

STAGE 1 (3 x 660 MW)

CHEMICAL CLEANING PROCEDURE

POINTS TO DISCUSS

- 1. BOILER SPECIFICATION**
- 2. EQUIPMENT NEEDED**
- 3. TEST PIECE MATERIAL AND ITS LOCATION**
- 4. CHEMICAL CLEANING CIRCUIT**
- 5. CHEMICAL CLEANING PROCEDURE**
- 6. COMPLETION CRITERIA**
- 7. POINTS TO CLARIFY**

BOILER SPECIFICATION

Manufacturer	M/s. DOOSAN HEAVY INDUSTRY CONSTRUCTION Ltd
Type	Balanced-draft, once-through, supercritical, single reheat, dry bottom.
Effective volume	21,462 M3
Tube arrangement	The furnace is made up of two sections-the lower spiral wall section and the upper vertical wall section
Evaporation Rate	2225 T / Hr
Normal Generating Power	660 MW

VOLUME OF DIFFERENT COMPONENT

Main Feed Water Pipe (FW Shut Off Valve to ECO I/L HDR)	28.8 m3
Economizer	253.2 m3
Furnace (Eco Check Valve to Separator Link)	41.5 m3
Separators & Link	13.8 m3
Storage Tank	8.2 m3
Temporary Piping	28.2 m3
Total	373.7 m3

EQUIPMENT NEEDED

No.	Temporary Equipment	Capacity	Q'ty	Remarks
1	Main Circulation Pump	300 m ³ /HR	2	Pump Head Up: 120 M
2	Chemical Injection Pump	60 m ³ /HR	2	Pump Head Up: 80 M
3	Drum Pump	700 L/MIN	1	
4	Wastewater transfer Pump	50 m ³ /HR	2	
5	Effluent Disposal Pump	100 m ³ /HR	2	
6	Mixing Air Blower	2000 Nm ³ /HR	2	Wastewater Mixing

No.	Chemical	Capacity	Q'ty	Application
1	Circulation Tank	10 m ³	2	Circulation
2	Chemical Storage Tank	10 m ³	4	Chemical Storage
3	Chemical Tank	2m ³	1	Hydrazine Dissolving
4	Chemical Tank (Neutralization)	5m ³	2	NaOH, HCl Injection
5	Wastewater Collection Basin	1000 m ³	1	Wastewater Storage
6	Neutralization Pit	2000 m ³	1	Wastewater Mixing

TEST PIECE

LOCATION

Inlet And Outlet pipe line of Circulation Pump

MATERIAL

SA-106 : 4 each (2 each X 2Point)

SA-210C : 4 each (2 each X 2Point)

SA-213 T 12 : 4 each (2 each X 2Point)

SA-213 T 22 : 4 each (2 each X 2Point)

SA-213 T 23 : 4 each (2 each X 2Point)

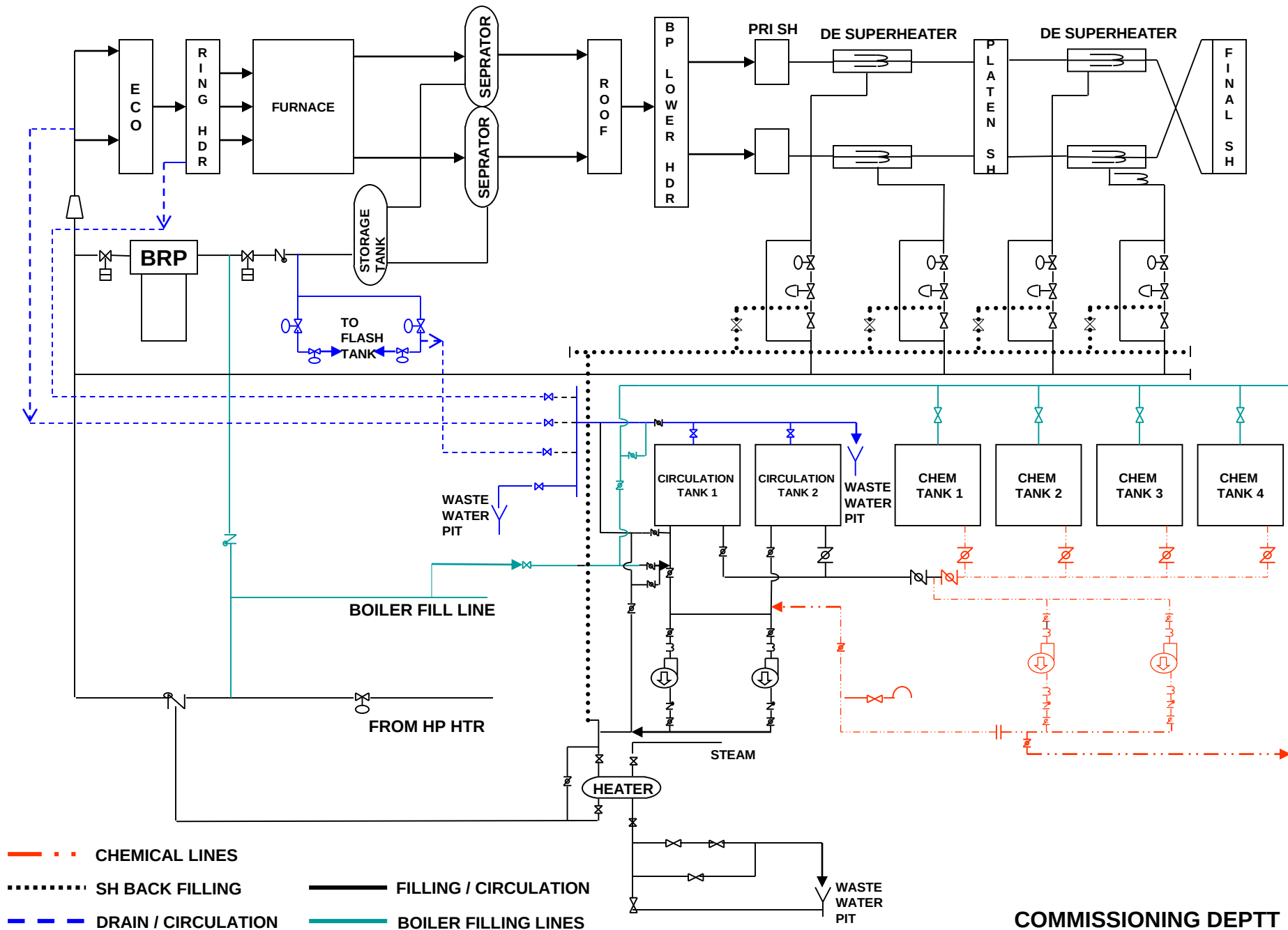
CHEMICAL SAMPLE POINTS

Inlet/Outlet of Circulation Pump

Outlet of Waste Water Line

U # 1

CHEMICAL CLEANING SYSTEM



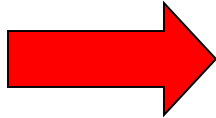
CHEMICAL CLEANING STEPS

- 1. FLUSHING**
- 2. ACID CLEANING**
- 3. RINSING**
- 4. PRE NEUTRALIZATION – NEUTRALIZATION - PASSIVATION**
- 5. CONSERVATION**

REHEARSAL & FLUSHING

CHEMICAL REQUIREMENT : N₂H₄ (Working Cons : 10 %)

CIRCUIT OF BOILER FILLING



ECO' Check V/V → Economizer → Furnace → Wall Tube →
Separator → Separator Storage Tank → LCT10AA052 MOV outlet piping →
Circulation Pump

DURATION

FILLING : 2-3 Hr

CIRCULATION : 2-3 Hr

Draining : 2-3 Hr

COMPLETION CRITERIA

Turbidity : 15 NTU or Below

N₂H₄ : Less than 100PPM

HYDROTEST

1. Before hydro test, check the total system, temporary piping, fittings & valves for proper installation.
2. Fill with DM/treated water through circulation pump.
3. During filling open all the vent valves to remove any locked up air.
4. After filling, close all vents and drain valves.
5. Pressurize the system to 15 kg/cm²(g)
6. Inspect all piping, fittings and valves for any possible leakage

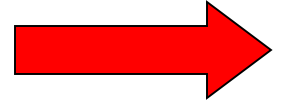
DURATION : 1 Hr

COMPLETION CRITERIA

No Leakage at 15 Kg / Cm² in chemical cleaning system, temporary piping.

Drain the boiler to Neutralization Pit

Chemical Cleaning



Chemical Requirement

FORMIC ACID	10 %	75 TO 85	36000 kG
CITRIC ACID			
AMMONIUM BI FLUORIDE			
SORBIC ACID	0.15 %		540 kG

1. Fill the Boiler with Demi-water and supply steam until temperatures reaches to $80 \pm 5^{\circ}\text{C}$
2. Check and ensure that the C.S.Tank is filled with DM water.
3. Check the readiness of circulating pump.
4. Start filling the boiler with DM water.
5. Ensure supply of steam through the heat exchanger
6. Check that the DM water temperature reaches $80 \pm 5^{\circ}\text{C}$
7. INJECT THE SORBIC ACID DURING 1ST CIRCULATION CYCLE

After the finishing of Acid Cleaning Drain the Boiler to the drain pit under the N2 Capping (Pressure : 0.3 to 0.5 Kg / Cm2)

RINSING

1. Fill the system with DM Water
2. N₂H₄ concentration to be maintained at 100 PPM
3. Temperature to be maintained around 45 – 55 C
4. Circulate the rinse water
5. Total 4 rinsing cycle to be done

DURATION 7 – 10 Hr / Rinsing

COMPLETION CRITERIA

Turbidity Below 100 PPM

TOC Less Than 0.5 PPM

After the finishing of rinsing Drain the Boiler in collection basin

PRE NEUTRALIZATION-NEUTRALIZATION-PASSIVATION

1. Fill The System With DM Water
2. Circulate the water through heater and maintain the temperature in the range 75 to 85
3. Inject the Citric acid once temperature achieved
4. Circulate the water to 2-3 Hrand bring Ph in the range of 3 – 4
5. Inject Ammonia to the system and circulate for 2 – 3 Hr
6. Bring the Ph in the range of 9-10
7. Inject Hydrazine (0.05 % / 500 PPM) and circulate for 3-4 Hr
8. Maintain Ph around 9 – 10
9. Drain the system under N2 Capping

DURATION

24 - 36 Hr

After the finishing of rinsing Drain the Boiler in Neutralization Pit

CONSERVATION

Dry Conservation Using N₂ Gas,

1. blow out 2~3 times in order to purge the system from any chemical remaining
2. conserve the system under N₂ Gas pressure at 0.35~0.5 Kg/cm².

Wet Conservation

1. Fill the system with Demi-Water containing N₂H₄ 200 PPM and Conserve.
2. If the pH value is lower than 9.5 the ammonia will be used along with hydrazine to maintain the pH value 9.5 – 10.0.

COMPLETION CRITERIA

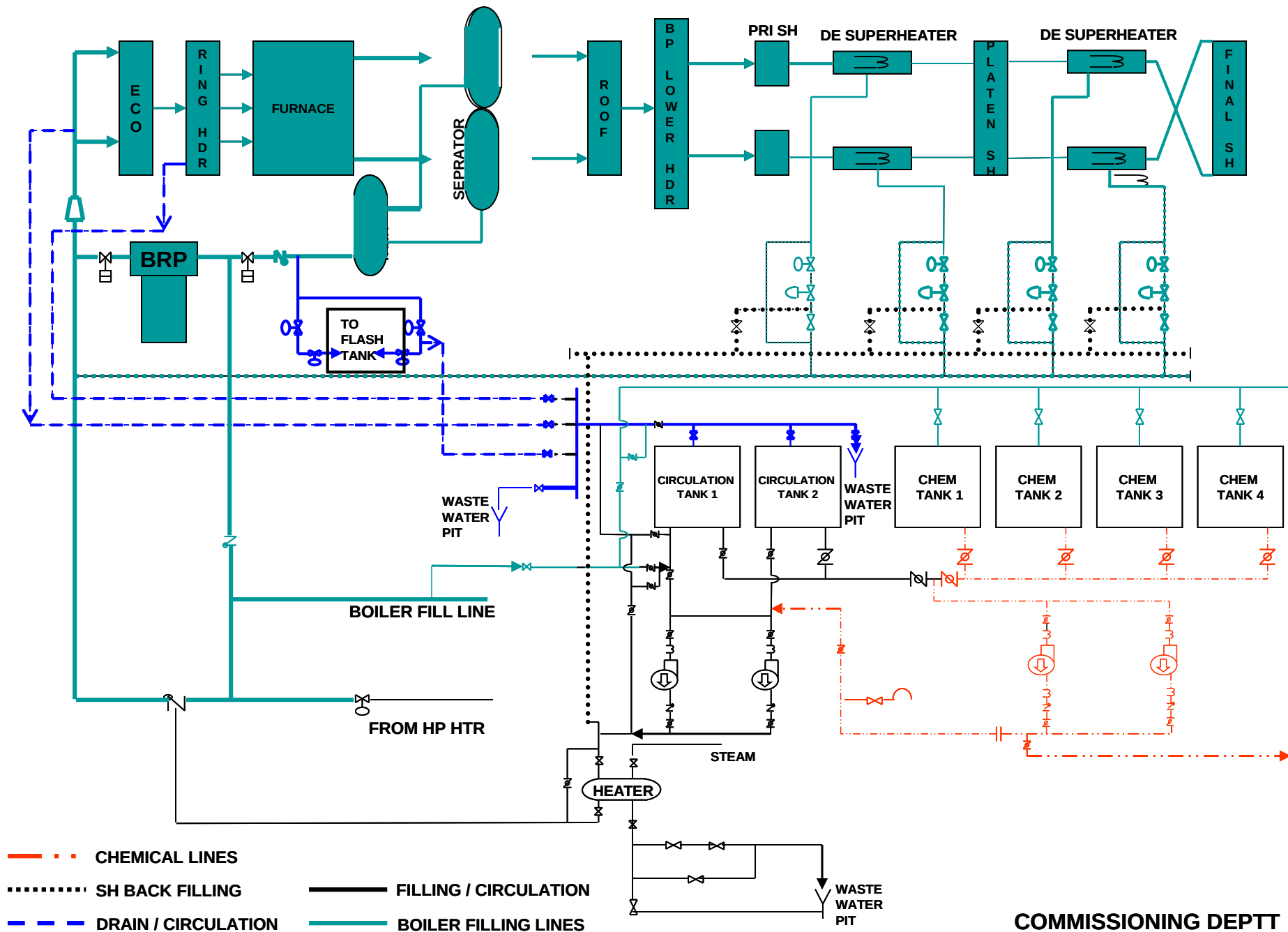
1. Inspection Standard The Corrosion Rate of Test Piece : 0.1 mg/cm²/hr (Based on NACE Standard Test Method)
2. Passivation : 95 % or more (with respect to cleanliness of test piece).

POINTS TO CLARIFY

1. Nothing mentioned about SH Back Flushing Procedure
2. Location of sample point not shown in the drawing.
3. Axon-Tek Chemical qty and its used not mentioned anywhere in the procedure But in safety precaution it had been mentioned.
4. What is martyar valve and its location not mentioned any where.

U # 1

BOILER FILLING DURING CHEMICAL CLEANING



U # 1

CHEMICAL CLEANING SYSTEM

