intended to prove the valve will pass the full capacity.

The water level stability test was performed with acceptable results.

Verified:_____ **Date:**_____

Plant Operational Test:

We suggest the boiler and supplementary equipment be placed on line for a period of time to assure the boiler, auxiliary equipment, and control system are properly adjusted.

The Plant Operational Test was performed with acceptable results.

Verified:_____ **Date:**_____

BOILER PREDICTED PERFORMANCE SUMMARY

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SUPERIOR BOILER

SAMPLE FORM

Predicted Performance Summary – Natural Gas						
	Load Rating	100%	75%	50%	25%	
Flow rates	Gross Steam	80000	60000	40000	20000	lb/hr
	Net Steam	80000	60000	40000	20000	lb/hr
	Steam to Deaerator	0	0	0	0	lb/hr
	Continuous blow down	1600	1200	800	400	lb/hr
	Feed water	81600	61200	40800	20400	lb/hr
	Fuel	4563	3392	2251	1122	lb/hr
	Combustion air	83588	62127	42125	21443	lb/hr
	Flue gas	88151	65519	44376	22565	lb/hr
	Flue gas recirculation	10578	7862	5325	2708	lb/hr
	Flue gas leaving furnace	98729	73381	49701	25273	lb/hr
Pressure	Steam pressure @ NRV	80	80	80	80	psig
	Drum Operating pressure	115	103	92	85	psig
	Boiler Design pressure	250	250	250	250	psig
Temperature	Superheat steam temp. @ NRV	431	427	413	397	°F
	Saturated steam temp. @ Drum	347	340	333	328	°F
	Feed water entering economizer	227	227	227	227	°F
	Feed water leaving economizer	296	285	274	265	°F
	Flue Gas temp leaving boiler	470	466	409	362	°F
	Flue Gas temp leaving economizer	300	270	251	236	°F
Draft losses	Silencer	-	-	-	-	in. WC
	Combustion air duct	-	-	-	-	in. WC
	Burner	-	-	-	-	in. WC
	Furnace & Boiler	5.04	2.73	1.22	0.30	in. WC
	Economizer	0.80	0.46	0.23	0.07	in. WC
	Flue gas duct & stack	-	-	-	-	in. WC
	Total draft loss	5.84	3.19	1.45	0.37	in. WC
Draft losses	Dry gas loss	4.77	4.14	3.83	3.59	%
	Fuel moisture loss	10.69	10.56	10.48	10.42	%
	Air moisture loss	0.10	0.09	0.08	0.07	%
	Radiation loss	0.65	0.73	0.87	1.16	%
	Unburned loss	0.00	0.00	0.00	0.00	%
	Manufacturer's margin	0.50	0.50	0.50	0.50	%
	Total heat loss	16.71	16.02	15.75	15.74	%
	Boiler efficiency	83.29	83.98	84.25	84.26	%
Heat Input	Boiler Heat input	99.75	74.14	49.20	24.52	MM Btu/hr
	Volumetric Heat release rate	76088	56553	37530	18706	Btu/ ft^3 hr
	Furnace Heat release rate	130736	97170	64485	32141	Btu/ ft^2 hr
	Economizer heat transfer	5.80	4.35	2.90	1.45	MM Btu/hr
	Economizer pressure drop	6.29	4.72	3.15	1.58	psig

SAMPLE

ASME DATA REPORTS

714 Corey Rd, Hutchinson, KS 67501
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FORM P-3 MANUFACTURER'S DATA REPORT FOR WATERTUBE BOILERS, SUPERHEATERS, WATERWALLS, AND ECONOMIZERS

As Required by the Provisions of the ASME Code Rules, Section I

MASTER DATA REPORT (Check one) YES ☑ NO ☐

Page ___ of ___

1. Manufactured by Superior Boiler Technologies, Inc., 3501-24 East 4th Avenue, Hutchinson, Kansas, 67501
(Name and address of manufacturer)
2. Manufactured for Superior Boiler, LLC. 714 Corey Road, Hutchinson, KS 67501
(Name and address of purchaser)
3. Location of installation _____
(Name and address)
4. Unit identification Complete Boiler ID Nos. _____ _____ _____ _____ _____ _____
(Complete boiler, superheater, waterwall, economizer, etc.) (Manufacturer's Serial No.) (CRN) (Drawing No.) (Nat'l. Board No.) (Year built)
5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design conforms to Section I of the ASME BOILER AND PRESSURE VESSEL CODE _____ (Year)
Addenda to _____ (Date) (if applicable), and Code Cases _____ (Numbers)

Supporting Manufacturer's Data Reports properly identified and signed by Commissioned Inspectors are attached for the following items of this report:

_____
(Name of part, item number, manufacturer's name, and identifying Designator)

SAMPLE

6(a). Drums

No.	Inside Diameter	Inside Length	Shell Plates: Material Spec. No., Grade	Shell Plates: Thickness	Shell Plates: Inside Radius	Tube Sheets: Thickness	Tube Sheets: Inside Radius	Tube Hole Ligament Efficiency, %: Longitudinal	Tube Hole Ligament Efficiency, %: Circumferential
1	36"	16' - 8"	SA516-70	3/4"	18"			37.50	66.70
2	24"	16' - 8"	SA516-70	3/4"	[illegible]"			37.50	60.70
3									

No.	Longitudinal Joints: No. & type*	Longitudinal Joints: Efficiency	Circum. Joints: No. & type	Circum. Joints: Efficiency	Heads: Material Spec. No., Grade	Heads: Thickness		Heads: Type**	Heads: Radius of Dish	Heads: Manholes No. Size	Hydrostatic Test
1	2 - 2	100%	1 - 2	100%	SA[illegible]	.62[illegible]	.587"	3	2:1	(2) 14x18"	
2	2 - 2	100%	1 - 2	100%	SA516[illegible]	.625"	.564"	3	2:1	(2) 12x16"	
3											

*Indicate if (1) Seamless; (2) Fusion welded.

**Indicate if (1) Flat; (2) Dished; (3) Ellipsoidal; (4) Hemispherical.

6(b). Boiler Tubes

Diameter	Thickness	Material Spec. No., Grade
2"	.120	SA-178 Gr [illegible]
2"	.105	SA-178 Gr A

6(c). Headers No. _____ or _____
(Box or sinuous or round; Material spec. no.; Thickness)

Heads or Ends _____ Hydro. Test _____
(Shape; Material spec. no.; Thickness)

6(d). Staybolts _____
(Material spec. no.; Diameter; Size telltale; Net area)

Pitch _____ Net Area _____ MAWP _____
(Horizonal and Vertical) (Supported by one bolt)

6(e). Mud Drum _____ or _____ Hydro. test _____
(For sect. header boilers. State Size; Shape; Material spec. no.; Thickness) (Shape; Material spec. no.; Thickness)

7(a). Waterwall Headers

No.	Size and Shape	Material Spec. No.	Thickness	Heads or Ends: Shape	Heads or Ends: Thickness	Heads or Ends: Material Spec. No.	Hydro. Test
1	4" Sch 40 Pipe	SA-106 B	.237" / .065"				
2	4" Sch 40 Pipe	SA-106 B	.237" / .065"	Flat	.375" / .201"	SA516-70	

7(b). Waterwall Tubes

Diameter	Thickness	Material Spec. No.
2"	.120"	SA-178A
2"	.120"	SA-178A

8(a). Economizer Headers

8(b). Economizer Tubes

Diameter	Thickness	Material Spec. No.

(07/15)

FORM P-6 MANUFACTURER'S DATA REPORT SUPPLEMENTARY SHEET
As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules

1. Manufacturer (or Engineering-Contractor) Superior Boiler Technologies, Inc., 3501-24 East 4th Avenue, Hutchinson, Kansas, 67501
(Name and address)

2. Purchaser _____
(Name and address)

3. Type of Boiler _____

4. Boiler No. _____ ----- _____ _____
(CRN) (Drawing No.)

_____
(Year built)

Data Items by Line No.	
10(a)	1. Boiler Front Trim/Drain Piping
	Piping: SA-106 Gr B: 1/2" Sch 80, 3/4" Sch 80, 1" Sch 80, 1 1/2" Sch 80, 2" Sch 40 Pipe
	Fittings/Flanges: SA-105: (14) 1/2" 3M SW 90° Elbow, (4) 1/2" 3M SW Coupling, (4) 1/2" 3M SW Union,
	(5) 1/2" 3M SW Tee, (2) 1/2" 3M Thrd Coupling, 3/4" 3M Thrd Union, (14) 3/4" 3M SW 90° Elbow,
	(2) 3/4" 3M SW Union, (3) 3/4" 3M SW Couplet, 1" x 3/4" 3M SW Reducing Insert, 1" 3M SW Union,
	1" 3M Thrd Cross, 1" 3M SW Cross, 1" x 1/2" 3M Thrd Bushing, 1" 3M Plug, 1" 3M SW Tee,
	, (2) 1" 3M Thrd Plug, 1" x 1/2" Reducing Bushing, 1 1/2" 3M Thrd Cross, (6) 1 1/2" 300# RFSO Flange
	(8)1 1/2" 3M Plug, 1 1/2" 3M SW Tee, (2)1 1/2" x 1/2" 3M Thrd Bushing, 1 1/2" x 1/2" 3M SW Reducing Insert
	,2" 150# RFSO Flange,
	Fittings: SA-234 WPB: 2" Sch 40 Cap
	Valves: (5) 1/2" 800# SW Gate, (3) 3/4" 800# SW Gate, (3) 1/2" 800# Thrd Gate
	2. Condensate Pot
	Fittings: SA-234 WPB: (2) 3" Sch 80 Pipe Cap
	Fittings: SA-105: (2) 1/2" 3M SW Couplet, 1/2" 3M Thrd Couplet, 1/2" 3M Thrd Plug
	3. Chemical Feed Piping
	Piping: SA-106B: 1" Sch 80
	Fittings/Flanges: SA-105: (3) 1" 3M SW 90° Elbow
	Valves: (2) 1" 800# SW Gate, 1" 800# Thrd Check
	4. Continuous Blowdown Piping
	Piping: SA-106B: 1" Sch 80
	Fittings/Flanges: SA-105: 1" 3M SW 90° Elbow
	Valves: 3/4" 800# SW Gate, 3/4" 800# Thrd Metering Valve

SAMPLE

Signed _____

Commission

_____ _____
(Authorized Inspector) mmission Number)

FORM P-7 MANUFACTURER'S DATA REPORT FOR PRESSURE RELIEF VALVES
As Required by the Provisions of the ASME Code Rules, Section I

1. Boiler manufactured by SUPERIOR BOILER TECHNOLOGIES, INC. (Name and address of manufacturer), P-7 ID No. 20068

2. Boiler manufactured for Superior Boiler, LLC. 714 Corey Road, Hutchinson, KS 67501 (Name and address of purchaser)

3. Location of installation Ro (Name and address)

4. Unit identification COMPLETE BOILER (Complete boiler, superheater, waterwall, economizer, etc.) ___ ID Nos. ___ (Mfr's. Serial No.) (CRN) (Drawing No.) (Nat'l. Board No.)

5. Identification of Pressure Relief Valves

Tag No.	Service Location	Quantity	Size	Manufacturer Name	Design or Type No.	Material* / Conn.**	Set Press.	Capacity
	STEAM DRUM	1	4" x 4"	KUNKLE	6252FMM	5D	150	30,297
	STEAM DRUM	1	4" x 4"	KUNKLE	6252FLM	5D	155	24,739

SAMPLE

* Material: (1) SA-216, WCB. (2) SA-217, WC6. (3) SA-2[illegible], W[illegible] (4) S[illegible]82, F 22. (5) Other A 126
** Connector type: (A) Groove Weld. (B) S[illegible] Weld. (C) [illegible]eaded. (D) Flanged.

6. Unit Relieving Capacity

Circuit	Minimum Required	Furnished
Boiler	50,000 LBS/HR	55,036 LBS/HR
Economizer		
Superheater		
Reheater Inlet		
Reheater Outlet		
Other		

7. Determination of Unit Relieving Capacity

Is PG-67.2.1.1 applicable to this boiler? NO

Approach taken to address capacity ___ PG-67.2.1.1.1 ___ PG-67.2.1.1.2

North American Safety Valve Industries, Inc.

1600 Warren Street
North Kansas City,
Missouri 64116 U.S.A.
Telephone: (816) 421-7042
1-800-800-8882
Fax: (816) 421-0297
Email: SALES@NASVI.COM

CERTIFICATE OF SET PRESSURE

Pick Ticket Number
3711233

Bill To:
SUPERIOR BOILER LLC
714 COREY ROAD
HUTCHINSON, KS 67501
800-444-6693 X 1220

Ship To:
SUPERIOR BOILER LLC
714 COREY ROAD
HUTCHINSON, KS 67501

SAMPLE

Customer ID: 103410

Order Date	*PO Number*	*Route*	*Ordered By*	*Entered By*

Quantities				
Ordered	*Shipped*	*Disp.*	*NASVI Part #* *Item Description* *Manufacturer Part #*	*UOM*
			KUN6252FMM01 4x4 250 x Female Kunkle 6252FMM01-AS	EA

Set At : 150.0 PSI Sec 1 Steam
Flow Capacity : 30297 LB/H *Seat Diameter :* 2.2460
Spring # : J62 *Code Stamp :* V

**** We certify the above valve performed in full accordance ****
with all applicable safety valve standards and codes.

BUILT TO OUTPERFORM

SB Project No. XX-XXX

(X) - Model No. XXX-XX-XXX

SECTION 3 MISCELLANEOUS INFORMATION

1. WARRANTY
2. SPARE PARTS LIST

714 Corey Rd, Hutchinson, KS 67501
Phone: 620-662-6693
www.superiorboiler.com

BUILT TO OUTPERFORM

WARRANTY

714 Corey Rd, Hutchinson, KS 67501
Phone: 620-662-6693
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Warranty and Limitation of Liability of Company

The COMPANY shall repair or shall replace f.o.b. point of shipment, any parts of said equipment within one year from the date of initial firing, but not to exceed (18) months after date of shipment or date of invoice, which are found to be defective in design, workmanship, or material, provided said equipment is operated by the PURCHASER in accordance with generally approved practice and in accordance with the conditions of service, if any, herein specified, and provided the PURCHASER notifies the COMPANY in writing as soon as such defect becomes apparent. No other warranty, other than title, shall be implied from the manufacture, sale, furnishing or erection of any of the said equipment to be furnished hereunder, or its use, except as may be otherwise specifically provided herein. The COMPANY shall not be responsible for work done, equipment or parts furnished, or repairs made by others, or for any loss, damages, or expenses arising from such work, equipment, parts or repairs. Auxiliary equipment and accessories not manufactured by the COMPANY, but furnished by it, are gathered only so far as guarantee by makers apply. No warranty beyond this is given or implied.
Neither Party shall be liable under this agreement to the other party for Indirect, Special, Exemplary, Punitive or Consequential Damages except for Indirect, Special, Punitive or Consequential Damages arising from the following:
- **Fines or Penalties**
- **Any Obligations arising out of or relating to the Indemnity Sections of this Agreement**
- **Any Breach by the Supplier of its Obligations under the Confidential Information Section of this Agreement.**
- **Any Breech by Supplier of its Obligations under the Privacy Section of the Agreement or;**
- **For Willful Misconduct or Fraud. Except for the "Limited Liability Exclusions", under no circumstances shall either party be liable to the other party for breach of the agreement in excess of 1x the Purchase Order amount.**

FEEDWATER: The treatment of feed water and the conditioning of boiler water are beyond the control of the COMPANY shall not be held responsible for any damage, direct or consequential, due to the presence of oil, grease, scale on deposits on the internal surfaces of the equipment; or for damage resulting from foaming caused by chemical conditions of the water; or for damages resulting from corrosion or caustic embrittlement; or from any other cause which results because of improper or inadequate treatment of feedwater or conditioning of boiler water.

Superior Boiler recommends that the current ABMA guidelines for boiler water chemistry be used as a guide for the customers' chemical treatment system.

BUILT TO OUTPERFORM

SPARE PARTS LIST

714 Corey Rd, Hutchinson, KS 67501
Phone: 620-662-6693
www.superiorboiler.com

714 Corey Road
Hutchinson, KS 67501
800-444-6693

RECOMMENDED SPARE PARTS FOR YOUR SUPERIOR BOILER

Date:
Customer: SAMPLE FORM
Project:

SB Job #: XX-XXX
Model: XXX-XX-XXX
SB S/N: XX-XXX

The reliable operation of any heating/power plant is largely dependent upon prior planning. Frequency of preventative maintenance and availability of spare parts are two factors largely effecting reliability. The following is a list of recommended spare parts, specific to your boiler, and should be carefully considered for inventory to facilitate routine maintenance and avoid extensive downtime in the unlikely event of equipment failure. Each boiler plant must evaluate it's unique steam demands, plant operation, and availability of back-up sources.

1. **Prices Do Not Include Taxes, Fees, Duty, Shipping & Handling Charges, Special Crating, or Special Part Certification.**
2. **Payment terms: Credit Card or Net 30 upon shipment, or notice to ship, with credit approval, unless alternate terms are mutually agreed upon by both parties. Prices are in US funds.**
3. **Product Warranty: Sub-vendors warranty will be forwarded to purchaser. No additional warranties will be provided by Superior Boiler.**
4. **Errors and/or omissions subject to correction.**
5. **All schedules, promised or implied, are contingent upon shop or vendor loading at time Purchase Order is placed with Superior Boiler.**
6. **Every effort is made to convey accurate pricing at date of issue. Please call Superior Boiler to verify pricing and availability. For questions or to place an order, contact Danny Rogers at 804.226.8227 ext 317.**
7. **Lead time can vary based on item ordered, quantity, and availability.**
8. **Minimum or quantity requirements may apply dependent on item ordered.**
9. **Price is Ex Works Point of Manufacture. Point of origin is Hutchinson, KS.**

Item No.	Quantity	Description
01	4	Boiler Drum Manway (12x16) Gaskets, T-200
02	4	Boiler Drum Manway (14x18) Gaskets, T-200
03	4	Mineral Wool Insulation Bundle, 1900 F Service
04	1	Woven Fiberglass Tape Gasket (Drop Wash), 2" wide x 100 ft roll
05		**Furnace Sight Port- rear of boiler**
06	option	2" Furnace Sight Glass Unit, EFI 540 Low Pressure, Clear Glass
07	1	Replacement Glass Kit, Clear Glass with gaskets
08		**Steam Service Gaskets - Flexitallic or Equal**
09	1	Boiler Gaskets - Pkg of (6), 1 1/2" 300# flange connection
10	2	Boiler Gaskets - Pkg of (6), 2 1/2" 300# flange connection
11	1	Boiler Gaskets - Pkg of (6), 8" 300# flange connection
12		**SB Water Column Parts**
13	1	Water Level Gage Valve Repair Kit, C/R RK-1A
14	4	Water Level Gage Valve Packing Kit, C/R RBG-403R-12, (minimum order 4)
15	option	Water Level Gage Valve - complete unit (set of 2), C/R BG-403RS
16	1	Water Column Body Gasket, 4"-300#, pkg of (6)
17	1	Conductivity Probe with Electrode w/ 2-gaskets, C/R TxxxRK
18	1	Gasket-Conductivity Electrode, pkg of (6), C/R RWCM-13
19	1	Flat Gage Glass Repair Kit (includes 2-each, glass and gaskets), C/R RK-4C (FG408)
20		**Low Water Cut Off Column (ALWCO), Levalarm EA-101-S**
21	1	Conductivity Probe with Electrode w/ 2-gaskets, C/R TxxxRK
22		**Water Level Relays**
23	1	Relay, Water Column Probe, Low/High Water Alarm, Warrick 16MB1B0 (LEH, LEL)
24	1	Relay, Water Column Probe, Low Water Cutout, Warrick 26NMB1B0 (LELL, ALWCO)
25		**Bottom Blowdown Valve**
26	1	Blowdown Valve Repair Kit
27	option	Slow/Quick Uni-Tandem Valve, Everlasting 5061 - complete unit
28		**Continuous Blowdown Valve/System**
29	1	Metering Valve (manual), 1" size, threaded, Vogt 12443G, DW04

SAMPLE

RECOMMENDED SPARE PARTS FOR YOUR SUPERIOR BOILER

30		**Safety Valves**	
31	1	Kunkle Safety Valve, Model 6252 (boiler), DS-12/DS-13	
32	1	Kunkle Safety Valve, Model 927 (economizer), FW12	
33		**Pressure Gauges**	
34	1	Steam Drum Pressure Gauge, 8.5" Dial, 0-400 psi, Ashcroft 1010A, PG1	
35		**Pressure Switch**	
36	1	Steam Pressure High-Auto Reset, Honeywell L404F1102, PSH	
37	1	Steam Pressure High-Manual Reset, Honeywell L4079B1041, PSHH	
38	1	Furnace Pressure, Dwyer 1950-20-2F, FP	
39		**Control Valve - Feedwater**	
40	1	2" NPT Siemens model 599-03026 globe style control valve	
41	1	Siemens SKD62UA Actuator	
42		**Stack Damper Actuator/Positioner**	
43	1	Triac 2R300DA Actuator with VAC V200EX Positioner	
44		**Boiler Manway Parts**	
45	1	12x16 Top Assembly; cover, yokes, bolt/nut	
46	1	14x18 Top Assembly; cover, yokes, bolt/nut	
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SAMPLE

Supply Chain/Inflation Notice with the issuse of this Spare Parts List.
Please note that Superior Boiler and our suppliers are experiencing the impact of the current global supply chain issue and economic conditions which is creating long lead times, fluxuations in the price of goods, added fees, and other charges.
Please keep this in mind when considering your boiler parts inventory.

NOTE: WHEN ORDERING PLEASE SPECIFY THE BOILER S/N (TOP OF PAGE 1) FOLLOWED BY LISTED ITEM NUMBER (XX-XXX-XX)

recommended spare parts on hand for commissioning and 2-yr service

BUILT TO OUTPERFORM

SB Project No. XX-XXX

(X) - Model No. XXX-XX-XXX

SECTION 4 BOILER VALVE LIST & IOMs

1. **BOILER VALVE LIST**
2. **BOILER VALVE IOMs**

714 Corey Rd, Hutchinson, KS 67501
Phone: 620-662-6693
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SUPERIOR BOILER

BUILT TO OUTPERFORM

BOILER VALVE LIST

714 Corey Rd, Hutchinson, KS 67501
Phone: 620-662-6693
www.superiorboiler.com

Superior Boiler LLC										Ref. # :			
714 Corey Rd										Prepared:		Date:	
Hutchinson, KS 67501										Revision:	0	Date:	
						SAMPLE VALVE SCHEDULE				Job No.:	XX-XXX	Sheet:	1 of 1
Schedule indicates quantity for one unit													
Mark If Reqd.	SB Tag #	Customer Tag #	Valve Application & Location	Qty / Blr	Type	Size	Rating # Class	Body Matl.	End Conn.	Design Conditions Psig	Design Conditions Deg F	Make	Model #
x	FW 01		Feed Water Control Valve	1	Globe	2"	300	Forged Steel	Flanged	400	406	Siemens	599-03026
x	FW 02		Isolation for FW Control Valve	2	Gate	2.5	300	Forged Steel	Flanged	400	406	Powell	3003
x	FW 03		Bypass for FW Control Valve	1	Globe	2.5	300	Forged Steel	Flanged	400	406	Powell	3031
x	FW 04		Drain - Feed Water Control Station	1	Gate	1"	800	Forged Steel	Threaded	400	406	Powell	GA08TA58GB
x	FW 05		Isolation Valve - Economizer Inlet	1	Gate	2.5	300	Forged Steel	Flanged	400	406	Powell	3003
x	FW 06		Isolation Valve - Economizer Outlet	1	Gate	2.5	300	Forged Steel	Flanged	400	406	Powell	3003
x	FW 07		Bypass Valve - Economizer	1	Gate	2.5	300	Forged Steel	Flanged	400	406	Powell	3003
x	FW 08		Stop Valve - Drum Inlet	1	Gate	2.5	300	Forged Steel	Flanged	400	406	Powell	3003
x	FW 09		Check Valve - Drum Inlet	1	Check	2.5	300	Forged Steel	Flanged	400	406	Powell	3061
x	FW 10		Economizer Outlet Drain	2	Gate	3/4"	800	Forged Steel	Threaded	400	406	Powell	GA08TA58GB
x	FW 11		Economizer Inlet Vent	1	Gate	3/4"	800	Forged Steel	Threaded	400	406	Powell	GA08TA58GB
x	FW 12		Safety Valve - Economizer	1	Safety Valv	3/4" x 1.25	800	Forged Steel	Threaded	Relieves 5,066 lb/hr @ 490 PSIG		Kunkle	927BED
x	DW01		Mud Drum Blowdown	1	Blowoff	1 1/2"	600	Cast Steel	Flanged	313	406	Everlasting	5061R
x	DW 03		Isolation for Continuous Blow Down	1	Gate	1"	800	Forged Steel	Socket Weld	250	406	Powell	GA08SA58GB
x	DW 04		Continuous Blow Down - Steam Drum	1	Metering	1"	800	Forged Steel	Threaded	250	406	Vogt	12443
0	DW 05		Drain Valve - Water Column	1	Gate	3/4"	800	Forged Steel	Socket Weld	250	406	Powell	GA08SA58GB
x	DW 06		Drain Valve - Gage Glass	1	Gate	1/2"	800	Forged Steel	Socket Weld	250	406	Powell	GA08SA58GB
x	DW 07		Drain Valve - Aux. Low Water Cut-off	1	Gate	3/4"	800	Forged Steel	Socket Weld	250	406	Powell	GA08SA58GB
x	DW 09		Chemical Feed Isolation - Drum Inlet	1	Gate	1"	800	Forged Steel	Socket Weld	250	406	Powell	GA08SA58GB
x	DW 10		Check Valve - Chemical Feed	1	Check	1"	800	Forged Steel	Threaded	250	406	Powell	SW08TA58GB
x	DW 11		Isolation Valves - Drum Level Transmitte	2	Gate	1/2"	800	Forged Steel	Socket Weld	250	406	Powell	GA08SA58GB
x	DW 12		Drain Valves - Drum Level Transmitter	2	Gate	1/2"	800	Forged Steel	Socket Weld	250	406	Powell	GA08SA58GB
x	DS 01A		Vent Valve - Steam Drum	1	Gate	1"	800	Forged Steel	Threaded	250	406	Powell	GA08TA58GB
x	DS 01B		Nitrogen Valve - Steam Drum	1	Gate	1"	800	Forged Steel	Threaded	250	406	Powell	GA08TA58GB
x	DS 02		Isolation Valve - Drum Pressure Gauge	1	Gate	1/2"	800	Forged Steel	Threaded	250	406	Powell	GA08TA58GB
x	DS04		Drum Pressure Transmitter Isolation Va	1	Gate	1/2"	800	Forged Steel	Threaded	250	406	Powell	GA08TA58GB
x	DS 05		Drain Valve - Drum Pressure Gauge	1	Gate	1/2"	800	Forged Steel	Socket Weld	250	406	Powell	GA08SA58GB
x	DS 06		Test Valve - Drum Pressure Gauge	1	Gate	1/2"	800	Forged Steel	Threaded	250	406	Powell	GA08TA58GB
x	DS 12		Safety Valve I - Steam Drum	1	Safety Valv	4"	250	Cast Iron	Flanged	Relieves 30 lb/hr @ 150 PSIG		Kunkle	6252FMM01-AS0150
x	DS 13		Safety Valve II - Steam Drum	1	Safety Valv	4"	250	Cast Iron	Flanged	Relieves 39 lb/hr @ 155 PSIG		Kunkle	6252FLM01-AS0155
x	MS 01		Main Steam Non-Return Valve	1	Non-Return	8"	300	Cast Steel	Flanged	250	406	Powell	3084FC8GXXX
x	MS 02		Main Steam Stop Valve	1	Gate	8"	300	Cast Steel	Flanged	250	406	Powell	3003
x	MS 04		Main Steam Spool Drain Valve	1	Gate	1"	800	Forged Steel	Threaded	250	406	Powell	GA08SA58GB
x	HC 01A		Heating Coil Isolation Valve	1	Gate	1"	800	Forged Steel	Socket Weld	250	406	Powell	GA08SA58GB
x	HC 01B		Heating Coil Isolation Valve	1	Gate	1"	800	Forged Steel	Socket Weld	250	406	Powell	GA08SA58GB
x	HC 03		Heating Coil Control Valve	1	Ball	1"	600	316	Threaded	250	406	Jamesbury	9F
x	HC 02		Heating Coil Strainer	1	Y - Strainer	1"	800	Forged Steel	Socket Weld	250	406	Titan	YS82-CS
x	HC 05		Heating Coil Trap	1	Steam Trap	1"	800	Forged Steel	Threaded	250	406	Spirax Sarco	FT-450-21

SAMPLE

BOILER VALVE IOMs

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BUILT TO OUTPERFORM

BOILER VALVE IOMs

- APOLLO
- DSI
- EVERLASTING
- FISHER
- KUNKLE
- POWELL
- TITAN
- VOGT

SAMPLE

714 Corey Rd, Hutchinson, KS 67501
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www.superiorboiler.com

Apollo 2 Piece Threaded Steel and Steel Alloy Ball Valves
Installation, Operation, & Maintenance Guide

SAMPLE

Installation

Pre-Installation Inspection

Inspect the piping system prior to valve installation whenever possible, to ensure that it has been properly flushed and cleared of construction and fabrication debris. The seating surfaces in soft seated valves are particularly susceptible to weld slag and sand blasting grit. Pipe scale, metal chips and other foreign materials should be removed.

Just prior to installation, remove each valve from its packing and remove any end covers. Examine the flow bore for debris. All Apollo ball valves are shipped in the open position to prevent damage to the ball surface. Any grit or foreign matter must be removed. Scratched or dented balls must be replaced. Do not install a damaged valve.

Two piece threaded end Apollo Ball valves are bi-directional. They may be installed in vertical or horizontal pipe runs without regard to flow direction and without regard to stem orientation.

Note: Valves must be installed in piping systems that comply with the applicable portions of the ASME B31 standards. Special considerations must be taken with respect to pipe line expansions and contractions and the media expansion and contractions within the piping system.

Threaded End Valves

Pipe connections to be threaded into these valves should be accurately threaded, clean and free of foreign material or metal shavings. Apply pipe sealant compound or PTFE tape to the male pipeline threads only. Do not use sealant on the female threads as excess compound may be forced into the valve body. This could cause sticking of the ball or encourage the accumulation of dirt and

debris that could prevent positive valve shutoff. Two wrenches must be used when making up pipe joints to these valves. Apply one wrench on the valve end closest to the pipe joint being tightened and the other wrench to the pipe to prevent transmitting torque through the valve body joint. Typical pipe make-up is 1-1/2 turns after installing the pipe hand-tight.

Operation

Ball valves are intended to be on-off devices operating through 90° of stem rotation. The valve handle is marked showing proper rotation direction for "ON" and "OFF" positions. Rotation is clockwise for "OFF" (closed) and counterclockwise for "ON" (open).

The most common service failures not related to the installation and start-up processes are:

- Exceeding the operating temperature or pressure limits of the valve due to a process upset condition.
- A chemical attack on valve components due to either misapplication or changes in the service.

Violating temperature and pressure limits can result in immediate valve failure where chemical attack or corrosion generally occurs gradually.

Maintenance

Valve Adjustments

Normal stem packing wear can be compensated for by tightening the packing gland screw. (Wrench part number H371400 is available to ease this operation.) Tighten the packing gland screw clockwise in 1/8 turn increments until observed leakage stops. Do not exceed the values shown in Table 1. If all of the adjustments to the packing gland screw have been made, remove the handle nut, handle and packing gland screw and add one or two replacements bearings on top of the old packing. Reinstall the handle and handle nut.

Caution: Do not disassemble valve while under pressure nor with entrapped hazardous fluids therein.

Disassembly

1) Operate the valve fully opened to fully closed to assure there are no trapped fluids or pressure in the body cavity. Leave the valve in the closed position.
2) Remove the handle nut, handle and packing nut. Set aside for reuse.
3) Install pipe plugs in the body and retainer ports of NPT valves to prevent collapsing those areas.
4) Remove the retainer from the body. It may be necessary to heat the body joint above 450°F to breakdown the sealant used to secure the valve halves.
5) Remove the ball from the body cavity. Inspect the ball. If it is scarred, it is recommended that the whole valve be replaced, but replacement balls are available. Clean and set aside good balls for reuse.
6) Push the stem from the outside into the body cavity. Inspect the stem. If it is scarred or has damaged threads, replacements are available. Clean and set aside good stems for reuse.
7) Remove all seals and seats from the body and retainer then discard. Inspect the body and retainer for damage. If damaged, scrap the valve as replacements of these components are not offered.

Re-Assembly

1) Install stem bearing on to stem.
2) Fit stem into body from the retainer end and position the stem with the handle flats perpendicular to the flow axis.
3) Install stem packing over stem and fit into body recess.
4) Install packing gland screw into the threaded stem area.
5) Tighten the gland screw to manufacturing torque specifications, shown in Table 1.
6) Install the handle and handle retaining hardware.

SAMPLE

7) Apply suitable light lubricant to seat and fit into the seat pocket of the body.
8) Install the ball in the closed position.
9) Apply suitable light lubricant to seat and fit into the seat pocket of the retainer.
10) Apply an adequate amount of thread locking compound (Loctite® 609, 648 or 680) to the retainer threads so that it covers no less than two complete threads opposite of the retainer shoulder.
11) With the ball in the closed position, thread the retainer into the body and torque to manufacturing specification to secure the body joint. Torque values are provided in Table 2.
12) Cycle the valve to the open position and verify proper operation and alignment of handle and/or mechanism.

Note: Valves in oxygen or other like services should be assembled with compatible thread sealant and lubricants.

Note: Always test valve and system before putting the system into service.

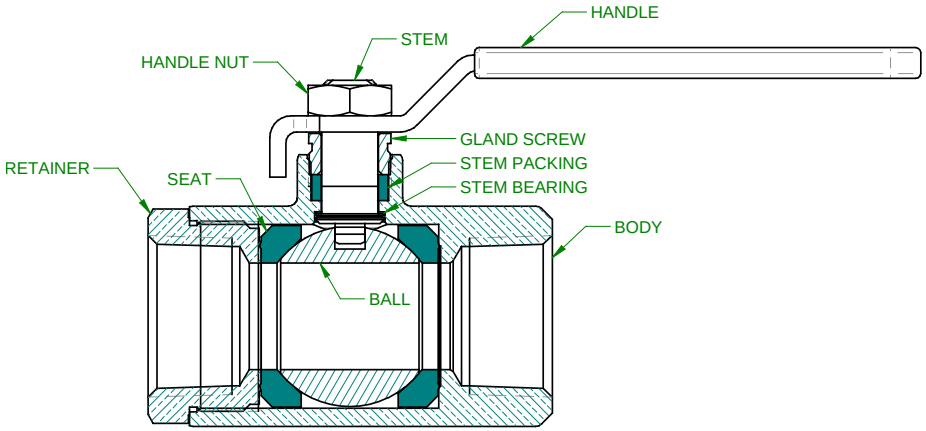
Table 1: Gland Nut Torque Requirements (ft-lbs.)

Valve Size	Gland Nut Torque
1/4" - 3/8"	12-18
1/2"	12-18
3/4"	20-25
1"	20-25
1-1/4"	61-100
1-1/2"	61-100
2"	61-100
2-1/2"	61-100
3"	61-100

Table 2: Retainer Torque Requirements, min. (ft-lbs.)

Valve Size	72, 73A, 74, 76, 89, 399, 489	7H, 76F	72-A
1/4" - 3/8"	25	15	-
1/2"	25	15	50
3/4"	25	20	100
1"	70	50	130
1-1/4"	110	95	230
1-1/2"	130	230	260
2"	200	230	450
2-1/2"	300	450	-
3"	960	1800	-

Parts Illustration



SAMPLE

BUILT TO OUTPERFORM

SB Project No. XX-XXX

(X) - Model No. XXX-XX-XXX

SECTION 5 BOILER INSTRUMENT LIST AND IOMs

1. BOILER INSTRUMENT LIST
2. BOILER INSTRUMENT IOMs

714 Corey Rd, Hutchinson, KS 67501
Phone: 620-662-6693
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SUPERIOR BOILER

BUILT TO OUTPERFORM

BOILER INSTRUMENT LIST

714 Corey Rd, Hutchinson, KS 67501
Phone: 620-662-6693
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SAMPLE INSTRUMENTATION LIST

SB JOB NUMBER: xx-xxx
PROJECT: Customer's Company Name
PROJECT MANAGER

Date:
Revision:

Gauges:	Customer Tag#	TAG #	MAKE / MODEL	LINE SIZE	SERVICE CONDITIONS	NOTES
Drum Pressure Gauge		PG 01	Ashcroft / 1010S02L400#		0-400 PSI	8.5 inch Dial
Pressure Switches:	Customer Tag#	TAG #	MAKE / MODEL	LINE SIZE	SERVICE CONDITIONS	NOTES
Operating Limit Steam Pressure		PSH	Honeywell / L404F1094	1/2" NPT	Field Set	Installed by SB on Boiler
High Limit Steam Pressure		PSHH	Honeywell L4079B1066	1/2" NPT	Field Set	Installed by SB on Boiler
Transmitters:	**Customer Tag#**	**TAG #**	**MAKE / MODEL**	**LINE SIZE**	**SERVICE CONDITIONS**	**NOTES**
Drum Level Transmitter		LT 01	Yokogawa /EJA110E-JMS4G-U12EN/FU1/D1/JH05-OG	1/2" NPT	Steam Drum Level -25" to +25"WC	Installed by SB on Boiler
3-valve manifold			Yokogawa / C13ST-3TSA0-S4-NNNNN-NNNN			Integral to Transmitter
Steam Flow Transmitter		FT 01	Yokogawa / EJA110E-JMS4G-U12EN/FU1/D1/JH05-OG	1/2" NPT	Ranged 0-125,000 lb/hr	Ships Loose
3-valve manifold			Yokogawa / C13ST-3TSA0-S4-NNNNN-NNNN			
Orifice Plate			OP1-F-CB-2.7372-2-C-10-300-X-40-BBC	10" 300#		
Feedwater Flow Transmitter		FT 02	Yokogawa / EJA110E-JMS4G-U12EN/FU1/D1/JH05-OG	1/2" NPT	Ranged 0-140,000 lb/hr	Ships Loose
3-valve manifold			Yokogawa / OP1-F-CB-1.4827-2-C-3-300-X-40-BBC			
Orifice Plate			OP1-F-CB-2.7372-2-C-3-300-X-40-BBC	3" 300#		PIPE BRACKET
Water Column Parts:	**Customer Tag#**	**TAG #**	**MAKE / MODEL**	**LINE SIZE**	**SERVICE CONDITIONS**	**NOTES**
Gauge Glass			Clark Reliance FG909 Flat Glass	3/4"	Boiler Water Level Gage Glass	Ships Loose
Gauge Glass Valves			Clark Reliance SG-4	3/4" NPT		Installed by SB on Boiler
Water Column			Superior Boiler	1 1/2" NPT	Drum Water Level & Alarms	Installed by SB on Boiler
Probe		LELL	Clark Reliance T360RK	1/4" SS Rod	Part of Water Column Alarm	Installed by SB on Boiler
Probe		LEL	Clark Reliance T360RK	1/4" SS Rod	Part of Water Column Alarm	Installed by SB on Boiler
Probe		LEH	Clark Reliance T360RK	1/4" SS Rod	Part of Water Column Alarm	Installed by SB on Boiler
Probe Housing		N/A	Warrick 90471	N/A	Part of Water Column Alarm	Installed by SB on Boiler
Auxillary Low Water Cut Off		ALWCO	Clark Reliance EA101-S (Single Probe)	1" NPT	Auxilary Boiler Cut Off	Installed by SB on Boiler
Water Level Relay		LSLL	Littelfuse / LLC643F26M		Low water cutoff	Installed by SB in Junction Box
Water Level Relay		LSH	Littelfuse / LLC643F26M		Low water alarm	Installed by SB in Junction Box
Water Level Relay		LSH	Littelfuse / LLC643F26M		High water alarm	Installed by SB in Junction Box
Water Level Relay		ALWCO	Littelfuse / LLC643F26M		Auxiliary low water cutoff	Installed by SB in Junction Box
ALWCO (Bypass) Switch Housing		N/A	Schneider Electric XAP G19501	N/A	Part of Auxilary Boiler Cut Off	Installed by SB on Boiler
ALWCO (Bypass) Contact Block		N/A	Schneider Electric ZB4 BZ103	N/A	Part of Auxilary Boiler Cut Off	Installed by SB on Boiler
ALWCO (Bypass) Switch Actuator		N/A	Schneider Electric ZB4 BA2	N/A	Part of Auxilary Boiler Cut Off	Installed by SB on Boiler
Customer Provided Items	**Customer Tag#**	**TAG #**	**MAKE / MODEL**	**LINE SIZE**	**SERVICE CONDITIONS**	**NOTES**
Burner Assembly						
FD Fan						
Economizer						

SAMPLE

BOILER INSTRUMENT IOMs

- Ashcroft
- Honeywell
- Reliance
- Yokogawa

SAMPLE

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www.superiorboiler.com

Installation and Maintenance Instructions for 50mm-63HPXmm High Purity Gauges

ASHCROFT®

50mm HPX High Purity Gauges

63mm HPX High Purity Gauges

Table of contents:

1. INTRODUCTION

As measurement is an important aspect of manufacturing. equipment and plant engineering technology advancements require higher performance and more versatile instrument functions.

The Ashcroft 50HPX/63HPX High-Purity pressure gauges are similar to standard instruments, yet they have been assembled under a significantly different process where treatment, control, and inspection are rigidly maintained. This manual describes the basic operation of this product for the semiconductor industry; adhering to the following instructions will ensure their proper and effective application.

[Before Using Pressure Gauge]

It is highly recommended that this instruction be thoroughly reviewed to prevent improper instrument handling and/or implementation. Consult Ashcroft on related topics not covered within this document.

[Warranty]

Instruments are repaired or replaced, at no cost, if determined to be within the 1-year warranty period and non-conforming in accordance with defects due to design or manufacture by Ashcroft.

Please note that the following instances are excluded.

1. Delivered products are disassembled, altered, parts replaced, or where any new function is added by the user or any third party.
2. Directions described within the instruction manual or catalog have not been observed.
3. Non-conformance is caused by deterioration due to use, natural disaster, fire or other force majeure events.
4. Secondary damage caused by the non-conformance of the products including the above.

Regardless of recognized mishandling, any apparent evidence of deformation, abrasion, burnout or other identified issue shall be excluded from the warranty scope with the cost being incurred by the customer.

[Definition of Safety Terms]

Safety precautions within this manual have been classified as follows:

⚠ **DANGER** - Ignoring this warning may result in serious injury or death.

⚠ **WARNING** - Ignoring this warning may result in serious injury or death.

⚠ **CAUTION** - Ignoring this warning may result in the material damage and render instrument performance defective.

2. APPLICATION

This pressure gauge has an electropolished wetted surface measuring material-compatible gas pressure. The pressure gauge is fabricated in accordance with high cleanliness and tight sealed standards. Therefore, the models 50/63HPX High-Purity pressure gauges are ideally suited for pressure measurement within the semiconductor production process, etc.

⚠ **WARNING**

The instrument's pressure element is a Bourdon tube. Do not use the pressure gauge with the wetted material exposed to any corrosive gas or atmosphere. Additionally, it is industry practice for the gas detector's to be installed within the same environment; this will provide an alert to escaping gas that may adversely affect people and/or equipment

---

3. TRANSPORTATION, STORAGE, UNPACKING PRECAUTION

3.1 Transportation

Units should be handled the same as electronic or test measurement instruments. Be very careful not to apply vibration to the pressure gauge during transportation.

Do not hit or drop the pressure gauge.

⚠ **CAUTION**

The instrument may incur damage if dropped/impacted.

3.2 Storage

Store in a temperature-controlled environment free from dust, humidity, and vibration. Prevent temperature variances as this may result in condensation developing in the product.

3.3 Unpacking

Handle product with great care during unpacking.

Physically inspect the instrument to ensure no damage exists and that the instrument fulfills the required specifications. Please contact the dealer or Ashcroft if an issue exists.

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All sales subject to standard terms and conditions of sale. 50-63_HPX_Gauge_im_RevA_(I&M008-10277)_04-16-20

4. INSTALLATION

4.1
Install the instrument where the environment is free from vibration, humidity, dust and high temperature.

4.2
The pressure gauges are packaged in a hermetically-sealed polyethylene bag. To avoid contamination, only unpack the bag immediately before use.

4.3
Direct connected pressure gauges should be properly and securely threaded into the process piping.

4.4
Install the pressure gauge so that the dial reading is vertical.

⚠ CAUTION
An error in accuracy that will result in the event the pressure gauge is not installed in a vertical position.

4.5
In liquid measurement, the pressure head difference between the pressure outlet port and pressure gauge has a negative effect upon the accuracy.

⚠ CAUTION
If a pressure gauge with a range of 0 to 0.1 mPa is installed one meter higher than the pressure outlet port, the instrument reading will reflect a lower than actual pressure. This error corresponds to 10% of the span. On the contrary, if a pressure gauge is one meter lower than the pressure outlet port, the unit will register a value that is 10% higher than the actual gauge.
In the event the installation point is known, the pointer may be adjusted higher or lower to coincide with the estimated error. A pressure gauge with a zero adjustment pointer can be re-zeroed after it has been installed.

4.6
Reduce pressure pulsation to an absolute minimum.

4.7
When installing the instrument, be sure to apply a wrench to the flats of the gauge's pressure connection and rotate clockwise. Do not apply force to the enclosure as this will cause the dial to move and result in zero-point shift.

⚠ CAUTION
Do not apply force to the enclosure as this will cause damage and adversely affect product performance.

4.8
Leave a space around the installation point of the instrument. The blow-out disk and clearance hole of the gauge is designed to relieve pressure to the outside environment once the Bourdon tube has ruptured. Immediately shut off pressure source and relieve pressure to the instrument once a leak has been detected.

⚠ WARNING
Leave a space of ½ inch or more around the blow-out disk and clearance hole of the pressure gauge. Blocking the blow-out disk can render the pressure relief function ineffective; this may result in dangerous accidents/injuries and damage to the instrument.

4.9
Take precautions to ensure the unit is not exposed to temperatures where process media is liable to freeze.

4.10
It is recommended that a siphon or length of pipe be utilized when high-temperature fluids are being measured.

4.11
Take precautions in the use of 9/16-18UNF connections.
❶ Take care not to damage the seat surface.

⚠ WARNING
Scratches or scoring can result in the measuring device to leak. This may prove hazardous, though this would depend upon the type of application being measured.

❷ Do not use previously removed packing and filter packing. Replace with new parts whenever they are disassembled.

5. OPERATION

5.1
Make sure that the pointer is at the '0' position prior to applying pressure to the gauge.

5.2
Raise and lower pressure slowly, while avoiding sudden increase/decrease of pressure.

5.3
Never apply pressure in excess of the unit's pressure rating.

5.4
Use the pressure gauge for measuring pressure less than ½ to ⅔ of the full-scale range.

⚠ WARNING
Never apply pressure beyond the maximum pressure (e.g., full-scale value). Injury and/or damage may occur if pressure element ruptures due to extreme pressure in excess of the unit's pressure rating.

5.5
Measured fluids, gas or liquid, should be compatible and not corrosive to SUS316L.

⚠ WARNING
Do not use this pressure gauge with fluids that may corrode the instrument's wetted parts. If corrosive fluid flows through this pressure gauge, the pressure element (Bourdon tube) may be damaged or burst and it flows out, resulting in injury or damages to the peripheral device and equipment.

SAMPLE

5.6
Pull-up on yellow vent plug of the blow-out disk when pressure range less than 1 mPa (145 psi) for Model 63HPX (63mm).

⚠ WARNING
An error will occur if the vent plug is not pulled-up; this is due to the increase of the internal case pressure.

5.7
Do not modify the pressure gauge.

⚠ WARNING
Do not attempt to modify the product or provide it with additional functions.

5.8
Do not apply glue to the blow-out disk, tear a hole, interspace, or make any other alterations to the instrument. If ignored, the unit will fail to function as designed. Failure to relieve pressure properly, this could result in quite dangerous accidents.

6. INSPECTION AND MAINTENANCE

6.1
Check gauge accuracy regularly to ensure correct indication; this is recommended to be once or more per year.

6.2
Pressure indication error of approximately 1 graduation is repairable, yet the instrument must be replaced when the error is identified as substantial.

7. TROUBLESHOOTING

Refer to the accompanying table and implement appropriate countermeasures. Contact Ashcroft in the event the issue persists.

SAMPLE

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TROUBLES	CHECKPOINTS	POSSIBLE CAUSES	COUNTERMEASURES
The pointer does not move.	1. Check if the pressure had been applied to the pressure gauge.	1. The pressure is zeroed.	1. Apply pressure.
The pointer does not indicate pressure.	1. Check whether the fluid and ambient temperature are within the operating temperature range of the pressure gauge. 2. Check whether excessive vibration exists. 3. Check whether excessive pressure fluctuations exist.	1. The operating temperature range has been exceeded. 2. Movement wears due to vibration. 3. Movement wears due to pressure fluctuations.	1. Re-install pressure gauge in a different position. 2. Re-install pressure gauge in a different position. 3. Reduce pressure fluctuations.
The pointer does not read zero when the pressure gauge is removed from the piping.	1. Check whether excessive pressure had been applied. 2. Check whether excessive vibration or fluctuating pressure had been applied.	1. The Bourdon tube has been deformed due to excessive pressure. 2. Movement wears due to vibration or fluctuating pressure.	1. Use a higher pressure range. 2. Re-install pressure gauge in a different position.
The pointer indicates overpressure reading.	1. Check whether excessive pressure had been applied. 2. Check whether the gauge was exposed to excessive vibration or if it was dropped/impacted.	1. Deformed sensing element due to excessive pressure. 2. Pointer shift or material deformation due to excessive pressure or impact.	1. Use a higher pressure range. 2. Be careful not to drop/impact gauge.

SAMPLE

BUILT TO OUTPERFORM

SB Project No. XX-XXX

(X) - Model No. XXX-XX-XXX

SECTION 6 BOILER PROJECT DRAWINGS

1. BOILER DRAWING LIST
2. BOILER DRAWINGS

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BOILER DRAWING LIST

1. Boiler GA
2. Boiler P&ID
3. Foundation and Loading
4. Water Column
5. AUXILIARY LOW WATER CUT OFF (ALWCO)
6. Front Trim Piping
7. Rear Trim Piping
8. Economizer Bypass To Boiler
9. Feedwater Station
10. Feedwater to Boiler Piping

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SUPERIOR BOILER

BUILT TO OUTPERFORM

BOILER DRAWINGS

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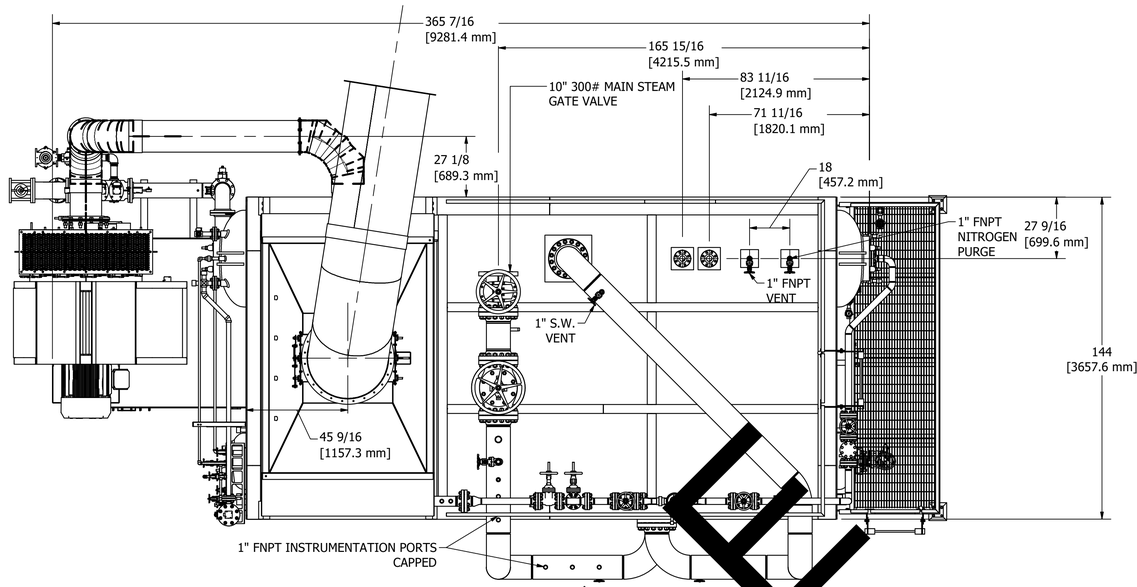
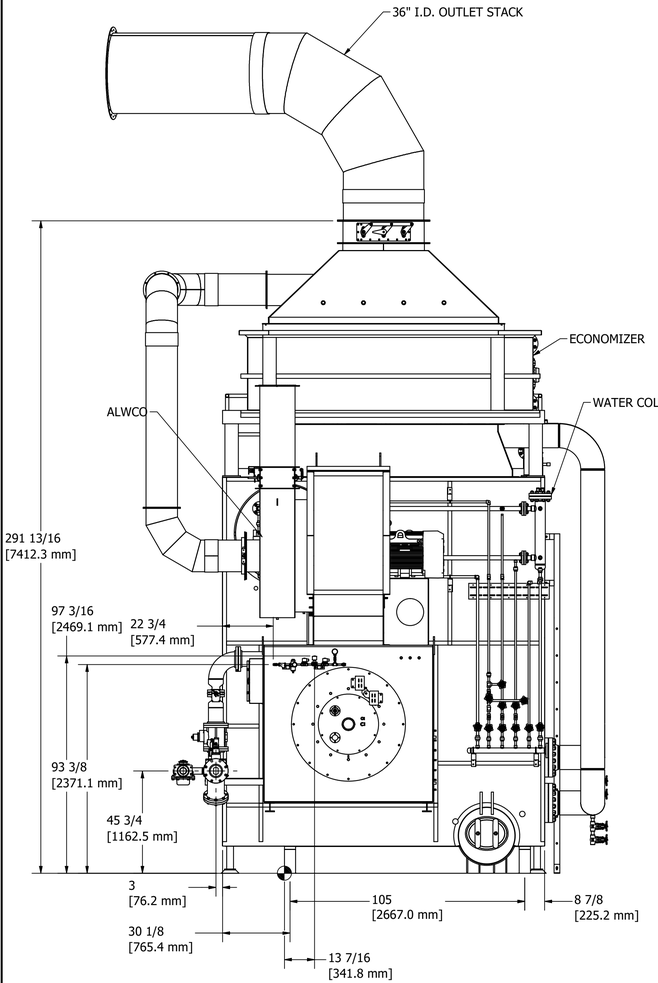
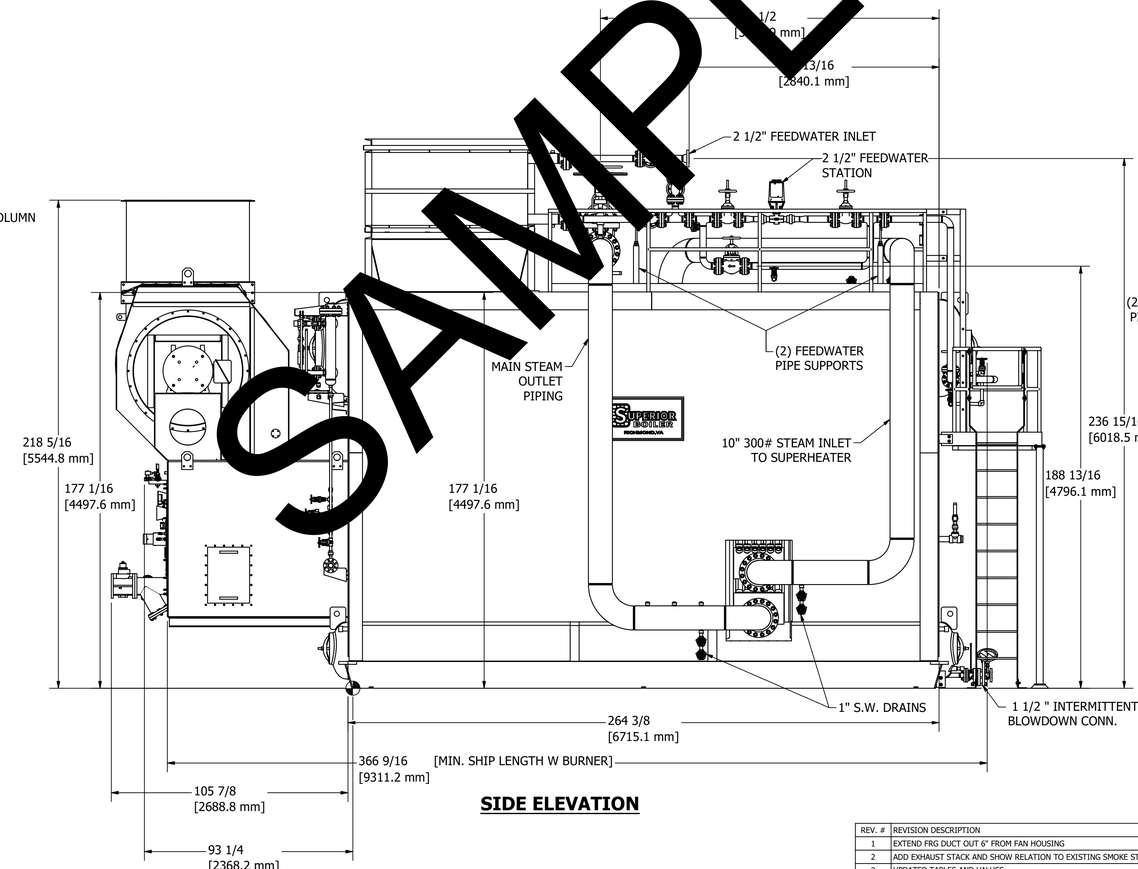
CONNECTION SCHEDULE					
CONNECTION	SIZE & DESCRIPTION	MATERIAL	X	Y	Z
MAIN STEAM OUTLET	10" 300# R.F. FLANGE	CAST STEEL	-5.73	195.67	-111.19
MAIN STEAM SPOOL DRAIN	1" FNPT	FORGED STEEL (SCH 80)	-31.54	185.69	-124.34
SAFETY VALVES (STEAM DRUM)	(2) 2 1/2 " x4" 300# R.F. FLANGED	CAST STEEL	6.09	181.55	-193.50
SAFETY VALVES (SUPER HEATER)	2 1/2" x 4" 300# R.F. FLANGED	CAST STEEL	80.76	213.38	-117.13
STEAM DRUM VENT	1" FNPT	FORGED STEEL (SCH 80)	0.15	184.06	-222.97
NITROGEN PURGE	1" FNPT	FORGED STEEL (SCH 80)	0.15	184.06	-240.97
FEEDWATER INLET	2 1/2" 300# R.F. FLANGED	SA-105	108.36	236.90	-150.35
FEEDWATER STATION DRAIN	1" MNPT	SA 106 GR B (SCH 40)	-8.80	182.93	-71.59
CHEMICAL FEED	1" FNPT	FORGED STEEL (SCH 80)	-23.80	114.12	-281.40
INTERMITTENT BLOWDOWN	1 1/2" 300# R.F. FLANGE	SA-105	90.49	5.81	-285.79
CONTINUOUS BLOWDOWN	1" FNPT	FORGED STEEL	26.68	134.13	-267.69
HEATING COIL(S)	1" MNPT	SA 106 GR B (SCH 40)	95.49	8.81	-273.29
OBSERVATION PORT	1" MNPT	SA 106 GR B (SCH 40)	29.92	82.88	-269.81
FRONT TRIM DRAIN	2" 300# R.F. FLANGE	SA-105	117.84	54.90	-9.93
ECONOMIZER VENT	1" MNPT	SA-105	108.36	240.50	-85.35
ECONOMIZER SRV	1" x 1 1/4" FNPT	FORGED STEEL	108.36	240.50	-89.35
ECONOMIZER DRAIN	1" MNPT	SA-105	108.36	206.25	-89.35
NATURAL GAS SUPPLY	4" FLANGE	A126-B CAST IRON	-3	45.75	105.875
PILOR GAS VENT	3/8"	BRASS	13.18	13.43	93.25



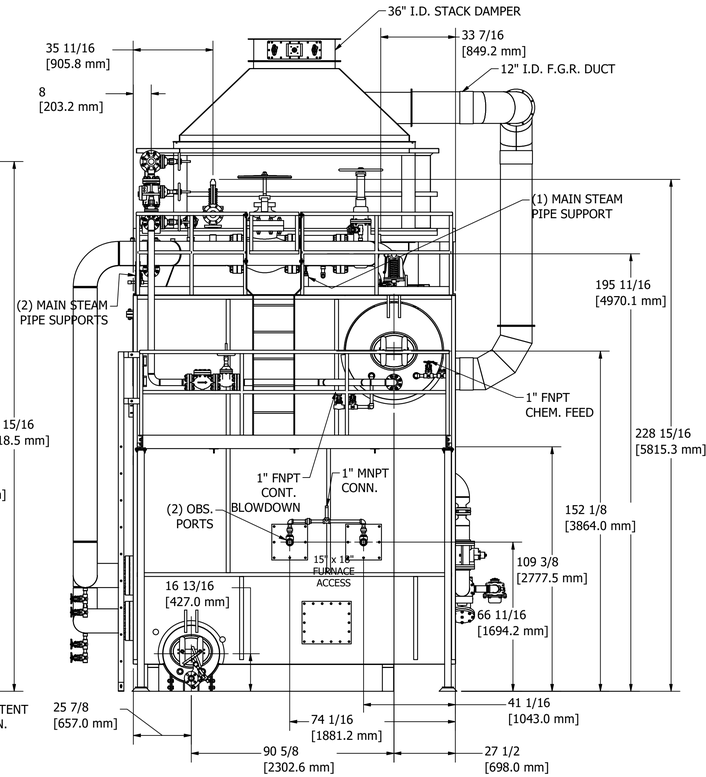
TOP VIEW



FRONT ELEVATION



SIDE ELEVATION



REAR ELEVATION

BOILER DATA	
MODEL NUMBER	80-DS-250
GROSS CAPACITY	80,000 LB/HR
DESIGN PRESSURE	250 PSIG
OPERATING PRESSURE (NOM.)	80 PSIG
OPERATING PRESSURE (AUX.)	115 PSIG
SATURATED STEAM TEMP. @ DRUM	347 °F
SUPERHEAT STEAM TEMP. @ NRV	431°F
FURNACE VOLUME	1,311 CUFT
FLAT PROJECTED FURNACE AREA	763 SQFT
TOTATL EFFECTIVE HEATING SURFACE	5,591 SQFT
FEEDWATER TEMP. INTO ECON.	227 °F
FEEDWATER TEMP. OUT OF ECON.	296°F
ELEVATION	2,690 FT
FUEL	NATURAL GAS

NOTES:

1. DESIGNED & FABRICATED ACCORDING TO ASME SECTION 1, FOR POWER BOILERS AND PRESSURE VESSELS 2021 EDITION.
2. SAFETY VALVES SUPPLIED WITH BOILER:
   A. KUNKLE MODEL 300LLJ01 (STEAM DRUM)
      SET PRESSURE: 250 PSIG
      CAPACITY: 35,115 LB/HR
   B. KUNKLE MODEL 300LLJ01 (STEAM DRUM)
      SET PRESSURE: 245 PSIG
      CAPACITY: 34,451 LB/HR
   C. KUNKLE MODEL 300LLJ01 (SUPERHEATER)
      SET PRESSURE: 150 PSIG
      CAPACITY: 21,827 LB/HR
   D. KUNKLE MODEL 927BFEM06 (ECONOMIZER)
      SET PRESSURE: 490 PSIG
      CAPACITY: 7,912 LB/HR

SAMPLE

REV. #	REVISION DESCRIPTION	DATE	DRAWN	APPR.	P.M.
1	EXTEND FRG DUCT OUT 6" FROM FAN HOUSING	1/4/23	MS		
2	ADD EXHAUST STACK AND SHOW RELATION TO EXISTING SMOKE STACK	6/23/23	MS		
3	UPDATED TABLES AND VALUES	7/21/23	TSR		
4	ADDED DIMENSIONS PER CUSTOMER REQUEST	8/7/23	TSR		

QC STAMP | PRODUCTION STAMP | ENGINEERING STAMP

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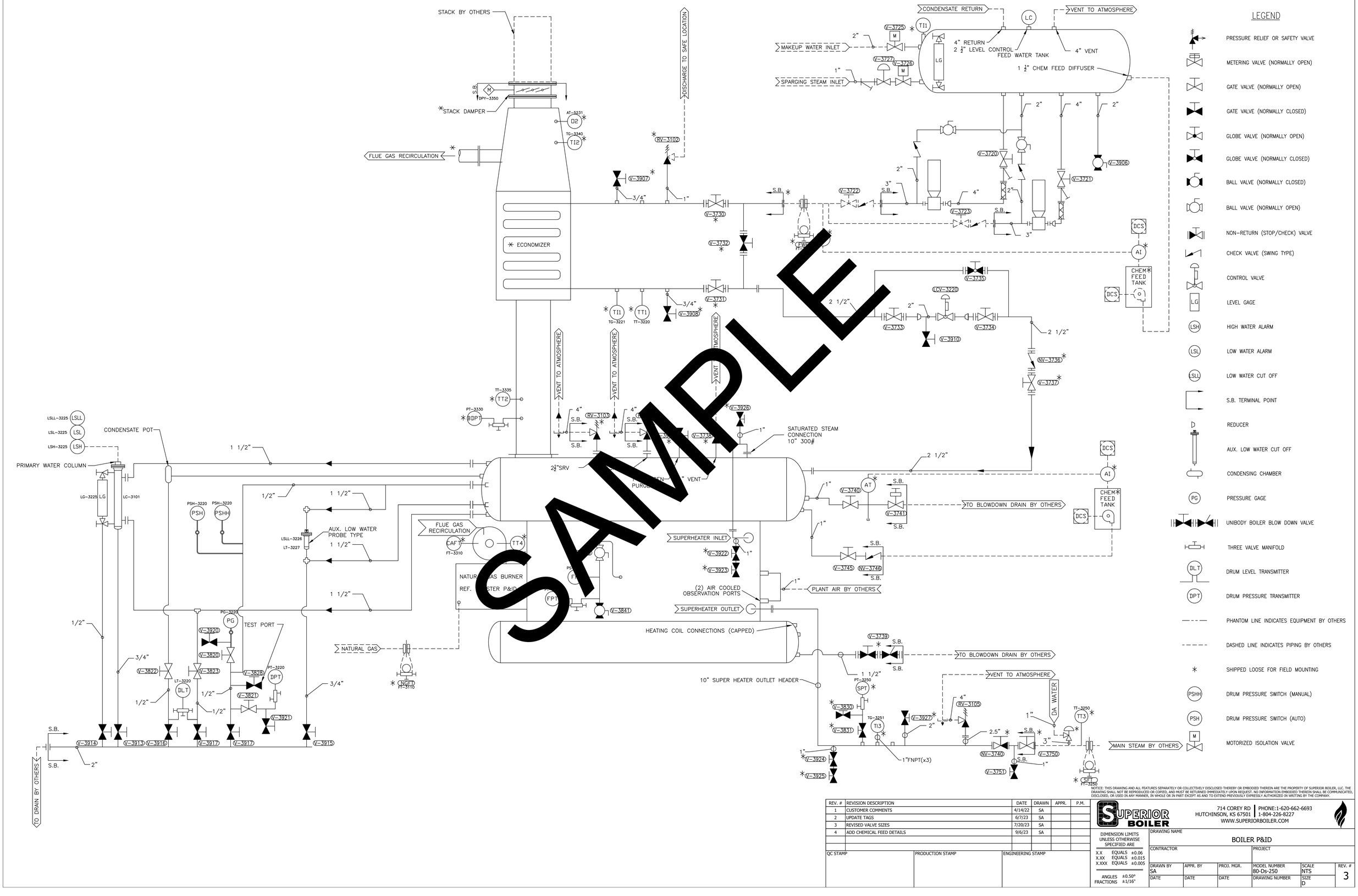
REFERENCE STANDARD S.B. TOLERANCE DOCUMENT FOR ALLOWABLE SHOP CONSTRUCTION TOLERANCES

DRAWING NAME: GENERAL ARRANGEMENT

CONTRACTOR | PROJECT

DRAWN BY	APPR. BY	PROJ. MGR.	MODEL NUMBER	SCALE	REV. #
MS			80-DS-250	3/8" = 1'	4
DATE	DATE	DATE	DRAWING NUMBER	SIZE	
02/23/2023				D	



SAMPLE

LEGEND

- PRESSURE RELIEF OR SAFETY VALVE
- METERING VALVE (NORMALLY OPEN)
- GATE VALVE (NORMALLY OPEN)
- GATE VALVE (NORMALLY CLOSED)
- GLOBE VALVE (NORMALLY OPEN)
- GLOBE VALVE (NORMALLY CLOSED)
- BALL VALVE (NORMALLY CLOSED)
- BALL VALVE (NORMALLY OPEN)
- NON-RETURN (STOP/CHECK) VALVE
- CHECK VALVE (SWING TYPE)
- CONTROL VALVE
- LG — LEVEL GAGE
- LSH — HIGH WATER ALARM
- LSL — LOW WATER ALARM
- SLL — LOW WATER CUT OFF
- S.B. TERMINAL POINT
- REDUCER
- AUX. LOW WATER CUT OFF
- CONDENSING CHAMBER
- PG — PRESSURE GAGE
- UNIBODY BOILER BLOW DOWN VALVE
- THREE VALVE MANIFOLD
- DLT — DRUM LEVEL TRANSMITTER
- DPT — DRUM PRESSURE TRANSMITTER
- PHANTOM LINE INDICATES EQUIPMENT BY OTHERS
- DASHED LINE INDICATES PIPING BY OTHERS
- * — SHIPPED LOOSE FOR FIELD MOUNTING
- PSHH — DRUM PRESSURE SWITCH (MANUAL)
- PSH — DRUM PRESSURE SWITCH (AUTO)
- M — MOTORIZED ISOLATION VALVE

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REV. #	REVISION DESCRIPTION	DATE	DRAWN	APPR.	P.M.
1	CUSTOMER COMMENTS	4/14/22	SA		
2	UPDATE TAGS	6/7/23	SA		
3	REVISED VALVE SIZES	7/20/23	SA		
4	ADD CHEMICAL FEED DETAILS	9/6/23	SA		

QC STAMP | PRODUCTION STAMP | ENGINEERING STAMP

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DIMENSION LIMITS UNLESS OTHERWISE SPECIFIED ARE
X.X EQUALS ±0.06
X.XX EQUALS ±0.015
X.XXX EQUALS ±0.005
ANGLES ±0.50°
FRACTIONS ±1/16"

DRAWING NAME: BOILER P&ID
CONTRACTOR | PROJECT

DRAWN BY	APPR. BY	PROJ. MGR.	MODEL NUMBER	SCALE	REV. #
SA			80-Ds-250	NTS	3
DATE	DATE	DATE	DRAWING NUMBER	SIZE	
				D	