

SL.NO	Drg./ Doc. Name	Drg./Doc.		Cat	DATE OF SUBMISSION	Remarks
		Number	No. of SHEETS	A/I		
A.	MECHANICAL					
I. GENERAL						
1	DESIGN BASIS REPORT				ONE WEEK FROM PO	
2	PIPING AND INSTRUMENTATION DRAWING FOR DM PLANT				ONE WEEK FROM PO	
	P & I DIAGRAM FOR SIDE STREAM FILTER				ONE WEEK FROM PO	
	PIPING LAYOUT OF DM PLANT				TWO WEEKS FROM PO	
	PIPING LAYOUT FOR SIDE STREAM FILTER				TWO WEEKS FROM PO	
	EQUIPMENT LAYOUT OF MB UNIT				TWO WEEKS FROM PO	
	EQUIPMENT LAYOUT OF SSF				ONE WEEK FROM PO	
3	INSPECTION CATEGORIZATION PLAN				ONE WEEK FROM PO	
4	BILL OF MATERIALS & SUB VENDOR LIST				TWO WEEKS FROM PO	
5	CALCULATION FOR CHEMICAL REQUIREMENT				TWO WEEKS FROM PO	
6	VALVE LIST				TWO WEEKS FROM PO	
7	EQUIPMENT FOUNDATION INPUT DRAWINGS (INCLUDING SSF)				THREE WEEKS FROM PO	
8	2Yrs of Recommended SPARE LIST				THREE WEEKS FROM PO	
9	OPERATION & CONTROL PHILOSOPHY				THREE WEEKS FROM PO	
10	OPERATION & MAINTAINENCE MANUAL				FOUR WEEKS FROM PO	
11	LIST OF CONSUMABLES(Chemicals, Lubricants, Oils for Instruments, etc)				THREE WEEKS FROM PO	
12	PROCEDURE FOR PERFORMANCE AND GUARANTEE TEST RUN				THREE WEEKS FROM PO	
II. GENERAL ARRANGEMENT DRAWINGS						
1	GA DRAWING FOR MB VESSEL				ONE WEEK FROM PO	
2	GA DRAWING FOR CAUSTIC MEASURING TANK(MB)				ONE WEEK FROM PO	
3	GA DRAWING FOR ACID MEASURING TANK(MB)				ONE WEEK FROM PO	
4	GA DRAWING FOR SIDE STREAM FILTER				ONE WEEK FROM PO	
5	GA DRAWING FOR AIR SCORING BLOWERS				TWO WEEKS FROM PO	
6	GA DRAWING FOR BACKWASH PUMPS				TWO WEEKS FROM PO	

	GA DRG OF SERVICE AND POTABLE WATER TANK				TWO WEEKS FROM PO	
7	AS BUILT DRAWINGS					
III. DATA SHEETS						
1	DATA SHEET OF SSF				ONE WEEK FROM PO	
2	DATA SHEETS FOR TANKS & VESSELS				ONE WEEK FROM PO	
3	DATA SHEETS & GA FOR REGENERATION PUMPS				TWO WEEKS FROM PO	
4	DATA SHEETS & GA FOR MB BLOWER				TWO WEEKS FROM PO	
5	DATA SHEETS & GA FOR EJECTORS				TWO WEEKS FROM PO	
6	DATA SHEET & GAD FOR VALVES				TWO WEEKS FROM PO	
7	TECHNICAL DATASHEET FOR SIDE STREAM FILTER				ONE WEEK FROM PO	
8	TECHNICAL DATASHEET FOR AIR SCOURING BLOWERS				ONE WEEK FROM PO	
	DATA SHEET AND GA DRG. OF SAFETY SHOWER & EYE WASH				TWO WEEKS FROM PO	
B. INSTRUMENTATION						
1	DATA SHEET FOR LEVEL SWITCH				THREE WEEKS FROM PO	
2	DATA SHEET FOR LEVEL INDICATOR				THREE WEEKS FROM PO	
3	DATA SHEET FOR DIFFERENTIAL PRESSURE SWITCH				THREE WEEKS FROM PO	
4	DATA SHEET FOR PRESSURE GAUGES				THREE WEEKS FROM PO	
5	DATA SHEET FOR PRESSURE SWITCH				THREE WEEKS FROM PO	
6	DATA SHEET FOR FLOW INDICATORS				THREE WEEKS FROM PO	
7	DATA SHEET FOR PH ANALYZER				THREE WEEKS FROM PO	
8	DATA SHEET FOR CONDUCTIVITY ANALYZER				THREE WEEKS FROM PO	
9	DATA SHEET FOR SILICA ANALYZER				THREE WEEKS FROM PO	
C. ELECTRICAL						
1	ELECTRICAL LOAD LIST				ONE WEEK FROM PO	
2	SINGLE LINE DIAGRAM FOR MCC PANEL				ONE WEEK FROM PO	
3	GA DRAWING FOR MCC PANEL				THREE WEEKS FROM PO	
4	DATA SHEET FOR LOCAL PUSH BUTTON				TWO WEEKS FROM PO	
D. MISC.						
1	Billing Break-Up				TWO WEEKS FROM PO	

CHECK LIST FOR CHEMICAL DOSING SKID OFFER

Note: Bidder to note that Check List shall be completely filled and the data required in-line with Check List shall be submitted along with their Offer to enable Purchaser to evaluate the offer submitted.

<u>S.No.</u>	<u>Description</u>	Enclosed or [Yes/No]	Remarks/Co mments By Bidder
	Bidder to confirm compliance with PEMC-06165 and its annexure (Including P&IDs for Mixed bed and associated system & CW system for SSF unit) without any deviations.		
	Bidder has already raised pre-bid queries (if any) on Purchase specification.		
	Bidder to Confirm Compliance with scope, terminal points and exclusions for Mechanical/Electrical/C&I Sub-Sections of Purchase Specification.		
	Bidder Shall submit completely filled following Annexures enclosed with Technical Purchase Specification PY 51199, Rev00 along with their offer Annexure-I: Key Information Annexure-II: List of Recommended Spare Parts Annexure-III: Special Tools and Tackles Annexure-IV: Commissioning spares Annexure-V: Deviation from specification		
	Bidder to comply compliance with list of sub-vendor indicated in Job Specification for Chemical Dosing System, Doc. No. PEMC-06165.		
	Tentative Electrical Load List is enclosed with offer.		
	Bidder shall furnish the list of Erection and commissioning spares along with their offer.		
	Bidder to fill Deviation list (Refer Annexure-IV of PY 51199). Only those deviation indicated in this list will be considered during technical evaluation of offer. Bidder to indicate the deviations which are impractical.		
	All other requirements except for the deviation brought out under deviation list, have been taken into consideration.		
	Bidder to Confirm Compliance with Typical QAP enclosed with purchase specification PEMC-06165		

Typical Quality Plan for Mixed Bed and SSF Units

SL.NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
									D	P	W	V	
1 STORAGE VESSELS & PIPINGS													
A RAW MATERIALS & BROUGHT OUT ITEMS.													
1.1	Plate	Material	Major	1 per heat	100%	Approved Drawing & Mtc	Approved Drawing & Mtc	Material identification report	v	3	2	1	
1.2	Piping Materials, identification, Material certification review & material traceability	Physical, chemical & visual	MAJOR	Visual / MTC review	100%	Approved Drawing, ASME Code & PO Spec	Approved Drawing, ASME Code & PO Spec	Material identification report	v	3	2	1	
1.3	Rubber sheet	Material	Major	Random	100%	Approved Drawing & Mtc	Approved Drawing & Mtc / Is 4682	Material identification report	v	3	2	1	if applicable
B IN PROCESS INSPECTION													
1.4	Welding procedure tanks & vessels	Welding properties	Major	Visual/ Measurement	100%	Approved WPS	As per Sec - IX	WPS, WPQ & PQR	v	3	2	1	
1.5	Dimensional & welding	Fit up check & weld	Major	Visual/ Measurement	100%	Approved Drawing	Approved Drawing	Fit up report	v	3	2	1	
1.6	Fabrications of Piping as per the Drawing	Fit-Upps, Visual & Alignments	MAJOR	Visual / Dimensional	100%	Approved Drawing, ASME Code & PO Spec	Approved Drawing, ASME Code & PO Spec	Inspection report	v	3	2	1	

SL.NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
									D	P	W	V	
C FINAL INSPECTION & TESTING													
1.8	Hydro test & Nozzle pad leak test	Check the joint leakage & pressure drops. (Hydro test before & after lining)	Major	Visual	100%	APPROVED DRAWINGS	APPROVED DRAWINGS / ASME SEC- VIII	HYDRO TEST REPORT	v	3	1	1	
1.9	Rubber lining	Thickness bonding & Shore Hard ness	Major	Spark test ,Hardness test & Visual	100%	APPROVED DRAWINGS	IS - 4682	TEST REPORT	v	3	2	1	
1.10	PAINTING	DRY FLIM THICKNESS	Major	Visual / Measurement	100%	APPROVED DRAWINGS	BS - 4232	TEST REPORT	v	3	2	1	
D PRESERVATIONS & PACKING													
1.11	PACKING	LEGIBILITY & COMPLETENESS	MAJOR	VISUAL	100%	AS PER THE VENDOR PROCEDURE	AS PER THE VENDOR PROCEDURE	-	v	3	2		
2 MOTORS & PUMPS													
A RAW MATERIALS & BROUGHT OUT ITEMS.													
2.1	CASING, IMPELLER & WEAR RING	MATERIAL	MAJOR	MECHANICAL TEST, CHEMICAL ANALYSIS	1 PER HEAT	APPROVED DATA SHEET AND SPEC.	APPROVED DATA SHEET & SPECIFICATION	COMPLIANCE REPORT		3	2	1	
2.2	SHAFT & SLEEVES	MATERIAL	MAJOR	MECHANICAL TEST, CHEMICAL ANALYSIS	1 PER HEAT	APPROVED DATA SHEET AND SPEC.	APPROVED DATA SHEET & SPECIFICATION	COMPLIANCE REPORT		3	2	1	
B IN PROCESS INSPECTION													
2.3	DYNAMIC BALANCING OF IMPELLER	DYNAMIC BALANCING	MAJOR	VISUAL & MEASUREMENT	100%	APPROVED DATA SHEET AND SPEC.	APPROVED DATA SHEET & SPECIFICATION	VENDOR TEST REPORT	v	3	2	1	
2.4	HYDRO TEST	CASING & STUFFING BOX	MAJOR	HYDRO TEST	100%	APPROVED DATA SHEET AND SPEC.	APPROVED DATA SHEET & SPECIFICATION	VENDOR TEST REPORT	v	3	2	1	
2.5	MOTOR	TYPE TEST, ROUTINE TEST	MAJOR	VISUAL & MEASUREMENT	100%	APPROVED DATA SHEET AND SPEC.	APPROVED DATA SHEET & SPECIFICATION	VENDOR TEST REPORT	v	3	2	1	

SL.NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
									D	P	W	V	
C FINAL INSPECTION & TESTING													
2.6	PUMP NOZZLE, FLANGE CENTRE DISTANCE	VISUAL & DIMENSION	MAJOR	VISUAL & MEASUREMENT	100%	APPROVED DATA SHEET AND SPEC.	APPROVED DATA SHEET & SPECIFICATION	VENDOR TEST REPORT	v	3	2	1	
2.7	FIBAL ASSEMBLY ALONG WITH ALL ACCESSORIES	PERFORMANCE TEST ALONG WITH JOB MOTOR, NOISE LEVEL, VIBRATION CHECK & IP CERTIFICATE	MAJOR	VISUAL & MEASUREMENT	100%	APPROVED DATA SHEET/DRAWING AND SPEC.	APPROVED DATA SHEET/DRAWING AND SPEC.	INSPECTION REPORT	v	3	2	1	
D PAINTING													
2.8	PAINTING	SURFACE FINISH & UNIFORMITY	MAJOR	VISUAL	100%	APPROVED DRAWINGS	AS PER THE DATE SHEET	INSPECTION REPORT		3	2	1	
E PRESERVATIONS & PACKING													
2.9	PACKING	LEGIBILITY & COMPLETENESS	MAJOR	VISUAL	100%	AS PER THE VENDOR PROCEDURE	AS PER THE VENDOR PROCEDURE	-		3	2		
3 BLOWERS													
A RAW MATERIALS & BROUGHT OUT ITEMS.													
3	CASING, COVER / ST. BOX / BOTTOM BRG. HSG. IMPELLER	MATERIAL	MAJOR	MECHANICAL TEST, CHEMICAL ANALYSIS	1 PER HEAT	APPROVED DRAWING / DATA SHEET	APPROVED DRAWING / DATA SHEET	TEST REPORT	v	3	2	1	
3.1	SHAFT & SLEEVES	MATERIAL	MAJOR	MECHANICAL TEST, CHEMICAL ANALYSIS	1 PER HEAT	APPROVED DRAWING / DATA SHEET	APPROVED DRAWING / DATA SHEET	TEST REPORT	v	3	2	1	
3.2	IMPELLER	MATERIAL	MAJOR	MECHANICAL TEST, CHEMICAL ANALYSIS	RANDOM	APPROVED DRAWING / DATA SHEET	APPROVED DRAWING / DATA SHEET	TEST REPORT	v	3	2	1	
B IN PROCESS INSPECTION													
3.3	IMPELLER	DYNAMIC BALANCING	MAJOR	VISUAL & MEASUREMENT	100%	APPROVED DATA SHEET AND SPEC.	APPROVED DATA SHEET & SPECIFICATION	VENDOR TEST REPORT	v	3	2	1	
3.4	MOTOR	TYPE TEST, ROUTINE TEST	MAJOR	VISUAL & MEASUREMENT	100%	APPROVED DATA SHEET AND SPEC.	APPROVED DATA SHEET & SPECIFICATION	VENDOR TEST REPORT	v	3	2	1	

SL.NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
									D	P	W	V	
3.5	BLOWERS	STATIC BALANCING	MAJOR	VISUAL & MEASUREMENT	100%	APPROVED DATA SHEET AND SPEC.	APPROVED DATA SHEET & SPECIFICATION	VENDOR TEST REPORT	V	3	2	1	
C FINAL INSPECTION & TESTING													
3.7	FINAL ASSEMBLY ALONG WITH ALL ACCESSORIES	OVERALL DIMENSIONS ALONG WITH JOB MOTOR	MAJOR	MEASUREMENT - VISUAL INSPECTION, VERIFICATION OF ACCESSORIES & PERFORMANCE TEST	100%	APPROVED DATA SHEET/DRAWING AND SPEC.	APPROVED DATA SHEET/DRAWING AND SPEC.	INSPECTION REPORT	V	3	2	1	
4 VALVES													
A RAW MATERIALS & BROUGHT OUT ITEMS.													
4.1	C.S & S.S BOBY COVER, body disc, shaft, rubber seal, stem & ball	CHEMICAL & PHYSICAL PROPERTIES	MAJOR	PHYSICAL	100%	AS PER DWG	AS PER DWG / STANDARDS	TEST REPORT & INSPECTION REPORT	V	3	2	1	FOR ALL APPLICABLE VALVES
B IN PROCESS INSPECTION													
4.2	MACHINING OF BODY, BONNET, COMPRESSOR & STEM	DIMENSIONS & SURFACE QUALITY AFTER FINAL ASSEMBLY	MAJOR	VISUAL / MEASUREMENT	100%	AS PER DWG	AS PER DWG / STANDARDS		V	3	2	1	FOR ALL APPLICABLE VALVES
C FINAL INSPECTION & TESTING													
4.3	FINAL ASSEMBLY	DIMENSIONS, SURFACE DEFECTS, HYDRO SHELL TEST, HYDRO SEAT TEST, PNEU. SEAT TEST, HARDNESS, SPARK TEST & PERFORMANCE TEST	MAJOR	DIMENTIONAL, PRESSURE TESTING & PHYSICAL	10%	AS PER DWG / VALVE SCHEDULE	AS PER DWG / STANDARDS	HYDRO TEST REPORT	V	3	2	1	FOR ALL APPLICABLE VALVES

SL.NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
									D	P	W	V	
5 INSTRUMENTS													
A	RAW MATERIAL INSPECTION & FINAL ASSEMBLY												
5.1	MATERIALS	CHEMICAL & PHYSICAL PROPERTIES	MAJOR	CHEMICAL & MECHANICAL ANALYSIS	SAMPLE	APPROVED DATA SHEET/DRAWING AND SPEC.	APPROVED DATA SHEET/DRAWING AND SPEC.	VENDOR REPORT	v	3	2	1	
B	IN PROCESS INSPECTION												
5.2	DIMENSIONS	CHECK FOR DIMENSIONS	MAJOR	VISUAL	100%	APPROVED DATA SHEET/DRAWING AND SPEC.	APPROVED DATA SHEET/DRAWING AND SPEC.	INSPECTION / CALIBRATION REPORT	v	3	2	1	
5.3	CHECK RANGE	LOWER & HIGHER RANGE	MAJOR	VISUAL	100%	APPROVED DATA SHEET/DRAWING AND SPEC.	APPROVED DATA SHEET/DRAWING AND SPEC.	INSPECTION / CALIBRATION REPORT	v	3	2	1	
5.4	IP CHECK	CHECK FOR INSULATION PROTECTION CLASS	MAJOR	VISUAL	100%	APPROVED DATA SHEET/DRAWING AND SPEC.	APPROVED DATA SHEET/DRAWING AND SPEC.	INSPECTION / CALIBRATION REPORT	v	3	2	1	
B	FINAL INSPECTION & TESTING												
5.2	FINAL ASSEMBLY & FUNCTIONAL TEST	CALIBRATION , OPERATION & PERFORMANCE TEST, HYDROTEST	MAJOR	VISUAL & MEASUREMENT	100%	APPROVED DATA SHEET/DRAWING AND SPEC.	APPROVED DATA SHEET/DRAWING AND SPEC.	INSPECTION / CALIBRATION REPORT	v	3	2	1	
6 ELECTRICALS													
A	RAW MATERIAL INSPECTION & FINAL ASSEMBLY												
6.1	CABLES, CABLE TRAY, CABLE GLAND & LUGS	CHEMICAL & PHYSICAL PROPERTIES	MAJOR	CHEMICAL & MECHANICAL ANALYSIS	SAMPLE	AS PER VENDOR SPECIFICATION	AS PER VENDOR SPECIFICATION	VENDOR REPORT	v	3	2	1	
6.2	INSTRUMENTS & ELECTRICAL HARDWARE	CHEMICAL & PHYSICAL PROPERTIES	MAJOR	CHEMICAL & MECHANICAL ANALYSIS	SAMPLE	AS PER GA DWG	AS PER GA DWG	VENDOR REPORT	v	3	2	1	
B	IN PROCESS INSPECTION												
6.3	DIMENSIONS	CHECK THE DIMENSIONS FOR PANEL, JUNCTION BOX	MAJOR	VISUAL & MEASUREMENT	100%	AS PER APPROVED DRAWING	AS PER APPROVED DRAWING	GET INSPECTION REPORT	v	3	2	1	
6.4	ELECTRICAL CHARACTERISTICS	WIRING CONTINUITY, INSULATION CLASS, H. V	MAJOR	VISUAL	100%	AS PER APPROVED DRAWING	AS PER APPROVED DRAWING	GET INSPECTION REPORT	v	3	2	1	
6.5	INSULATION CLASS	WEATHER PROOF & INSULATION PROTECTION CLASS	MAJOR	VISUAL	100%	AS PER APPROVED DRAWING	AS PER APPROVED DRAWING	GET INSPECTION REPORT	v	3	2	1	

SL.NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
									D	P	W	V	
B FINAL INSPECTION & TESTING													
6.3	CONDUCTOR RESISTANT TEST & H.V TEST	FUNCTIONAL REQUIRMENT	MAJOR	FUNCTIONAL TEST	10%	AS PER VENDOR SPECIFICATION	AS PER VENDOR SPECIFICATION	VENDOR REPORT	v	3	2	1	ONLY FOR CABELS
6.4	FINAL ASSEMBLY	TERMINATION OF ALL CONNECTIONS , ALIGNMENT	MAJOR	VISUAL & MEASUREMENT	SAMPLE	AS PER APPROVED DRAWING	AS PER APPROVED DRAWING	GET INSPECTION REPORT	v	3	2	1	
C PRESERVATIONS & PACKING													
6.5	PACKING	PROPER PACKING	MAJOR	VISUAL	RANDOM	PACKING LIST	AS PER THE VENDOR PROCEDURE	-	v	3	2	2	
7 MISC ITEMS (MEDIAS, RESINS, SAND & PEBBLES)													
7.1	INDIVIDUAL PRODUCT	CHEMICAL & PHYSICAL PROPERTIES	MAJOR	COMPLETENESS	100%	AS PER APPROVED DRAWING	AS PER APPROVED DRAWING	GET INSPECTION REPORT	v	3	2	1	
8 FINAL ASSEMBLY OF SKID MOUNTED DM PLANT													
8.1	FINAL INSPECTION OF SKID	VISUAL INSPECTION AS PER P & ID & BOM , Painting Check, Dimensional	MAJOR	COMPLETENESS	100%	AS PER APPROVED DRAWING	AS PER APPROVED DRAWING	GET INSPECTION REPORT	v	3	1	1	
9 PACKING													
891	PACKING	PROPER PACKING	MAJOR	VISUAL	RANDOM	PACKING LIST	AS PER THE VENDOR PROCEDURE	PACKING LIST	v	3	2	2	
1.1	Safety Shower	Physical & Dimensional verification	Major	Visual	100%	Approved Data Sheet	Approved Data Sheet	MTC / Compliance certificate	v	3	2	1	

1.9	Mandatory Spares	Physical & Chemical Properties	Major	Visual	100%	Approved Drawing& Mtc	Approved Drawing& Mtc	Compliance certificate	v	3	2	1	
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PRODUCT : AGITATORS													
SL.NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
									D	P	W	V	
1	RAW MATERIALS & BROUGHT OUT ITEMS.												
1.1	Materials	Physical & Chemical Properties	Major	Visual	100%	Approved Drawing& Mtc	Approved Drawing& Mtc	MTC	v	3	2	1	
2	IN PROCESS INSPECTION												
2.1	Impeller & Shaft Machining	Visual & Dimensions	MAJOR	VISUAL & MEASUREMENT	100%	Approved Data sheet & Specification	Approved Data sheet & Specification	Inspection Report	v	3	2	1	
2.2	Motor	Routine test, type test	MAJOR	VISUAL & MEASUREMENT	100%	Approved Data sheet & Specification	Approved Data sheet & Specification	Inspection Report	v	3	2	1	
2.3	Impeller	Dynamic balancing and static balancing	MAJOR	VISUAL & MEASUREMENT	100%	Approved Data sheet & Specification	Approved Data sheet & Specification	Inspection Report	v	3	2	1	
3	FINAL INSPECTION & TESTING												
3.1	Assembled Agitators	Overall Performance	MAJOR	Performance Test with Job Motor	100%	Approved Data sheet & Specification	Approved Data sheet & Specification	Inspection Report	v	3	2,1	1	
3.2	Final Inspection	Overall dimensions,	Major	Visual	100%	Approved Data sheet & Specification	Approved Data sheet & Specification	Inspection Report	v	3	2,1	1	
4	PRESERVATION & PACKING												
4.2	Packing	Visual	Major	Visual	100%					3	2		

PRODUCT : EJECTORS													
SL.NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
									D	P	W	V	
1	RAW MATERIALS & BROUGHT OUT ITEMS.												
1.1	Materials	Material	Major	Visual	100%	Approved Drawing & Mtc	Approved Drawing & Mtc	MTC	v	3	2	1	Compliance certificate for PP materials
2	IN PROCESS INSPECTION												
2.1	Machining	Finished Machining dimensions	Major	Visual/ Measurement	100%	Approved Drawing	Approved Drawing	Inspection Report	v	3	2	1	
3	FINAL INSPECTION & TESTING												
3.1	Final inspection & testing	Overall dimensions, functional test	Major	Visual	100%	Approved Drawing	Approved Drawing	Inspection Report	v	3	2,1	1	functional test will be done at site
4	PRESERVATION & PACKING												
4.1	Packing	Visual	Major	Visual	100%					3	2		

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY) & 2 & 3 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. FOR ITEMS MARKED (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.


Note :

1. Typical /Indicative /Standard QAP(s) for equipment /package attached is reference document and to use by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval.
2. No deviation to reference document is acceptable.
3. Please note that this is not a scope document & Only the items applicable as per Engg. Specification shall be considered by bidder.
4. This MQP should be read along with specification (latest revision), approved drawings & approved data sheet.
5. Drawing/data sheet shall prevail over quality plan for contradiction if any between quality plan and drawing/specification.
6. Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.

	Subject	Doc. No.	Rev.	Vol. / Sec.
	BID PACKAGE FOR COMBINED CYCLE CAPTIVE POWER PLANT AT HAZIRA PLANT, GUJARAT	5111168-ME-SPC-100-001	R1	IV / 7
				Sheet No. 900

1.4.12	Quantity		
1.4.13	Material of construction		
1.6.0	Acid measuring tank		
1.6.1	Design standard		
1.6.2	Material of construction		
1.6.3	No. of tanks		
1.6.4	Fluid handled		
1.6.5	Capacity		
1.6.6	Accessories / instruments		
1.7.0	Caustic dilution tank		
1.7.1	Design standard		
1.7.2	Material of construction		
1.7.3	Nos.		
1.7.4	Fluid handled		
1.7.5	Capacity		
1.7.6	Accessories / instruments		
1.8.0	Agitators for caustic dilution tanks		
1.8.1	Quantity		
1.8.2	Type		
1.8.3	Material of construction		
1.8.4	Impeller / shaft		
1.8.5	Mounting		
1.8.6	Impeller type		
1.8.7	Transmission		
1.9.0	Ejectors		
1.9.1	Nature of fluid		
1.9.2	No. of ejectors		
1.9.3	Location		
1.9.4	Injection fluid		
1.9.5	Material of construction		

FORMT9-P REV-A (MUM)

	Subject	Doc. No.	Rev.	Vol. / Sec.
	BID PACKAGE FOR COMBINED CYCLE CAPTIVE POWER PLANT AT HAZIRA PLANT, GUJARAT	5111168-ME-SPC-100-001	R1	IV / 7
				Sheet No. 901

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1.4.0	SSF backwash water transfer pump		
1.4.1	No. of pumps	no.	
1.4.2	Design capacity of pumps	m ³ /hr.	
1.4.3	Head of the pumps	bar (g)	
1.4.4	Material of construction		
	i. Casing / impeller / shaft		
	ii. Base plate		
1.4.5	Shaft sealing arrangement		
1.4.6	Design temperature	Deg. C	

FORMT9-P REV-A (MUM)



TYPICAL PRESSURE RELIEF VALVE

Document No. :
PEMC-0XXXX

Rev.
00

General Data	1	Tag No.						
	2	Service						
	3	Line/Vessel No						
	4	Type of nozzle (Full/Semi)						
	5	Purpose of Valve (Safety/Relief)						
	6	Conventional/Bellow/Pilot operated						
	7	Bonnet Type (Open/Close)						
	8	Installation (On pipe/Vessel)						
	9	Service Type						
Fluid Data	10	Fluid	State					
	11	Required Discharge Capacity						
	12	Design Pressure	Design Temp.					
	13	Oper. Pressure	Set Pressure					
	14	Oper. Temp.	Relief Temp.					
	15	Constant Back Pressure						
	16	Max. Flow						
	17	Max. Pressure						
	18	Max. Temp.						
	19	Variable Back Pr	From	To				
	20	% Over Pressure (Allowable)						
	21	Compressibility Factor						
	22	Operating Viscosity						
End Conn.	23	Blow Down Capacity						
	24	Type (Flanged/Screwed/Welded)						
	25	Size & Rating	Inlet	Outlet				
	26	Flange Facing	Inlet	Outlet				
Material	27	Body & Bonnet						
	28	Seat & Disc						
	29	* Resilient Seat Seal						
	30	Nozzle						
	31	Guide & Spindle Rings						
	32	Spring						
	33	Bellows						
Selectio Options	34	Cap (Screwed / Bolted)						
	35	Lifting Lever (Plain / Packed)						
	36	Test Gag						
	37	Sizing Code						
	38	* Calc. Orifice Area	* Selected Area					
	39	*Model No.						
Test & Certificates	40	IBR Certificate Form IIIC						
	41	Material Certification						
	42	Radiography Test for Castings (Note-2)						
	43	Hydrostatic Test						
	44	Seat leakage, Set & Reset Pressure Test						
	45	Calibration						
	46	Visual & Dimensional Check						
	47	Type Test Certificate for IBR.						
	48	Molecular Weight						
	49	Hardness Test						

Bidder to note that the MOC of existing acid/alkali pipelines are CSRL.
Bidder to provide suitable end connecting flanges and counter flanges.

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GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

TAG NOS. ALLOCATION SUMMARY

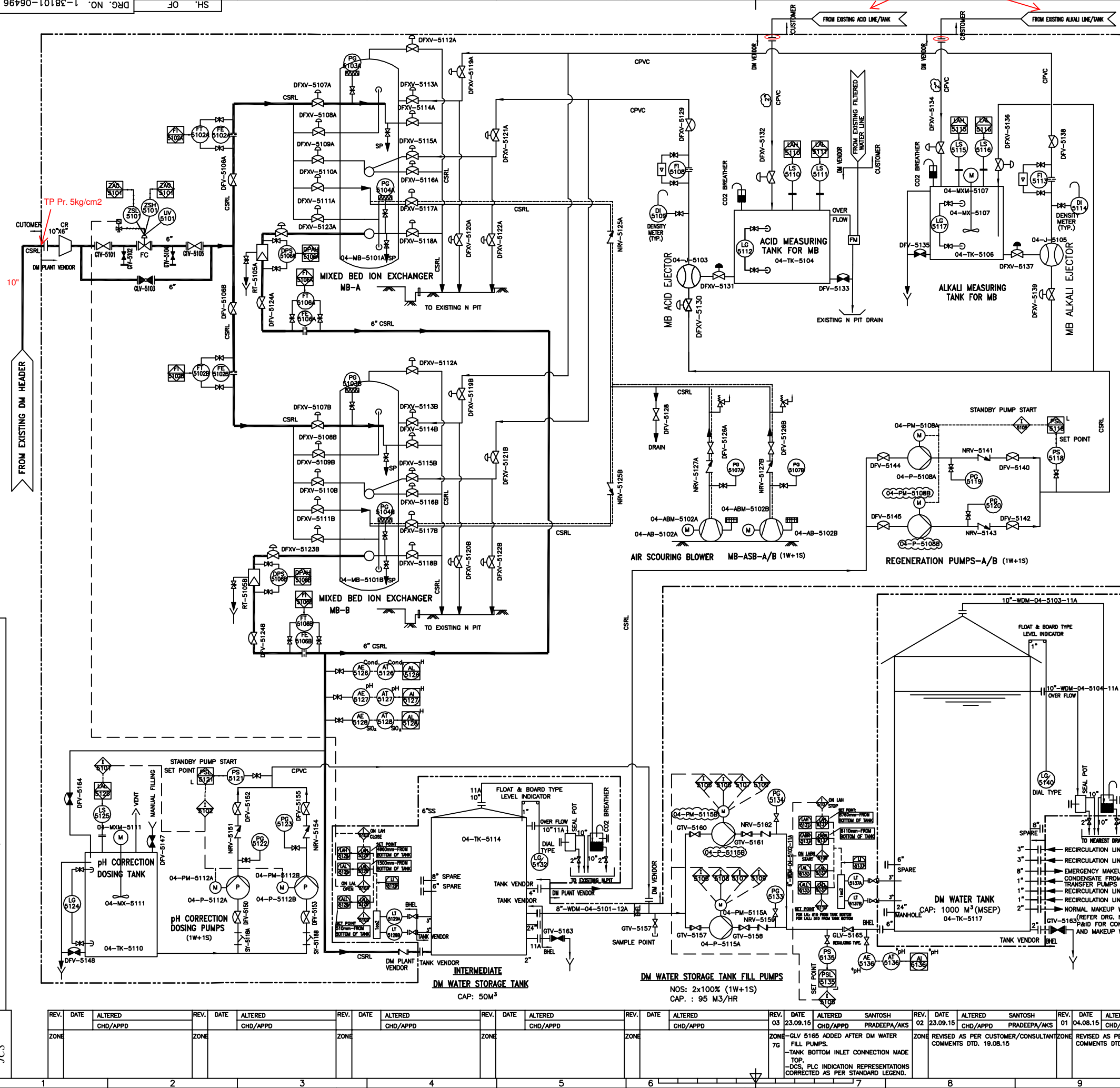
DESCRIPTION	USED TAG NO.	RANGE	NOT USED
VALVE TAG.	5101-5165	5101-5199	5156,5146,5146
INTERLOCKS	5101-5110	5101-5199	-
INSTRUMENTATION TAG.	5101-5140	5101-5199	5130,5131,5138,5139
LINE NUMBERS	5101-5104	5101-5199	-
EQUIPMENT TAG.	5101-5118	5101-5199	5109,5113,5115

INTERLOCK SUMMARY:-

TITLE OF LOGIC	LOGIC NO.	TAGS INVOLVED	CONDITIONS FOR LOGIC EXECUTION	REMARKS
DM WATER INLET TO MB UNIT	5103	LAH -5130	INTERMEDIATE DM WATER STORAGE TANK FULL	TO CLOSE UV-5101
	5104	LAL-5131	INTERMEDIATE DM WATER STORAGE TANK LEVEL LOW	TO OPEN UV-5101
DM WATER STORAGE FILL PUMP	5107	LAH -5139	DM WATER STORAGE TANK FULL	TRIP THE DM WATER STORAGE FILL PUMP.
	5106	LAL-5138	DM WATER STORAGE TANK LEVEL LOW	START THE DM WATER STORAGE FILL PUMP.
	5105	PSL-5135	DISCHARGE HEADER PRESSURE LOW	START STANDBY DM WATER STORAGE FILL PUMP.
	5109	LALL-5129	INTERMEDIATE DM WATER STORAGE TANK LEVEL LOW LOW	TRIP THE DM WATER STORAGE FILL PUMP.
REGENERATION PUMP	5108	PSL-5118	DISCHARGE HEADER PRESSURE LOW	START STANDBY REGENERATION PUMP.
PH CORRECTION PUMP	5101	LAH -5125	PH CORRECTION TANK LEVEL LOW.	TRIP THE PH CORRECTION DOSING PUMP.
	5102	PSL-5121	DISCHARGE HEADER PRESSURE LOW	START STANDBY PH CORRECTION DOSING PUMP.
NORMAL & EMERGENCY DM MAKE UP WATER PUMPS (REF P&ID-13810106218)	5110	LALL-5137	DM WATER STORAGE TANK LEVEL LOW LOW	TRIP THE NORMAL & EMERGENCY DM MAKE UP WATER PUMPS.

NOTES:-

- ADDITIONAL VENTS AT HIGH POINTS AND DRAINS AT LOW POINT SHALL BE PROVIDED AS PER FINAL LAYOUT.
 - DM PLANT WILL BE OPERATED ON SEMI-AUTOMATIC MODE WITH ADEQUATE INSTRUMENTS FOR MONITORING AND ANNOUNCEMENTS IN DCS
 - THE ACTUAL SIZE OF VALVES & PIPES SHALL BE INDICATED AFTER FINALIZATION OF DM PLANT VENDOR.
- * TO BE SUPPLIED BY DM PLANT VENDOR.



DRAWING NO.	TITLE	REMARKS
1-38101-06323	STANDARD LEGEND FOR P&ID	
PEMC-05061	NUMBERING PHILOSOPHY	
REFERENCE DRAWINGS		
CUSTOMER: OIL AND NATURAL GAS CORPORATION LIMITED		
CONSULTANT: FICHTNER CONSULTING ENGINEERS (INDIA) PVT. LTD.		
PROJECT: 1x51MW COMBINED CYCLE CAPTIVE POWER PLANT, AT HAZIRA PLANT, GUJARAT.		
DEPT. FE&SD	NAME	SIGN.
CODE 450	DRN. AJIT SINGH	SD/-
	CHD. PRADEEPA	SD/-
	APPD. AMIT SINHA	SD/-
	DATE	NO. OF VARS.
	16.05.15	-N.A.-
	16.05.15	-N.A.-
	16.05.15	-N.A.-
TITLE: P&ID OF MIXED BED UNIT & ASSOCIATED SYSTEM		
SCALE	WEIGHT (KG)	NO. OF ITEMS
		-N.A.-
REV. DATE	ALTERED	NO. OF ITEMS
03/23.09.15	SANTOSH CHD/APPD PRADEEPA/AKS	-N.A.-
02/23.09.15	SANTOSH CHD/APPD PRADEEPA/AKS	-N.A.-
01/04.08.15	CH.P CHD/APPD AKS	-N.A.-
REVISED AS PER CUSTOMER/CONSULTANT COMMENTS DTD. 19.08.15		
REVISED AS PER CUSTOMER/CONSULTANT COMMENTS DTD. 01.06.15.		
REV. DATE	ALTERED	NO. OF ITEMS
03/23.09.15	SANTOSH CHD/APPD PRADEEPA/AKS	-N.A.-
02/23.09.15	SANTOSH CHD/APPD PRADEEPA/AKS	-N.A.-
01/04.08.15	CH.P CHD/APPD AKS	-N.A.-
REVISED AS PER CUSTOMER/CONSULTANT COMMENTS DTD. 19.08.15		
REVISED AS PER CUSTOMER/CONSULTANT COMMENTS DTD. 01.06.15.		

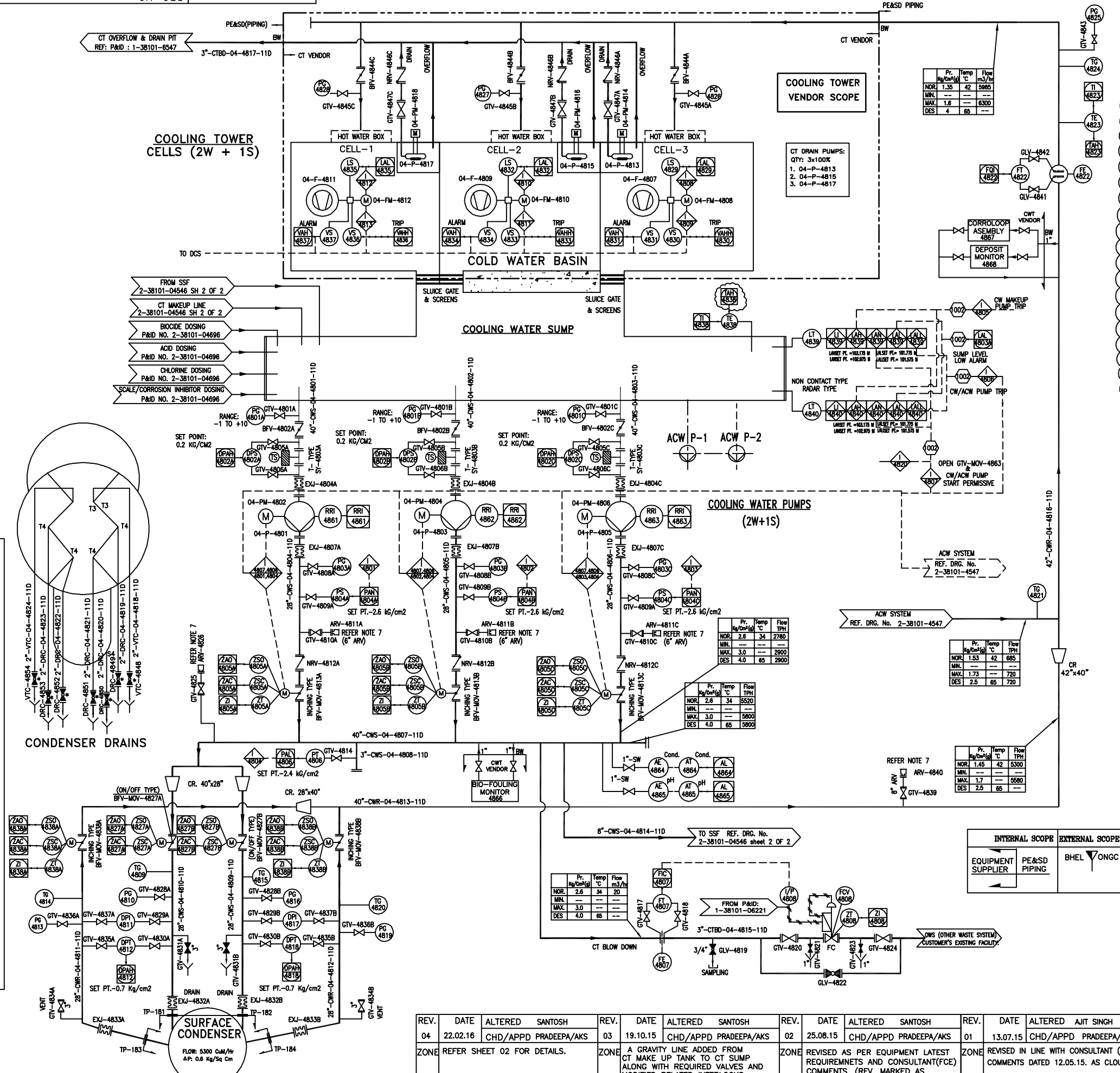
REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
03	23.09.15	SANTOSH CHD/APPD PRADEEPA/AKS	02	23.09.15	SANTOSH CHD/APPD PRADEEPA/AKS	01	04.08.15	CH.P CHD/APPD AKS	03	23.09.15	SANTOSH CHD/APPD PRADEEPA/AKS	02	23.09.15	SANTOSH CHD/APPD PRADEEPA/AKS
76		CLV 5165 ADDED AFTER DM WATER FILL PUMPS. -TANK BOTTOM INLET CONNECTION MADE TOP. -DCS, PLC INDICATION REPRESENTATIONS CORRECTED AS PER STANDARD LEGEND.												

INVENTORY NO. JCS

NO. OF SHEETS 04p

DRG. NO. 2-38101-04546 SH. 01 OF 02

INVENTORY NO. SIGN. AND DATE REF. DRG. NO. COMPUTER FILE NAME GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261 THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY TO THE INTEREST OF THE COMPANY



INTERLOCK SUMMARY table with columns: TITLE OF LOGIC, LOGIC NO., TAGS INVOLVED, CONDITIONS FOR LOGIC EXECUTION, and REMARKS. It lists various interlocks for cooling water pumps, fans, and sumps.

TAG NOS. ALLOCATION SUMMARY table with columns: TAG, USED IN THIS DRG. NO., RANGE, and NOT USED. It lists valve, interlock, instrument, and equipment tags.

Reference drawings table with columns: DRAWING NO., TITLE, and REMARKS. It lists related P&ID drawings for the CW treatment system, ACW system, and effluent collection.

CUSTOMER: OIL AND NATURAL GAS CORPORATION LIMITED
CONSULTANT: FICHTNER CONSULTING ENGINEERS (INDIA) PVT. LTD.
PROJECT: 1x51MW COMBINED CYCLE CAPTIVE POWER PLANT, AT HAZIRA PLANT, GUJARAT.

Revision table with columns: REV., DATE, ALTERED, and description of changes. It tracks four revisions to the drawing.

DEPT. PE&SD CODE 450 UNTOL. DIMS. GR. G/M/F SCALE NTS WEIGHT (KG) NA REF. TO ASSY. DRG. -N.A.- ITEM NO. -N.A.- NO. OF ITEMS -N.A.- TITLE: P&ID FOR COOLING WATER SYSTEM CARD CODE N.A. BHEL DRG NO. 2-38101-04546 CUST. DRG NO. 4548-04-1248 REV. 04P SHT. NO. 01 NO. OF SHT. 02

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COMPUTER FILE NAME

REF. DRG. NO.

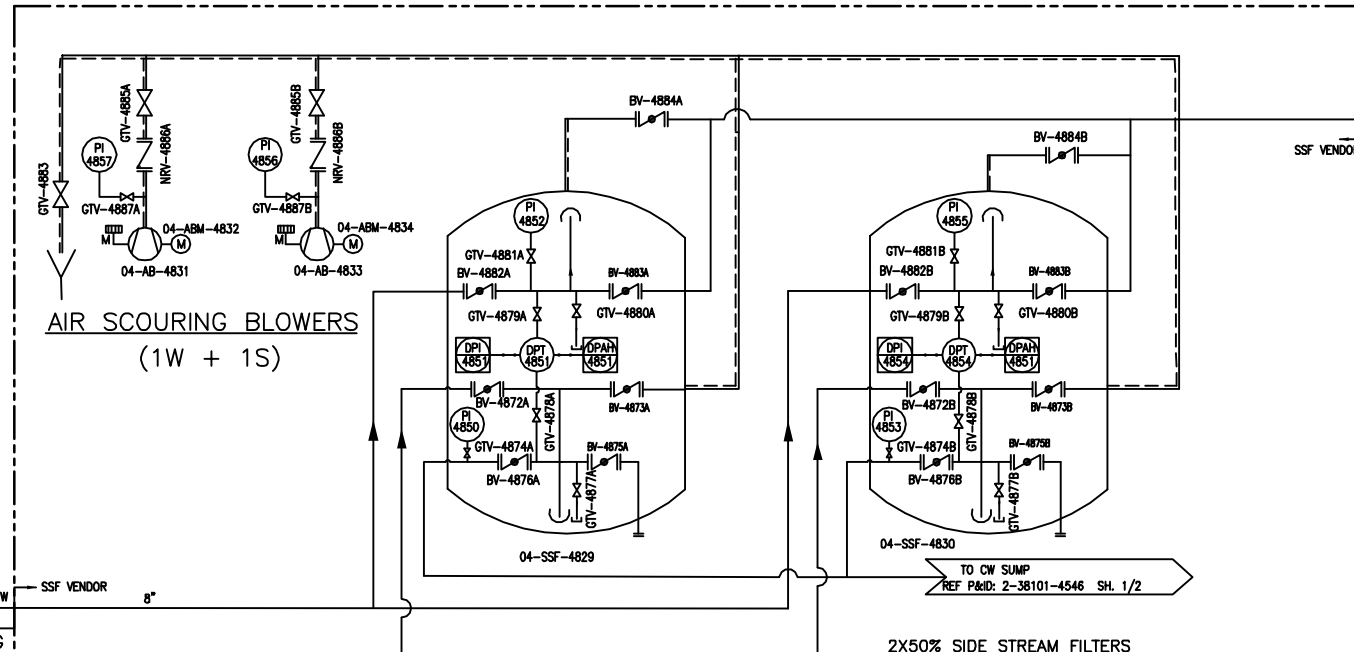
SIGN. AND DATE

INVENTORY NO

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

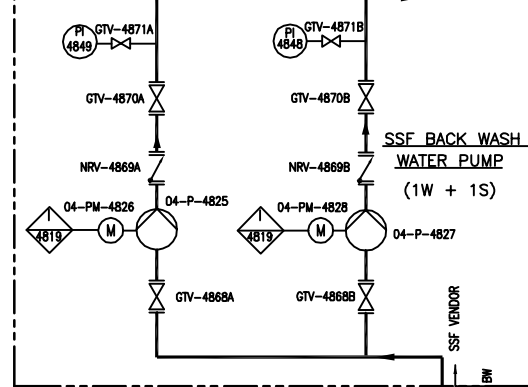
	Pr. Kg/Cm ² (g)	Temp °C	Flow m ³ /hr
NOR.	2.6	34	200
MIN.	---	---	---
MAX.	3.0	---	---
DES.	4.0	65	---

AIR SCOURING BLOWERS (1W + 1S)



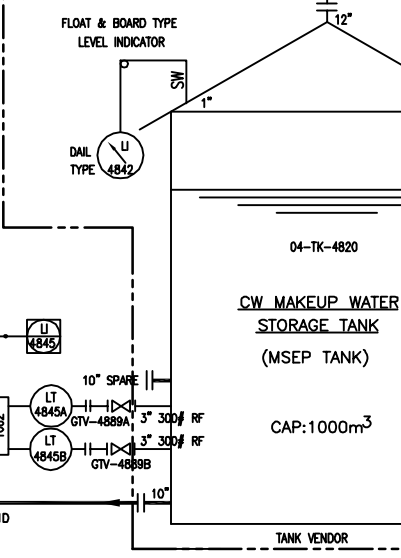
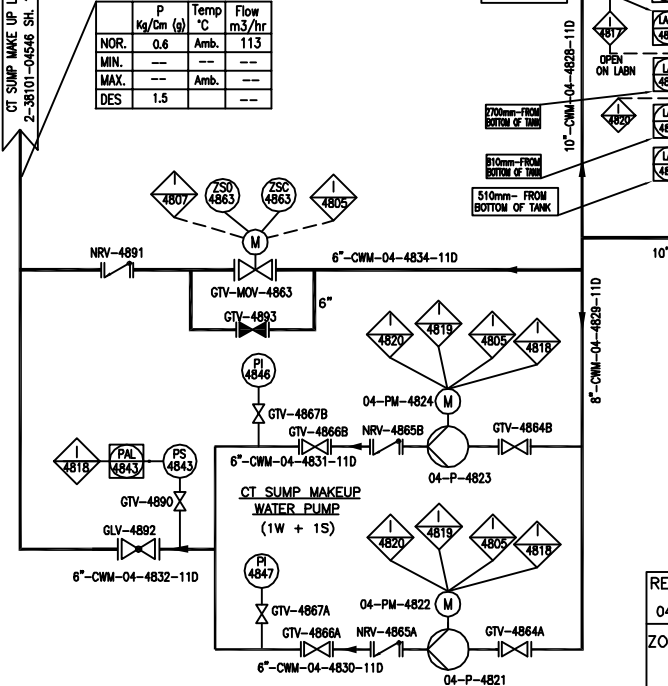
2X50% SIDE STREAM FILTERS CAP: 100 M3/HR. EACH (SSF Vendor Scope)

SSF BACK WASH WATER PUMP (1W + 1S)



	P Kg/Cm (g)	Temp °C	Flow m ³ /hr
NOR.	0.6	Amb.	113
MIN.	---	---	---
MAX.	---	Amb.	---
DES.	1.5	---	---

CT SUMP MAKE UP LINE 2-38101-04546 SH. 1 OF 2



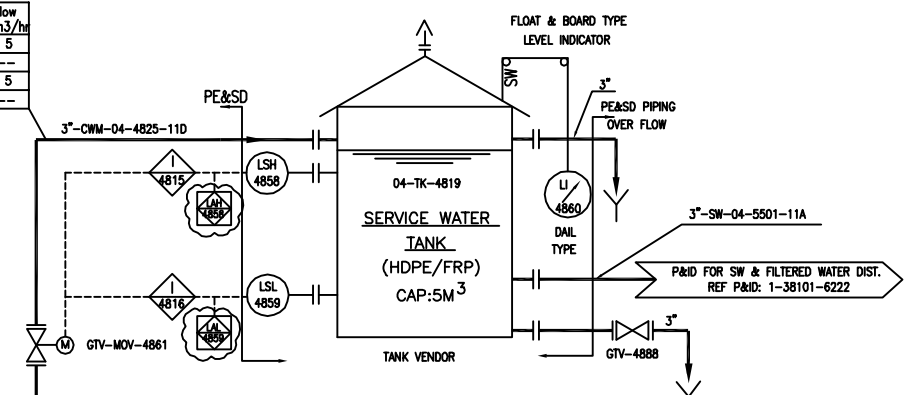
CW MAKEUP WATER STORAGE TANK (MSEP TANK) CAP:1000m³

	Pr. Kg/Cm ² (g)	Temp °C	Flow m ³ /hr
NOR.	3.0	Amb.	5
MIN.	---	---	---
MAX.	6	65	5
DES.	---	---	---

	Pr. Kg/Cm ² (g)	Temp °C	Flow m ³ /hr
NOR.	3.0	---	133.2
MIN.	---	---	---
MAX.	6	65	---
DES.	6	65	---

NOTES:-

- LOW DRAIN POINTS AND HIGH VENT SHALL BE AS PER ISOMETRIC/PIPING LAYOUT.
- END CONNECTIONS FOR TAP OFFS TO BE PROVIDED ON PIPING FOR INSTRUMENTS SHALL BE AS FOLLOWS:
 - ROOT VALVE ENDING WITH 1/2" SW FOR PRESSURE
 - M3.3X2 CONNECTION FOR TEMPERATURE.
- ALL INSTRUMENTS OF COOLING TOWER ARE IN CT VENDOR'S SCOPE.
- ALL ABOVE GROUND DRAINS SHALL BE ROUTED TO THE NEAREST DRAIN.
- ALL BURIED PIPES WILL BE COAL TAR COATED, EXTERNALLY, AS PER AWWA C203-02. ALL BURIED PIPES SHALL BE DOUBLE COATED AND WRAPPED AS PER IS: 10221 / IS: 15337 -2003.
- ALL INSTRUMENT TAG NOS SHALL BE PREFIXED WITH 04.
- ALL ARV TO BE LOCATED AT HIGHEST POINT AS PER PIPING LAYOUT. ARV SHALL BE COMBINATION AIR RELEASE VALVE. ADDITIONAL AIR RELEASE VALVES SHALL BE PROVIDED, IF REQUIRED AS PER SURGE ANALYSIS.
- MANHOLE SHALL BE PROVIDED AT BURIED PIPES IN SUPPLY AND RETURN HEADER.
- VIBRATION LEVEL SWITCH WITH ALARM & TRIP PROVISION FOR FAN WITH ALL THE SWITCH CONTACTS WIRED TO A JUNCTION BOX LOCATED TO GROUND LEVEL
- ALL ON/OFF TYPE MOTORISED VALVES SHALL BE PROVIDED WITH OPEN & CLOSE LIMIT SWITCHES. ALL INCHING TYPE MOV'S SHALL BE PROVIDED WITH OPEN & CLOSE LIMIT SWITCHES AND ALSO THE POSITION TRANSMITTER.
- * ITEMS WILL BE SUPPLIED WITH THE RESPECTIVE EQUIPMENT. HOWEVER COUNTER FLANGES, GASKETS AND STUD NUTS SHALL BE IN PE&SD-PIPING SCOPE OF SUPPLY.
- THE CONTROL VALVE ASSEMBLY SHALL BE LOCATED CLOSER TO THE CW MAKE-UP TANK.
- "LABN" INDICATES THE CT MAKEUP STORAGE TANK LEVEL AT WHICH ITS SUPPLY CONTROL VALVE SHALL OPEN & "LAP" INDICATES THE CT MAKEUP STORAGE TANK LEVEL AT WHICH THE MAKE UP PUMP SHALL START.



SERVICE WATER TANK (HDPE/FRP) CAP:5M³

CUSTOMER: OIL AND NATURAL GAS CORPORATION LIMITED

CONSULTANT: FICHTNER CONSULTING ENGINEERS (INDIA) PVT. LTD.

PROJECT: 1x51MW COMBINED CYCLE CAPTIVE POWER PLANT, AT HAZIRA PLANT, GUJARAT.

DEPT.	UNTO. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEMS
PE&SD	GR. 0.5M/F			-N.A.-	-N.A.-	-N.A.-
CODE						
450						

REV.	DATE	ALTERED	SANTOSH	REV.	DATE	ALTERED	SANTOSH	REV.	DATE	ALTERED	SAINTOSH	REV.	DATE	ALTERED	SAINTOSH
04	22.02.16	CHD/APPD	PRADDEEPA/AKS	03	19.10.15	CHD/APPD	PRADDEEPA/AKS	02	25.08.15	CHD/APPD	PRADDEEPA/AKS	01	13.07.15	CHD/APPD	PRADDEEPA/AKS
ZONE				ZONE				ZONE				ZONE			

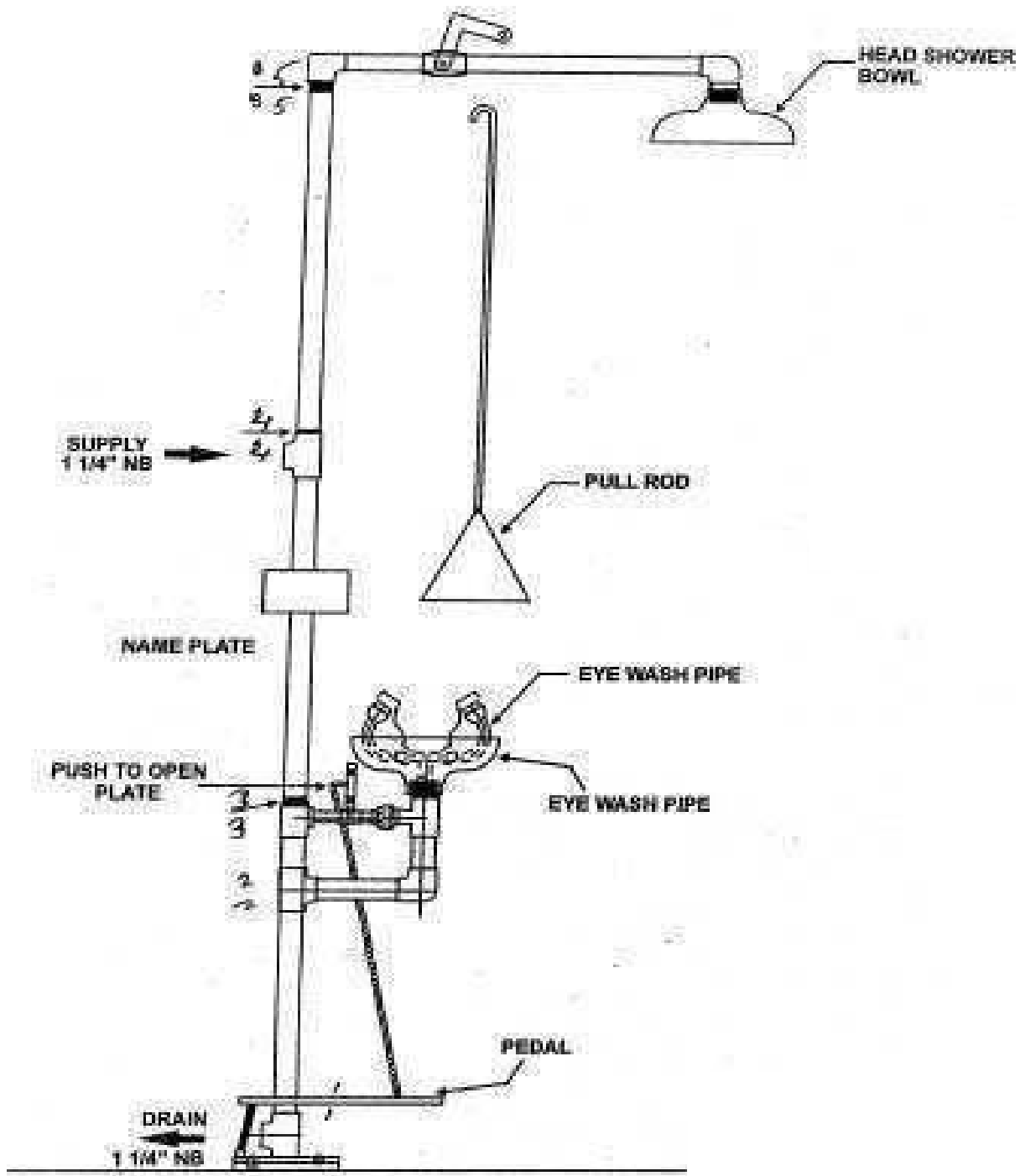
TITLE: P&ID FOR COOLING WATER SYSTEM

DEPT. PE&SD CODE 450

UNTO. DIMS. GR. 0.5M/F

SCALE WEIGHT (KG) REF. TO ASSY. DRG. ITEM NO. NO. OF ITEMS

REV. BHEL DRG NO. 2-38101-04546 CUST. DRG NO. 4548-04-1248 SHT. No 02 NO. OF SHT. 02



EYE WASH AND SAFETY SHOWER

DRG. NO. 1-381-01-06222

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GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

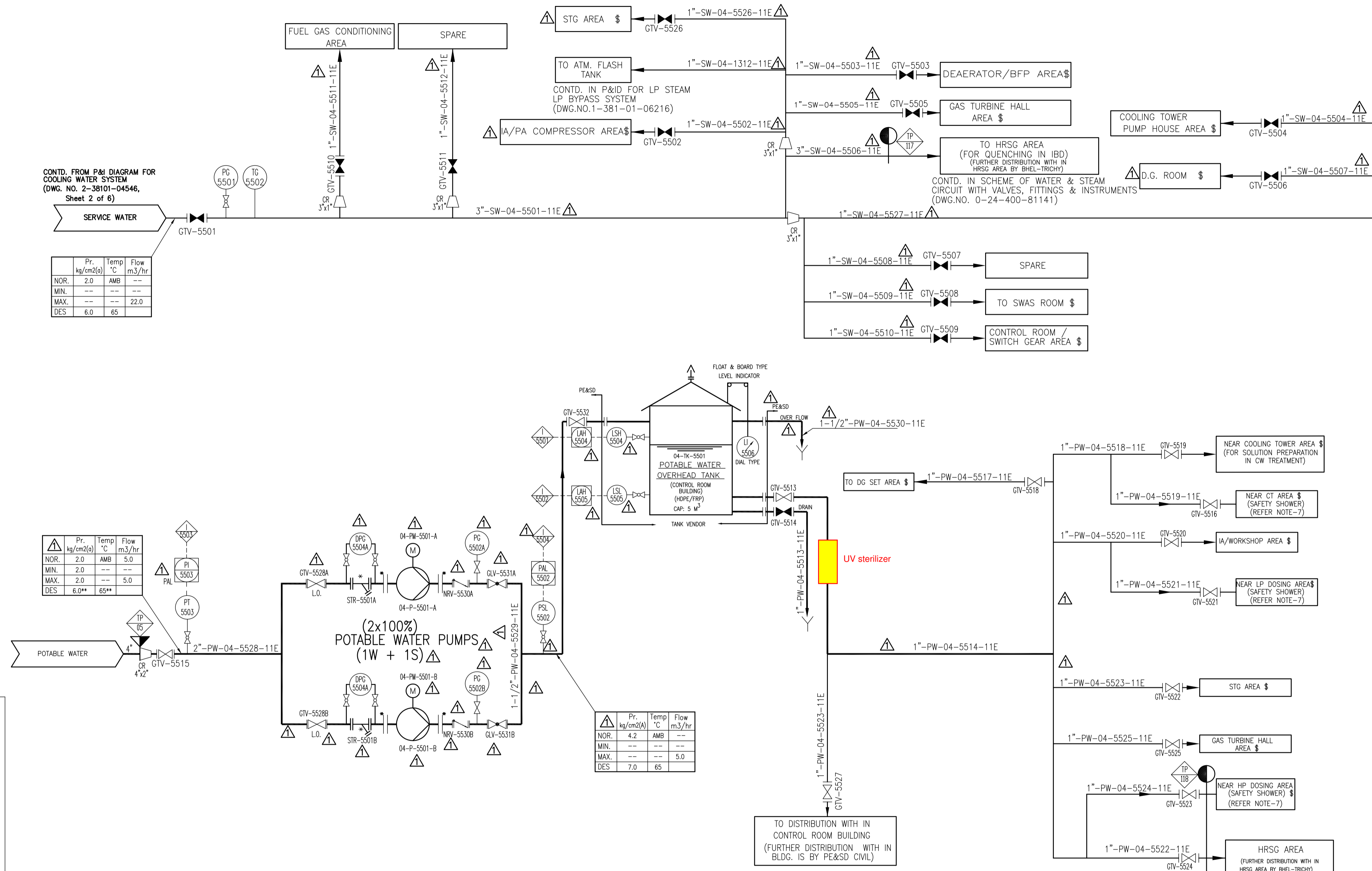
INVENTORY NO

CONTD. FROM P&ID DIAGRAM FOR COOLING WATER SYSTEM (DWG. NO. 2-38101-04546, Sheet 2 of 6)

	Pr. kg/cm2(a)	Temp °C	Flow m3/hr
NOR.	2.0	AMB	---
MIN.	---	---	---
MAX.	---	---	22.0
DES.	6.0	65	---

	Pr. kg/cm2(a)	Temp °C	Flow m3/hr
NOR.	2.0	AMB	5.0
MIN.	2.0	---	---
MAX.	2.0	---	5.0
DES.	6.0**	65**	---

	Pr. kg/cm2(a)	Temp °C	Flow m3/hr
NOR.	4.2	AMB	---
MIN.	---	---	---
MAX.	---	---	5.0
DES.	7.0	65	---



INTERLOCK SUMMARY:-

EQUIPMENT INVOLVED	LOGIC NO.	TAG NOS. INVOLVED	CONDITION FOR LOGIC EXECUTION	ACTION
POTABLE WATER PUMPS	1 5501	LAH-5504	WATER LEVEL HIGH	PUMP START (04-P-5501A/B)
	1 5502	LAL-5505	WATER LEVEL LOW	PUMP STOP (04-P-5501A/B)
	1 5503	PT-5506	SIXTON PRESSURE > 1.2 kg/cm2(a)	START PERMISSIVE FOR BOTH THE PUMPS (04-P-5501A AND B)
	1 5504	PAL-5502	PUMP DISCH. PRESSURE IS LOW	START STANDBY POTABLE WATER PUMP (04-P-5501A/B)

NOTES:-

- ALL OVERHEAD TANK DRAINS SHALL BE SITE ROUTED TO NEAREST DRAIN TRENCH.
- FURTHER DISTRIBUTION/ROUTING OF UTILITIES UPTO THE CONSUMPTION POINT SHALL BE DONE AT SITE. RESPECTIVE AGENCY OF BHEL SHALL CONSIDER THE MATERIAL ACCORDINGLY.
- " \$ " : FURTHER DISTRIBUTION WITHIN BUILDING/ AREA SHALL BE DONE AT SITE.
- " ** " : TO BE CONFIRMED BY ONGC / FICHTNER.
- ALL TAPPINGS HAVE TO BE TAKEN FROM TOP OF THE HEADER.
- END CONNECTIONS FOR TAP OFFS TO BE PROVIDED ON PIPING FOR INSTRUMENTS SHALL BE AS FOLLOWS:
 - ROOT VALVE ENDING WITH 1/2" SW FOR PRESSURE.
 - M3X2 CONNECTION FOR TEMPERATURE.
- SAFETY SHOWER FOR LP DOSING AREA & CT AREA SHALL BE BY BHEL-PE&SD, FOR HP DOSING AREA SHALL BE BY BHEL-TRICHY.

TAG NO. INDEX

	TAGS USED	RANGE	SPARE TAGS
EQUIPMENT TAG	5501	---	---
LINE NUMBERS	5501-30	---	5516
VALVE TAG.	5501-32	---	5517,29
INSTRUMENTATION TAG	5501-05	---	---
INTERLOCKS	---	---	---
TERMINAL POINTS	05	---	---

SCOPE	BHEL INTERUNIT	BHEL/VENDOR
BHEL/CUSTOMER	BHEL (INTERNAL SCOPE)	BHEL (VENDOR SCOPE)
BHEL (PE&SD)	BHEL (TR)	BHEL (PE&SD)
BHEL (HPEP)	BHEL (BAP)	BHEL (PC)
BHEL (PE&SD)	BHEL (BAP)	BHEL (PC)

REF. DRG NO.s

- STANDARD LEGEND FOR P&ID DIAGRAMS 1-381-01-06495
- NUMBERING PHILOSOPHY PEMC-05061
- P&ID FOR IA, PA & N2 DISTRIBUTION 1-381-01-06221
- P&ID FOR COOLING WATER SYSTEM 2-381-01-04546
- SCHEME OF WATER & STEAM CIRCUIT WITH VALVES, FITTINGS & INSTRUMENTS 0-24-400-81141

PE&SD INTERNAL REVIEW	C&I	NAME	SIGN.
REV.01	SUJATHA	-sd-	

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	
		CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD	
1			2			3			4			5			6			7			8			9

CUSTOMER: OIL & NATURAL GAS CORPORATION			
CONSULTANT: FICHTNER CONSULTING ENGINEERS (INDIA) PVT. LTD.			
PROJECT: 51MW COMBINED CYCLE CAPTIVE POWER PLANT, HAZIRA			
DRN.	CHINTAN	SIGN.	DATE
CHD.	BADARI	SIGN.	DATE
APPD.	M.S.S.N	SIGN.	DATE
DEPT.	UNTOL.	DIMS.	SCALE
CODE	GR.	9/M/f	N.T.S
450			
TITLE P&ID FOR SERVICE WATER & POTABLE WATER DISTRIBUTION		NO. OF ITEMS	
DRG. NO. 1-381-01-06222		N.A.	
PROJECT DRG. NO. 6222-04-1155		N.A.	
SHT. No 01		NO. OF SHT. 01	

	Subject	Doc. No.	Rev.	Vol. / Sec.
	BID PACKAGE FOR COMBINED CYCLE CAPTIVE POWER PLANT AT HAZIRA PLANT, GUJARAT	5111168-ME-SPC-100-001	R1	III / 2.14
Sheet No.				
312				

VOLUME - III
SECTION - 2
DETAILED TECHNICAL SPECIFICATION - MECHANICAL

SUB-SECTION - 2.14
WATER SYSTEM

FORMT9-P REV-A (MUM)

	Subject	Doc. No.	Rev.	Vol. / Sec.
	BID PACKAGE FOR COMBINED CYCLE CAPTIVE POWER PLANT AT HAZIRA PLANT, GUJARAT	5111168-ME-SPC-100-001	R1	III / 2.14
				Sheet No.
				313

**VOLUME - III
SUB-SECTION - 2.14
WATER SYSTEM**

CLAUSE NO.	DESCRIPTION	SHEET NO.
1.0.0	GENERAL	314
2.0.0	PLANT DESCRIPTION	314
3.0.0	SPECIFIC REQUIREMENTS	316
4.0.0	PERFORMANCE TEST REQUIREMENTS & GUARANTEES	317
5.0.0	SUBMISSION OF TEST PROCEDURES	318
6.0.0	DESIGN AND CONSTRUCTION FEATURES	318
7.0.0	TECHNICAL SPECIFICATION FOR VALVES	320
8.0.0	BOLTS AND NUTS	321
9.0.0	WELDING	322
10.0.0	INSTRUMENT LIST FOR WTP	322
12.0.0	WATER ANALYSIS	324
13.0.0	SPECIFIED DATASHEETS	325

FORMTS-P REV-A (MUM)

	Subject	Doc. No.	Rev.	Vol. / Sec.
	BID PACKAGE FOR COMBINED CYCLE CAPTIVE POWER PLANT AT HAZIRA PLANT, GUJARAT	5111168-ME-SPC-100-001	R1	III / 2.14 Sheet No. 314

SUB-SECTION – 2.14

WATER TREATMENT PLANT

1.0.0 GENERAL

- 1.1.0 This section is intended to provide within the scope which includes design, constructional and functional requirements for water system for Gas Based Combined Cycle Captive power plant (CCCPP).
- 1.2.0 The bidders are requested to note that only the major equipments are mentioned below. Any other equipment / system not specifically mentioned below but mentioned elsewhere in the specifications and any other equipment / system essential for smooth and efficient functioning of the system shall be considered in the scope of the bidder at no extra cost. Also bidder shall ensure the adequacy of extension from existing filtered water, DM water, service water and potable water lines from locations as marked in the plot plan.
- 1.3.0 This section covers the technical aspects of design, manufacture, testing at works and transportation to site, supervision of erection, testing and commissioning of Water system. Capacity shall be decided by EPC bidder as per the design basis given elsewhere.
- 1.4.0 Supply and services shall be rendered in conformity with proven design principles, taking into account the current technology. The requirements of the contract must be fulfilled in its entirety.
- 1.5.0 The supply and services shall be rendered inclusive of all appliances and interconnecting arrangements with other supplies needed for proper and reliable continuous operation and for satisfactory maintenance and repair.

2.0.0 PLANT DESCRIPTION

2.1.0 Description of existing Facilities

2.1.1 Pre-treatment Plant

Raw water from river is pumped to the raw water reservoir. From raw water reservoir, water is treated through clarifier and gravity sand filter. This filtered water is pumped into the complex with help of filtered water transfer pump located near raw water reservoir, through 14" & 30" filtered water line. Bidder shall identify the tapping point either in 14" or 30" line based on the availability of adequate flow and pressure

Bidder shall start their scope from counter flange and extend the piping up to cooling tower as well as overhead service water storage tank of proposed power plant with fittings, pipe rack, supports etc. However, bidder to ensure the adequacy of the flow and head at the tap off point.

2.1.2 DM Plant

There are 3 x 100 % (2w+1s) each of 100 m³/hr is available in the existing HRSG area. Bidder to check the adequacy of the existing plant in terms of capacity requirement of DM water for proposed CCCPP.

FORMTS-P REV-A (MUM)

	Subject	Doc. No.	Rev.	Vol. / Sec.
	BID PACKAGE FOR COMBINED CYCLE CAPTIVE POWER PLANT AT HAZIRA PLANT, GUJARAT	5111168-ME-SPC-100-001	R1	III / 2.14 Sheet No. 315

2.1.3 **Potable water**

There is existing potable water running near to the proposed power plant as marked in the attached plot plan.

Bidder shall start there scope by taking tapping from existing potable water piping and extend the same up to overhead potable water storage tank located at the highest elevation in the proposed power plant (Over Control room building). However bidder to ensure the adequacy of the flow and head at the tap off point.

2.2.0 **Description of Proposed water system**

2.2.1 Scope of proposed DM plant for HRSG make up purpose is as below,

- Checking adequacy of existing DM plant for make - up water requirement for steam generation of proposed power plant.
- Tapping from the existing DM water line shall be taken by bidder
- 2 x 100 % (1w+1s) Mixed Bed
- 1 x 100% Acid dosing tank
- 1 x 100 % of caustic dosing tank
- ~~1 no. Intermediate DM water tank of 30 minutes Retention.~~
- ~~2 x 100 % DM water storage tank fill pumps of suitable capacity.~~
- ~~1 no. DM water storage tank of (1000 m³)~~
- ~~2 x 100 % DM water transfer pumps for HRSG make - up.~~
- ~~1 x 100% HRSG Initial fill pump.~~
- 1 x 100 % pH correction dosing system with 1 no. of pH Correction dosing tank and 2 nos. of pH correction dosing pumps.
- ~~DM water piping after Mixed Bed to DMWST in CCCPP area along with pipe fittings, pipe rack.~~

2.2.2 ~~Scope of proposed Filtered water distribution for cooling tower make - up and service water purpose is as below:~~

- ~~Checking adequacy of existing Pre-treatment plant for make - up water requirement for cooling tower.~~
- ~~Tapping from existing filtered water line shall be taken by bidder.~~
- ~~1 no. CW makeup water storage tank.~~
- ~~Extension of piping along with pipe fittings and pipe rack.~~

2.2.3 Scope of proposed Potable water system:

- ~~Tapping from the existing potable water network shall be taken by bidder.~~
- 1 no. potable water overhead tank.
- ~~Extension of piping along with pipe fittings and pipe rack. Distribution of potable water in the proposed CCCPP.~~
- "UV sterilizers" shall be used to disinfect the potable water near the potable water outlets.

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2.2.4 Scope of proposed Service water system:

- ~~• Tapping from filtered water line shall be taken for service water purpose~~
- 1 no. Service water overhead tank
- ~~• Extension of piping along with pipe fittings and pipe rack.~~
- ~~• Distribution of service water in the proposed CAPP.~~

2.2.5 Scope of proposed Effluent disposal system:

~~Effluent generated from HRSG blow down along with oily waste shall be collected in the HRSG blow down tank, and pumped with HRSG blow down transfer pump to the existing PWS drain pit. SSF backwash water shall be collected in the SSF backwash storage tank and with the help of SSF backwash water transfer pump; it shall be transferred to the OWS drain pit. Cooling tower blow down, shall be routed to the existing OWS drain pit. MB regeneration waste shall be neutralised in the existing N-Pit. Bidder to check the adequacy of existing N-Pit in terms of capacity so as to accommodate the additional regeneration effluent generated by Mixed Bed unit for proposed CCCPP.~~

~~Contractor to check the adequacy of the existing effluent treatment system such as OWS & PWS, so as to handle the additional flows from the proposed CCCPP.~~

3.0.0 **SPECIFIC REQUIREMENTS**

- a) Gross capacity of the plant shall be sized corresponding to net requirement indicated including regeneration.
- b) Piping of Mixed Bed Unit shall be done in such a way that there shall be interchangeability of the streams shall be done.
- c) Contractor to check the adequacy of extending the existing acid/alkali lines, for MB regeneration.
- d) ~~1 X 100% CW make-up water storage tank of 1000 m³ capacity shall be provided near CW forebay.~~
- e) Minimum thickness of pressure vessels shall be 6 mm.
- f) For unlined pressure vessels a minimum of 2 mm corrosion allowance shall be provided.
- g) Chemical dosing pumps shall be provided with SS 316 strainer.
- h) Contractor to furnish all necessary instruments including level indicators for all tanks.
- i) Mixed Bed shall be designed to provide minimum chemical consumption for the specified outlet water quality.
- j) The maximum allowable noise level shall be 85 dBa at 1 m from the outline of respective equipment.
- k) Approved quality assurance plan of Owner/Owner's representative shall be followed by Contractor.
- l) Erection and Commissioning.
- m) All Electrical Equipment.
- n) Complete Instrumentation & control.

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- o) Contractor to consider adequacy of flow, pressure & also recheck the location of hook up points at site before ordering / commercial negotiation, any change in the hook up points shall be done by Bidder without any cost implications, Also if isolation of the system is not possible at hook up points, then Bidder shall take the hot tapping at the interface points

4.0.0 **PERFORMANCE TEST REQUIREMENTS & GUARANTEES**

4.1.0 **Guarantee Requirements**

All chemicals & consumables shall be given by Supplier for 72 hours availability period from commissioning.

In addition to compliance with the requirements of the Specification, Supplier shall meet the specific guarantees of performance as required and as stated in the Schedule of Guaranteed Data. All tests shall be carried out in accordance with the relevant international standards, unless otherwise specified or approved by Owner/Owner's representative.

- a) The Complete Water treatment plant & its auxiliaries shall operate safely, reliably, and without undue maintenance or operator attention/intervention. Guarantees shall be such as can be met in everyday operation under all specified operating conditions. All guarantee figures shall be realisable in everyday operation under all anticipated operating conditions.
- b) Supplier shall note the provisions of the clauses on tests as outlined in the specification for "Inspection and Testing".
- c) Performance test will be carried out within the appropriate time period as specified. The performance test result of the water treatment plant & its auxiliaries shall be corrected to the design conditions to establish an "as new and clean" performance.
- d) **Guarantee Test Procedure**

In conducting the plant performance tests, the plant shall be operated by Owner/Owner's representative's staff under the direction and responsibility of Supplier's representative and to the mutual satisfaction of the parties concerned, but under the general supervision of Supplier.

- e) **Water treatment plant**
 - i. Supplier shall submit the design calculations for arriving at the required quantity of resin for each exchanger, supported by resin characteristic data used in the calculations, inline with manufacturer's / best engineering practices. Supplier shall take into account derating factor of 10% while deciding the useful quantity of resin. A derating factor of 30% shall be considered for resin used for MB unit. After including the above margins and other additions such as minimum resin quantity, the chemical consumption shall be calculated. The quantity of resin and regeneration chemical consumption shall be as per the "Guaranteed Data".
 - ii. Before commencement of tests, Supplier may if so desired by him, bring the MB resins to the fully regenerated condition by carrying out double regeneration, that is, two consecutive regenerations. No other double regeneration will be permitted during the capacity test period.

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- iii. Minimum six (6) runs shall be carried out for establishing the guaranteed values of treated water with regard to quality (stage wise) and capacity as well as for establishing the guaranteed values for chemical consumption, continuous power consumption etc. Of these six test runs, a minimum of three (3) consecutive test results shall meet the guaranteed values. For Mixed Bed, a minimum of (3) three test runs shall be conducted and all the results shall meet the guaranteed values.

5.0.0 SUBMISSION OF TEST PROCEDURES

The Supplier shall submit for approval **one month** prior to testing, detailed test procedures for equipment, sub-systems and complete systems covered under this Order. These procedures shall include details of all performance tests either conducted in the manufacturer's works or at site. Detailed lists shall be provided which shall specify applicable codes, functional and other tests to be carried out on each item of equipment, each sub-system and each complete system. The lists shall be supplemented with logic diagram to show the correct plant functioning requirements together with system flow diagrams showing all points of measurement for both functional and performance tests.

The procedures, lists, logic diagrams and flow diagrams together with test results shall be correlated and presented as a single bound document to form a comprehensive set of test procedures and records of the tests conducted on the plant.

6.0.0 DESIGN AND CONSTRUCTION FEATURES

6.1.1 Mixed Bed

The Mixed bed Ion exchange units are provided for removal of TDS and to achieve desired DM water quality to produce Dematerialized water of required quality and quantity for steam cycle.

The Mixed Bed Exchanger contains both Strong Acid Cation and Strong Base Anion resins. Hydrochloric Acid and Sodium Hydroxide are used for regenerating cation and Anion Resins respectively. The Dematerialized water thus generated will be led and stored in DM water storage tanks. MB is designed for regeneration every 7 days. The MB will be constructed of vulcanized rubber lined Carbon steel. Resin Traps are provided in rinse outlet and process outlet of the Mixed Bed unit.

Design

Mixed bed shall have Shells and Dished ends both constructed of IS:2062 and shall be designed as per IS 2825. Vessels shall be designed to contain resins, filter media, distribution system and under drain system. All the vessels shall be supplied with frontal pipe work with valves and fittings.

Mixed bed shall be provided with a group of individual pneumatic operated valves designed for manual operation. The Material of construction of all valves and piping shall be as per specification. All internal material shall be of Stainless steel (SS - 316) for pipe size less than 50 NB and more than 50 NB shall be MSRL unless otherwise specified elsewhere.

All the vessels shall be provided with Cat Ladder and Platform.

The interior of all vessels and all parts, which come into contact with corrosive liquid, shall be lined with natural rubber.

Wherever rubber lining is required, the same shall conform to IS 4682 Part I.

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All vessels shall be furnished with a manhole, hand hole, view glass, vent and drain valves, resin traps, flanged connections for the piping system and structural steel leg support.

MB units shall be equipped with three (3) nos. of sight glass, one (1) at upper resin level, one (1) in upper section of exchanger vessel & one (1) at resin interface level.

Construction

The Mixed Bed shall be of vertical, cylindrical type. It shall have shells and dished shall be designed as per IS 2825. The filters shall be designed to contain filter media, distribution system and under drain system. All internal material such as nuts bolts & washers shall be of Stainless steel (SS 316) unless otherwise specified elsewhere.

The Ion exchangers shall be supplied with frontal pipe work with valves and fittings. Instrument and accessories shall be supplied as per specified in relevant clause.

6.1.2 ~~**DM Water Storage Tank**~~

~~One number of DM water storage tank shall be located in the proposed HRSG area. The tank will be vertical, cylindrical, field erected tanks of Carbon steel construction with protective interior coating. The tank roof will be of the self-supported type. The tank will be provided with a vent, stub type overflow, etc.~~

6.1.3 **General**

All piping shall be designed, fabricated and tested in accordance with the Approved Standards, Piping Materials Specification as per the specification.

All pipes subject to corrosion which are unwrapped, unlagged and external to the building, in addition to the normal designed wall thickness, shall have an additional corrosion allowance sufficient to ensure a minimum service life of 20 years.

The velocity of flow in pipes shall not generally exceed the following values unless otherwise specifically mentioned.

Water lines	m/s
Water Discharge lines	1.0 to 2.2
Water suction lines	0.6 to 0.9

6.1.4 **Pipe Materials**

Instrument tubing shall be of stainless steel 316 for all pressures. Pipe connections after the isolating valves can be compression type couplings to the approval of the Owner/Owner's representative. Steels made by Acid Bessemer process are not acceptable. Fittings made from block forgings and machined to required dimensions are not acceptable.

Chemical Lines	:	GRP/CPVC.
DM water	:	SS 316
Filtered water piping	:	MSEP

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6.1.5 **Bends and Fittings**

Wherever possible, pipe fittings such as bends and tees, shall be to standard dimensions.

All flanged joints shall meet the requirements of **ANSI B 16.5**. All fasteners shall be in mm size only.

All flanges shall be machined on the edge and spot faced at the back to receive bolts, washers and nuts.

For high-pressure services, flange faces must be of serrated finish. Blank flanges are to be solid steel and machined all over.

Flanges having pressure ratings less than 10 bar (g) shall not be used. All flange jointing material unless specified shall be approved quality.

7.0.0 **TECHNICAL SPECIFICATION FOR VALVES**

7.1.0 **Intent of Specification**

7.1.1 This section of the specification covers the requirements of valves for various system of the plant.

7.2.0 **Codes & Standards**

7.2.1 The supply manufacture, inspection, testing and performance of valves shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. The equipment shall also conform the latest applicable standards. Nothing in this specification shall be construed to relieve the Supplier of this responsibility.

7.2.2 Latest edition of design codes and standards shall be considered as minimum requirements.

7.3.0 **Design and Construction Features**

7.3.1 Supplier shall select valves and accessories, which are suitable for the operating conditions of the systems.

7.3.2 Valves and accessories which are of a similar make, size and type shall be interchangeable with one another.

7.3.3 All valve bodies shall be of the same nominal size as the adjacent piping, unless otherwise required.

7.3.4 Hand wheels shall be of painted normal standard type and of spoked construction with smooth finished spokes and rims.

7.3.5 Spindles for all valves located outdoors shall have weather-proof protection on spindle bearings and guards. Valve stem shall be forged or from a forged rolled bar. Casting for stem is not acceptable.

7.3.6 All valves shall be designed to withstand a hydrostatic pressure test for tightness and mechanical strength as per applicable standards.

7.3.7 For handling heavy valves (or part of valves), eye bolts, lugs etc. shall be provided.

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7.3.8 All valves shall be designed so that the hand wheel moves in a clockwise direction to close the valve. The face of each hand wheel shall be clearly marked with the words 'OPEN' and 'CLOSE' and shall be provided with an arrow to indicate the direction for opening.

7.3.9 Valves of sizes 50 NB and above shall be provided with position indicators.

7.3.10 All flanged valves shall have flanges integral with the valve body.

7.3.11 All the valves shall be of CI diaphragm type. All the valves for corrosive service shall be rubber lined / ebonite lined to a thickness of minimum 3mm.

The material of construction of diaphragm shall be as follows:

- a. Reinforced natural rubber for water service.
- b. Reinforced neoprene rubber for handling weak chemicals
- c. Teflon with backing for severe chemicals and solvents.

Needle valves shall be used in sampling lines and for instrument isolation.

7.4.0 Tests and Inspection

7.4.1 All valves shall be subjected to tests. Tests shall be conducted at Supplier/ Sub Supplier's works witnessed by the Owner/Owner's representative and conforming to the relevant standards and all test certificates shall be submitted for approval of Owner/Owner's representative before despatch of material. All valves shall be tested hydrostatically for strength, tightness of seats and tightness of backseating at pressure specified in the standards.

7.4.2 Procedure for testing the tightness of seats of valves shall be as follows. The valves shall be subjected to city water pressure to or a minimum of 2.812 Kg/cm² (40 psig). The pressure shall then be increased to the specified seat test pressure. Valves shall then be cracked open at this pressure to determine the tightness of the seat ring in the body. Gate valves shall be tested on both sides of the disc and globe valves shall be tested under the disc.

8.0.0 BOLTS AND NUTS

All bolts and nuts shall conform dimensionally and be threaded in accordance with the Approved Standards and shall be in mm size only.

Where there is a risk of corrosion, studs and bolts are to be finished flush with the surface of the nuts otherwise a maximum of 1.5 complete threads shall protrude.

The use of slotted screws shall be avoided, hexagon socket screws of recess type heads being preferred.

When connecting pipe work to fittings studs shall not be used. Where fitted bolts are used they shall be adequately marked to ensure correct assembly and the fitted portion shall be not less than 4 mm in diameter larger than the threaded diameter. They shall be driving fit in the reamed holes they occupy.

All washers shall be included in the scope, including locking devices and anti vibration arrangements, which shall be subject to the approval of the Owner/Owner's representative. Taper washers shall be fitted where necessary.

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If bolts are to be tightened under heat or by mechanical extension, one set of the necessary equipment shall be provided under this Order and retained at site for each unit.

9.0.0 **WELDING**

9.1.0 **General**

All welding performed in pursuance of this Order shall conform to the Approved Standards.

The Supplier shall show that the proposed welding specifications and standards conform to the requirements of the design codes adopted for the relevant portion of the work.

Wherever there is conflict between Codes and Standards the Owner/Owner's representative shall decide which shall prevail.

9.2.0 **Welding Techniques**

Single sided butt weld joints (in low alloy steel and high yield steel) shall be designed to have the root run made by the Gas Tungsten Arc Welding process.

For butt welded joints the following techniques are acceptable.

- i. Shielded Metal arc welding with argon root-run.
- ii. Shielded Metal arc welding with consumable insert in root fused by argon arc.
- iii. Semi-automatic or automatic welding with argon root-run.

Weld joint preparations shall be in accordance with ASME Sec. VIII Div.1 as applicable or an equivalent or superior approved standard and to the Owner/Owner's representative's approval. Welding symbols shall be to any Approved Standard.

10.0.0 **INSTRUMENT LIST FOR WTP**

A)	DM PLANT	
1	Mixed Bed	Conductivity transmitter at the outlet (common for each MB)
		Pressure gauge at the I/L & O/L
		pH transmitter (Ultra Pure Water) at the outlet (common for MB)
		Dual Channel Silica analyzer at the common outlet of MB
		FT at the I/L & O/L
2	DM Water Tank	Float and Board type level indicator
		Level switch low low and Level switch high
		Differential pressure/Ultrasonic type level Transmitter
3	DM water transfer pump/HRSG Initial fill pump	Pressure Gauge on the discharge of each Pump.
		Pressure switch on the common discharge header
		pH transmitter at the discharge of pumps.
4	CW makeup storage tank	Level gauge
		Level low switch
5	Acid dosing system	Level gauge

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		Level low switch
6	Caustic dosing system	Level gauge
		Level low switch
7	HRSG Blow down Pit	Level switch low low and Level switch high
8	HRSG Blow down transfer pumps	Pressure Gauge on the discharge of each Pump.
		Pressure switch on the common discharge header
		Temperature gauge
9	SSF backwash water storage tank	Level switch low low and Level switch high
10	SSF backwash water transfer pump	Pressure Gauge on the discharge of each Pump.
		Pressure switch on the common discharge header
11	Overhead Service water storage tank	Float and board level gauge
12	Overhead potable water storage tank	Float and board level gauge

11.0.0 DESIGN CRITERIA - TREATMENT SCHEME

11.1.0 Filtered Water

- i. Raw water source / storage : Filtered water
- ii. Design Filtered water analysis : Refer 12.1.0 below.

11.2.0 DM Plant

- i. Feed water source : DM water from existing DM plant.
- ii. Design DM water analysis : Refer 12.2.0 below.
- iii. Net output capacity of DM plant : 2 x 100 %
- iv. Operation / location : Manual / Outdoor
- v. Stream configuration : Refer flow scheme and scope of supply

Note : There shall be interconnection between two MB streams in such a way that, during regeneration of one mixed bed, second mixed bed can be possible. Also in case of emergency 2 mixed bed shall run together

11.3.0 ~~Effluent Treatment Plant~~

- i. ~~Effluent water source~~ : ~~Effluent from Cooling tower blow down, HRSG blow down, SSF backwash, MB. Regeneration waste, Oily waste water.~~

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12.0.0 WATER ANALYSIS (TYPICAL)

12.1.0 Filtered Water Analysis (Typical)

Sr. No.	Characters	Unit	Filtered water Analysis
1	pH		8.3
2	Total Hardness	Mg/l as CaCO3	115
3	Ca Hardness	Mg/l as CaCO3	60
4	Sodium	Mg/l as CaCO3	78
5	Iron	As Fe	Traces
6	Total Cation	Mg/l as CaCO3	193
7	Turbidity	NTU	<2
8	Total Alkalinity	Mg/l as CaCO3	130
9	Sulphate	Mg/l as CaCO3	6
10	Chloride	Mg/l as CaCO3	57
11	EMA	Mg/l as CaCO3	63
12	Total Anion	Mg/l as CaCO3	193
13	Silica	Mg/l as SiO2	20
14	KMnO4 Value	Mg/l as CaCO3	15

Note : Bidder shall consider 20% deterioration in the above values while considering the same for Cooling tower make up purpose as well as service water purpose.

12.2.0 DM water analysis at the outlet of existing DM plant (Typical)

Sr. No.	Characters	Unit	Filtered water Analysis
1	pH		6.5 - 7
2	Conductivity		

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13.0.0 SPECIFIED DATASHEETS

A	DM PLANT		
1.1.0	Mixed bed exchanger-		
1.1.1	Design standard		IS:2825
1.1.2	Type		Vertical, dished ended, Rubber lined, Steel, welded vessel.
1.1.3	No. of units		2 x 100% – MB
1.1.4	Design pressure		Shut-off head of upstream pump
1.1.5	Hydrostatic test pressure		1.5 times design pressure
1.1.6	Maximum flow rate		45 m ³ /hr/m ²
1.1.7	Rubber lining		4.5 mm thick (min.) to IS:4682 Part-I
1.1.8	Free board		100 % of bed depth
1.1.9	Gross output of each exchanger per cycle		As per requirement indicated in Section-1 of this specification.
1.1.10	Minimum resin bed depth		1000 mm
1.1.11	Material of construction		IS:2062
1.1.12	Minimum shell / dishend thickness		6 / 8 mm thick
1.1.13	Tolerance		0.2 mm mill tolerance for dished end, 2 mm thinning allowance.
1.1.14	Resin type		High capacity strongly acidic, polystyrene based cation exchanger resin and Strongly basic anion exchange resins.
1.1.15	Method of regeneration		Co current (Simultaneous air blower)
1.1.16	Under drain system		Strainer on plate.
1.1.17	Accessories / Instrumentation		Refer control and instrumentation for details.
1.2.0	Air scouring blowers (For MB units)		
1.2.1	Type		Rotary, twin lobe
1.2.2	No. of units		2 x 100% (1w+1s)
1.2.3	Capacity & Head		As per requirement of MB units.
1.2.4	Material of construction		CI Gr. 25-with EN8 shaft with SS sleeving, damper and filters in CS, Base plate in M.S.
1.2.5	Medium handled		Air
1.2.6	Design temperature		Refer project information.
1.2.7	Painting		As per painting specification
1.3.0	DM Water Storage Tank		
1.3.1	Design standard		IS:803
1.3.2	No. of tanks		1 No – DM water
1.3.3	Material of construction		MSEP- DM water
1.3.4	Working capacity of each tank		1000 m ³ – DM Water

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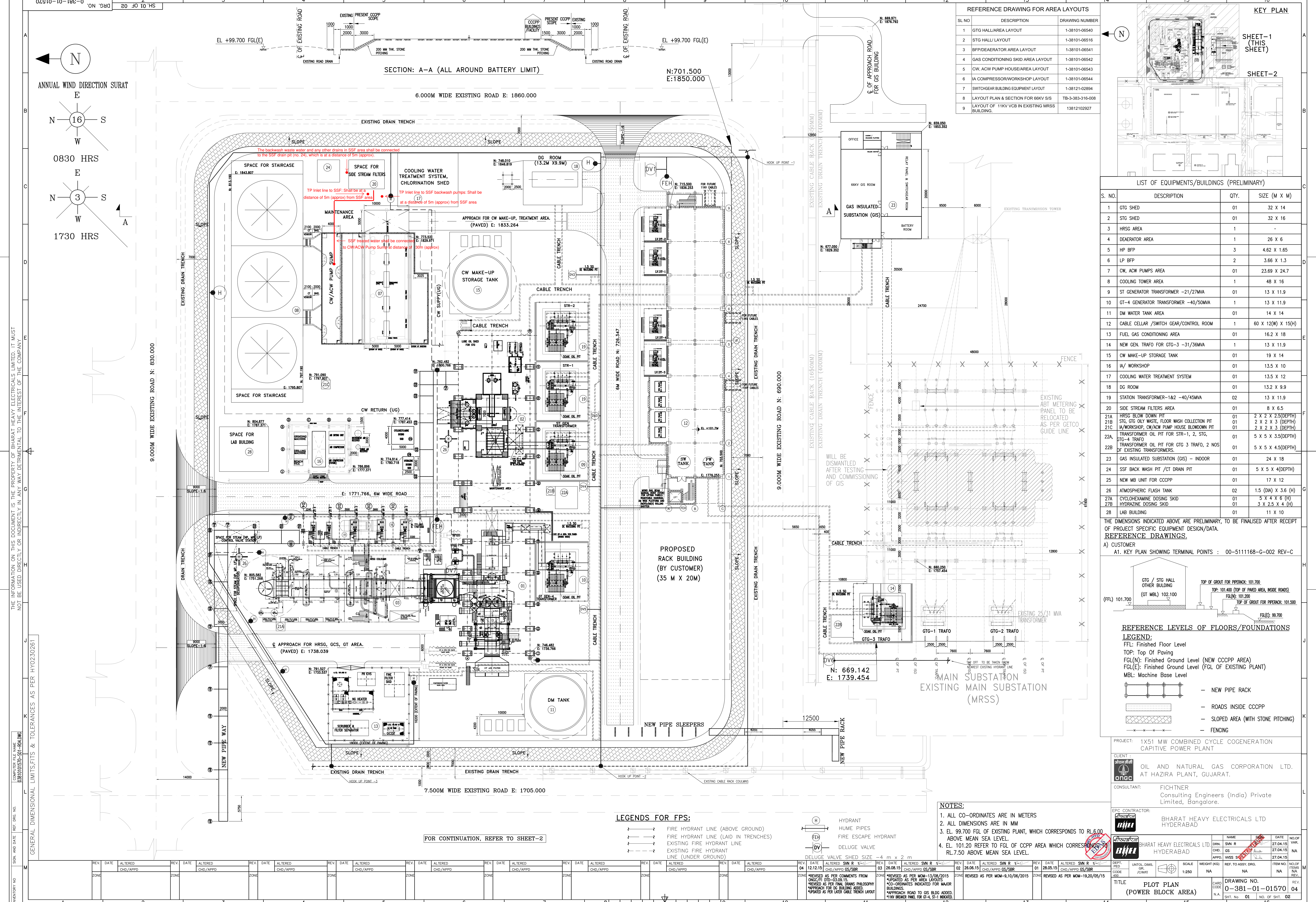
1.3.5	Type		Conical roof type, Vertical atmospheric steel tank. Tank shall have 3 layers of PP balls of 50 mm dia. Also it shall be provided with CO2 absorbers.
1.3.6	Accessories / instruments		As per control & instrumentation requirements.
1.4.0	pH Correction Dosing Station		
1.4.1	PH Correction Solution tank		
1.4.2	No. of tank	No.	One (1W)
1.4.3	Capacity of tank	Litres	To suit process requirement.
1.4.4	Material of construction		MSRL / FRP
1.4.5	pH Correction Dosing Pump		
1.4.6	No. of pumps	Nos.	2(1w + 1s)
1.4.7	Capacity of pump		To suit process requirement.
1.4.8	head of pump		To suit process requirement.
1.4.9	Type		Positive displacement
1.4.10	Material of construction		PP
1.4.11	Motorised Agitator for above tank		
1.4.12	Quantity		One
1.4.13	Material of construction		SS316
1.5.0	DM water transfer Pump for Hotwell make up / HRSG Initial fill pump		
1.5.1	Type		Centrifugal, horizontal.
1.5.2	Design standard		IS :1520 / IS: 5120
1.5.3	No. of pumps	Nos.	2(1w + 1s)
1.5.4	Medium handled		DM water
1.5.5	Design temperature		Ambient
1.5.6	Capacity of each pump		2 x 100% (for Hot well makeup) / 1 x 100 % (for HRSG Initial fill)
1.5.7	Head required		Suitable.
1.5.8	Material of construction		
	i. Casing / impeller / shaft		SS 316
	ii. Base plate		MS
1.5.9	Shaft sealing arrangement		Mechanical sealing
1.6.0	Acid measuring tank		
1.6.1	Design standard		BS 4994
1.6.2	Material of construction		FRP
1.6.3	No. of tanks		i) 1 no. 100% capacity for MB.
1.6.4	Fluid handled		32 % HCl diluted to required concentration

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1.6.5	Capacity		One regeneration requirement with 20% margin
1.6.6	Accessories / instruments		Refer control and instrumentation
1.7.0	Caustic dilution tank		
1.7.1	Design standard		IS 803
1.7.2	Material of construction		MSEP / FRP
1.7.3	Nos.		i) 1 no. 100% capacity for MB.
1.7.4	Fluid handled		48 % NaOH diluted to 10% solution
1.7.5	Capacity		One regeneration requirement with 20% margin
1.7.6	Accessories / instruments		Refer control and instrumentation
1.8.0	Agitators for caustic dilution tanks		
1.8.1	Quantity		1 no. per tank
1.8.2	Type		Turbine type
1.8.3	Material of construction		
1.8.4	Impeller / shaft		SS - 316
1.8.5	Mounting		Clamped / flanged
1.8.6	Impeller type		Propeller
1.8.7	Transmission		Direct coupled
1.9.0	Ejectors		
1.9.1	Nature of fluid		Acid/ Caustic
1.9.2	No. of ejectors		2 Nos.
1.9.3	Location		i) 1 no. at the outlet of AMT ii) 1 no. at the outlet of CDT
1.9.4	Injection fluid		HCl / NaOH
1.9.5	Material of construction		Ebonite lined CI
2.0.0	CW Makeup Water Storage Tank		
	Design standard		IS:803
	Quantity	No	1 – Filtered water
	Material of construction		MSEP
	Working capacity	m³	1000
	Free board	Mm	300
	Type		Conical roof type, Vertical atmospheric steel tank.
B	POTABLE WATER SYSTEM		
1.1.0	Potable water overhead tank		
1.1.1	No. of tank	No.	One (1)
1.1.2	Capacity of each tank	Litres	To suit drinking water requirement.
1.1.3	Material of construction		HDPE / FRP

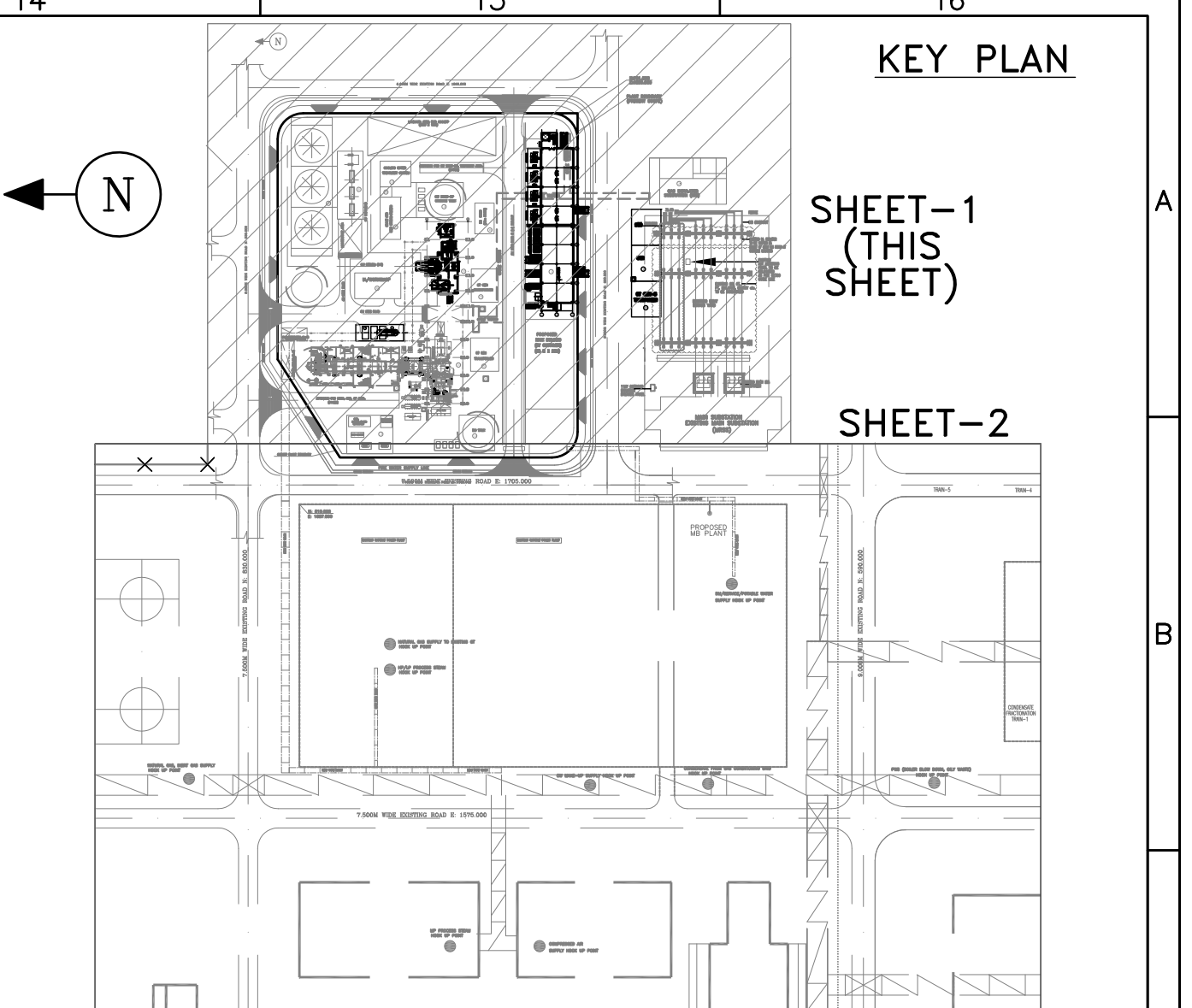
	Subject	Doc. No.	Rev.	Vol. / Sec.
	BID PACKAGE FOR COMBINED CYCLE CAPTIVE POWER PLANT AT HAZIRA PLANT, GUJARAT	5111168-ME-SPC-100-001	R1	III / 2.14
Sheet No.				
328				

C	SERVICE WATER SYSTEM		
1.1.0	Service water overhead tank		
1.1.1	No. of tank	No.	One (1)
1.1.2	Capacity of each tank	Litres	To suit process requirement.
1.1.3	Material of construction		HDPE / FRP
D	EFFLUENT DISPOSAL SYSTEM		
1.1.0	HRSRG Blow down pit		
1.1.1	No. of tank	No.	One (1)
1.1.2	Capacity	m ³	Suitable to store the HRSRG Blow down for 2 hrs
1.1.3	Location		Underground (u/g)
1.1.4	Material of construction		RCC
1.2.0	HRSRG Blow down transfer Pump		
1.2.1	No. of pumps	Nos.	2(1w + 1s)
1.2.2	Design capacity of pumps	m ³ /hr	As per System requirement
1.2.3	Head of the pumps	bar (g)	As per System requirement
1.2.4	Material of construction		
	i. Casing / impeller / shaft		SS : 316
	ii. Base plate		MSEP
1.2.5	Shaft sealing arrangement		Gland packing
1.2.6	Design temperature	Deg. C	80 to 90
1.3.0	SSF backwash water storage tank		
1.3.1	No. of tank	Nos.	One
1.3.2	Capacity	m ³	Suitable to store the SSF backwash for 20 minutes.
1.3.3	Location		Underground
1.3.4	Material of construction		RCC
1.4.0	SSF backwash water transfer pump		
1.4.1	No. of pumps	Nos.	2(1w + 1s)
1.4.2	Design capacity of pumps	m ³ /hr	As per System requirement
1.4.3	Head of the pumps	bar (g)	As per System requirement
1.4.4	Material of construction		
	i. Casing / impeller / shaft		SS : 316
	ii. Base plate		MSEP
1.4.5	Shaft sealing arrangement		Gland packing
1.4.6	Design temperature	Deg. C	Atmospheric



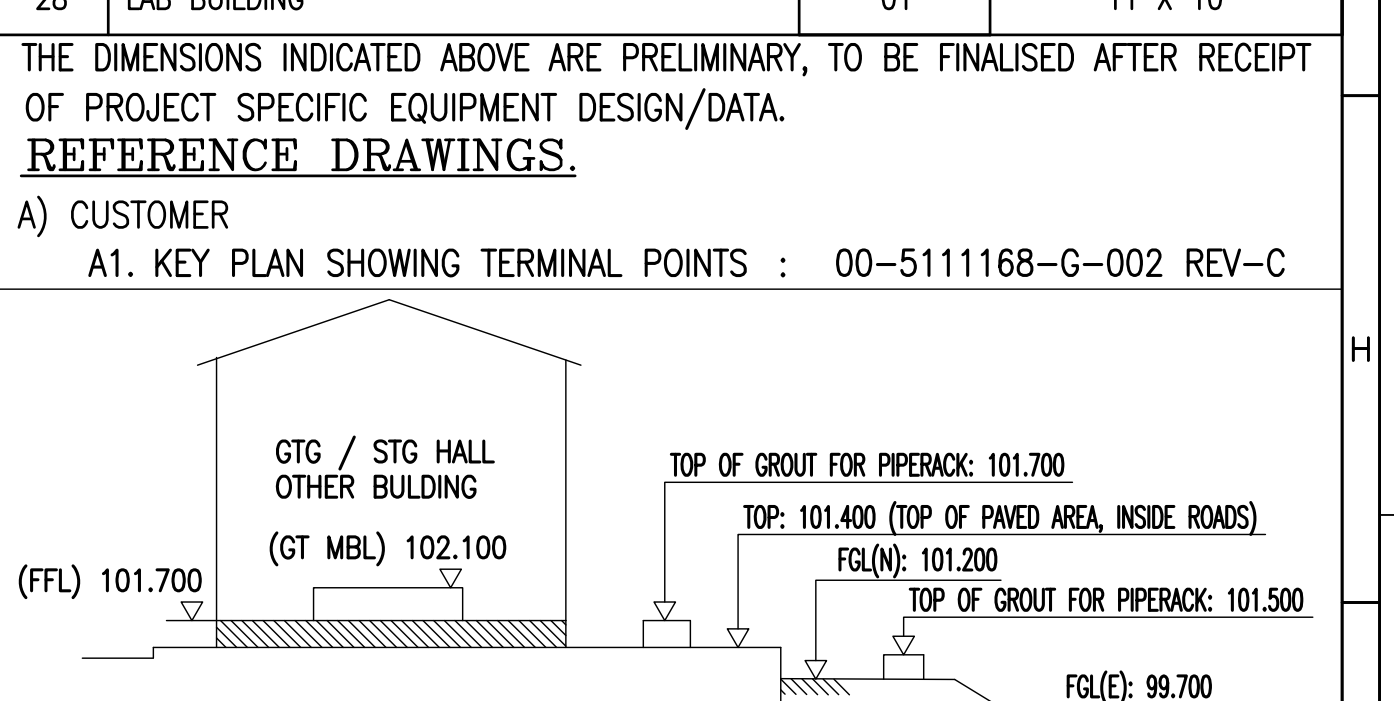
REFERENCE DRAWING FOR AREA LAYOUTS

SL NO	DESCRIPTION	DRAWING NUMBER
1	GTG HALL/AREA LAYOUT	1-38101-06540
2	STG HALL/LAYOUT	1-38101-06516
3	BFP/DEAERATOR AREA LAYOUT	1-38101-06541
4	GAS CONDITIONING SKID AREA LAYOUT	1-38101-06542
5	CW, ACW PUMP HOUSE/AREA LAYOUT	1-38101-06543
6	IA COMPRESSOR/WORKSHOP LAYOUT	1-38101-06544
7	SWITCHGEAR BUILDING EQUIPMENT LAYOUT	1-38121-02894
8	LAYOUT PLAN & SECTION FOR 66KV SIS	TB-3-383-316-008
9	LAYOUT OF 11KV VCB IN EXISTING MRSS BUILDING.	13812102927



LIST OF EQUIPMENTS/BUILDINGS (PRELIMINARY)

S. NO.	DESCRIPTION	QTY.	SIZE (M X M)
1	GTG SHED	01	32 X 14
2	STG SHED	01	32 X 16
3	HRSG AREA	1	-
4	DEAERATOR AREA	1	26 X 6
5	HP BFP	3	4.62 X 1.65
6	LP BFP	2	3.66 X 1.3
7	CW, ACW PUMPS AREA	01	23.69 X 24.7
8	COOLING TOWER AREA	1	48 X 16
9	ST GENERATOR TRANSFORMER -21/27MVA	01	13 X 11.9
10	GT-4 GENERATOR TRANSFORMER -40/50MVA	1	13 X 11.9
11	DM WATER TANK AREA	01	14 X 14
12	CABLE CELLAR /SWITCH GEAR/CONTROL ROOM	1	60 X 12(W) X 15(H)
13	FUEL GAS CONDITIONING AREA	01	16.2 X 18
14	NEW GEN. TRAF0 FOR GTG-3 -31/36MVA	1	13 X 11.9
15	CW MAKE-UP STORAGE TANK	01	19 X 14
16	IA/ WORKSHOP	01	13.5 X 10
17	COOLING WATER TREATMENT SYSTEM	01	13.5 X 12
18	DC ROOM	01	13.2 X 9.9
19	STATION TRANSFORMER-1&2 -40/45MVA	02	13 X 11.9
20	SIDE STREAM FILTERS AREA	01	8 X 6.5
21A	HRSG BLOW DOWN PIT	01	2 X 2 X 2.5(DEPTH)
21B	STG, GTG OILY WASTE FLOOR WASH COLLECTION PIT	01	2 X 2 X 3 (DEPTH)
21C	IA/WORKSHOP, CW/ACW PUMP HOUSE BLOWDOWN PIT	01	2 X 2 X 3 (DEPTH)
22A	TRANSFORMER OIL PIT FOR STR-1, 2, STG.	01	5 X 5 X 3.5(DEPTH)
22B	TRANSFORMER OIL PIT FOR GTG 3 TRAF0, 2 NOS OF EXISTING TRANSFORMERS.	01	5 X 5 X 4.5(DEPTH)
23	GAS INSULATED SUBSTATION (GIS) - INDOOR	01	24 X 18
24	SSF BACK WASH PIT /CT DRAIN PIT	01	5 X 5 X 4(DEPTH)
25	NEW MB UNIT FOR CCCC	01	17 X 12
26	ATMOSPHERIC FLASH TANK	02	1.5 (DIA) X 3.6 (H)
27A	CYCLOHEXAMINE DOSING SKID	01	5 X 4 X 6 (H)
27B	HYDRAZINE DOSING SKID	01	3 X 2.5 X 4 (H)
28	LAB BUILDING	01	11 X 10



REFERENCE LEVELS OF FLOORS/FOUNDATIONS

LEGEND:

- FFL: Finished Floor Level
- TOP: Top of Paving
- FGL(N): Finished Ground Level (NEW CCCPP AREA)
- FGL(E): Finished Ground Level (FGL OF EXISTING PLANT)
- MBL: Machine Base Level

PROJECT: 1X51 MW COMBINED CYCLE COGENERATION CAPTIVE POWER PLANT

CLIENT: ONGC

CONSULTANT: FICHTNER Consulting Engineers (India) Private Limited, Bangalore.

EPC CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD HYDERABAD

REV.	DATE	ALTERED	BY	REASON
01	12.12.15	CHD/APPD	GS/SBR	ISSUED AS PER COMMENTS FROM ONGC/FI DTD-03.09.15.
02	26.08.15	CHD/APPD	GS/SBR	ISSUED AS PER MOW-11/08/2015 *CO-ORDINATES INDICATED FOR MAJOR BUILDINGS.
03	26.08.15	CHD/APPD	GS/SBR	*APPROACH ROAD TO GIS BLDG ADDED.
04	19.06.15	CHD/APPD	GS/SBR	*11KV BREAKER PANEL FOR GT-4, 5-1 MODIFIED.

DRAWING NO. 0-381-01-01570-04

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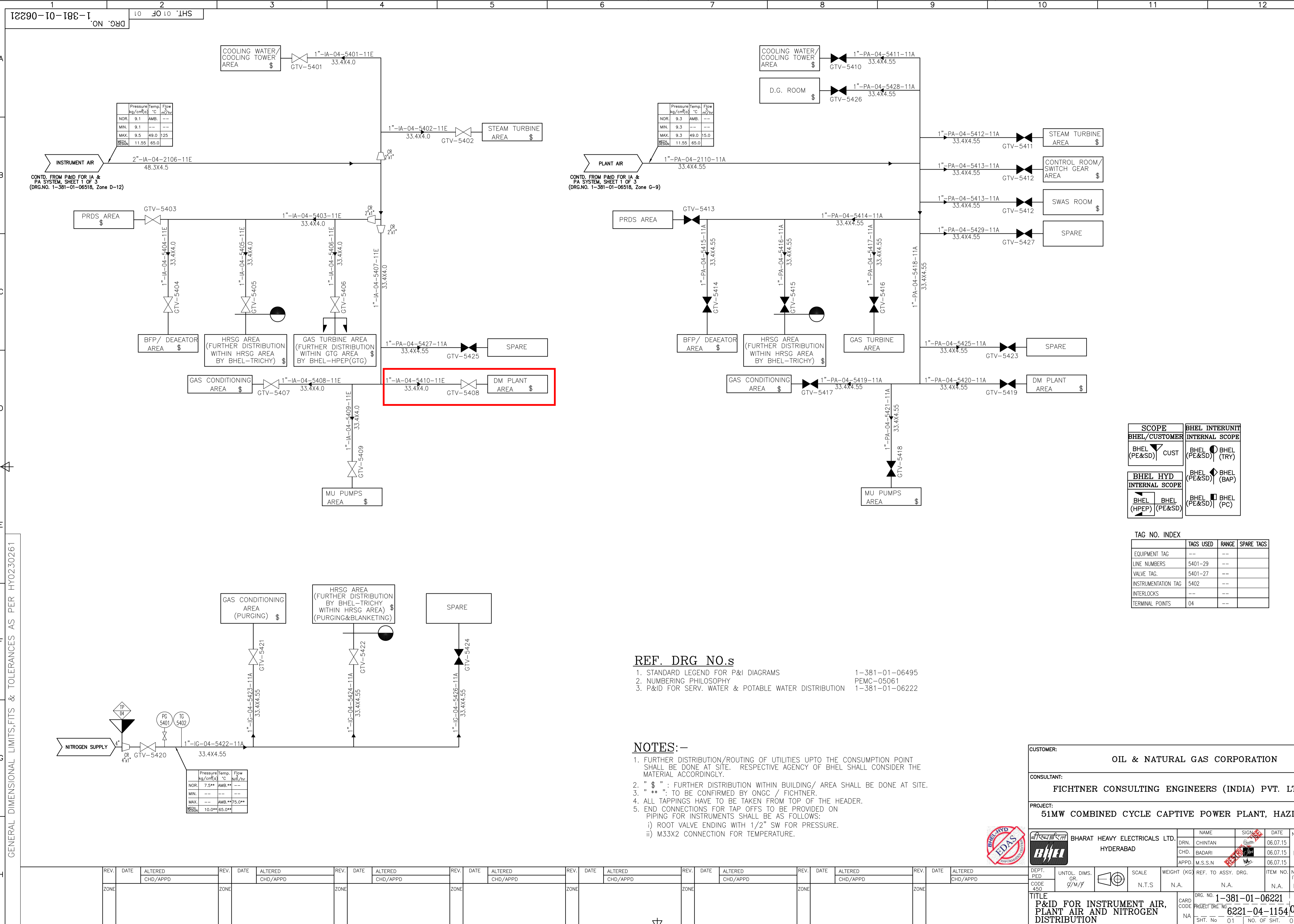
GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

SIGN. AND DATE: REF. Dwg. NO. 0310101570-001-00A.DWG

LEGENDS FOR FPS:



FOR CONTINUATION, REFER TO SHEET-2



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GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME: 13810106221-500-ROD.DWG

Pressure	Temp	Flow
NOR.	9.1	AMB.
MIN.	9.1	---
MAX.	9.5	49.0
DESIGN	11.55	65.0

Pressure	Temp	Flow
NOR.	9.3	AMB.
MIN.	9.3	---
MAX.	9.3	49.0
DESIGN	11.55	65.0

Pressure	Temp	Flow
NOR.	7.5**	AMB.**
MIN.	---	---
MAX.	---	AMB.**75.0**
DESIGN	10.0**	65.0**

SCOPE BHEL/CUSTOMER	BHEL INTERUNIT INTERNAL SCOPE
BHEL (PE&SD) CUST	BHEL (PE&SD) BHEL (TRY)
BHEL (PE&SD) BHEL (TRY)	BHEL (PE&SD) BHEL (BAP)
BHEL HYD INTERNAL SCOPE	BHEL (PE&SD) BHEL (PC)
BHEL (HPEP) BHEL (PE&SD)	BHEL (PE&SD) BHEL (PC)

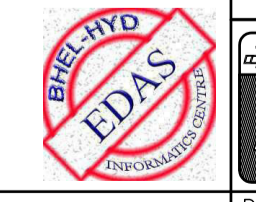
TAG NO. INDEX	TAGS USED	RANGE	SPARE TAGS
EQUIPMENT TAG	--	--	--
LINE NUMBERS	5401-29	--	--
VALVE TAG.	5401-27	--	--
INSTRUMENTATION TAG	5402	--	--
INTERLOCKS	--	--	--
TERMINAL POINTS	04	--	--

REF. DRG NO.s

- STANDARD LEGEND FOR P&I DIAGRAMS 1-381-01-06495
- NUMBERING PHILOSOPHY PEMC-05061
- P&ID FOR SERV. WATER & POTABLE WATER DISTRIBUTION 1-381-01-06222

NOTES:-

- FURTHER DISTRIBUTION/ROUTING OF UTILITIES UP TO THE CONSUMPTION POINT SHALL BE DONE AT SITE. RESPECTIVE AGENCY OF BHEL SHALL CONSIDER THE MATERIAL ACCORDINGLY.
- "\$": FURTHER DISTRIBUTION WITHIN BUILDING/ AREA SHALL BE DONE AT SITE.
- "**": TO BE CONFIRMED BY ONGC / FICHTNER.
- ALL TAPPINGS HAVE TO BE TAKEN FROM TOP OF THE HEADER.
- END CONNECTIONS FOR TAP OFFS TO BE PROVIDED ON PIPING FOR INSTRUMENTS SHALL BE AS FOLLOWS:
 - ROOT VALVE ENDING WITH 1/2" SW FOR PRESSURE.
 - M33X2 CONNECTION FOR TEMPERATURE.



CUSTOMER: OIL & NATURAL GAS CORPORATION			
CONSULTANT: FICHTNER CONSULTING ENGINEERS (INDIA) PVT. LTD.			
PROJECT: 51MW COMBINED CYCLE CAPTIVE POWER PLANT, HAZIRA			
BHARAT HEAVY ELECTRICALS LTD. HYDERABAD		NAME: CHINTAN SIGN: [Signature] DATE: 06.07.15	NO. OF VAR.: 06.07.15
DEPT. PED: 450 UNTO. DIMS. GR. 9/M/f		SCALE: N.T.S. WEIGHT (KG): N.A.	REF. TO ASSY. DRG.: N.A. ITEM NO.: N.A.
TITLE P&ID FOR INSTRUMENT AIR, PLANT AIR AND NITROGEN DISTRIBUTION		DRG. NO.: 1-381-01-06221 PROJECT DRG. NO.: 6221-04-115400A	REV.: 01 NO. OF SHT.: 01