

ANNEXURE - I

SITE CONDITION

- | | |
|--|---|
| 1. Ambient air temperature
(Performance guarantee)
Range | : 35 deg.C

: 5 to 50 deg.C |
| 2. Relative humidity
(Performance guarantee) | : 38 % |
| 3. Plant elevation above M.S.L | : 380 m |
| 4. Overall seismic co-efficient | : 4 (on Mercalli measure) |
| 5. Wind speed | :32 m/sec
(expected to happen 10min) |
| 6. Maximum total rainfall | :115.5 mm per day |

ANNEXURE - II

Characteristics	Results
Density at 15 °C,kg/litre	0.9054
Specific gravity at 60/60°F	0.9059
Gravity °API at 60°F	24.70
REID vapor pressure at 38°C	-
Kg/cm2	ND
Viscosity, kinematic,cSt at 60°C	162.29
Viscosity, kinematic,cSt at 80°C	67.00
Viscosity, kinematic,cSt at 100°C	40.50
Viscosity, kinematic,cSt at 110°C	28.59
Viscosity, kinematic,cSt at 120°C	21.88
Viscosity, kinematic,cSt at 130°C	18.31
Viscosity, kinematic,cSt at 140°C	15.75
Pour point°C	39
Salt content, % wt	0.00029
Lb/1000bb;(PTB)	1.0
Carbon residue,%wt	8.1
Flash point °C	50.0
Fire point °C	90.0
Asphaltenes,% wt	0.47
Ash content,% wt	0.053
Wax content, % wt at -20°C	14.06
Sediment & water(BS&W), % VOL	Trace
Sediment by extraction,%wt	0.06
Elemental Analysis % wtC %wt H	87.3, 12.15

ANNEXURE - II

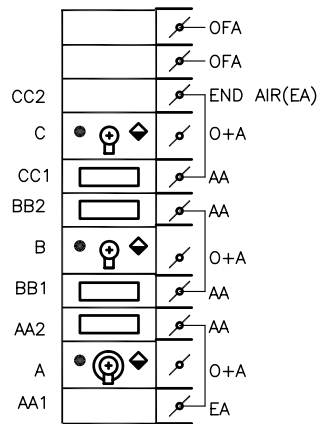
Water content % vol.	0.06
Total acid value ,mg koh/g	2.3
Suiphur, % wt	0.034
Total nitrogen % wt	0.28
Trace metal, ppm	
Vanadium	0.87
Sodium	22.1
Calorific value MJ/kg	44.65
Net	42.03

ANNEXURE III
GAS OIL PROPERTIES

DESCRIPTION	SPECIFICATION	TEST METHOD
Density at 50 deg. C, kg/l	Max. 0.87	ASTM D 1298
Kinematic Viscosity at 20 deg.C ,cst	Max. 8.8	ASTM D 445
Cloud Point deg.C	Max. 11	ASTM D 2500
Flash Point deg.C	Max. 57	ASTM D 93
Color	Max. 3	ASTM D 1500
Cetane Index (Calc)	Min 52	ASTM D 967
Sulphur % wt	Max. 1	ASTM D 129
Water (by distillation) %vol,	Max. 0.25	ASTM D 95
Sediment by extration % wt.	Max. 0.10	ASTM D 473
Ash % wt	Max. 0.01	ASTM D 482
Coxradson Carbon %wt.	Max. 0.30	ASTM D 189
Copper Corrosion (3 Hr/100c)	1	ASTM D 130
Strong Acid No. (mgKOH/g)	NIL	ASTM D 974
Total Acid No (mgKOH/g)	Max. 0.25	ASTM D 974
Distillation recovery at 35 deg.C %wt	Max 50	ASTM D 156

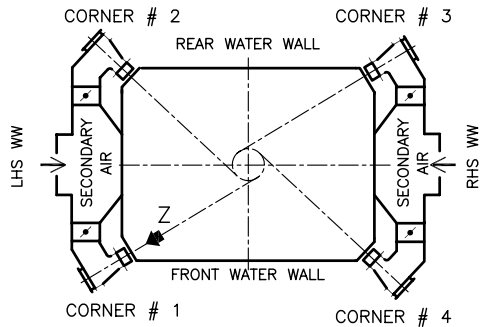
ANNEXURE – IV

LIST OF DRAWINGS ENCLOSED



VIEW – Z , ELEVATION DESIGNATION

AA = AUXILIAR AIR
EA = END AIR
OFA = OVER FIRE AIR
O+A = OIL + AIR



FURNACE PLAN – CORNER DESIGNATION

	AUX. AIR		FLAME SCANNER
	CRUDE OIL GUN		HEA IGNITOR
	GAS OIL + CRUDE OIL GUN		AIR DAMPER

OIL GUN PERFORMANCE
(PERFORMANCE AND FLOW)

ATOMISER	CRUDE OIL		STEAM		GAS OIL		AIR	
	p	f	p	f	p	f	p	f
MAX RATING	13.5	2900	5.25	200	3.8	1000	5.25	203
MIN RATING	3.5	900	5.25	270	3.0	750	5.25	206
SCAVENGING	–	–	–	323	–	–	–	245

LEGEND

	GAS OIL		NORMALLY OPEN VALVE		GAUGES – LOCAL
	CRUDE OIL		NORMALLY CLOSED VALVE		GAUGES – LOCAL PANEL
	STEAM		GATE VALVE		GAUGES – REMOTE
	ATOMISING AIR		GLOBE VALVE		DIAPHRAGM OPERATED
	CONDENSATE		REGULATING GLOBE		PISTON OPERATED
	GAS		NON–RETURN VALVE		MOTOR OPERATED
	AIR		PLUG VALVE		HYDRAMOTOR OPERATED
	ELECTRIC TRACING		BUTTERFLY VALVE		SINGLE SOLENOID OPR'D
	ELECTRIC SIGNAL		BALL VALVE		DUEL SOLENOID OPR'D
	SCOPE ARROW		THREE WAY VALVE		VALVE POSITIONER
	SCOPE DEMARCATION		FOUR WAY VALVE		POSITION TRANSMITTER
	FLOW DIRECTION		RELIEF VALVE		AIR LOCK VALVE
	SLOPE DOWN		DRAIN VALVE		SPEED REGULATOR
	PNEUMATIC SIGNAL		VENT COCK		AIR FILTER
	FLEXIBLE HOSE		STM TRAP STN (HDR)		AIR LUBRICATOR
	PAIR OF FLANGES		STM TRAP STN (HDR)		AIR FILTER–REGULATOR
	Y – STRAINER		STM TRAP WITH STRAINER		
	PIPE REDUCER		CONDENSATE HEADER		

INSTRUMENT TAG

PD	S	AH
		A – ALARM
		AL– ALARM, LOW
		AH– ALARM, HIGH
		CL– CONTROL, LOW
		CH– CONTROL, HIGH
		I – INDICATOR
		T– TRANSMITTER
		C– CONTROLLER
		E– ELEMENT
		P– (TEST) POCKET
		W– (THERMO) WELL
		P – PRESSURE
		T – TEMPERATURE
		PD– PRESSURE, DIFFERENTIAL
		F – FLOW

LIMIT SWITCH TAG

LS	S
	S– SPDT
	D– DPDT
	*– 1 CIRCUIT
	2 BREAK
	O– OPEN POSITION
	C– CLOSED POSN.
	E– ENGAGED POSN.
	A– ADVANCED POSN.
	R– RETRACT POSN.
	L– LEVEL
	LS – LIMIT SWITCH

INSTRUMENT PREFIX

XX	PI
	CL – WITHN CONDENSING LOOP
	DS – WITH DIAPHRAGM SEAL
	GP – WITH GLYCERIN SEAL POT

NOTES:–

1. **FUEL OILS :**
IGNITOR : – (HEA IGNITOR)
WARM UP FUEL : GAS OIL (LO) 10% MCR AT "A" ELVN.
STABILISING FUEL : CRUDE OIL (CO)
(100% MCR IN 3 ELEVATIONS.)

	'pp'	'pt'	CST @ 'pt'	KG/LIT @ 'pt'	'ft'	CST @ 'ft'
GO (LO)	39	39	≈15	0.87	39	≈15
CRUDE OIL (CO)	39–42	60	163	0.91	130	20

'pp' = POUR POINT ; 'pt' = PUMPING TEMPERATURE ;
'ft' = FIRING TEMPERATURE ; CST = CENTISTOKES

2. **NORMAL LINE PARAMETERS ARE IN,**
'p' = PRESSURE IN Kg/Sq.CM(g)
'f' = FLOW IN Kg/hr. FOR OIL AND STEAM.
'f' = FLOW IN NCu.M/hr FOR AIR
't' = TEMPERATURE IN DEG.C

3. **INSTRUMENT TAPPINGS :**
PRESSURE : 25MM SW END VALVE FOR CO LINES.
: 15MM SW END VALVE FOR OTHER LINES.

TEMP. TEST : THERMOWELL WITH INSTRUMENT CONNECTION
: M20 x 1.5 (F) ALONG WITH PLUG

4. **PIPE SCHEDULE :**
PIPE SPECIFICATION – SA210 GrA1 OR SA106 GrB
NB10 – 14 x 2
NB15 – 21.34 x 2.77
NB25 – 33.4 x 3.38
NB40 – 48.26 x 3.68
NB50 – 60.32 x 3.91
NB80 – 88.9 x 5.49
NB100 – 114.3 x 6.02
NB150 – 168.27 x 7.11
NB200 – 219.07 x 6.35
NB250 – 273 x 6.35
NB300 – 323.9 x 8.8
NB350 – 355.6 x 6.4

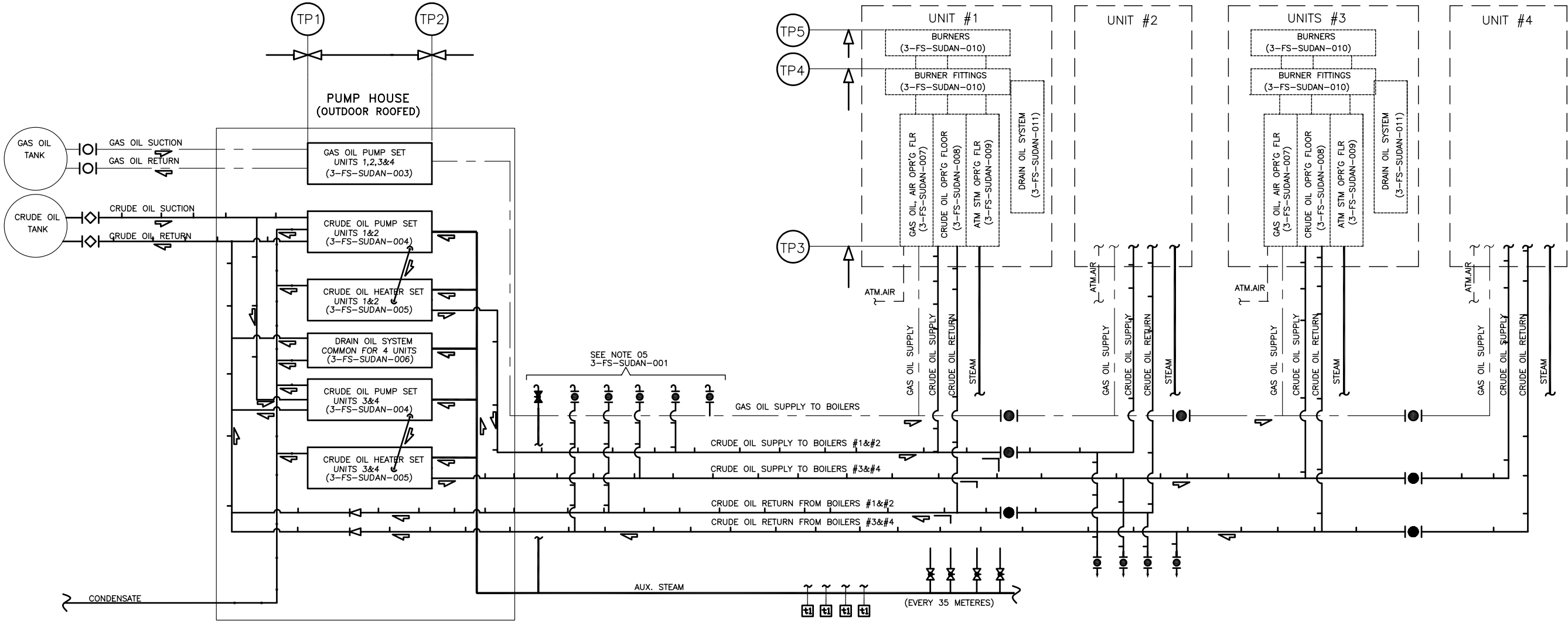
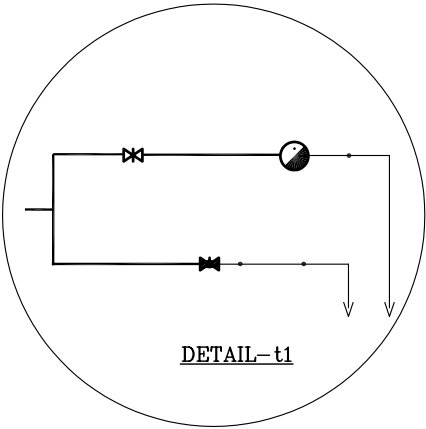
5. CO VENT & DRAIN, AUX STEAM, & GO VENT VALVES PROVIDED AT ALL HIGH AND LOW POINTS RESPECTIVELY.

PRELIMINARY

 355-055	Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI – 620014	DRN	NAME S.G.N	SIGNATURE –sd–	DATE 04-10-07
		CHD	S.V.S	–sd–	04-10-07
		APPD	R.S.R	–sd–	04-10-07
TITLE LEGEND & NOTES		DRAWING NO : 3-FS-SUDAN-001			REV R0

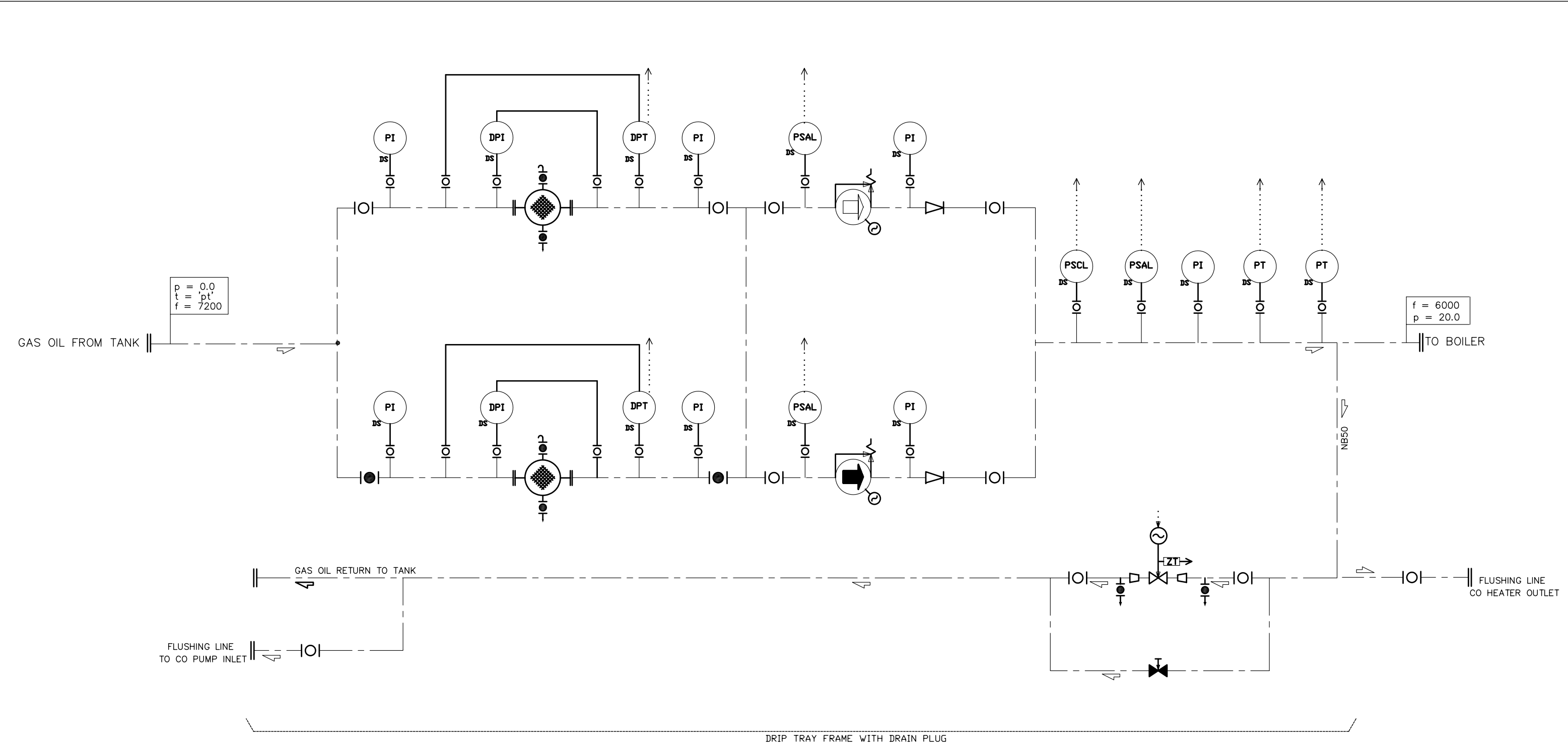
TP1	PUMP SET INLET
TP2	PUMP SET OUTLET
TP3	OPERATING FLR INLET
TP4	OPERATING FLR OUTLET
TP5	BURNER OUTLET

KEY DIAGRAM



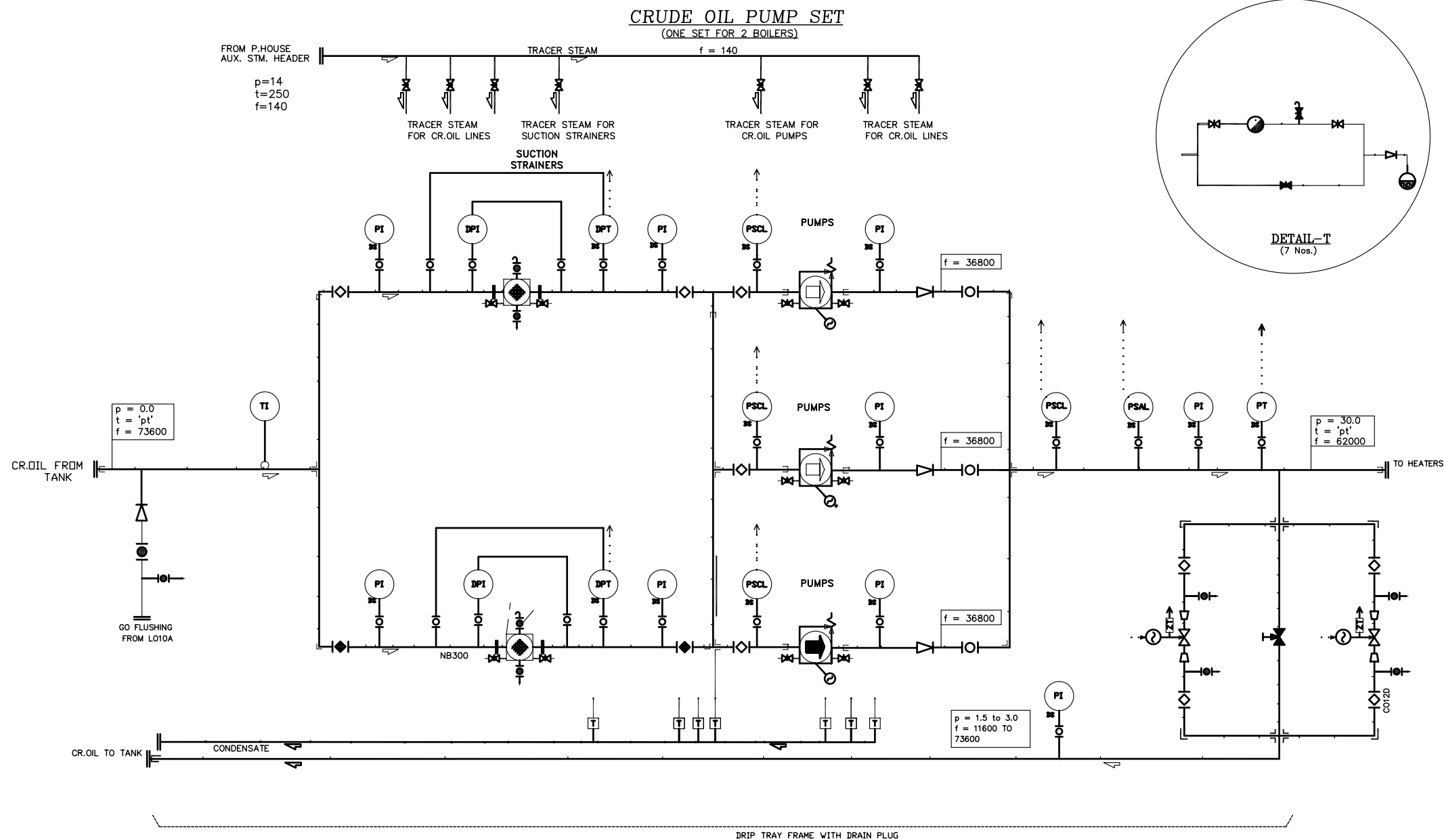
PRELIMINARY

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	UNIT: HIGH PRESSURE BOILER PLANT			CHD	S.V.S	—sd—	04-10-07	
	TIRUCHIRAPALLI — 620014			APPD	R.S.R	—sd—	04-10-07	
TITLE KEY DIAGRAM				DRAWING NO : 3—FS—SUDAN—002				REV R0



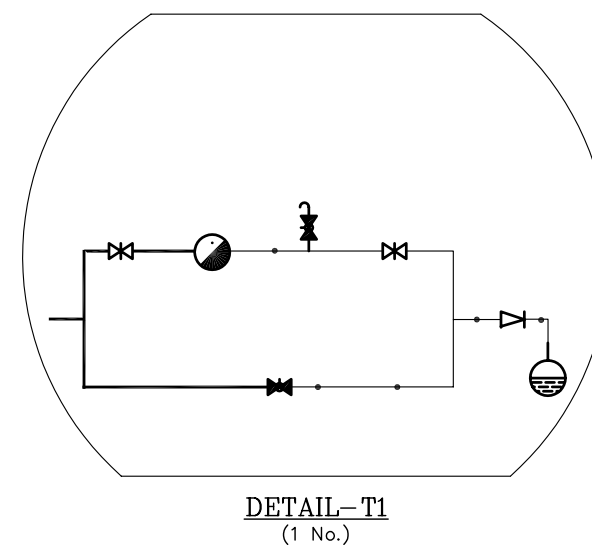
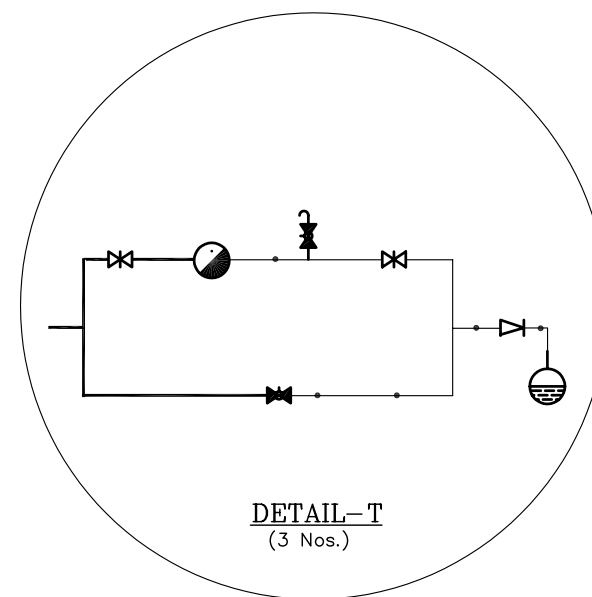
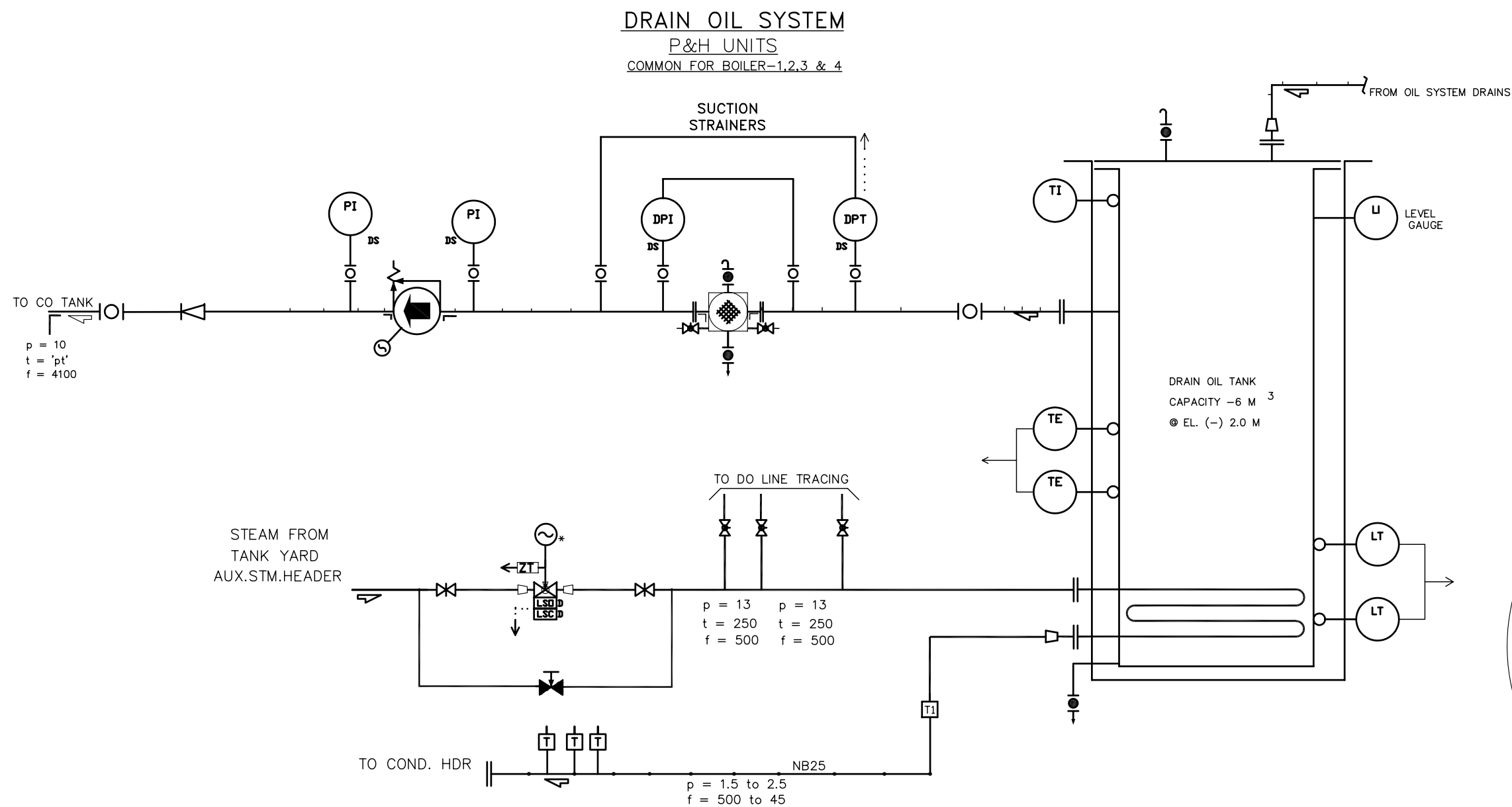
PRELIMINARY

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	TIRUCHIRAPALLI - 620014		APPD	R.S.R	-sd-	04-10-07
TITLE GAS OIL PUMP SET			DRAWING NO : 3-FS-SUDAN-003			REV R0



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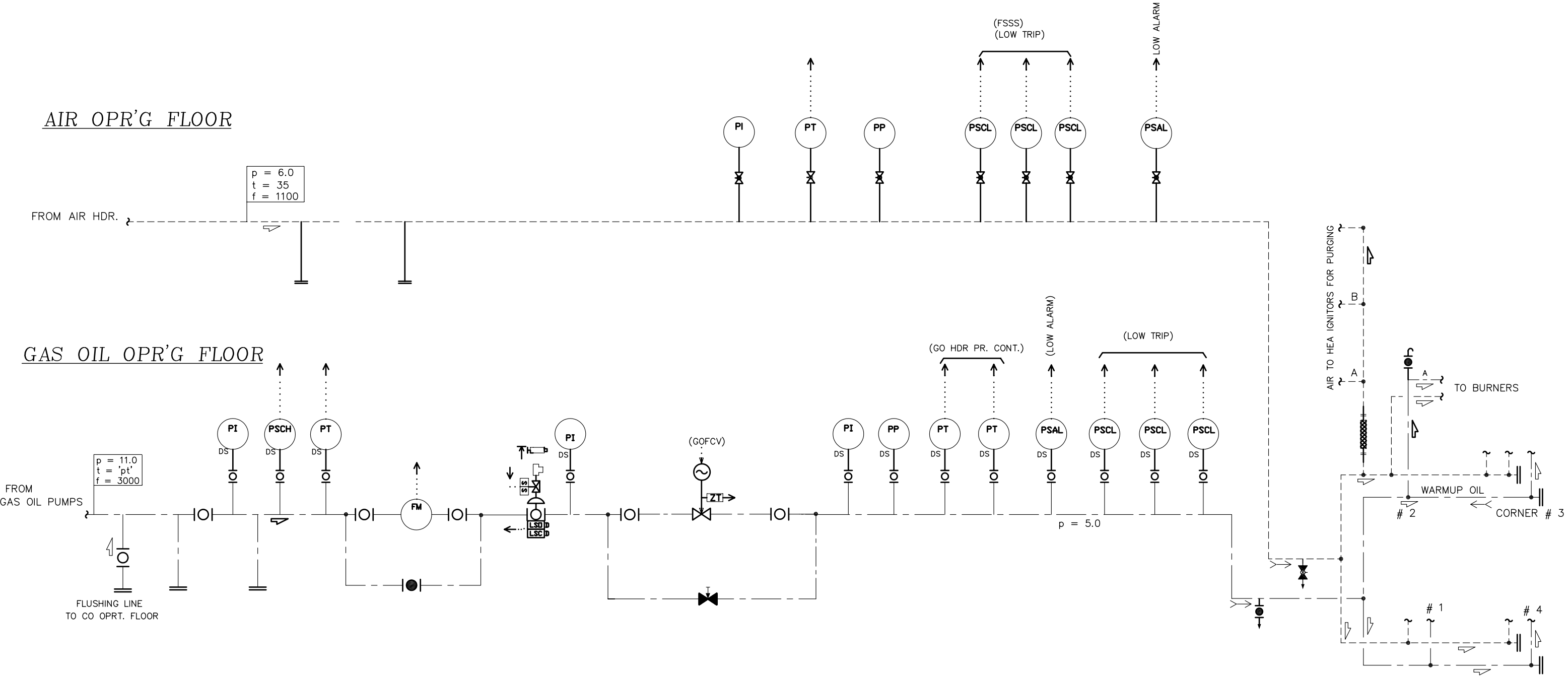
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	APPD	R.S.R	-sd-	04-10-07
TITLE CRUDE OIL PUMP SET			DRAWING NO : 3-FS-SUDAN-004	
			REV	R0



PRELIMINARY

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	DRN	NAME S.G.N	SIGNATURE -sd-	DATE 04-10-07
	CHD	S.V.S	-sd-	04-10-07
APPD			R.S.R	-sd- 04-10-07
TITLE DRAIN OIL SYSTEM P&H UNITS			DRAWING NO : 3-FS-SUDAN-006	
			REV	R0

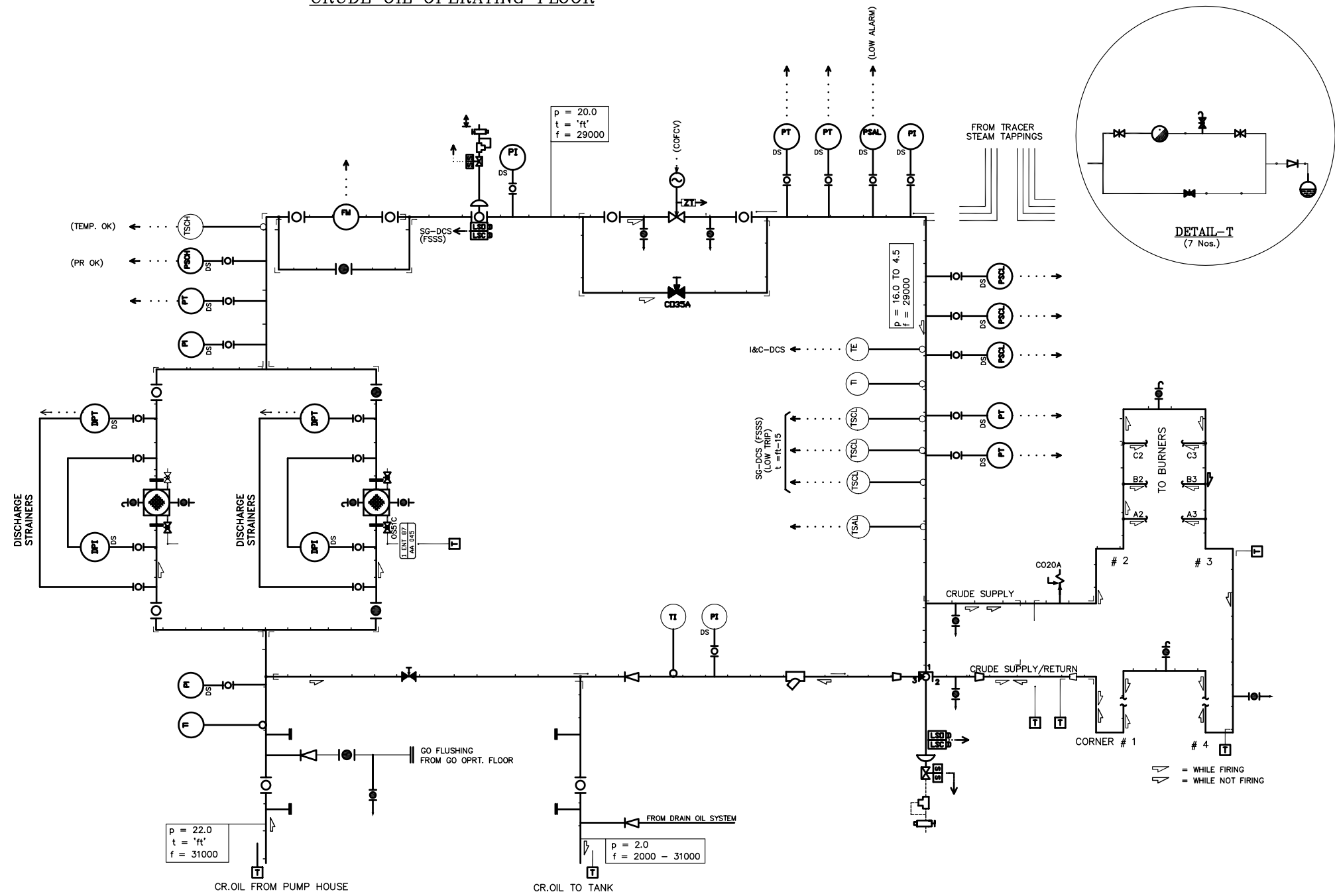
AIR OPR'G FLOOR



PRELIMINARY

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			CHD	S.V.S	-sd-	04-10-07
			APPD	R.S.R	-sd-	04-10-07
	TITLE ATM AIR & GAS OIL OPR'G FLOOR		DRAWING NO : 3-FS-SUDAN-007			REV R0

CRUDE OIL OPERATING FLOOR



PRELIMINARY



Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI - 620014

TITLE

CRUDE OIL OPRATING FLOOR

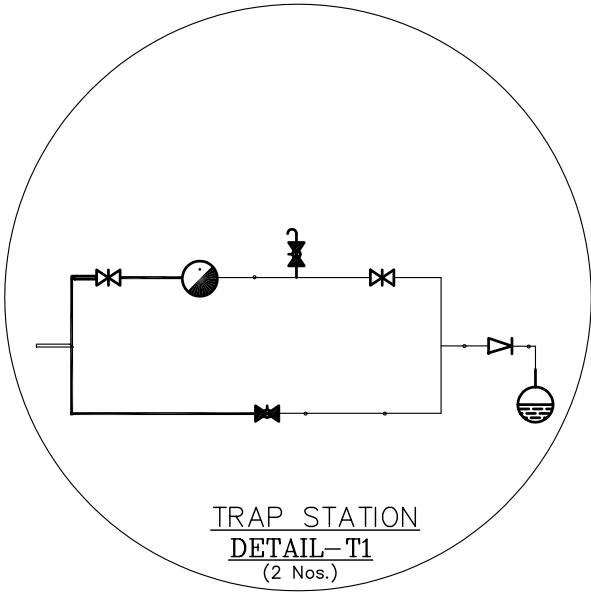
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APPD	R.S.R	-sd-	04-10-07

DRAWING NO :

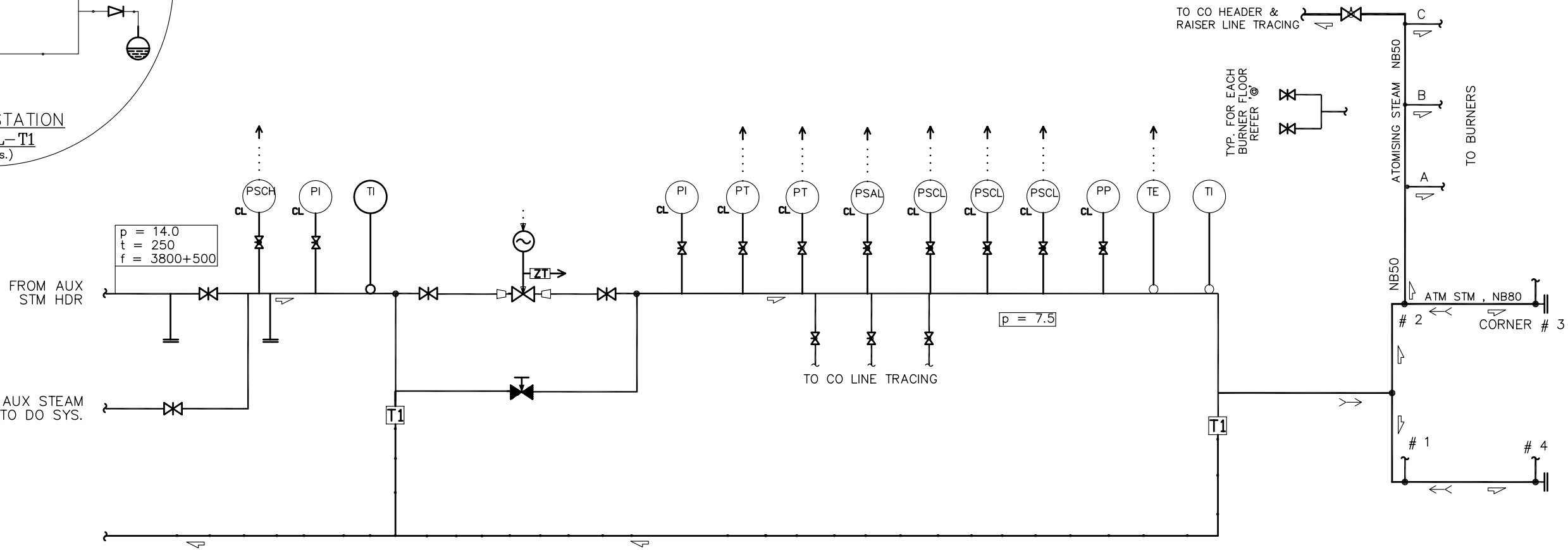
3-FS-SUDAN-008

REV

R0



ATM STEAM OPR'G FLOOR

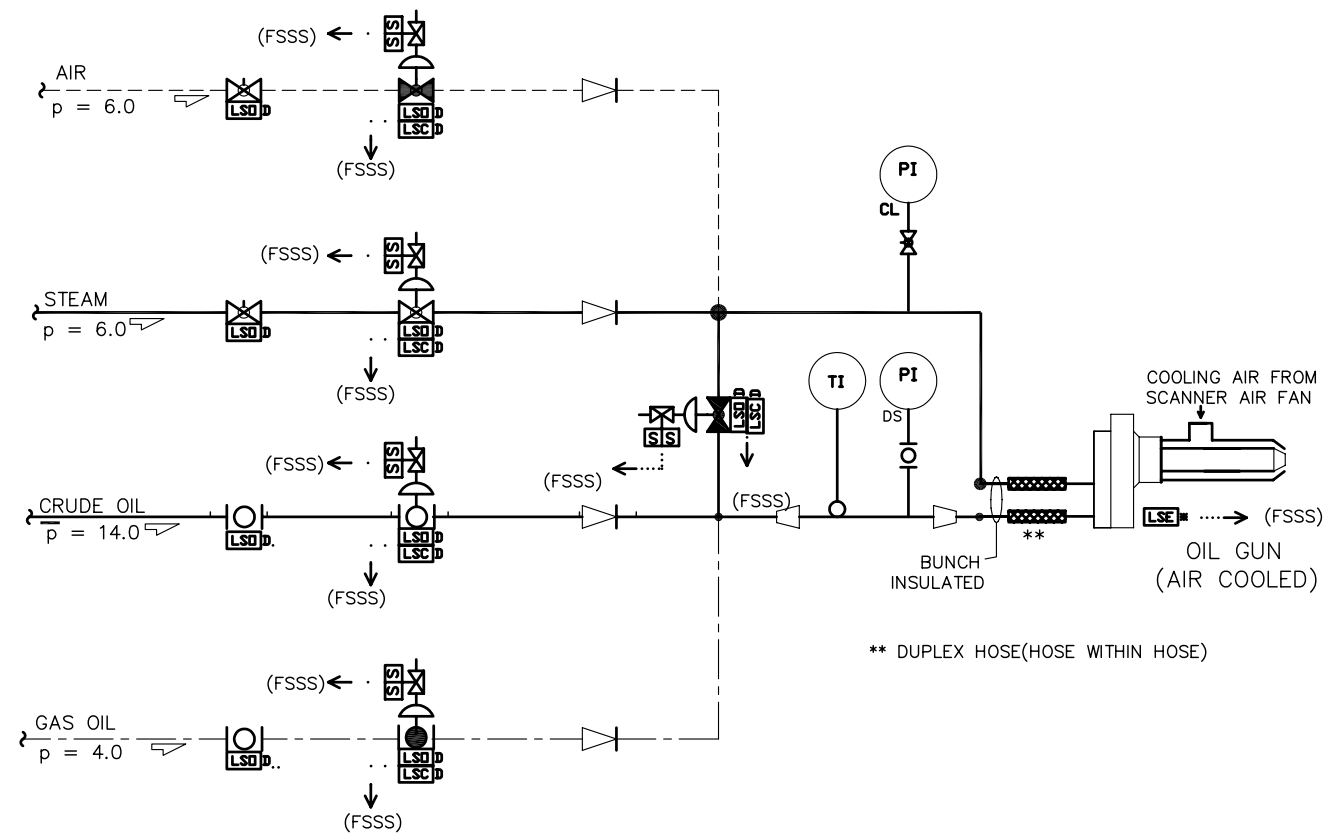


PRELIMINARY

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			CHD	S.V.S	–sd–	04-10-07
			APPD	R.S.R	–sd–	04-10-07
TITLE ATM STEAM OPRATING FLOOR			DRAWING NO :			REV
			3–FS–SUDAN–009			R0

OIL BURNER CONNECTIONS

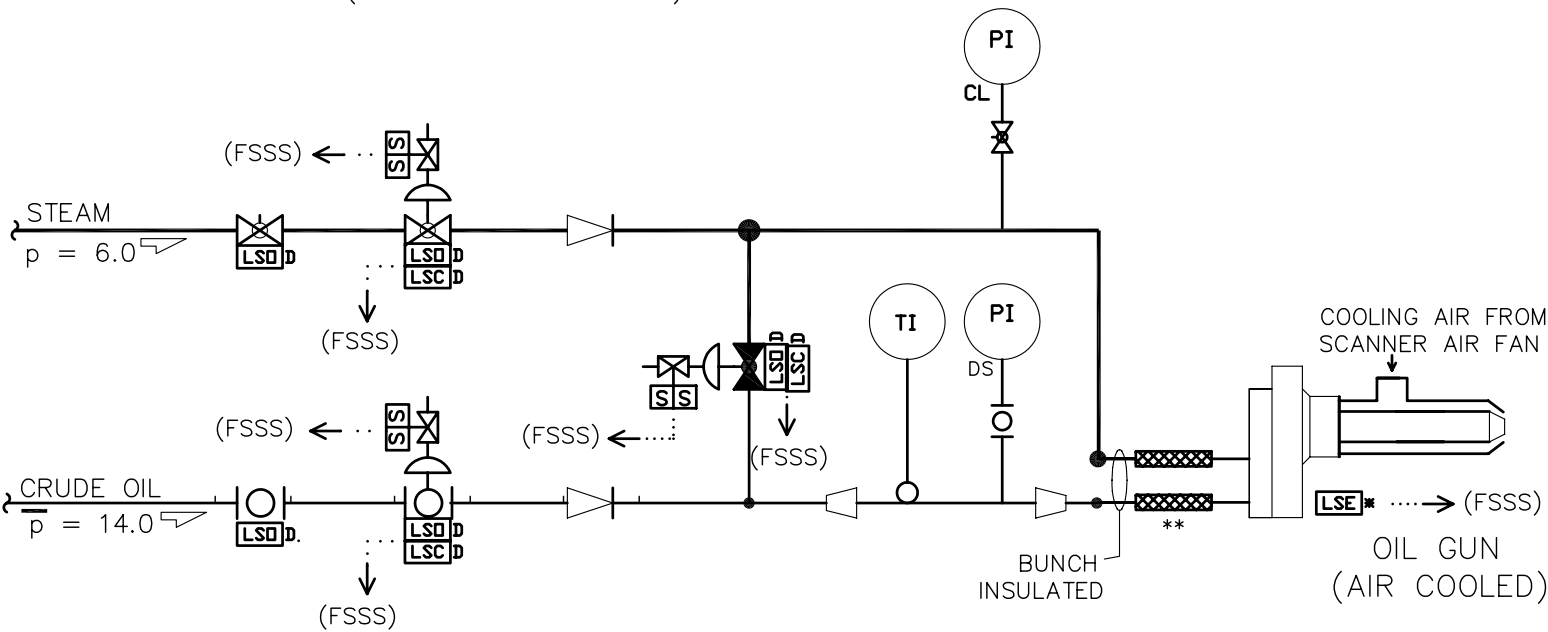
(ELEVATION - A)



** DUPLEX HOSE(HOSE WITHIN HOSE)

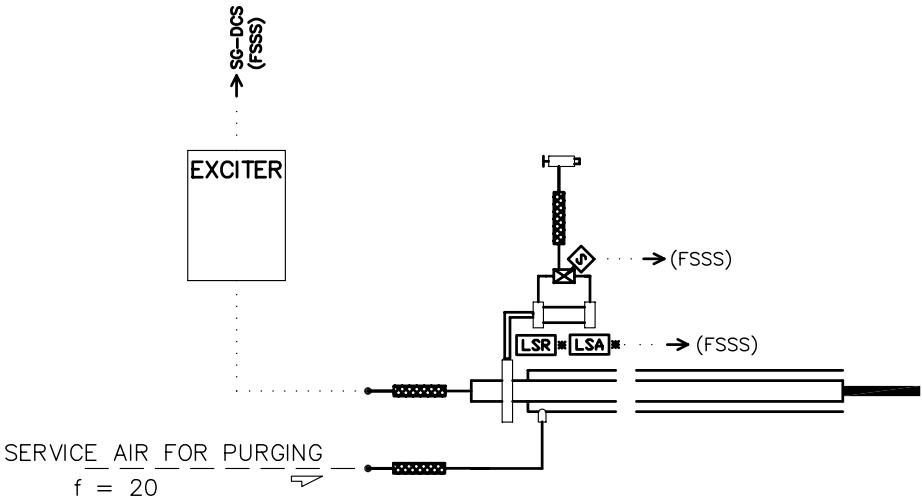
OIL BURNER CONNECTIONS

(ELEVATION - B & C)

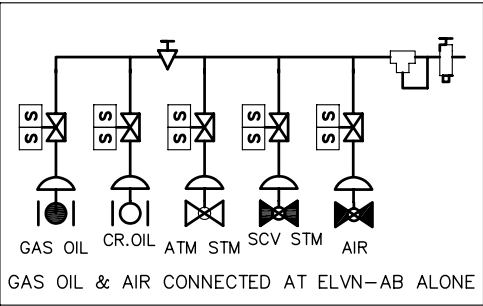


** DUPLEX HOSE(HOSE WITHIN HOSE)

HIGH ENERGY ARC IGNITOR ASSY



FO BURNER TRIP VALVES
PNEUMATIC PIPING DETAILS

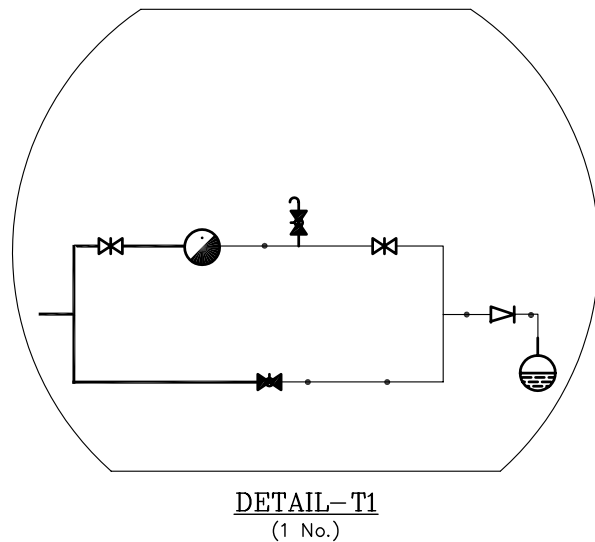
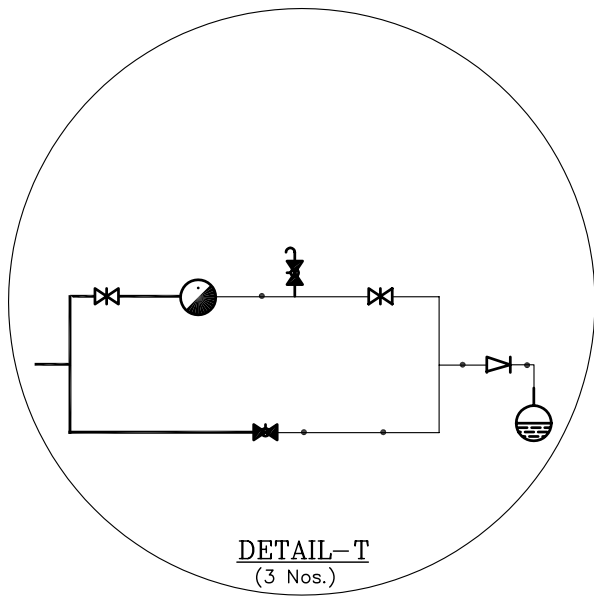
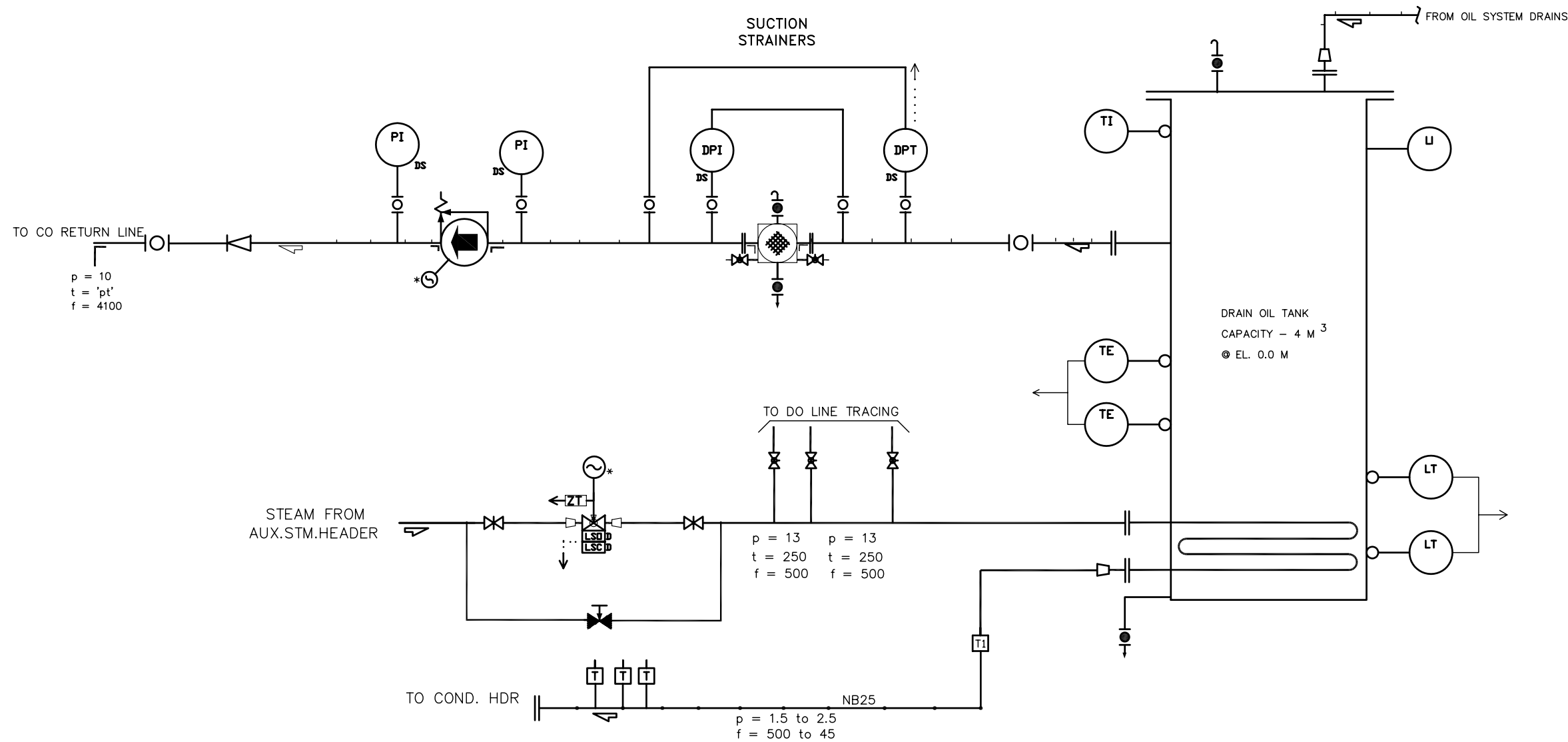


GAS OIL & AIR CONNECTED AT ELVN-AB ALONE

PRELIMINARY

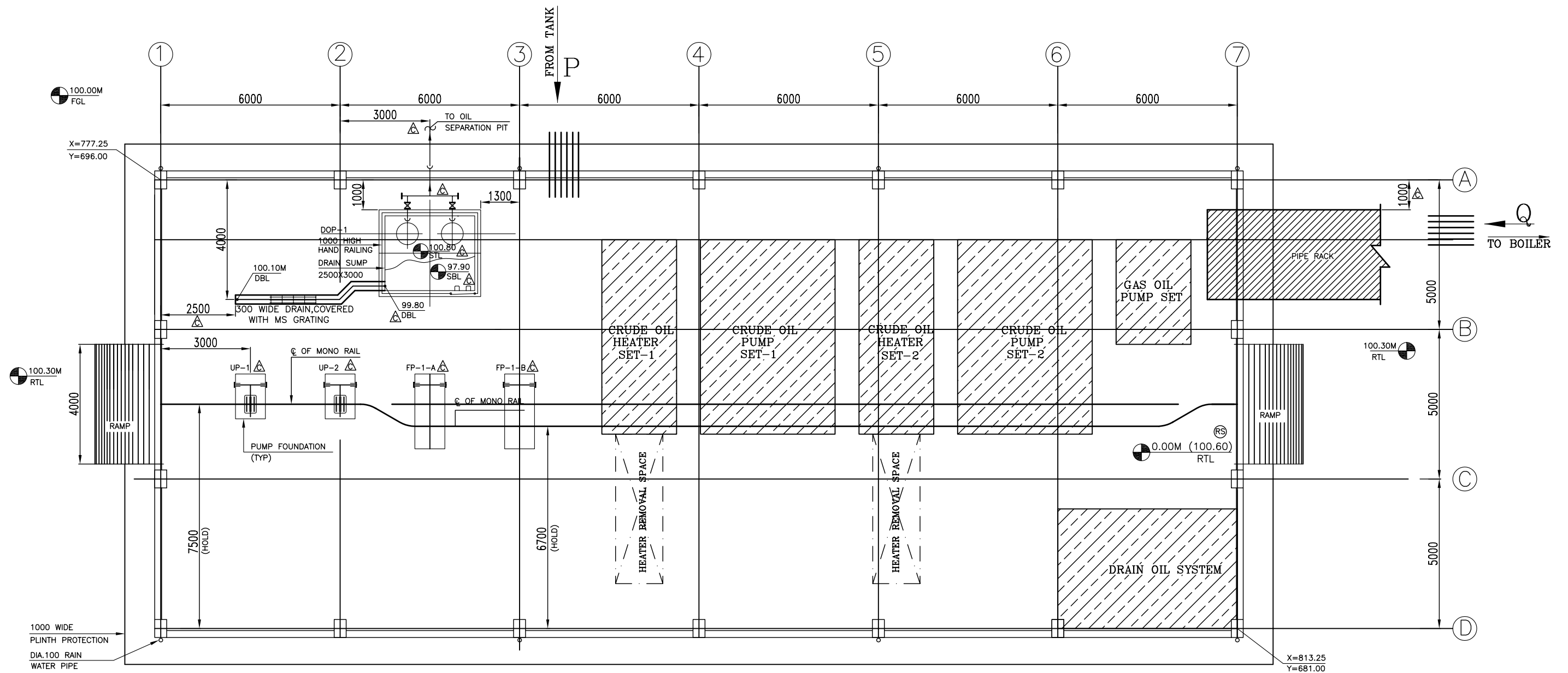
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			APPD	R.S.R	–sd–	04-10-07
TITLE OIL BURNER CONNECTION			DRAWING NO : 3–FS–SUDAN–010			REV R0

DRAIN OIL SYSTEM
BOILER AREA

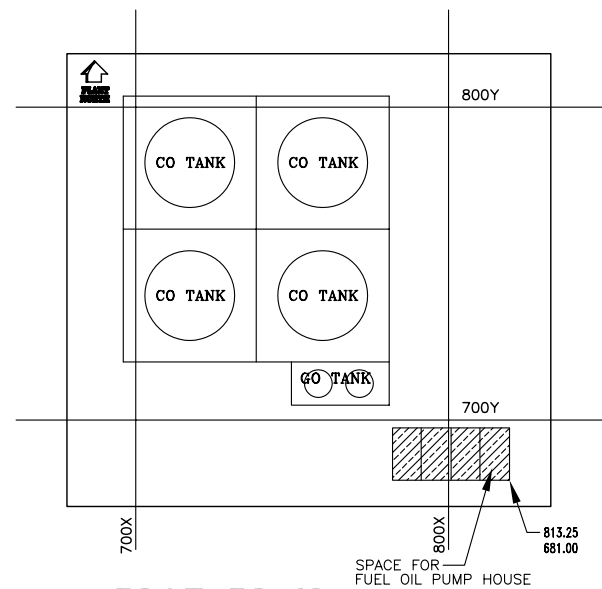


PRELIMINARY

 355-055	Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI – 620014		DRN	NAME S.G.N	SIGNATURE –sd–	DATE 04-10-07
			CHD	S.V.S	–sd–	04-10-07
			APPD	R.S.R	–sd–	04-10-07
TITLE DRAIN OIL SYSTEM–BOILER AREA			DRAWING NO : 3–FS–SUDAN–011			REV R0



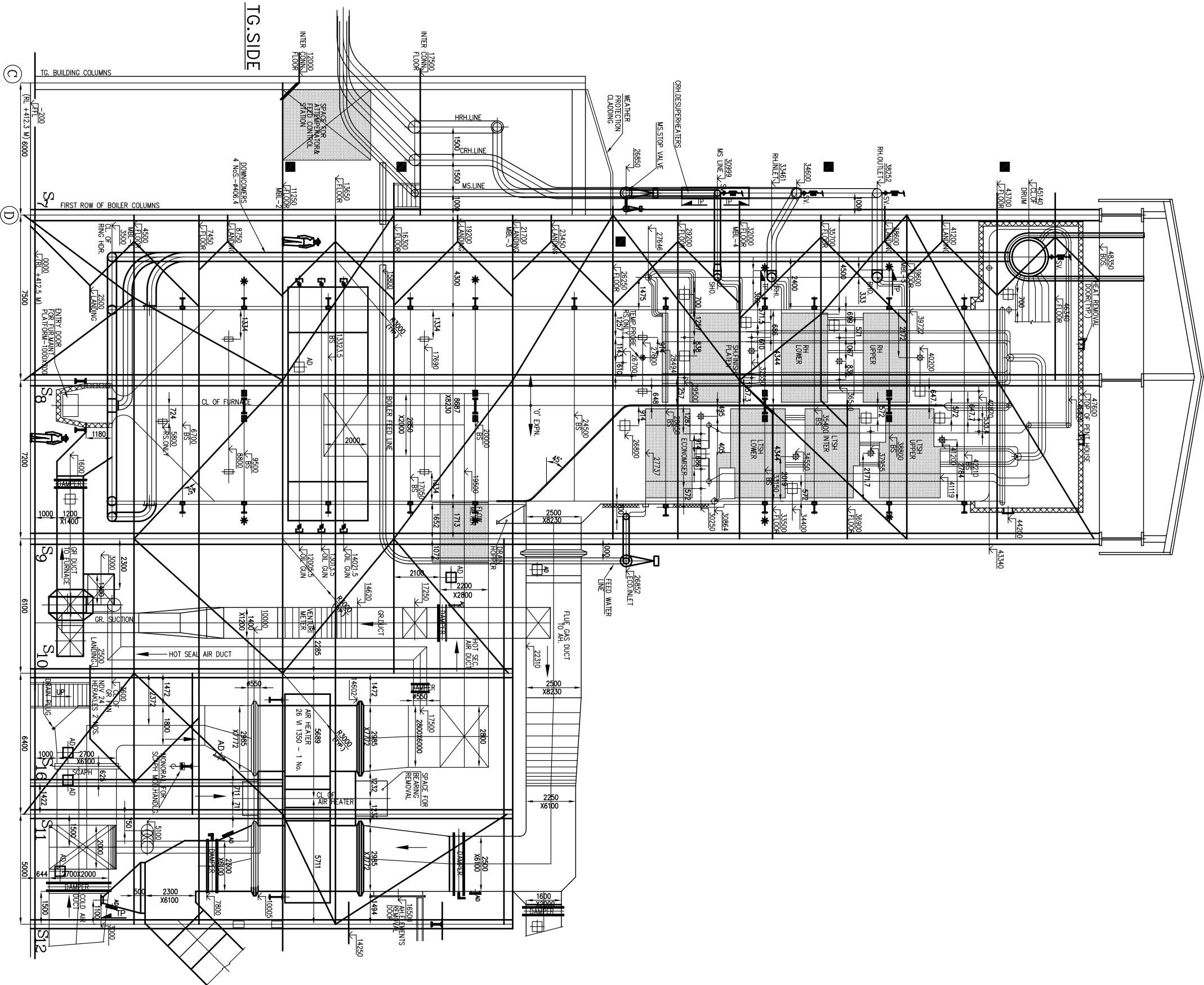
PLAN



PLOT PLAN

PRELIMINARY

 355-055	Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI – 620014	DRN	NAME S.G.N	SIGNATURE –sd–	DATE 04-10-07
		CHD	S.V.S	–sd–	04-10-07
		APPD	R.S.R	–sd–	04-10-07
TITLE FUEL OIL PUMP HOUSE LAYOUT		DRAWING NO : 3-FS-SUDAN-012			REV R0



Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014

355-055

DRN	NAME	SIGNATURE	DATE
CHD	S.V.S	-sd-	05-10-07
APPD	R.S.R	-sd-	05-10-07

TITLE

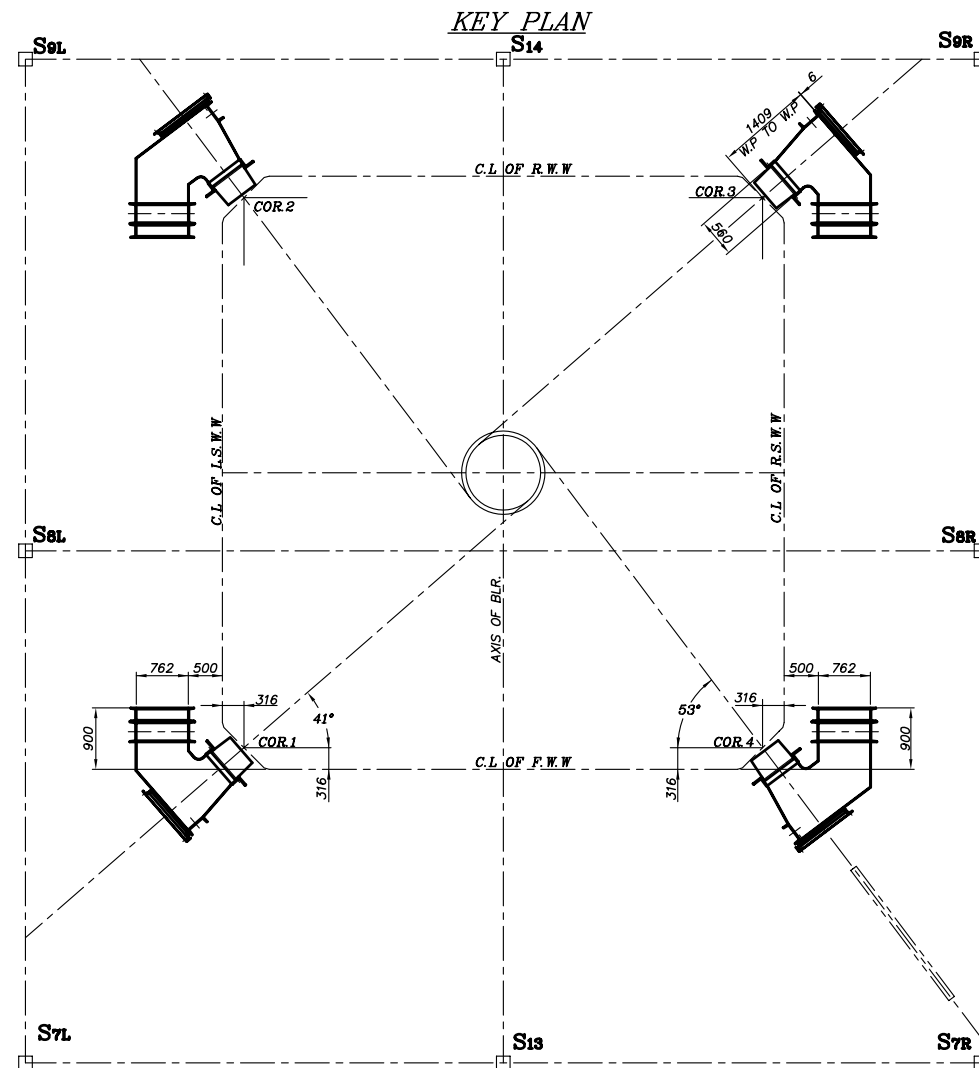
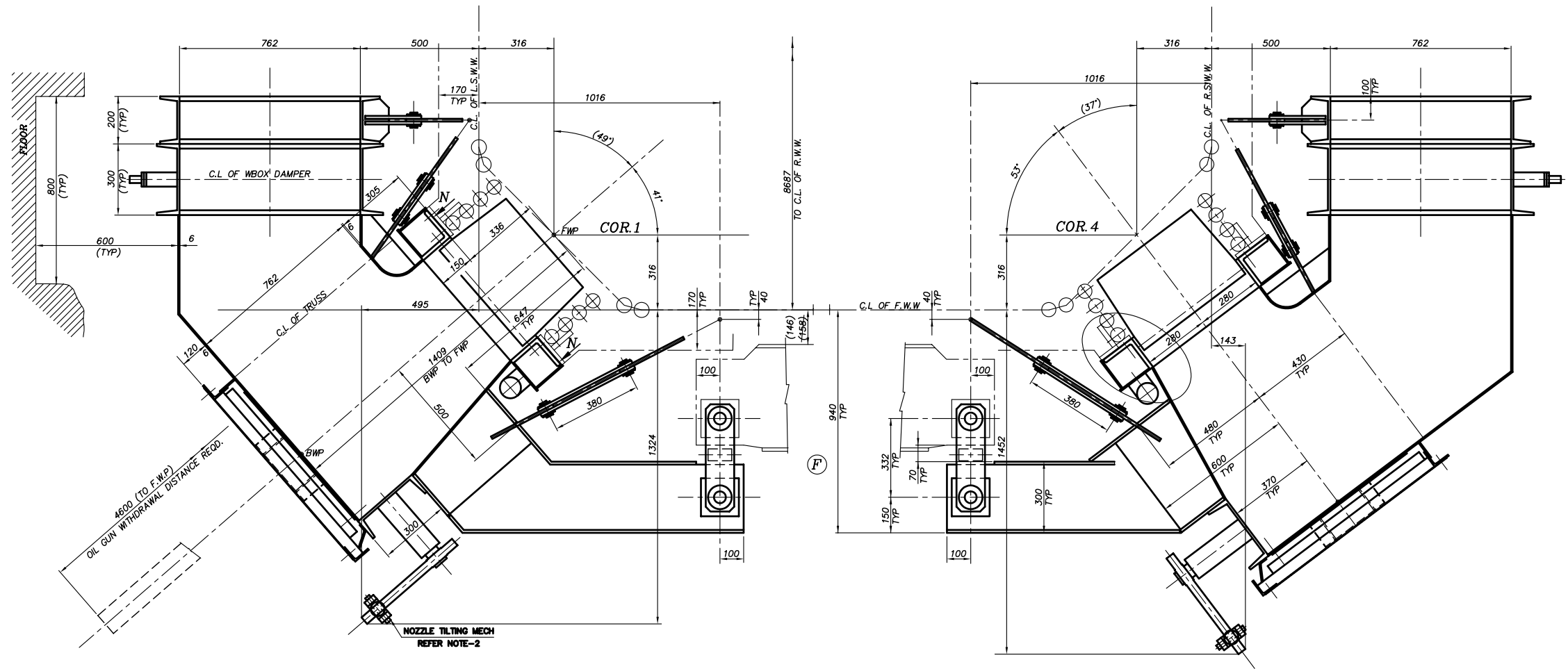
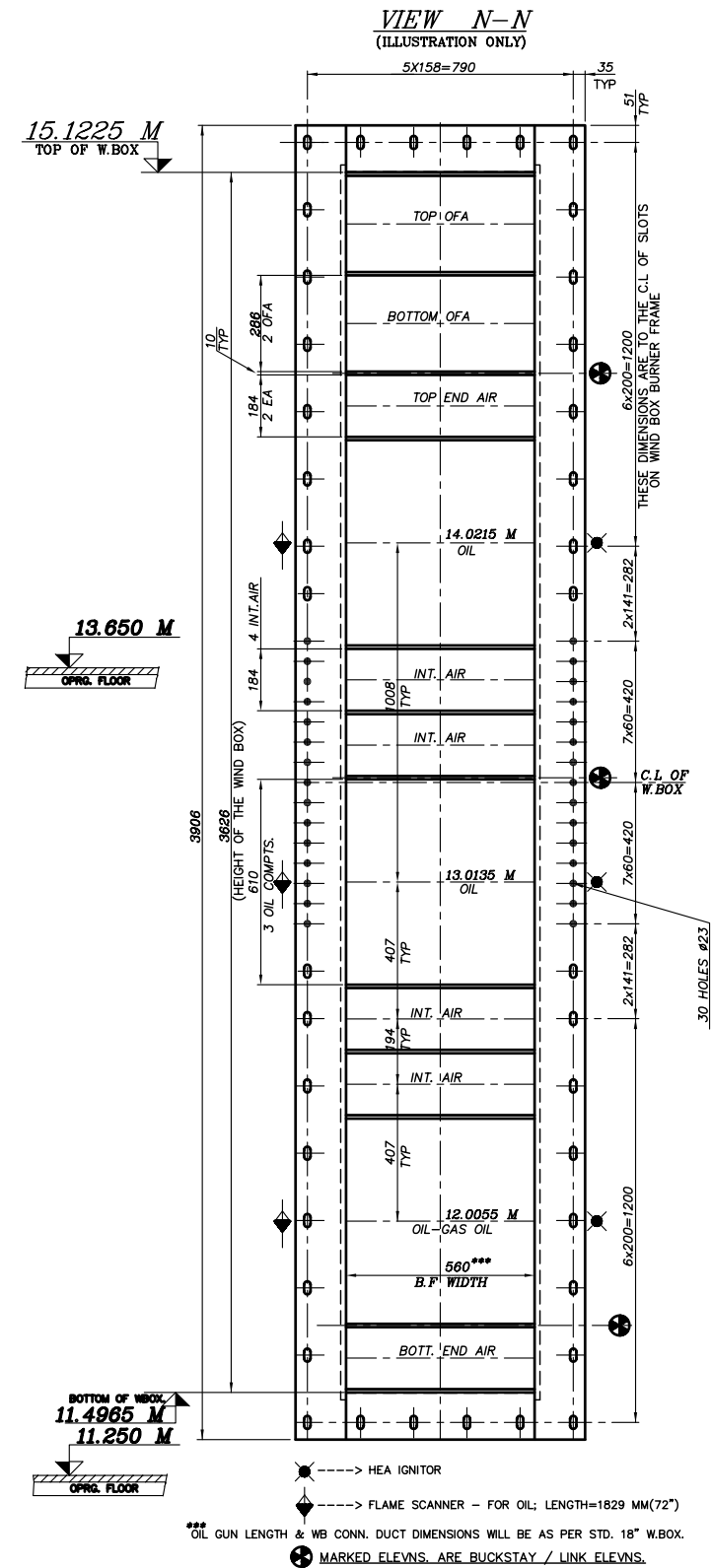
GENERAL ARRANGEMENT OF
BOILER – SIDE ELEVATION

DRAWING NO :

3-FS-SUDAN-013

REV

RO



NOTES:

- ARRANGEMENT AT CORNER 3 IS SAME AS AT CORNER 1;
ARRANGEMENT AT CORNER 2 IS SAME AS AT CORNER 4.
- FLOORS NEAR THE WIND BOX SHOULD PERMIT WIND BOX
AND EXTERNALS TO MOVE FREELY IN HOT CONDITION.

 355-055	Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014		DRN	NAME S.G.N	SIGNATURE -sd-	DATE 05-10-07
			CHD	S.V.S	-sd-	05-10-07
			APPD	R.S.R	-sd-	05-10-07
	TITLE <i>DISPOSITION OF WIND BOXES</i>		DRAWING NO : 3-FS-SUDAN-016			REV R0

