Title: Operation of Boiler			
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1.0 OBJECTIVE:

To lay down a procedure for the Operation of Boiler.

2.0 SCOPE:

This SOP is applicable for Operation of Boiler having capacity 2 TPH, 2.8 TPH & 8 TPH in Engineering Department.

3.0 RESPONSIBILITY:

Operator/Officer / Executive Engineering

4.0 ACCOUNTABILITY:

Head Engineering

5.0 ABBRIVATION:

ER	Engineering
SOP	Standard Operating Procedure
ºC	Degree Celsius
TPH	Ton per Hour
ID	Induced Draft
FD	Force Draft
SFD	Secondary Force Draft

6.0 PROCEDURE:

6.1 STARTING & STOPPING PROCEDURE OF BOILER (2.0 TPH & 2.8 TPH)

6.1.1 Ensure that boiler is clean.

6.1.2 Ensure feed water hardness is less than 5 ppm at boiler feed water inlet line.

6.1.3 Ensure day soft water tank and boiler are filled to adequate level.

6.1.4 Ensure day furnace oil tank is filled to adequate level.

6.1.5 Open fuel and feed water inlet valves.

6.1.6 Ensure blow-down and fuel drain valves are fully closed.

6.1.7 Start the electric heater and press oil circulation button to heat up the fuel till nozzle and return line. Observe the fuel temp indicator and ensure that temperature is above 90ºC±10.

6.1.8 Keep the rotary switch in auto position. The water feed pump will start. Check water coming out form the feed water pump into a boiler.

6.1.9 Put the rotary switch in "Auto" position. Blower, fuel pump and water pump will start. Sparking between electrodes begins, a fuel is sprayed after pre-purge timing. This "Pre-purging" is done to drive out any combustible gases that may be present in the furnace.

6.1.10 Red lamp will glow, indicating "BURNER On" fuel spray starts and flame is established. Sparking will stop when flame is established and heating of water will start in the coil.

6.1.11 In about 3 to 5 minutes steam will come out of the auxiliary steam valve. After pressure start increasing, open the main steam stop valve gradually and close the auxiliary steam valve simultaneously.

6.1.12 When the pressure of steam reaches to 5-6 kg/cm^{2,} open the steam valve and close the drain Valve slowly at the same time.

6.2 TO 'OFF' THE BOILER:

6.2.1 Turn "OFF" the boiler burner & heater switch.

6.2.2 Close the steam stop valve fully. The pressure switch will cut off boiler.

6.2.3 Open the blow down valve fully and measure blow down time.

6.2.4 Open the auxiliary steam valve and turn the feed switch on "fill" position. Water pump will be on and cooling will start. Let the steam temperature indication fall below 40ºC. Turn the "Fill" key switch to "OFF" position.

6.2.5 Operation record of boilers (2.0 TPH & 2.8 TPH) shall be recorded as per annexure – I.

6.3 STARTING & STOPPING PROCEDURE OF BOILER (08 TPH)

6.4 CHECK POINT BEFORE STARTING THE BOILER:

6.4.1 Check & ensure that Air vent is open.

6.4.2 Check & keep main steam Stop valve closed.

6.4.3 Check & Ensure that Gauge Glass Isolation cock is open & Gauge Glass Drain is close.

6.4.4 Check & Ensure that Mobrey Isolation valve is open and Mobrey Drain is close.

6.4.5 Check & ensure that feed water pump is in working condition.

6.4.6 Check & ensure that all feed line valves are open.

6.4.7 Check & ensure that blow down valve is close.

6.4.8 Check & ensure that all instruments are under operation.

6.4.9 Check & ensure that availability of boiler feed water and fuel.

6.4.10 Furnace should be clean and all nozzle holes should be clean.

6.4.11 Any foreign material inside the boiler should be removed properly.

6.4.12 All air and gas line flanges should be properly tightened and Manhole should be closed.

6.4.13 All electrical equipment should be checked to be in a working state.

6.4.14 Check the direction of all electric motor rotation & conform that all electric motor are running in right direction.

6.4.15 Check flue gas damper position. It should be in open condition.

6.5 BOILER START UP PROCEDURE:

6.5.1 Check all the points mentioned in the checklist.

6.5.2 First fill water inside drum/boiler shell. The boiler filling rate shall be so chosen that the drum top-bottom level difference is always < 50 ^{0}C and feed water and drum bottom metal temperature difference is <30 ^{0}C.

6.5.3 Take the drum/Boiler shell water level is 40% of gauge glass.

6.5.4 Check Gauge glass, level transmitter & Mobrey are in proper working condition.

6.5.5 Fill bed material at 200 mm above (It is recommended to use operator instructions) as per given bed material quality.

6.5.6 Provide Charcoal (Wood coal) layer on the bed material layer.

6.5.7 Thickness for this layer should be 50mm (max coal size-25mm).

6.5.8 On this layer provide another layer of charcoal wetted with diesel having height of 200mm.

6.5.9 Ignite charcoal while ensuring that I.D fan & F.D fan are in off condition.

6.5.10 Check & ensure that fire is lit all over the furnace.

6.5.11 Start F.D & I.D fan with slow speed while checking flame inside furnace.

6.5.12 Continue mentoring flame inside furnace & increase speed of I.D & FD fan.

6.5.13 Then Start SFD fan.

6.5.14 Keep continuously monitoring flame inside furnace until bed temperature reaches 500 ^{0}C.

6.5.15 When furnace temperature reaches 500 ^{0}C start fuel feeding at slow rate.

6.5.16 Check bed temperature and add bed material inside furnace as per requirement to control bed temperature.

6.5.17 Increase firing rate if bed temperature is getting down.

6.5.18 By controlling bed filling, ID fan, FD fan and fuel feeding stabilize furnace operation at minimum safe operation condition.

6.6 STOP THE BOILER:

6.6.1 Before shut down, give the good blow down to remove as much sediment as possible. Stop when the drain runs clear.

6.6.2 Put the boiler steam pressure control in manual mode, and slowly reduce the firing rate .watch the main steam header pressure to make sure that the other boilers are taking up the load. Do not reduce the firing rate below that necessary to maintain a stable flame.

6.6.3 When the boiler is at minimum firing rate the fuel can be shut off. Alternatively, this is often a good time to rest the low water level shutdown switch, or some other boiler interlock. If this method is chosen make sure you note it in logbook.

6.6.4 Allow the fan to post –purge the furnace with a reduced air flow, & then shut down particularly careful not to let the fan supply large amounts of cold air into the furnace in the winter.

6.6.5 Close the boiler header stop valve.

6.6.6 Open a steam drum vent valve when the boiler pressure drops to slightly above atmospheric pressure. This will prevent a vacuum from forming.

6.6.7 Operation record of 8.0 TPH boiler shall be recorded as per annexure- II.

7.0 ANNEXURES:

ANNEXURE No.	TITLE OF ANNEXURE	FORMAT No.
Annexure - I	Operation Record of Boiler (2.0 TPH & 2.8 TPH)	
Annexure - II	Operation Record of Boiler (8.0 TPH)	

ENCLOSURES: SOP Training Record

8.0 DISTRIBUTION:

- Controlled Copy No. 1 Quality Assurance
- Controlled Copy No. 2 Engineering
- Master Copy Quality Assurance

9.0 REFERENCES:

Manual

10.0 REVISION HISTORY:

Revision No.	Change Control No.	Details of Changes	Reason for Change	Effective Date	Updated By

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ANNEXURE – I
OPERATION RECORD OF BOILER (2.0 TPH & 2.8 TPH)

Equipment ID:

Date:
Shift:

Frequency: After Every 4 Hours

Time			Pressure (Kg/cm^2)		Temperature (°C)			Blow Down Time	TDS & pH	Gauge Glass & Mowbray Check time	Consumption		Done by Sign & Date	Remarks
Start	Stop	Reading	Fuel	Steam	Feed Water	Fuel	Steam				FO	HSD		

Review By:
Sign & Date

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ANNEXURE – II
OPERATION RECORD OF BOILER (8.0 TPH)

Equipment ID:

Date:
Shift:

Frequency: After Every 2 Hours

Reading Time	Fuel Feeder		Temperature (°C)		Boiler Pr. Kg/cm2	Fan Amp.		Stack Temp	Consumption		Total Steam Produced KG	Done by Sign & Date	Remarks
	RPM-01	RPM-02	Bed-01	Bed-02		ID	FD		Fuel (kg)	Feed Water (liter)			

	Timing	TDS	HARDNESS	PH	Done By
Blow Down					
Day Shift					
Night Shift					
FEED WATER					
Day Shift					
Night Shift					

Review By:…….
Sign & Date