SAFETY FIRST! Review the Confined Space Entry Log to ensure that everyone is logged out of any equipment that may have been accessed during the time period from when the unit came off-line until present. Notify the S&PP-IV of anyone not logged out of the equipment to be started. Do not proceed with the startup until this step has been completed.

5.0 Prerequisites			
Step	**Activity**	**Initials Completed**	**Time Completed**
5.1	All boiler safety valves are installed and certified.		
5.2	Drum level indicators and pressure gauges are in service and in good working condition.		
5.3	Valve alignment for startup is complete per Attachment A.		
5.4	The Electrical Distribution System is in service **AND** electrical switches are aligned according to Attachment B.		
5.5	Natural gas system is available **AND** valves aligned to fuel regulator PCV-NG-3156.		
5.6	Chemical feed systems must be in service, with chemical tank inventory at sufficient levels for sustained operation.		
5.7	**ALL** manways are closed per Attachment C, all equipment is cleared of Lock-Out/Tag-Outs and ready for service.		
Note: The manhole and handholes should be checked for leaks repeatedly during the first hour after starting the boiler.			
5.8	The forced draft fan, CA&FG dampers, actuators and linkages are verified free of obstructions.		
5.9	The instrument compressed air system is verified to be in service, including the supply to the pilot & igniter assembly.		
5.10	The CEMS is verified to be in service **AND** self-calibrating on schedule.		
5.11	The Distributed Control System (DCS) is in service.		
5.12	The south plant flash tank is in service.		

5.0 Prerequisites			
Step	**Activity**	**Initials Completed**	**Time Completed**
5.13	The boiler continuous blowdown flash tank and south plant waste water flash tanks are in service **AND** aligned to the appropriate steam distribution systems or roof, and to the coal ditch.		
5.14	Essential instrumentation is aligned and available.		

6.0 Precautions, Limitations, and Actions	
6.1	Pressure and temperature increase of the boiler during startup should be limited per Attachment D, the B&W Boiler Start-up Curve. Steam drum metal temperature should stay to the right of the green line on the curve during startup. Steam drum pressure should stay to the right of the purple line during startup.
NOTE: Failure to maintain pressure and temperature within the boundaries of the curve will cause excessive stress on the boiler material and could result in damage or failure of the boiler pressure parts.	
6.2	During initial firing, the fuel flow should be kept at or below ten percent of the full load firing rate (Maximum continuous rating) until operating pressure is achieved.
NOTE: Maintaining fuel flow at the minimum fire limit until the boiler is at operating pressure reduces thermal stress on the boiler internals.	
6.3	During startup, Attachment E - Title V Environmental Log must be completed and delivered to the APP Environmental Specialist upon completion of the Boiler Startup.
6.4	All PPE is worn in accordance with facility requirements.
6.5	Exercise caution around rotating machinery.
6.6	Equipment operating in CAS mode can start without warning. To prevent personnel injury, use caution when inspecting rotating equipment in CAS mode.
6.7	Piping and equipment associated with the Boiler is hot and may cause severe burns, even when the system is not in operation. Exercise caution in the vicinity.

6.0 Precautions, Limitations, and Actions	
6.8	The Fuel gas regulating valve is sized to pass the design maximum firing rate with normal gas supply pressure, thereby inhibiting boiler operation beyond design limits.
6.9	The boiler and controls are designed to be in compliance with all applicable codes. Trips and interlocks must be satisfied before a light-off can occur. An MFT (main fuel trip) condition exists until the following conditions are satisfied: □ Forced Draft Fan running, minimum airflow satisfied □ Steam Drum water level above minimum □ Steam pressure below the upper limit □ No flame present □ All ignition valves closed □ Main burner valve closed □ Fuel gas pressure neither high or low
6.10	Maintain proper Drum Level at all times. Normal water level is at the centerline of the steam drum.
NOTE: Failure to maintain Drum Level in the proper band can lead to thermal damage and leaks (low drum level) or moisture carry over and downstream component damage (high level).	
6.11	During Startup, close the steam drum vent at 50 psig.
6.12	When the boiler is operating at less than 10% full load, the superheater drains should be throttled to ensure steam flow through the superheater tubes.
NOTE: Failure to maintain adequate steam flow through the superheater while a flame exists in the Boiler will result in overheating the superheater by failing to remove the heat induced by the hot flue gas.	
6.13	If an emergency trip occurs which is either caused by, or results in, the Forced Draft Fan being shut off, the fan should be restarted and the boiler purged for at least fifteen minutes **VERIFY** before attempting to relight the ignitor.
6.14	The BMS logic includes a hard-wired low water bypass input. If this input is enabled, all low water conditions will be bypassed for 180-seconds. The low water cutouts will not initiate a boiler trip. If the low-low conditions still exist after the 180-second timer is done, an MFT will occur. While the bypass logic is enabled, the drum level indications will continue to display the status of the water level. The alarm horn will not sound.
6.15	When starting a boiler on oil and atomizing steam is not available, compressed air may be used for atomizing.

6.0 Precautions, Limitations, and Actions	
6.17	A source of feedwater must be aligned to the economizer inlet. Normally condensate from a deaerating heater must be aligned to a boiler feed pump. The boiler fill should always be accomplished with de-oxygenated water to prevent corrosion of boiler internals.
6.18	The boiler output must be aligned with a load that can accept its output; either a turbine in isolation **OR** a high pressure steam header fed from other sources.

7.0 Definitions / Acronyms
PPE: Personal Protective Equipment
LOTO: Lockout/Tagout
HMI: Human Machine Interface
DCS: Distributed Control System
BMS: Burner Management System
CCS: Combustion Control System
BIAS: Determines Boiler Lead/Lag with control in AUTOMATIC
FD Fan: Forced Draft Fan
FEGT: Furnace Exit Gas Temperature
CA&FG – Combustion Air and Flue Gas
ASME – American Society of Mechanical Engineers
CEMS – Continuous Emissions Monitoring System
LSP: Local Set Point with control in MANUAL
PV: Process Variable
RSP: Remote Set Point
LSH – High Water Level Alarm
NWL – Normal Water Level
LSL – Low Water Level Alarm
LSLL – Low Low Water Level Cutout
Aux LSLL – Auxiliary Low Water Cutout
VAD: Variable Area Diffuser
B1_OVW: Boiler 1 Overview Delta-V Screen
B1_WTR: Boiler 1 Water/Steam Detail Delta-V Screen
B1_RING: Boiler 1 Boiler Management System (BMS) Ring Delta-V Screen
B1_MFT: Boiler 1 BMS MFT Delta-V Screen
B1_BMS: Boiler 1 BMS Burner Detail Delta-V Screen
B1_FD_FAN: Boiler 1 FD Fan Detail Delta-V Screen

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
8.1 Pre-Light Off Preparation and Filling the Boiler			
NOTE: When filling a boiler for start-up during a cold start, the metal temperature must be no less than 70°F. When filling a boiler for hydro after an outage during a cold start, the metal temperature must be not less than 70°F or greater than 120°F. The water temperature for filling the boiler must be within 100°F of the mean temperature of the drum.			
NOTE: When filling the boiler for start-up, fill the boiler one inch above the lowest indication in the gage glass. Use the Lower Drum Blowdown valves to control the normal swell of water when heating the boiler.			
8.1.1	VERIFY all boiler, sight glass, economizer, rear and side wall header drains are CLOSED.		
8.1.2	VERIFY safety valves are installed **AND** not gagged.		
8.1.3	OPEN / VERIFY OPEN Steam Drum Vent Valves.		
8.1.4	VERIFY boiler steam drum level instruments root valves are OPEN.		
8.1.5	VERIFY NexGuard inject valves are OPEN to the feedwater supply header **AND** the steam drum.		
8.1.6	OPEN / VERIFY OPEN the Superheater Drain Valves.		
8.1.7	CONNECT the boiler fill hose to the boiler fill connection.		
8.1.8	START the RO Boiler Fill Pump		
8.1.9	ALIGN the discharge of the RO Boiler Fill Pump to the Boiler feedwater supply line **AND** START filling the boiler.		
8.1.10	BRING the drum water to visible.		
CAUTION: Failure to isolate and remove the boiler fill hose prior to pressuring the boiler feedwater train will result in a ruptured hose when the train is pressurized with the south plant feedwater system. There is not a check valve between the feedwater train and the hose connection.			
8.1.11	ISOLATE **AND** REMOVE the boiler fill hose.		

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
8.1.12	STOP the RO Boiler Fill pump, **UNLESS** being used to fill another boiler.		
8.1.13	VERIFY the feedwater train stop valves are CLOSED.		
NOTE: It is important to verify the feedwater train stop valves are closed prior to cycling the feedwater regulating valve. Failure to do so would result in supplying a full flow of feedwater to the boiler.			
8.1.14	EXERCISE the Feedwater Regulating Valve as follows: • VERIFY automatic feed water valve is isolated. • Manually INCREASE feed water controller output to 100%. • VERIFY automatic feed water valve OPEN 100%. • RETURN automatic feed water control output to 0%. • VERIFY automatic feed water valve is closed.		
8.1.15	VERIFY the south plant feedwater system is in service **OR** START if necessary.		
8.1.16	OPEN the feedwater train stop valves.		
8.1.17	VERIFY the Variable Area Diffuser (VAD) is in service.		
8.1.18	CYCLE OPEN **AND** CLOSED the feedwater regulating valve bypass valve as needed to bring water level in the boiler to light off level, -2” to -3” water column.		
NOTE: The high and low water alarms should be tested before lighting the burner.			
8.1.19	OPEN the boiler steam outlet non-return valve.		
8.1.20	VERIFY proper FD fan bearing oil levels		

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
NOTE: Before starting the boiler, all dampers should be checked and cycled to ensure they are not stuck. The associated linkage should be checked for abnormalities. Ideally, an operator will cycle the dampers from the Control Room while another operator monitors the damper locally for binding or any other issues.			
8.1.21	CYCLE **ALL** CA&FG Dampers to verify no stuck or bound dampers: • Fresh Air Damper • FGR Damper • FD Fan Air Inlet Damper • FD Fan Air Outlet Damper • Stack Damper		
8.1.22	VERIFY the FD Fan fresh air inlet filter/silencer is clear of debris and obstructions.		
8.1.23	VERIFY all auxiliary systems and boiler subsystems are ready for operation. Systems include, but are not limited to: • FD Fan • Steam Drum • Feedwater System • Fuel Systems (Natural Gas or Fuel Oil) • Boiler Safety Valves • Gauge and Instrument Valves • Valve Actuators and Beck Drives • Instrument Air Supply		
8.2 Chemical Feed Startup **VERIFY**			
8.2.1	VERIFY NexGuard shutoff valves at the feedwater supply header **AND** the steam drum are OPEN.		
8.2.2	VERIFY the feedwater sample line is aligned to the feedwater sample station.		
8.2.3	TURN ON the Feedwater Sample Station.		
8.2.4	VERIFY continuous blowdown sample line is aligned to the continuous blowdown sample station.		

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
8.2.5	TURN ON the Continuous Blowdown Sample Station.		
8.2.6	START the Boiler No. 1 NexGuard Pump.		
8.2.7	**FROM** the WATER screen, VERIFY the following: • NexGuard Chemical Injection Controller is in AUTO • Blowdown Controller is in AUTO		
8.3 Steam Line Warming			
8.3.1	VERIFY boiler steam drum vent valves are OPEN.		
8.3.2	VERIFY mud drum drains are CLOSED.		
8.3.3	VERIFY the boiler steam outlet non-return valve is OPEN.		
8.3.4	OPEN the non-Return Valve before and after seat drain valves.		
8.3.5	OPEN / VERIFY OPEN the non-return valve outlet valve (Main Steam Stop Valve).		
8.3.6	VERIFY the Main Steam Header Isolation valve is CLOSED.		
8.3.7	OPEN the small warmup bypass around the Main Steam Header Isolation valve, thereby pressurizing back to the Non-Return valve.		
8.3.8	**ONCE** pressure is equalized, OPEN the Main Steam Header Isolation Valve.		
NOTE: Failure to equalize pressure across the Isolation Valve can lead to difficult operation or valve damage.			
8.3.9	CLOSE the small warmup bypass around the Main Steam Header Isolation valve.		
8.4 FD Fan Startup			
8.4.1	VERIFY FD Fan dampers are aligned for startup.		

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
8.4.2	START the Forced Draft Fan **AND** ADJUST airflow to light-off position.		
8.5 Startup of Gas Burner			
NOTE: This section is for starting the boiler on Gas. Proceed to the next section for starting the boiler on Oil.			
8.5.1	VERIFY that instrument air pressure is normal.		
8.5.2	VERIFY that electricians have accomplished pre-startup electrical checks.		
8.5.3	VERIFY that maintenance crew has completed all work and necessary preparation.		
8.5.4	VERIFY that instrument technicians have completed all pre-firing checks.		
8.5.5	VERIFY that manual "Boiler E-STOP" in the Control Room is in the "OUT" position.		
8.5.6	VERIFY the south plant LP gas distribution system is in service and the LP Gas is supplied to the boiler gas trains.		
8.5.7	**FROM** boiler Delta V control screen RING, VERIFY GAS is selected.		
NOTE: Before lighting the burner, all superheater header drains should be opened wide until the superheater is completely drained. The superheater header drain valves may be throttled during the pressure raising period to conserve steam and reduce noise. They should remain cracked open to assure removal of condensate until the boiler is producing 10% of full load steam flow.			
8.5.8	VERIFY the gas flow control valve is in AUTO on control screen OVERVIEW.		
8.5.9	VERIFY the Gas Supply Pressure Control Valve is maintaining proper pressure in the Gas Supply Header.		
8.5.10	**FROM** boiler Delta V control screen BMS, CLICK RESET.		

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
8.5.11	**FROM** boiler Delta V control screen BMS, CLICK START.		
NOTE: At start of purge Forced Draft Damper control will open damper to 100% and count down timer will start, if damper fails to open 100%, purge count down will not start. When purge times out complete, Forced Draft Damper control will return damper to low fire position. BMS control will begin light off sequence and indicate boiler firing on gas. If permissives have not been satisfied or an MFT condition is present, the start button will not appear and a fault bulletin will appear on the screen. The bulletin must be cleared by corrective action before a light off can proceed.			
8.5.12	VERIFY the Air Dampers position appropriately for the purge.		
8.5.13	VERIFY the FD Fan automatically adjusts speed appropriately for purge.		
8.5.14	VERIFY the purge initiates.		
8.5.15	**WHEN** the purge permissives are satisfied, VERIFY 300 second purge starts.		
8.5.16	**AFTER** 300 seconds, VERIFY the purge is completed successfully.		
NOTE: After the purge is complete, the burner management system allows 60 seconds **VERIFY** for the burner interlocks to be met and fire inserted. If 60 **VERIFY** seconds elapses before these interlocks are met, the operator must press the system reset and reinitiate the Boiler Start.			
8.5.17	VERIFY the Combustion Air Dampers move to the light-off position.		
8.5.18	VERIFY the Stack Damper is 100% Open.		
8.5.19	VERIFY the FD Fan speed changes to achieve light off flow.		
8.5.20	**AFTER** the Igniter Interlocks are met, VERIFY: • Pilot Gas Safety Shutoff Valves OPEN • Pilot Gas Vent CLOSES • High Energy Spark Igniter (HESI) Activates		

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
8.5.21	VERIFY a pilot flame is detected by checking the "PILOT ON" indication on the RING screen.		
8.5.22	VERIFY the Main Gas ignition sequence starts.		
8.5.23	AFTER the Gas Interlocks are met, VERIFY: • Main Gas Safety Shutoff Valves OPEN • Main Gas Vent Valve CLOSES • Main Gas Flow Control Valve moves to the appropriate position for light-off		
8.5.24	VERIFY boiler light off by observing pilot **AND** main flame intensity indication on RING screen.		
CAUTION: The Operator should make no more than three attempts at lighting off the burner unless they have corrected whatever problem caused the failure to light. An I&C technician should be brought in to trouble shoot and fix the problem(s) if the operator is unable to light off in three attempts.			
8.5.25	VERIFY the Gas Burner indicates Release to Modulate on the RING screen.		
8.5.26	STOP **OR** VERIFY STOPPED the Gas Igniter & Pilot: • Pilot Gas Safety Shutoff Valves CLOSE • Pilot Gas Vent Valve OPENS		
8.6 Startup of Oil Burner			
NOTE: This section is for starting the boiler on Oil. Proceed to the previous section for starting the boiler on Gas.			
8.6.1	VERIFY that instrument air pressure is normal.		
8.6.2	VERIFY that electricians have accomplished pre-startup electrical checks.		
8.6.3	VERIFY that maintenance crew has completed all work and necessary preparation.		
8.6.4	VERIFY that instrument technicians have completed all pre-firing checks.		

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
8.6.5	VERIFY that manual "Boiler E-STOP" in the Control Room is in the "OUT" position.		
8.6.6	VERIFY the south plant fuel oil supply system is in service and No. 2 fuel oil is supplied to the boiler fuel oil train.		
8.6.7	OPEN the Boiler manual Fuel Oil Supply block valve.		
8.6.8	OPEN the manual Fuel Oil Return block valve **APPROXIMATELY** 1 turn to provide a continuous flow of recirculating oil.		
8.6.9	VERIFY the south plant 150 psig steam system is in service and 150 psig steam is supplied to the boiler atomizing steam train.		
8.6.10	OPEN the atomizing steam supply manual block valve.		
8.6.11	DRAIN **ALL** Boiler Atomizing Steam System steam traps to remove condensate from the system.		
8.6.12	INSERT **OR** VERIFY INSERTED the Oil Gun into the burner.		
8.6.13	**MANUALLY** INITIATE an Oil Gun Purge on the Oil Gun.		
8.6.14	**FROM** boiler Delta V control screen RING, VERIFY Oil is selected.		
NOTE: Before lighting the burner, all superheater header drains should be opened wide until the superheater is completely drained. The superheater header drain valves may be throttled during the pressure raising period to conserve steam and reduce noise. They should remain cracked open to assure removal of condensate until the boiler is producing 10% of full load steam flow.			
8.6.15	VERIFY the oil flow control valve is in AUTO on control screen OVERVIEW.		
8.6.16	**FROM** boiler Delta V control screen BMS, CLICK RESET.		

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
8.6.17	**FROM** boiler Delta V control screen BMS, CLICK START.		
NOTE: At start of purge Forced Draft Damper control will open damper to 100% and count down timer will start, if damper fails to open 100%, purge count down will not start. When purge times out complete, Forced Draft Damper control will return damper to low fire position. BMS control will begin light off sequence and indicate boiler firing on gas. If permissives have not been satisfied or an MFT condition is present, the start button will not appear and a fault bulletin will appear on the screen. The bulletin must be cleared by corrective action before a light off can proceed.			
8.6.18	VERIFY the Air Dampers position appropriately for the purge.		
8.6.19	VERIFY the FD Fan automatically adjusts speed appropriately for purge.		
8.6.20	VERIFY the purge initiates.		
8.6.21	**WHEN** the purge permissives are satisfied, VERIFY 300 second purge starts.		
8.6.22	**AFTER** 300 seconds, VERIFY the purge is completed successfully.		
NOTE: After the purge is complete, the burner management system allows 60 seconds **VERIFY** for the burner interlocks to be met and fire inserted. If 60 **VERIFY** seconds elapses before these interlocks are met, the operator must press the system reset and reinitiate the Boiler Start.			
8.6.23	VERIFY the Combustion Air Dampers move to the light-off position.		
8.6.24	VERIFY the Stack Damper is 100% Open.		
8.6.25	VERIFY the FD Fan speed changes to achieve light off flow.		
8.6.26	**AFTER** the Igniter Interlocks are met, VERIFY: • Pilot Gas Safety Shutoff Valves OPEN • Pilot Gas Vent CLOSES • High Energy Spark Igniter (HESI) Activates		

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
8.6.27	VERIFY a pilot flame is detected by checking the "PILOT ON" indication on the RING screen.		
8.6.28	AFTER the Oil **AND** Atomizing Steam Valve Interlocks are met, VERIFY: • Fuel Oil Safety Shutoff Valves OPEN • Fuel Oil Flow Control Valve moves to the appropriate position for light-off • Atomizing Steam Solenoid Shutoff Valve OPENS • Atomizing Steam Valve moves to maintain proper atomizing steam pressure to the oil gun		
8.6.29	VERIFY boiler light off by observing pilot **AND** main flame intensity indication on RING screen.		
CAUTION: The Operator should make no more than three attempts at lighting off the burner unless they have corrected whatever problem caused the failure to light. An I&C technician should be brought in to trouble shoot and fix the problem(s) it the operator is unable to light off in three attempts.			
8.6.30	VERIFY the Oil Burner indicates Release to Modulate on the RING screen.		
8.6.31	STOP **OR** VERIFY STOPPED the Gas Igniter & Pilot: • Pilot Gas Safety Shutoff Valves CLOSE • Pilot Gas Vent Valve OPENS		
8.7 Raising Pressure			
8.7.1	**AT** 50 psig drum pressure, CLOSE the drum vent **AND** THROTTLE superheater drains.		
NOTE: With the Main Flame proven by time trial, the BOILER MASTER face plate will switch from LO (Lockout) to MAN (Manual). The boiler firing rate can now be controlled with the BOILER MASTER face plate.			
8.7.2	MONITOR drum level and pressure **FROM** the boiler control screen.		

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
8.7.3	ADJUST firing rate to increase pressure at the low-fire level, about 12% or to meet the 100°F temperature rise heat up rate (See the heat up curve Attachment D).		
NOTE: During the pressure raising period, little or no steam passes through the superheater even though the header drain valves are open. Care must be taken to not overheat the superheater during start-ups. The firing rate must be regulated to maintain the temperature of the gas entering the superheater below 900°F.			
8.7.4	MONITOR the economizer inlet flue gas temperature; the temperature rise should remain below 100°F per hour.		
NOTE: As boiler starts to heat up it may be necessary to add water using B1 Feedwater Regulator Small Bypass or if drum level begins to increase much above 1” it may be necessary to open B1 Manual Blowdown Valves to control drum level.			
8.7.5	**AT** 200 psig drum pressure: • CLOSE the Main Steam Stop Before and After Seat Drains. • VERIFY Main Steam Header Isolation Valve is OPEN. • BLOW DOWN boiler sight glasses.		
8.7.6	TEST the Low Water Cutout (Low Drum Level Trip from the float switch) **AND** CONFIRM that a Drum Level Trip is indicated while blocked by the override.		
8.7.7	PLACE Feedwater Regulating Valve in the CAS position **AND** VERIFY boiler drum level is controlling at normal operating level.		
8.7.8	**GRADUALLY** INCREASE Boiler Master setpoint to increase steam output. This will cause boilers operating in parallel to reduce output automatically.		
8.7.9	**AT** 850 psig, VERIFY the non-return valve opens **AND** steam flow from the boiler is observed.		

8.0 Startup Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
8.7.10	**WHEN** Boiler 1 is on line **AND** steam flow is >10% (approximately 20,000 pph flow): • CLOSE superheater drain valve. • CLOSE the superheater drain root valve. • CLOSE the superheater vent valve.		
8.7.11	**WHEN** No. 1 Boiler Master control is matched up to the Plant Master control **OR** when load on B1 is equal with boilers operating on the 850 psig steam header, PLACE the No. 1 Boiler Master in CAS.		
8.7.12	BIAS the No. 1 Boiler Master as needed to allow the boiler to operate in LEAD or LAG compared with the other Abbott boilers operating in parallel.		
8.8 Finishing			
8.8.1	MONITOR the NO_X readings.		
8.8.2	RECORD that the startup of Boiler No. 1 is complete in the control room logbook.		
8.8.3	COMPLETE APPENDIX E (Title V Environmental Log) and deliver to the APP Environmental Specialist.		
8.8.4	30 MINUTES AFTER the Boiler No. 1 startup is complete, PERFORM round sheets on Boiler No. 1.		

9.0 Normal Operation

Step	Activity	Initials Completed	Time Completed
Normal operation consists of maintaining the boiler and associated systems within the design temperatures and pressures required for operation of this unit. Operators should be familiar with the equipment operating characteristics and system and equipment ranges to assist them in identifying abnormal conditions. This means maintaining a normal water level in the boiler drum, a water flow equal to the steam flow, normal feed water pressure, and normal drum pressure. Additionally, it means providing boiler blowdown.			

9.1 Monitored Parameters

Parameter	Normal Value
Steam drum pressure	850-880 psig
Superheated steam outlet temperature	740°F
Main Steam Pressure	850-870 psig
Main Steam flow	****LATER****
Flue Gas O_2	2-10%
Feedwater supply pressure to feedwater regulating valve	1,110 psig
Feedwater supply temperature at economizer inlet	245°F
Feedwater supply temperature to steam drum (economizer outlet)	350-450°F
Economizer gas outlet temperature to stack	300-320°F
Economizer gas inlet temperature	600-700°F
Furnace Pressure	5-10 inH20
LP Gas Skid natural gas supply	47 psig
Main Burner gas pressure	0-20 psig
Pilot gas pressure	8-12 psig
Atomizing Steam Supply Pressure	150 psig
Atomizing Steam to Burner	30-150 psig
Fuel Oil Supply Pressure to Fuel Oil Skid	150 psig
Fuel Oil Pressure to Burner	0-115 psig

9.0 Normal Operation			
Step	**Activity**	**Initials Completed**	**Time Completed**
Instrument Air Supply		100 psig	
Igniter Atomizing Air Pressure to Pilot		8-14 psig	
Gas / Oil Flame Intensity		100%	
Boiler Steam Drum NexGuard Concentration		200 ppm	
Boiler Feedwater Supply NexGuard Concentration		4 ppm	
9.2 Blowdown of Drum Level Gauges and Water Columns			
NOTE: The Drum Level Gauges and Water Columns are blown down once per week.			
9.2.1	PRESS the LWCO Bypass Pushbutton “BYPASS AND TEST” pushbutton to start the 180-second timer.		
9.2.2	BLOW DOWN the Low Water Cutout (LWCO) line until "DRUM LEVEL TRIP" alarm is received.		
9.2.3	BLOW DOWN the Level Switch Column line.		
9.2.4	BLOW DOWN the North Level Gauge line.		
9.2.5	BLOW DOWN the South Level Gauge Line.		
9.2.6	VERIFY all blow downs are stopped **AND** VERIFY the "DRUM LEVEL TRIP" alarm is cleared and reset.		
9.2.7	VERIFY the water has returned to its normal level.		
NOTE: The boiler will trip once the 180 second timer has elapsed if the level has not returned to normal.			
9.3 Fuel Switching (Gas to Oil)			
9.3.1	**LATER**		
9.3.2	VERIFY the boiler is operating on Natural Gas.		
9.3.3	WALKDOWN the Boiler Fuel Oil Skid **AND** VERIFY the fuel oil and atomizing steam trains are ready to be placed in service.		
9.3.4	VERIFY the south plant fuel oil supply system is in service **AND** fuel oil is aligned to the Boiler Fuel Oil Skid.		

9.0 Normal Operation			
Step	**Activity**	**Initials Completed**	**Time Completed**
9.3.5	VERIFY the south plant 150 psig steam system is in service **AND** fuel oil is aligned to the Atomizing Steam Train.		
9.3.6	VERIFY the fuel oil storage tanks have sufficient oil to start the boiler on Fuel Oil.		
NOTE: Depending on the expected load levels and run time, arrangements need to be made to maintain level in the Fuel Oil Storage Tanks.			
9.3.7	**IF** a south plant fuel oil pump is not operating, START a fuel oil pump in the basement (1 or 2).		
9.3.8	VERIFY the operating fuel oil pump discharge pressure is between 100-150 PSIG.		
9.3.9	OPEN the Boiler manual Fuel Oil Supply block valve.		
9.3.10	OPEN the manual Fuel Oil Return block valve **APPROXIMATELY** 1 turn to provide a continuous flow of recirculating oil.		
9.3.11	OPEN the atomizing steam supply manual block valve.		
9.3.12	DRAIN **ALL** Boiler Atomizing Steam System steam traps manually to remove condensate from the system.		
NOTE: Condensate should not be removed from the atomizing steam system using a MANUAL fuel oil gun purge if the gas burner is in service.			
9.3.13	PLACE the Gas Flow Controller in MANUAL.		
NOTE: Air Flow controller may be operated in AUTO as the setpoint will follow Total Fuel. However, Air Flow, Oxygen, & Opacity should be monitored constantly during the fuel switch.			
9.3.14	VERIFY Air Flow Controller is in AUTO.		
9.3.15	ADJUST Boiler firing rate to low fire.		

9.0 Normal Operation			
Step	**Activity**	**Initials Completed**	**Time Completed**
9.3.16	**FROM** the RING screen, TRIP the Gas Burner to remove natural gas from the burner (Gas Burner Stop).		
9.3.17	INSERT the Oil Gun into the burner.		
9.3.18	**MANUALLY** INITIATE an Oil Gun Purge on the Oil Gun.		
9.3.19	**FROM** boiler Delta V control screen RING, SELECT Oil.		
9.3.20	**FROM** boiler Delta V control screen BMS, CLICK RESET.		
9.3.21	**FROM** boiler Delta V control screen BMS, CLICK START.		
9.3.22	VERIFY 300 second purge starts.		
9.3.23	VERIFY boiler light off by observing pilot **AND** main flame intensity indication on RING screen.		
9.3.24	VERIFY the Oil Burner indicates Release to Modulate on the RING screen.		
9.3.25	VERIFY the oil flow controller is in AUTO.		
9.3.26	INCREASE Boiler Master setpoint to increase steam output. This will cause boilers operating in parallel to reduce output automatically.		
9.3.27	MONITOR the NOx readings.		
9.3.28	MONITOR Opacity.		
9.3.29	**WHEN** No. 1 Boiler Master control is matched up to the Plant Master control **OR** when load on B1 is equal with boilers operating on the 850 psig steam header, PLACE the No. 1 Boiler Master in CAS.		
9.3.30	BIAS the No. 1 Boiler Master as needed to allow the boiler to operate in LEAD or LAG compared with the other Abbott boilers operating in parallel.		

9.0 Normal Operation			
Step	**Activity**	**Initials Completed**	**Time Completed**
9.3.31	RECORD that the fuel switching is complete in the control room logbook.		
9.4 Fuel Switching (Oil to Gas)			
9.4.1	**LATER**		
9.4.2	VERIFY the boiler is operating on Fuel Oil.		
9.4.3	WALKDOWN the Boiler Natural Gas System **AND** VERIFY the main and pilot gas trains are ready to be placed in service.		
9.4.4	VERIFY the south plant LP Gas System is in service **AND** LP Gas is aligned to the Boiler Gas Skid.		
9.4.5	VERIFY the main gas shutoff valve to B1 is OPEN.		
9.4.6	VERIFY the sensing line isolations for the B1 gas train pressure reducing valve are OPEN.		
9.4.7	PLACE the Fuel Oil Flow Controller in MANUAL.		
NOTE: Air Flow controller may be operated in AUTO as the setpoint will follow Total Fuel. However, Air Flow, Oxygen, & Opacity should be monitored constantly during the fuel switch.			
9.4.8	VERIFY Air Flow Controller is in AUTO.		
9.4.9	ADJUST Boiler firing rate to low fire.		
9.4.10	**FROM** the RING screen, TRIP the Oil Gun to remove Fuel Oil from the burner (Oil Burner Stop).		
9.4.11	OPEN the oil burner purge valve.		
9.4.12	ALLOW Oil Burner to purge for 2 minutes.		
9.4.13	REMOVE Oil Gun from the Burner **AND** INSTALL the breech end plug.		
9.4.14	**FROM** boiler Delta V control screen RING, SELECT GAS.		
9.4.15	**FROM** boiler Delta V control screen BMS, CLICK RESET.		

9.0 Normal Operation			
Step	**Activity**	**Initials Completed**	**Time Completed**
9.4.16	**FROM** boiler Delta V control screen BMS, CLICK START.		
9.4.17	VERIFY 300 second purge starts.		
9.4.18	VERIFY boiler light off by observing pilot **AND** main flame intensity indication on RING screen.		
9.4.19	VERIFY the Gas Burner indicates Release to Modulate on the RING screen.		
9.4.20	VERIFY the gas flow controller is in AUTO.		
9.4.21	INCREASE Boiler Master set-point to increase steam output. This will cause boilers operating in parallel to reduce output automatically.		
9.4.22	MONITOR the NOx readings.		
9.4.23	**WHEN** No. 1 Boiler Master control is matched up to the Plant Master control **OR** when load on B1 is equal with boilers operating on the 850 psig steam header, PLACE the No. 1 Boiler Master in CAS.		
9.4.24	BIAS the No. 1 Boiler Master as needed to allow the boiler to operate in LEAD or LAG compared with the other Abbott boilers operating in parallel.		
9.4.25	RECORD that the fuel switching is complete in the control room logbook.		

9.5 Parallel Boiler Operation

Parallel boiler operation is accomplished through a single master pressure controller which controls all of the boilers. Each boiler is an individual unit with stand alone controls and individual piping systems. All of the operating units can, and routinely are, operated in automatic control (steam pressure). Theoretically, each boiler should carry the same steam load, however, each boiler is fitted with a boiler rating control device and the operation of this control device (normally set at 100 on a scale of 0 - 200) will bias each boiler up or down in relation to each of the other boilers. Specific instructions regarding the Plant Master, Boiler Masters, and Biasing the boilers is provided in the Steam Distribution System Operating Procedures.

10.0 Shutdown Procedure			
Step	**Activity**	**Initials Completed**	**Time Completed**
10.1 Pre-Shutdown Verification			
10.1.1	VERIFY that the Abbott Power Plant supports shutdown of Boiler No. 1.		
10.2 Boiler Normal Shutdown			
NOTE: It is important to closely monitor header pressure to make sure the operational boilers are maintaining the header pressure. If not, another boiler may need to be brought online before shutting down Boiler No. 1.			
10.2.1	**SLOWLY** REDUCE the BOILER MASTER firing rate to minimum fire in 5% increments.		
10.2.2	LEAVE FD Fan **AND** Feedwater controllers in AUTO so they will follow the firing rate accordingly.		
10.2.3	OPEN the superheater drain header root drain valve (HV-B1-1043).		
10.2.4	**CRACK** OPEN the superheater drain header drain valve (HV-B1-1044).		
10.2.5	**CRACK** OPEN the superheater drain header vent valve (HV-B1-1105).		
CAUTION: On a boiler trip not initiated by an operator OPEN the superheater drain header root drain valve (HV-B1-1043), then CRACK OPEN the superheater drain header drain valve (HV-B1-1044) and then CRACK OPEN the superheater drain header vent valve (HV-B1-1105).			
NOTE: The shutdown for the boiler is automated. Once the shutdown sequence is initiated, operators must monitor the boiler to ensure fires shutdown, a purge is completed, and all shutdown items are accomplished successfully.			
10.2.6	VERIFY the boiler is at minimum fire.		
10.2.7	**FROM** the BMS screen, INITIATE a boiler shutdown by clicking the Boiler Stop button.		
10.2.8	VERIFY the boiler shutdown sequence starts **AND** MONITOR the boiler during the shutdown sequence.		