



**C&I SPECIFICATION FOR
GYPSUM DEWATERING SYSTEM**

SECTION: C4
SUB SECTION: C&I

**INSTRUMENTATION CABLE
INTERCONNECTION AND TERMINATION
PHILOSOPHY**

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CLAUSE NO.	TECHNICAL REQUIREMENTS				
5.00.00	INSTRUMENTATION CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY				
	The cable interconnection philosophy to be adopted shall be such that extensive grouping of signals by large scale use of field mounted Group Junction Boxes (JBs) at strategic locations (where large concentration of signals are available, e.g. valves limit & torque switches, switchgear) is done and consequently cable with higher number of pairs are extensively used. The details of termination to be followed are mentioned in the given Table A.				
	TABLE A: CABLE TERMINATION TO BE FOLLOWED				
	Application		Type Of Termination		Type Of Cable
	FROM (A)	TO (B)	END A	END B	
	Valves/dampers drives (Integral Junction box)	Marshalling / Marshalling – cum Termination Cubicle / local group JB	Plug in connector	Post mount cage clamp type.	G
	Transmitters, Process Actuated switches mounted in LIE/LIR	Integral Junction box of LIE/LIR	Plug in connector	Cage clamp (Rail mount) type.	F,G
	RTD heads	Local junction box	Plug in connector	Cage clamp (Rail mount) type.	F
	Thermocouple	Local junction box / CJC box (if applicable)	Plug in connector	Cage clamp (Rail mount) type.	A, B, C*
	Other Field mounted Instrument	Local JB / Group JB	Plug in connector	Cage clamp (Rail mount) type.	F,G
RTD	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	F	
Thermocouple	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	A, B, C*	
Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ MCC/SWGR	Group JB	Cage clamp (Rail mount) type.	Cage clamp (Rail mount) type.	F,G	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-07 INSTRUMENTATION CABLES	PAGE 7 OF 13

CLAUSE NO.	TECHNICAL REQUIREMENTS 				
	Application		Type Of Termination		Type Of Cable
	FROM (A)	TO (B)	END A	END B	
	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ Group JB / MCC/SWGR	Marshalling / Marshalling – cum Termination Cubicle	Cage clamp (Rail mount) type.	Cage clamp (Post mounted) type.	F,G
	Marshalling cubicle/ Termination Cabinet	Electronic system cabinet	Cage clamp (Post mounted) type.	Plug-in connector / other system as per Mfr.'s Standard	Internal wiring
	Marshalling/ Termination System Cabinets	UCD mounted equipments	Cage clamp (Post mounted) type.	Plug in connector / Cage clamp type (rail mounted).	F,G (with plug-in connect or at one end)
	DDCMIS/PLC cabinets	PC, Printers etc.	Plug in connector	Plug in connector	Mfr.'s Standard
	Notes - Normally 10% spare cores shall be provided when the numbers of pairs of cables are more than four pairs, except for pre-fabricated cables which shall be as per manufacturer's standard. - For analog signals, individual pair shielding & overall shielding & for Binary signals, only overall shielding of instrumentation cables shall be provided. * For high temperature applications only. - For connection between field/JB and DDCMIS marshalling cabinet minimum 4 pair instrumentation cable shall be used. - All the spare cores of instrumentation cable have to be terminated in Marshalling cabinets/ DCS panel end. - For Cable type and cable termination scheme for the instruments/ equipment that are connected to Steam Turbine and Generator (STG) control system defined at Part A, sub section IIC, clause no. 2.03.01 (a) (ii) above and hydrogen generation plant auxiliaries system, Contractor's standard and proven practice is also acceptable. However, for termination of instrumentation cable at marshalling cabinets/DCS panel end, cage-clamp termination shall be offered. For power and control cable termination, Contractor's standard and proven practice would be acceptable				
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
6.00.00	TERMINAL BLOCKS		
6.01.00	All terminal blocks shall be rail mounted/post mounted, cage clamp type with high quality non-flammable insulating material of melamine suitable for working temperature of 105 deg. C. The terminal blocks in field mounted junction boxes, temperature transmitters, instrument enclosures/racks, etc., shall be suitable for cage clamp connections. The terminal blocks in Control Equipment Room logic/termination/marshalling cubicles shall be suitable for post mounted cage clamp connection at the field input end. The exact type of terminal blocks to be provided by the Bidder and the technical details of the same including width etc. shall be subject to Employer's approval.		
6.02.00	All the terminal blocks shall be provided complete with all required accessories including assembly rail, locking pin and section, end brackets, partitions, small partitions, transparent covers, support brackets, distance sleeves, warning label, marking, etc.		
6.03.00	The marking on terminal strips shall correspond to the terminal numbering on wiring diagrams. At least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures, termination/marshalling cabinets, etc. All terminal blocks shall be numbered for identification and grouped according to the function. Engraved labels shall be provided on the terminal blocks.		
6.04.00	For terminating each process actuated switches, drive actuators, control valves, Thermocouple, RTD, etc. in Local Junction Boxes, etc, refer Drg no. 0000-999-POI-A-065.		
6.05.00	The terminal blocks shall be arranged with at least 100 mm clearance between two sets of terminal blocks and between terminal blocks and junction box walls.		
7.00.00	INTERNAL PANELS/ SYSTEM CABINETS WIRING		
7.01.00	Internal panel/cabinet wiring shall be of multi-stranded copper conductor with FRLS PVC insulation without shield and outer sheath meeting the requirements of VDE 0815.		
7.02.00	All internal wires shall be provided with tag and identification nos. etched on tightly fitted ferules at both ends. All wires directly connected to trip devices shall be distinguished by one additional red colour ferrule.		
7.03.00	All external connection shall be made with one wire per termination point. Wires shall not be tapped or spliced between terminal points.		
7.04.00	All floor slots of desk/panels/cabinets used for cable entrance shall be provided with removable gasketed gland plates and sealing material. Split type grommets shall be used for prefabricated cables.		
7.05.00	All the special tools as may be required for solder less connections shall be provided by Bidder.		
7.06.00	Wire sizes to be utilised for internal wiring.		
	(i)	Current (4-20 mA), low voltage signals (48V); Ammeter/Voltmeter circuit, control switches etc. for electrical system.	0.5 Sq.mm.
	(ii)	Power supply and internal illumination.	2.5Sq.mm. minimum (shall be as per load requirement.)
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CLAUSE NO.	TECHNICAL REQUIREMENTS											
8.00.00	INSTRUMENTATION CABLE INSTALLATION AND ROUTING											
8.01.00	All cables assigned to a particular duct/conduit shall be grouped and pulled in simultaneously using cable grips and suitable lubricants. Cables removed from one duct/conduit shall not be reused without approval of Employer.											
8.02.00	Cables shall be segregated as per IEEE Std.-422. In vertically stacked trays, the higher voltage cable shall be in higher position and instrumentation cable shall be in bottom tier of the tray stack. The distance between instrumentation cables and those of other system shall be as follows: <table><tr><td>From 11 kV/6.6 kV/3.3 kV tray system</td><td>-</td><td>914 mm</td></tr><tr><td>From 415V tray system</td><td>-</td><td>610 mm</td></tr><tr><td>From control cable tray system</td><td>-</td><td>305 mm</td></tr></table>			From 11 kV/6.6 kV/3.3 kV tray system	-	914 mm	From 415V tray system	-	610 mm	From control cable tray system	-	305 mm
From 11 kV/6.6 kV/3.3 kV tray system	-	914 mm										
From 415V tray system	-	610 mm										
From control cable tray system	-	305 mm										
8.03.00	Cables shall terminate in the enclosure through cable glands. All cable glands shall be properly gasketed. Sealing (to prevent ingress of dust entry and propagation of fire) shall be provided for all floor slots used for cable entrance. Compression cable glands (double for armoured and single for other cables) shall be provided.											
8.04.00	Not in use											
8.05.00	The cables emanating from redundant equipment/devices shall be routed through different paths. The above segregation of cables & wiring for redundant equipments/devices shall be in accordance with IEEE-Std-422.											
9.00.00	CABLE LAYING AND ACCESSORIES											
9.01.00	CABLE LAYING											
	1	Cables shall be laid strictly in line with cable schedule.										
	2	Identification tags for cables.										
		Indelible tags to be provided at all terminations, on both sides of wall or floor crossing, on each conduit/duct/pipe entry/exit, and at every 20 m in cable trench/tray.										
	3	Cable tray numbering and marking.										
		To be provided at every 10m and at each end of cable way & branch connection.										
	4	No jointing is permissible for Instrumentation cables. For other cables Jointing for more than 250 Meters run of cable shall be permitted.										
	5	Buried cable protection										
		With concrete slabs; Route markers at every 20 Meters along the route & at every bend.										
	6	Road Crossings										
		Cables to pass through buried high density PE pipes encased in PCC. At least 300										
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CLAUSE NO.	TECHNICAL REQUIREMENTS 			
	mm clearance shall be provided between - HT power & LT power cables, - LT power & LT control/instrumentation cables, Spacing between cables of same voltage grade shall be in accordance with the derating criteria adopted for cable sizing. 7 Segregation (physical isolation to prevent fire jumping) - a All cable associated with the unit shall be segregated from cables of other Units. - b Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire. 8 Cable clamping All cables laid on trays shall be neatly dressed up & suitably clamped/tied to the tray. For cables in trefoil formation, trefoil clamps shall be provided. 9 Optical fiber cables (OFCs) : Outside Building Area - to be laid necessarily inside GI conduit with support from cable tray/Trestle structure Inside Building Area – to be laid on separate cable sub-trays While buried- in separate buried trench approx.1.0 meter depth, to be laid in 2” rodent proof HDPE conduits covered with sand, brick, laid breadth-wise and soil along the pipe line route by contractor; While crossing roads - to be laid in GI/ rodent proof HDPE conduits with sand filling at bottom and sand, soil filling at top with cement concrete; While crossing canals/river- to be laid in rodent proof HDPE conduits within hume pipe. 10 Laying of Network Cable (UTP/STP) : Out side Building Area- to be laid necessarily inside GI conduits with support from cable tray / Trestle structure. Inside Building Area- to be laid necessarily inside GI conduits on separate cable sub-trays. 9.02.00 Bidder shall supply and install all cable accessories and fittings like Light Interface Units, Surge suppressors, Opto isolators, Interface Converters, Fibre Optic Card Cage, Fibre Optic Line Driver, Repeater / Modem (for Optical Fibre Cables), cable glands, grommets, lugs, termination kits etc. on as required basis. 9.03.00 Cables, which terminate in cabinets of draw out sections shall have sufficient cable coiled in the bottom of the cabinet to permit full withdrawal of draw out sections without disconnecting the cables. When prefabricated cables with factory connectors on both ends are longer than required, the excess cable shall be coiled in the bottom of one or both termination cabinets.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
9.04.00	The Bidder shall be responsible for proper grounding of all equipment under this package. Further, proper termination of cable shields shall be verified and the grounding of the same shall be coordinated so as to achieve grounding of all instrumentation cable shields at same potential. This shall be completed prior to system tests.			
9.05.00	The Contractor shall take full care while laying / installing cables as recommended by cable manufacturers regarding pulling tensions and cable bends. Cables damaged in any way during installation shall be replaced at the expense of the Contractor.			
10.00.00	FIELD MOUNTED LOCAL JUNCTION BOXES			
	(i)	No. of ways	12/24/36/48/64/72/96/128 with 20% spares terminals.	
	(ii)	Material and Thickness	4mm thick Fiberglass Reinforced Polyester (FRP).	
	(iii)	Type	Screwed at all four corners for door. Door gasket shall be of synthetic rubber.	
	(iv)	Mounting clamps and accessories	Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands required for erection shall be of SS, included in Bidders scope of supply.	
	(v)	Type of terminal blocks	Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm ² . A M6 earthing stud shall be provided.	
	(vi)	Protection Class	IP: 55 minimum for indoor & IP-65 minimum for outdoor applications.	
	(vii)	Grounding	To be provided.	
	(viii)	Color	RAL 7035	
11.00.00	CONDUITS			
11.01.00	Conduits shall be generally used for interconnecting cables from field instruments to Local JB's. All rigid conduits, couplings and elbows shall be hot dipped galvanised rigid mild steel in accordance with IS: 9537 Part-I (1980) and Part-II (1981). The conduit interior and exterior surfaces shall have continuous zinc coating with an overcoat of transparent enamel lacker or zinc chromate. Flexible conduit shall be heat resistant lead coated galvanized steel with , water leak, fire and rust proof protected <i>for the areas of Mills,Drum, Main Steam, RH steam Air Heaters and Furnace, BFPDT's</i> . <i>And for remaining applications, water leak, fire and rust proof flexible GI conduits shall be provided. The temperature rating of flexible conduit shall be suitable for actual application.</i>			
11.02.00	All rigid conduit fittings shall conform to the requirements of IS: 2667, 1976. Galvanized steel fitting shall be used with steel conduit. All flexible conduit fittings shall be liquid tight, galvanized steel. The end fittings shall be compatible with the flexible conduit supplied.			
11.03.00	Conduit sealing, explosion proof, dust proof and other types of special fittings shall be provided as required by these specifications and shall be consistent with the area and equipment with which they are installed. Fittings installed outdoors and in damp locations shall be sealed and gasketed. Hazardous area fittings and conduits sealing shall conform			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	with NEC requirements for the area classification.			
11.04.00	Contractor shall provide double locknuts on all conduit terminations not provided with threaded hubs and couplings. Water tight conduit unions and rain tight conduit hubs shall be utilised for all the application which shall be exposed to weather. Moisture pockets shall be eliminated from conduits.			
11.05.00	Conduits shall be securely fastened to all boxes and cabinets.			
12.00.00	CABLE SUB-TRAY & SUPPORT			
12.01.00	The cable sub-trays and the supporting system, to be generally used between Local/Group JB's and the main cable trays and the same shall be furnished and installed by the Contractor. It is the assembly of sections and associated fittings forming a rigid structural system used to support the cable from the equipment or instrument enclosure upto the main cable trays (trunk route).			
12.02.00	The covers on the cable sub-trays shall be used for protection of cables in areas where damage may occur from falling objects, welding spark, corrosive environment, etc. & shall be electrically continuous and solidly grounded.			
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**C&I SPECIFICATION FOR
GYPSUM DEWATERING SYSTEM**

SECTION: C4
SUB SECTION: C&I

QUALITY ASSURANCE-INSTRUMENTS

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CLAUSE NO.	QUALITY ASSURANCE									
	MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)									
	TESTS ITEMS									
		Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (if applicable)(R)	Hydro Test(R)	Material Test certificate ®
		1. PR Gauge (IS-3624)	Y	Y	Y	Y				
		2. Temp. Gauge (BS-5235)	Y	Y	Y	Y				
		3. Pr./D.P.Switch(BS-6134)	Y	Y	Y	Y	Y			
		4. Electronic Transmitter(IEC-770)	Y	Y	Y	Y	Y			
		5. Temp. Switch	Y	Y	Y	Y	Y			
		6. Recorder(IS-9319/ANSI C-39.4)	Y	Y	Y	Y	Y			
		7. Vertical indicators	Y	Y	Y	Y	Y			
		8. Digital Indicators	Y	Y	Y	Y	Y			
		9. Integrators	Y	Y	Y	Y				
		10. Electrical Metering Instrument (IS-1248)	Y	Y	Y	Y	Y			
		11. Transducer (IEC-688)	Y	Y	Y	Y	Y			
		12. Thermocouples (ANSI-MC-96.1)	Y	Y	Y	Y	Y			
		13. RTD(IEC-751)	Y	Y	Y	Y	Y			
		14. Thermowell	Y		Y			Y	Y	Y
		R-Routine Test A- Acceptance Test Y – Test applicable								
		:								
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CLAUSE NO.		QUALITY ASSURANCE													
	ITEMS	TESTS													
		Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Requirement as per standard (R)	WPS approval (A)	Non-destructive testing (R)	Calculation for accuracy (R)	Insulation Resistance (R)	IBR Certification as applicable (R)	Hydro test (R)	Material test certificate (A)		
	15. Cold junction compensation box	Y	Y	Y	Y					Y					
	16. Orifice plate(BS-1042)	Y	Y	Y	Y *	Y	Y **	Y **			Y	Y **	Y		
	17. Flow nozzle(BS-1042)	Y	Y	Y	Y *	Y	Y	Y			Y	Y	Y		
	18. Impact head type element	Y	Y	Y					Y				Y		
	19. Level transmitter/float type switch	Y	Y	Y	Y					Y	Y	Y	Y		
	20. Flue Gas analyser	Y	Y	Y	Y										
	21. Dust emission monitors	Y	Y	Y	Y										
	*Calibration to be carried out on one flow element of each type and size if calibration carried out as type test same shall not be repeated.														
	** If applicable														
	R-Routine Test A- Acceptance Test Y – Test applicable														
	Note: 1) Detailed procedure of Environmental Stress screening test shall be as per Quality Assurance. Programme in General Technical Conditions 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.														
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.:CS-9585-001-2				SUB-SECTION-E-61A MEASURING INSTRUMENTS (PRIMARY & SECONDARY)				Page 2 of 2					

CLAUSE NO.	QUALITY ASSURANCE												एनटीपीसी NTPC	
ELECTRICAL ACTUATOR WITH INTEGRAL STARTER														
ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING	Test/Attributes Characteristics													
		RPM ®	No Load Current ®	IR & HV Test®	Mounting Dimension®	All routine Test as per Standard & Specification®	Correct Phase Sequence®	Operation & Setting of limit Switch/Torque Switch®	Stall Torque/Current (A)	Hand Wheel operation/ Auto de clutch function (A)	Function of Aux. like Potentiometer, space heater, position indicator ®	EPT output ®	Grease leakage ®	Local/ Remote (Open-Stop-Close) Operation® Safety check (Single phasing, Phase correction, Tripping etc.) (A)
	ELECTRICAL ACTUATOR WITH INTEGRAL STARTER(IS_9334)													
	Motor	Y	Y	Y	Y	Y								
	Final Testing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions. Requirement of test and procedure finalized during QP finalization 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the practices and procedure adopted along with relevant supporting documents.														
® - Routine Test (A) - Acceptance Test Y - Test applicable														
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.:CS-9585-001-2				SUB-SECTION-E-68 ELECTRICAL ACTUATOR WITH INTEGRAL STARTER				Page 1 of 1				



STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR SOLENOID VALVES

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	TYPE						
	MAKE						
	MODEL No.						
2	MATERIAL (BODY. PLUNGER/TRIM)			P	W	V	
3	PORT SIZE			P	W	V	
4	CABLE CONNECTION SIZE			P	W	V	
5	ENCLOSURE CLASS			P	W	V	TYPE TEST CERTIFICATE TO BE FURNISHED BY VENDOR
6	No. OF COILS & INSULATION CLASS			P	W	V	TEST CERTIFICATE TO BE FURNISHED FOR INSULATION CLASS BY VENDOR
7	POWER SUPPLY CHECK			P	W	V	
8	IR / HV TEST			P	W	V	
9	FUCTIONAL TEST			P	W	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL,
P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Contractor to provide compliance certificate for tests/checks verifid by contractor and submit the same alongwith test certificates to be verified by BHEL.

		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: PE-QP-999-145-I 006 VOLUME IIB SECTION C ISSUE NO. 2 REV. NO. 00 DATE: 25.05.2016 SHEET 1 OF 6			
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks			
									P	W	V				
1.0	INCOMING MATERIAL														
1.1	Body & Bonnet casting / forgings, plug, valve stem, seat ring/cage.	1. Physical, Chemical properties	MA	Physical, Chemical tests	One/Heat(HT Batch)	Approved drg. / data sheet /	Approved drg. / data sheet /	Test Certificate	3	---	2,1	TC for body/bonnet from foundry only			
		2. Heat Treatment	MA	Review of H.T. Chart	Each H.T.	Approved drg. / data sheet /	Approved drg. / data sheet /	Test Certificate	3/2	2	1	1.IBR Certification (if applicable) to be verified by BHEL. 2.Applicable for body /bonnet only			
		3. Internal quality of castings	MA	RT for Body & UT for Bonnet	100%	ASME B 16.34	ASME B 16.34	Test Report / FILM	3/2	2	1	Applicable for body and bonnet for rating ANSI 900 and above.			
		4. Surface Quality	MA	1. Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2				
				2. MT/PT	100%	ASME B 16.34	ASME B 16.34	Test Certificate	3	2	1	After Machining on machined surface only			
		5. Pressure test for shell	MA	Hyd. Test	100%	ISA-S-75.19/ ASME B 16.34	ISA-S-75.19/ ASME B 16.34	Test Certificate	2	2	1	For Body & Bonnet after machining.			
1.2	Diaphragm	1. Surface Quality	MA	Visual	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2				

LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics	RT- Radiographic Test UT - Ultrasonic Test	PT - Dye penetrant Test MT- Magnetic Test	\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.	1 - BHEL 2 - Vendor 3 - Sub-vendor
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 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: PE-QP-999-145-I 006				
												VOLUME IIB				
												SECTION C				
												ISSUE NO. 2 REV. NO. 00 DATE: 25.05.2016				
												SHEET 2 OF 6				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks				
									P	W	V					
1.3	Spring	2. Hardness	MA	Measurement	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2					
		3. Endurance / Life cycle	MA	Cyclic test 10,000 cycles	One / Type	10,000 cycles/ Mfr. standard.	No damage	Test Certificate	3/2	---	2,1					
		1. Composition	MA	Chemical-Analysis	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2					
		2. Mech. Properties	MA	Mech. Test	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2					
		3. Performance	MA	1. Stiffness ratio 2. Scragging 3. Cyclic test (Endurance) 4. Dimension (Measurement)	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2					
1.4	Electrical items [Limit switches, Solenoids, Position Transmitter(if provided externally)]	1. Routine Test	MA	HV, IR, Continuity function	100%	Relevant Standards	Relevant Standards	Test Certificate	3	---	2					
		2. Degree of protection	MA	IP/NEMA Tests	One sample / type	Approved Data sheet	Approved Data sheet	Test Certificate	3	---	2,1					
								Record	3	---	2					
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics																
\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.																
1 - BHEL 2 - Vendor 3 - Sub-vendor																

LEGEND: * CR - Critical characteristics
 MA - Major characteristics
 MI - Minor characteristics

\$ P - Agency Performing the Test.
 W - Agency Witnessing the Test.
 V - Agency Verifying the Test.

1 - BHEL
 2 - Vendor
 3 - Sub-vendor

 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: PE-QP-999-145-I 006 VOLUME IIB SECTION C ISSUE NO. 2 REV. NO. 00 DATE: 25.05.2016 SHEET 3 OF 6			
		Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks	
											P	W	V		
1.5	Pressure Gauges	1. Performance	MA	Review of calibration certificates	100%	Mfr. Standard	Mfr. Standard	Test Certificate	3	---	2				
		2. Marking	MA	Visual	100%	Mfr. standard	Mfr. standard	Records	3	---	2				
2.0	IN PROCESS INSPECTION														
2.1	After machining, i, Body ii Bonnet iii Plug iv Valve Stem v seat ring/cage	1. Surface flaws	MA	Visual & MT/PT	100% (on accessible surfaces)	ASME B 16.34	ASME B 16.34	Test Records	2	---	1		Butt weld ends shall be included.		
2. Dimensional checks		MA	Measurement	100%	Mfr. Standard	Mfr. Standard	Records	2	---	1					
3. Hard facing (wherever applicable)		MA	Hardness Measurement	One sample/Lot	Mfr. Standard	Mfr. Standard	Records	2	---	1					
3.0	TESTS ON COMPLETED VALVE														
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1	1		Refer Note-4		
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19/ ASME B16.34	No Leakage	Test Certificate	2	1	1		Refer Note-4		
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2	1	1		Refer Note-4		
4.0	OPERATION TEST ON COMPLETED VALVE (Final inspection)	1. Valve Travel	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1		Refer Note-4		
		2. Opening/Closing time	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1		Refer Note-4		
		3. Linearity/cam characteristic	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1		Refer Note-4		
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics \$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test. 1 - BHEL 2 - Vendor 3 - Sub-vendor															

BHEL भारत भारती PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)											QUALITY PLAN NO.: PE-QP-999-145-I 006															
													VOLUME IIB															
													SECTION C															
													ISSUE NO. 2 REV. NO. 00 DATE: 25.05.2016															
													SHEET 4 OF 6															
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks																
									P	W	V																	
4.	Repeatability		MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4																
5.	Hysteresis		MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4																
6.	Sensitivity		MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4																
7.	Accuracy (Overall)		MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4																
8.	Control Valve characteristics / CV Test		MA	♦Measurement (Press. vs. discharge and discharge vs. opening 0-100% in steps of 10%)	One per type	Mfr. Procedure	Approved drg. / data sheet	Test Certificate	2	--	1	♦ Size = Body & port size Or Body size & CV for non std port. Refer Note 1.																
9.	Operation of limit switch & solenoids and other accessories		MA	Function	100%	Mfr. Procedure	Approved drg./ data sheet	Test Report	2	1	1	On assembled valve Refer Note-4																
10.	Overall dimensions		MI	Visual and dimensional	100%	Approved drg. / data sheet	Approved drg./ data sheet	Records	2	1	1	Refer Note-4																
11.	Pre defined valve position in case of air failure		MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	1	1																	
12.	Cleanliness, painting, stamping (for direction of flow), Tag No.		MA	Visual and dimensional, paint thickness	100%	Mfr. Procedure	Approved drg./ data sheet	Test Certificate	2	1	1																	
13.	Surface Quality		MA	Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2,1																	
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics													\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.													1 - BHEL 2 - Vendor 3 - Sub-vendor		

LEGEND: * CR - Critical characteristics
 MA - Major characteristics
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 1 - BHEL
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 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: PE-QP-999-145-I 006						
												VOLUME IIB						
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Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks						
									P	W	V							

5.0 AUXILIARY ITEMS (Performance test of auxiliary items shall be performed on the completely assembled valve)												
5.1	Positioner	Overall leakage after assembly including Nozzles leakage	MA	Leak Test (in the steady state input signal)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	Certificate of Conformance (C.O.C)
5.2	Air filter regulator	1. Normal air consumption	MA	Measurement	Each type	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)
5.4	Electronic position transmitter(not applicable if provided integral to smart positioner)	1. Accuracy	MA	Operation	100%	Approved data sheet /	Approved data sheet /	Test Certificate	2	1	---	(C.O.C)
5.5	Current to Pneumatic converter(not applicable for smart positioner)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	---	(C.O.C)
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	---	(C.O.C)
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
		4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
5.6	Smart Positioner	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	---	(C.O.C)

LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics				RT- Radiographic Test UT - Ultrasonic Test	PT - Dye penetrant Test MT- Magnetic Test	\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.	1 - BHEL 2 - Vendor 3 - Sub-vendor
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 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: PE-QP-999-145-I 006				
												VOLUME IIB				
												SECTION C				
												ISSUE NO. 2 REV. NO. 00 DATE: 25.05.2016				
												SHEET 6 OF 6				
Sl. No.	Component / operation	Characteristics Checked	*	Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks			
										P	W	V				
	(As Applicable)	2.	Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	---	(C.O.C)			
		3.	Linearity	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)			
		4.	Hysteresis	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)			
		5.	Calibration with Hand Held Communicator	MA	Measurement	Each type	Mfr. Standard	Mfr. Standard	Test Certificate	2	---	---	(C.O.C)			
			Soundness of Painting	MA	Visual and Measurement	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-2			
6.0	PAINTING		Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-3			

NOTES:

1. In case valid CV test certificate for a similar control valve (same size, same CV, same trim characteristics) is not submitted to BHEL by the vendor, CV test shall be conducted at FCRI/Any govt. approved laboratory/ BHEL approved Laboratory.
2. In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
3. Sea worthy packing shall be provided, if called for in the Data sheets.
4. The quantum of check shall be 100% for manufacturer and 10% for BHEL/BHEL nominated inspection agency.
5. IBR certificates in Form III-C shall be submitted if called for in the specification/datasheet.
6. Copies of all TC's (Test Certificates) for materials duly correlated with Heat Nos., TC's for electrical items and mechanical tests (Leak/Operation), C.O.C's (Certificates of Conformance) shall be submitted to BHEL for verification and acceptance.

LEGEND:		* CR		\$ P		1 - BHEL	
- Critical characteristics	RT- Radiographic Test	PT - Dye penetrant Test	W - Agency Witnessing the Test.	1 - BHEL			
- Major characteristics	UT - Ultrasonic Test	MT- Magnetic Test	V - Agency Verifying the Test.	2 - Vendor			
- Minor characteristics				3 - Sub-vendor			

TYPE TEST REQUIREMENTS

EPC PACKAGE FOR
PATRATU SUPER THERMAL POWER STATION EXPANSION
PHASE –I (3X 800MW)

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC. NO.: CS:9585-001-2

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	TYPE TEST REQUIREMENTS			
1.01.00	General Requirements			
1.01.01	The Contractor shall furnish the type test reports of all type tests as per relevant standards and codes as well as other specific tests indicated in this specification. If the bidder proposes a different standard/code from that indicated at table 3.00.00, same is acceptable provided the equivalence of the proposed standard is established by the bidder. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR C&I SYSTEMS' at the end of this chapter and under the item Special Requirement for Solid State Equipments/Systems. For the balance equipment instrument, type tests may be conducted as per manufactures standard or if required by relevant standard. (a) Out of the tests listed, the Bidder/ sub-vendor/ manufacturer is required to conduct certain type tests specifically for this contract (and witnessed by Employer or his authorized representative) even if the same had been conducted earlier, as clearly indicated subsequently against such tests. (b) For the rest, submission of type test results and certificate shall be acceptable provided. i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment. ii. There has been no change in the components from the offered equipment & tested equipment. iii. The test has been carried out as per the latest standards alongwith amendments as on the date of Bid opening. (c) In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the Bidder/ sub-vendor within the quoted price and no extra cost will be payable by the Employer on this account.			
1.01.02	As mentioned against certain items, the test certificates for some of the items shall be reviewed and approved by the main Bidder or his authorized representative and the balance have to be approved by the Employer.			
1.01.03	The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.			
1.01.04	For the type tests to be conducted, Contractor shall submit detailed test procedure for approval by Employer. This shall clearly specify test setup, instruments to be used, procedure, acceptance norms (wherever applicable), recording of different parameters, interval of recording precautions to be taken etc. for the tests to be carried out.			
1.01.05	The Bidder shall indicate in the relevant BPS schedule, the cost of the type test for each item only for which type tests are to be conducted specifically for this project. The cost shall only be payable after conduction of the respective type test in presence of authorize representative of Employer. If a test is waived off, then the cost shall not be payable.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	PAGE 1 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
2.00.00 2.01.00	SPECIAL REQUIREMENT FOR SOLID STATE EQUIPMENTS/ SYSTEMS The minimum type test reports, over and above the requirements of above clause, which are to be submitted for each of the major C&I systems shall be as indicated below: i) Surge Withstand Capability (SWC) for Solid State Equipments/ Systems All solid state systems/ equipments shall be able to withstand the electrical noise and surges as encountered in actual service conditions and inherent in a power plant. All the solid state systems/ equipments shall be provided with all required protections that needs the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Hence, all front end cards which receive external signals like Analog input & output modules, Binary input & output modules etc. including power supply, data highway, data links shall be provided with protections that meets the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Complete details of the features incorporated in electronics systems to meet this requirement, the relevant tests carried out, the test certificates etc. shall be submitted along with the proposal. As an alternative to above, suitable class of EN 61000-4-12 which is equivalent to ANSI 37.90.1/ IEEE-472 may also be adopted for SWC test. ii) Dry Heat test as per IEC-68-2-2 or equivalent. iii) Damp Heat test as per IEC-68-2-3 or equivalent. iv) Vibration test as per IEC-68-2-6 or equivalent. v) Electrostatic discharge tests as per EN 61000-4-2 or equivalent. vi) Radio frequency immunity test as per EN 61000-4-6 or equivalent. vii) Electromagnetic Field immunity as per EN 61000-4-3 or equivalent. Test listed at item no. v, vi, vii, above are applicable for electronic cards only as defined under item (i) above.		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	PAGE 2 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS						एनटीपीसी NTPC
3.00.00	TYPE TEST REQUIREMENT FOR C&I SYSTEMS						
	Sl. No	Item	Test Requirement	Standard	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate	
	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	
	1	Elect. Metering instruments	As per standard (col 4)	IS-1248	No	Yes	
	2	Transducers	As per standard (col 4)	IEC-60688,IS12784	No	Yes	
	3	Thermocouple	Degree of protection test	IS-13947	No	No	
	4	RTD	As per standard (col 4)	IEC-60751	No	No	
	5	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes	
	6	E/P converter	As per standard (col 4)	Mfr. standard	No	No	
	7	Dust emission monitor	Degree of protection test	IS-13947	No	Yes	
	8	Instrumentation Cables Twisted & Shielded*					
		-Conductor	Resistance test	VDE-0815	No	Yes	
			Diameter test	IS-10810	No	Yes	
			Tin Coating test (Persulphate test)	IS-8130	No	Yes	
		-Insulation	Loss of mass	VDE 0472	No	Yes	
		Ageing in air ovens**	VDE 0472	No	Yes		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)			TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS		PAGE 3 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS					
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes	
		Heat shock	VDE 0472	No	Yes	
		Hot deformation	VDE 0472	No	Yes	
		Shrinkage	VDE 0472	No	Yes	
		Bleeding & blooming	IS-10810	No	Yes	
	-Inner sheath***	Loss of mass	VDE 0472	No	Yes	
		Heat shock	VDE 0472	No	Yes	
		Cold bend/ cold impact test	VDE 0472	No	Yes	
		Hot deformation	VDE 0472	No	Yes	
		Shrinkage	VDE 0472	No	Yes	
	-Outer sheath	Loss of mass	VDE 0472	No	Yes	
		Ageing in air ovens**	VDE 0472	No	Yes	
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes	
		Heat shock	VDE 0472	No	Yes	
		Hot deformation	VDE 0472	No	Yes	
		Shrinkage	VDE 0472	No	Yes	
		Bleeding & blooming	IS-10810	No	Yes	
		Colour fastness to water	IS-5831	No	Yes	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS		PAGE 4 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS					
		Cold bend/ cold impact test	VDE-0472	No	Yes	
		Oxygen index test	ASTMD-2863	No	Yes	
		Smoke Density Test	ASTMD-2843	No	Yes	
		Acid gas generation test	IEC-60754-1	No	Yes	
	-fillers	Oxygen index test	ASTMD-2863	No	Yes	
		Acid gas generation test	IEC-60754-1	No	Yes	
	-AL-MYLAR shield	Continuity test		No	Yes	
		Shield thickness		No	Yes	
		Overlap test		No	Yes	
	-Over all cable	Flammability Test	IEEE 383	No	Yes	
		Swedish Chimney Test	SEN 4241475	No	Yes	
		Noise interference	IEEE Trans- actions	No	Yes	
		Dimensional checks	IS 10810	No	Yes	
		Cross talk	VDE-0472	No	Yes	
		Mutual capacitance	VDE-0472	No	Yes	
		HV test	VDE-0815	No	Yes	
		Drain wire continuity		No	Yes	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS		PAGE 5 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	* 1.0 All cables to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last Ten years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. 2.0 In case the Contractor is not able to submit report of the type test(s) conducted within last Ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract free of cost to the Owner and submit the reports for approval. **These tests shall be carried out as per VDE0207 Part 6 & ASTM-D-2116 for TEFLON insulated & outer sheathed cables ***Applicable for armoured cables only			
9	DC Power Supply System (Applicable for each model and rating)			
	1)The Type Test reports for offered rectifier module and the controller module irrespective of the rectifier bank shall be acceptable			
	Surge Withstand Capability(SWC)	ANSI 37.90.1, No IEEE-472,EN 61000-4-12	Yes	
	Dry Heat Test	IEC-68-2-2 or No equivalent	Yes	
	Damp Heat test	IEC-68-2-3 or No equivalent	Yes	
	Vibration test	IEC68-2-6 or No equivalent	Yes	
	Electrostatic discharge test	EN 61000-4-2 No orr equivalent	Yes	
	Radio frequency immunity test	EN-61000-4-3 No orr equivalent	Yes	
	Electromagnetic field immunity	EN 61000-4-3 No orr equivalent	Yes	
	Degree of Protection	IS-13947 or No equivalent	Yes	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	PAGE 6 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS					एनटीपीसी NTPC
	10	Battery ##	As per standard (col 4)	IS-10918 (Ni- Cd Batteries)	No	Yes
				IS-1652 (Lead Acid Plante Batteries)	No	Yes
	11	NOT APPLICABLE				
	12	UPS (Applicable for each model and rating)				
		1) Type Test reports of same series of UPS with similar PCB's cards and controllers as the target UPS system shall be acceptable.				
		2) For Dry heat, Damp heat and vibration, the tests conducted on individual PCB's shall be acceptable.				
		Surge Withstand Capability(SWC)	ANSI 37.90.1, No IEEE-472,EN 61000-4-12	No	Yes	
		Dry Heat Test	IEC-68-2-2 or equivalent	No	Yes	
		Damp Heat test	IEC-68-2-3 or equivalent	No	Yes	
		Vibration test	IEC68-2-6 or equivalent	No	Yes	
		Electrostatic discharge test	EN 61000-4-2 or equivalent	No	Yes	
		Radio frequency immunity test	EN-61000-4-3 or equivalent	No	Yes	
		Electromagnetic field immunity	EN 61000-4-3 or equivalent	No	Yes	
		Degree of protection test	IS-13947	No	Yes	
		Fuse Clearing Capability	Approved procedure	No	Yes	
		Short Circuit current capability	IEC 60146-2	No	Yes	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS		PAGE 7 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS						एनटीपीसी NTPC	
	13	Voltage Stabilisers	Over Load Test	Approved procedure	No	Yes		
			Temp rise test without redundant fans	Approved procedure	No	Yes		
	14	Public Address System						
		- Amplifiers	As standard (col 4)	per IS 9302, Part-II	No	Yes		
		Microphones	As per standard (col 4)	IS 9302, Part-III IS 15482:2004/ IEC 61842(2002)	No	Yes		
		Loudspeaker	As per standard (col 4)	IS 9302, Part-IV	No	Yes		
	15	LIE / LIR	Degree of protection test	IS-13947	No	Yes		
	16	Flue analyzers	gas Degree of protection test	IS-13947	No	Yes		
	17	Master Clock	Functional test	As per approved procedure	No	Yes		
	18	CJC Box	Degree Of protection test	IS-13947	No	Yes		
19	Junction Box	Degree Of protection Test	IS-13947	No	Yes			
20	OPC Access Data Server, Data Exchange & Server	OPC Compliance Testing		No	Yes (Self certification is also	is		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)			TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS		PAGE 8 OF 9	

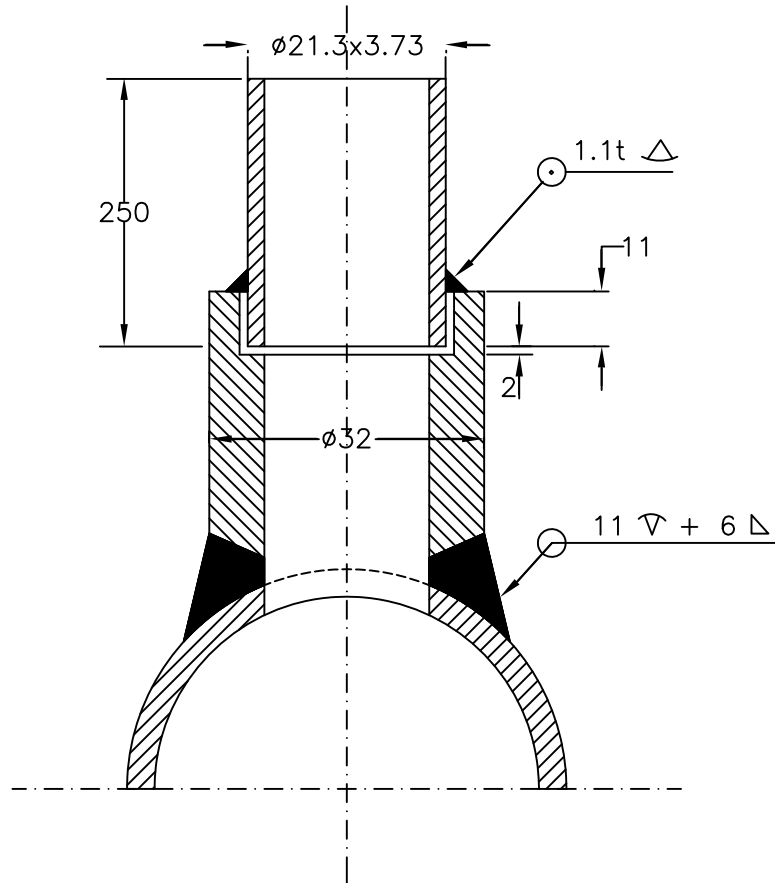
CLAUSE NO.	TECHNICAL REQUIREMENTS						एनटीपीसी NTPC
	Historical Data Access Server acceptable) 21 Conductivity Type Level Switch Degree of protection test IS-2147 No No 22 Local Gauges Degree of protection test IS-2147 No No 23 Process actuated Switches Degree of protection test IS-2147 No No 24 Control Valves CV test ISA 75.02& 75.11 No Yes 25 PLCs As per standard (Col 4) IEC 1131 No No 26 Flow Nozzle Orifice plates Calibration ASME PTC BS 1042 No Yes ## The contractor shall submit for Employers approval the reports of all the type test as per latest IS-10918 carried out within last ten years from the date of Bid opening and the test(s) should have been either conducted at an independent laboratory or in presence / owners representative. The complete type test reports shall be for any rating of Battery in a particular group based on plate dimensions being manufactured by supplier. Note: Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.						
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS		PAGE 9 OF 9	



**C&I SPECIFICATION FOR
GYPSUM DEWATERING SYSTEM**

SECTION: C4
SUB SECTION: C&I

INSTRUMENT STUB DETAILS



NOTE :

1. MATERIAL OF THE BOSS AND NIPPLE SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED AND CONFORM TO ANSI B16.11.
2. THE LENGTH OF NIPPLE SHALL BE 250 MM.
3. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED
4. EDGE HOLE MUST BE CLEAN AND SQUARE OR ROUNDED SLIGHTLY (1/64" RADIUS) FREE FROM BURRS, WIRE EDGES OR OTHER IRREGULARITIES
5. STUB LENGTH SHALL BE 64mm UPTO 250Nb PIPE, 45mm ABOVE 200Nb PIPE SIZE.

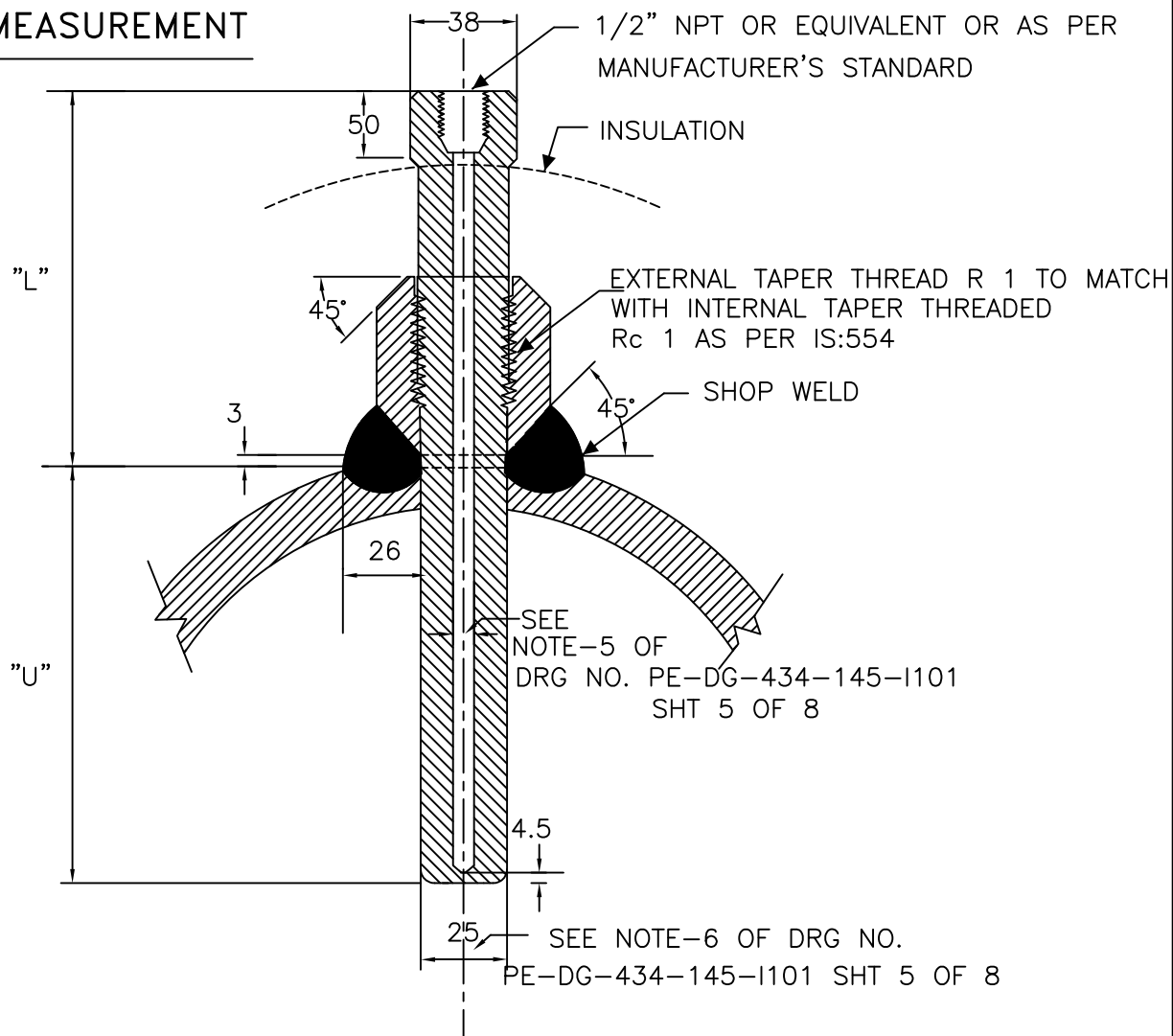


TITLE :
**INSTRUMENT STUB DETAILS
 FOR PRESSURE MEASUREMENT**

DRG. NO.
PE-DG-434-145-I101
 REV. 00
 SH. 04 OF 08 SHS.

(SYSTEM PRESS UPTO 40Kg/Cm², TEMP < 400 Deg C)

TEMP. MEASUREMENT



NOTES :-

1. THIS TYPE OF TEMPERATURE BOSS IS APPLICABLE FOR THE PROCESS PRESS/ TEMP. BELOW 40 KG/CM²(g)/400°C.
2. SEE NOTES-2 TO 9 IN SHT. 5 OF 8 OF THIS DRG.
3. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED.



TITLE :

INST. STUB DETAILS (TEMP)

(APPLICABLE FOR PIPE SIZE ABOVE 4")

[PROCESS PRESS < 40 Kg/Cm² (g), TEMP < 400 °C]

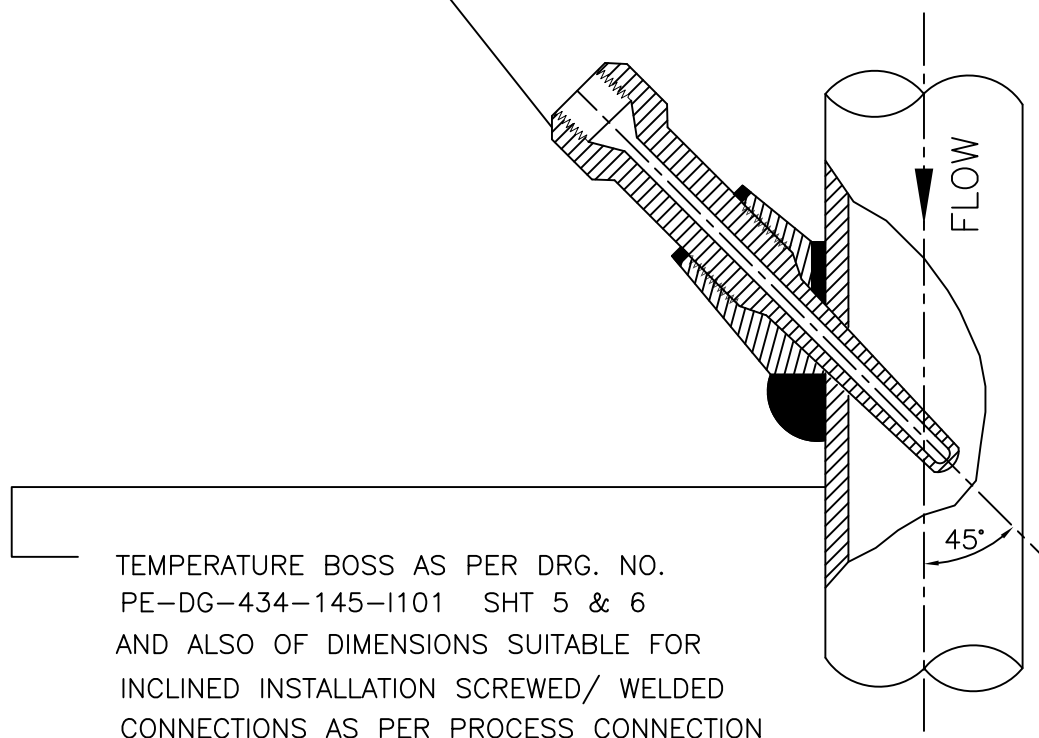
DRG. NO.

PE-DG-434-145-I101

REV. 00

SH. 06 OF 08 SHS.

THERMOWELL SUITABLE FOR THE BOSS
AS PER DRG. NO.
PE-DG-434-145-I101 SHT 5 & 6



NOTES :-

1. INCLINED INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MIN. 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF 3" SIZE OF MAIN PIPING SPECIFICATION SHALL BE USED.
3. THIS TYPE OF INSTALLATION IS APPLICABLE FOR HORIZONTAL AND VERTICAL PIPE SECTION.
4. FOR STEAM SERVICES EXPANDER SECTION MAY BE USED ONLY IN VERTICAL RUN.
5. THE EXPANDER SECTION SHALL BE OF ADEQUATE LENGTH (ATLEAST 3-4 TIMES DIA OF THE MAIN PROCESS PIPE AT BOTH SIDE OF INSTALLED THERMOWELL).



TITLE :

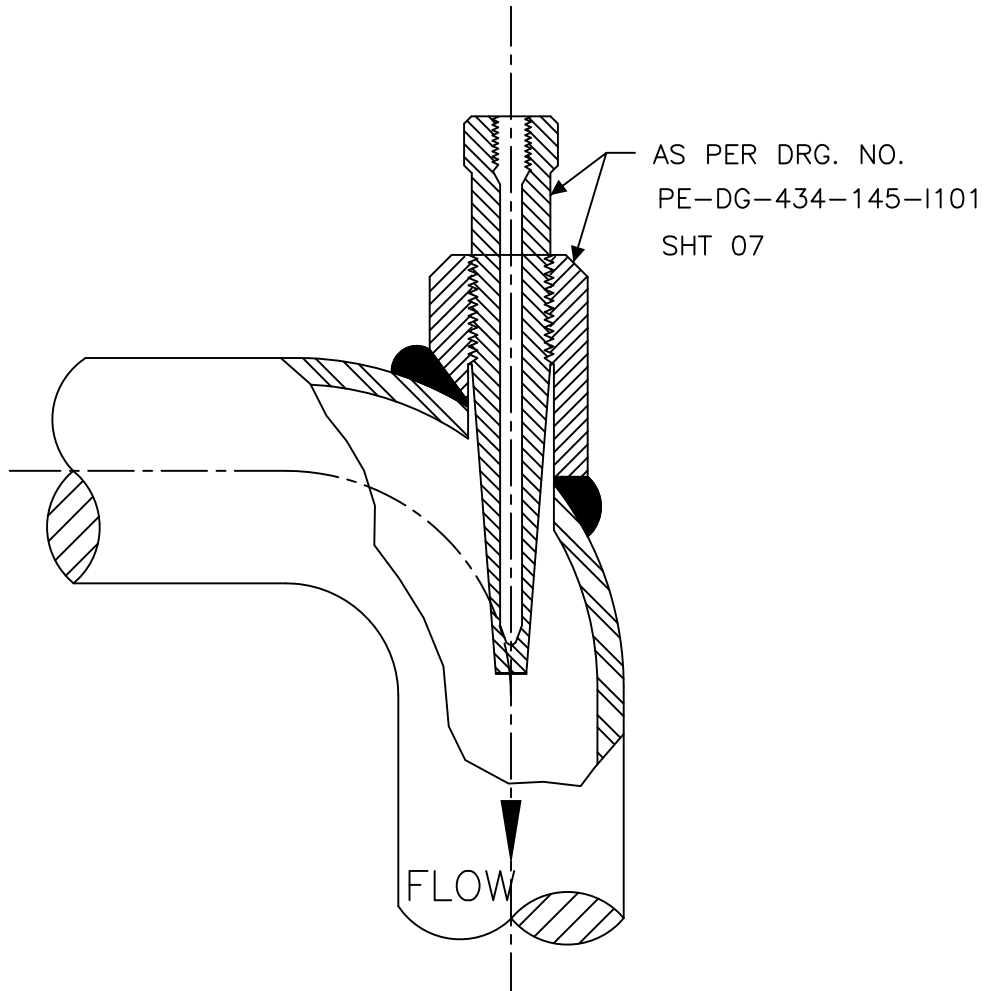
THERMOWELL INSTALLATION

DRG. NO.

PE-DG-434-145-I101

REV. 00

SH. 07 OF 08 SHS.



NOTES :-

1. FLOW INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MINIMUM 3" LINE SIZE. THIS DETAIL IS APPLICABLE FOR THERMOWELL INSTALLATION IN BEND PIPES.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF ELBOW FORM (AS SHOWN) OF 3" SIZE SHALL BE USED.
3. ELBOW EXPANDER SECTION IN HORIZONTAL PLANE TO BE USED FOR LIQUID SERVICE. FOR STEAM SERVICES EXPANDER SECTION TO BE USED IN VERTICAL PLANE.



TITLE :

**THERMOWELL INSTALLATION
(IN BEND PIPES)**

DRG. NO.

PE-DG-434-145-I101

REV. 00

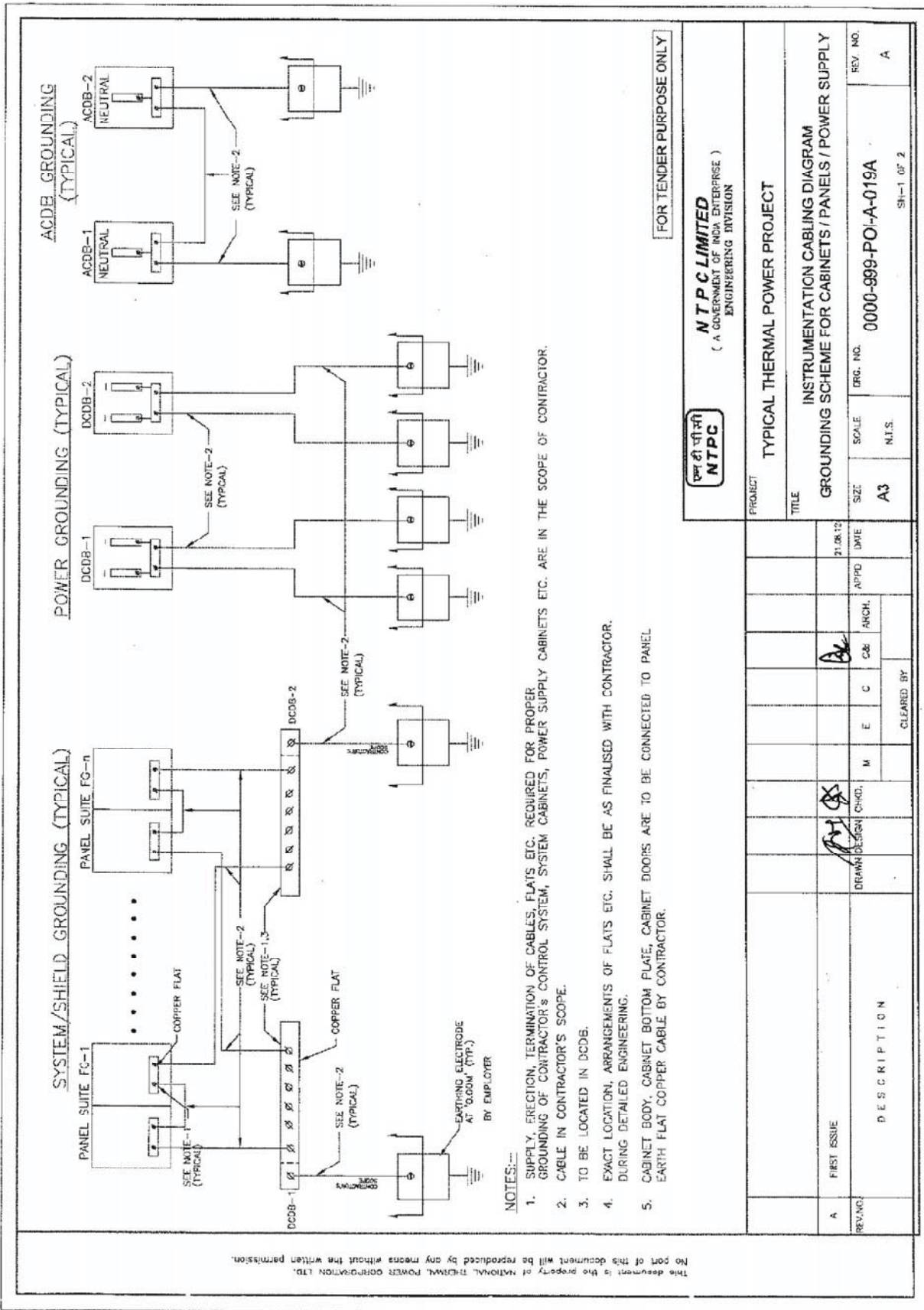
SH. 08 OF 08 SHS.



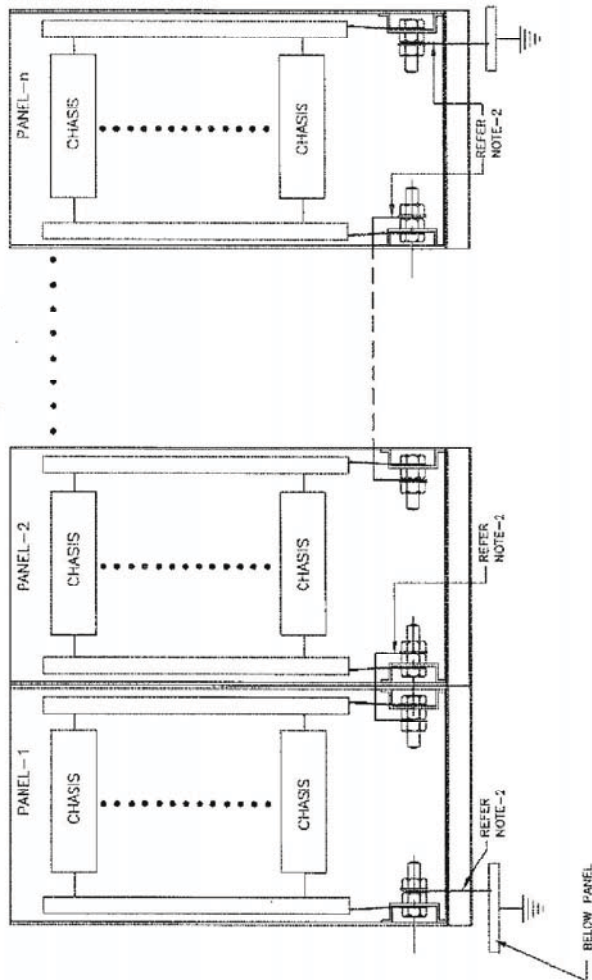
**C&I SPECIFICATION FOR
GYPSUM DEWATERING SYSTEM**

SECTION: C4
SUB SECTION: C&I

INSTRUMENT INSTALLATION DRAWING



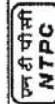
GROUNDING FOR EACH ROW OF PANELS (TYPICAL)



NOTES:-

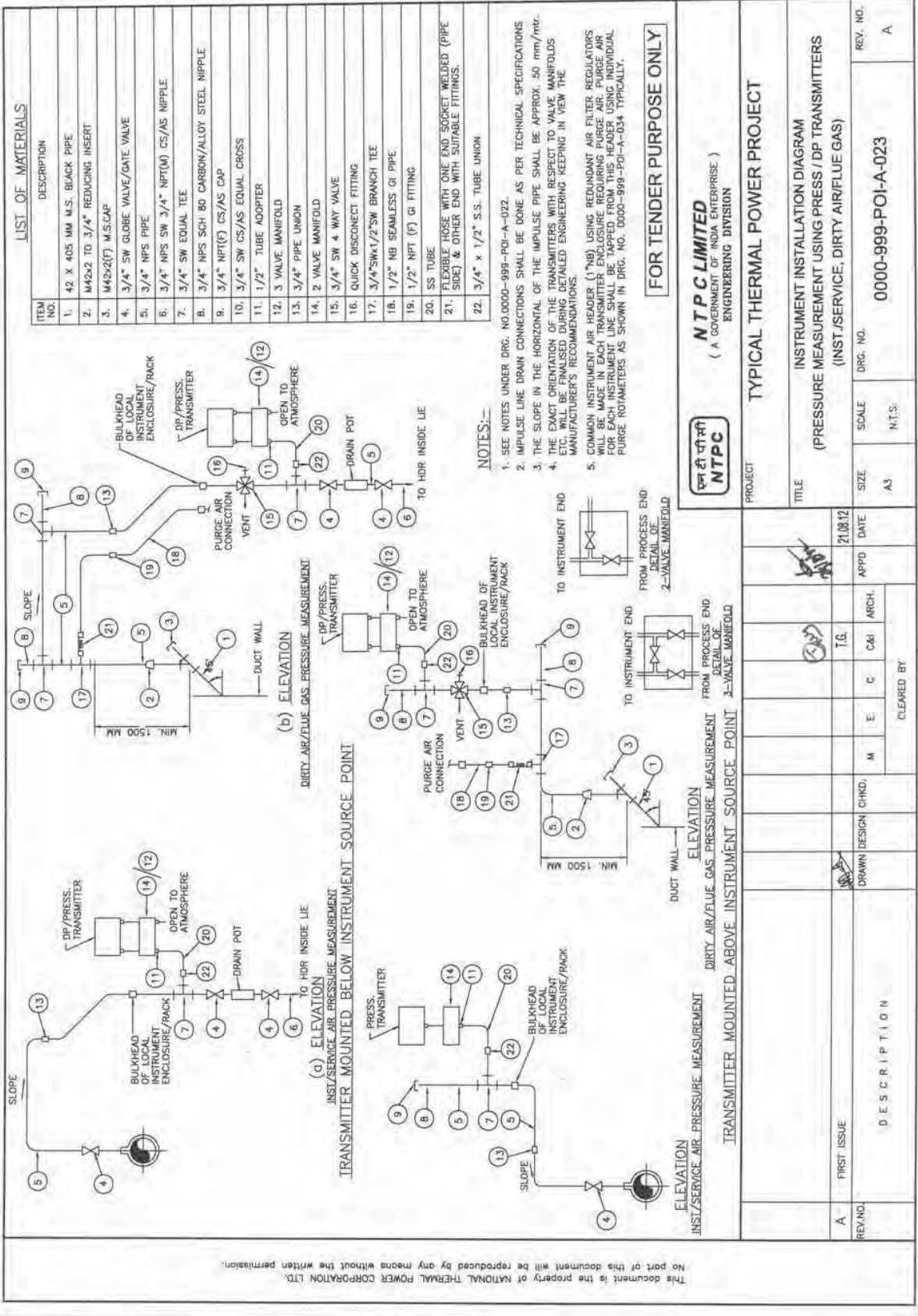
1. SUPPLY, ERECTION, TERMINATION OF CABLES, FLATS ETC. REQUIRED FOR PROPER GROUNDING OF CONTRACTOR'S CONTROL SYSTEM, SYSTEM CABINETS, POWER SUPPLY CABINETS ETC. ARE IN THE SCOPE OF CONTRACTOR.
2. CABLE IN CONTRACTOR'S SCOPE.
3. TO BE LOCATED IN DCDB.
4. EXACT LOCATION, ARRANGEMENTS OF FLATS ETC. SHALL BE AS FINALISED WITH CONTRACTOR DURING DETAILED ENGINEERING.
5. CABINET BODY, CABINET BOTTOM PLATE, CABINET DOORS ARE TO BE CONNECTED TO PANEL EARTH FLAT COPPER CABLE BY CONTRACTOR.

FOR TENDER PURPOSE ONLY



NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT									
TYPICAL THERMAL POWER PROJECT									
TITLE									
INSTRUMENTATION CABLING DIAGRAM									
GROUNDING SCHEME FOR CABINETS / PANELS / POWER SUPPLY									
REV. NO.		DRG. NO.		SCALE		SIZE		DATE	
A		0000-999-POI-A-019A		N.T.S.		A3		21.08.12	
DESCRIPTION									
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LIST OF MATERIALS	
ITEM NO.	DESCRIPTION
1.	42 X 405 MM M.S. BLACK PIPE
2.	M42x2 TO 3/4" REDUCING INSERT
3.	M42x2(1/2") M.S. CAP
4.	3/4" SW GLOBE VALVE/GATE VALVE
5.	3/4" NPS PIPE
6.	3/4" NPS SW 3/4" NPT(M) CS/AS NIPPLE
7.	3/4" SW EQUAL TEE
8.	3/4" NPS SCH 80 CARBON/ALLOY STEEL NIPPLE
9.	3/4" NPT(F) CS/AS CAP
10.	3/4" SW CS/AS EQUAL CROSS
11.	1/2" TUBE ADAPTER
12.	3 VALVE MANIFOLD
13.	3/4" PIPE UNION
14.	2 VALVE MANIFOLD
15.	3/4" SW 4 WAY VALVE
16.	QUICK DISCONNECT FITTING
17.	3/4"SWx1/2"SW BRANCH TEE
18.	1/2" NB SEAMLESS GI PIPE
19.	1/2" NPT (F) GI FITTING
20.	SS TUBE
21.	FLEXIBLE HOSE WITH ONE END SOCKET WELDED (PIPE SIDE) & OTHER END WITH SUITABLE FITTINGS.
22.	3/4" x 1/2" S.S. TUBE UNION

NOTES:-

- SEE NOTES UNDER DRG. NO.0000-999-POI-A-022.
- IMPULSE LINE DRAIN CONNECTIONS SHALL BE DONE AS PER TECHNICAL SPECIFICATIONS
- THE SLOPE IN THE HORIZONTAL OF THE IMPULSE PIPE SHALL BE APPROX. 50 mm/mtr.
- THE EXACT ORIENTATION OF THE TRANSMITTERS WITH RESPECT TO VALVE MANIFOLDS ETC. WILL BE FINALISED DURING DETAILED ENGINEERING KEEPING IN VIEW THE MANUFACTURER'S RECOMMENDATIONS.
- COMMON INSTRUMENT AIR HEADER (1"NB) USING REDUNDANT AIR FILTER REGULATORS SHALL BE PROVIDED IN EACH TRANSMITTER ENCLOSURE REQUIRING PURGE AIR. PURGE AIR FOR EACH INSTRUMENT LINE SHALL BE TAPPED FROM THIS HEADER USING INDIVIDUAL PURGE ROTAMETERS AS SHOWN IN DRG. NO. 0000-999-POI-A-034 TYPICALLY.

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT TYPICAL THERMAL POWER PROJECT

TITLE INSTRUMENT INSTALLATION DIAGRAM
(PRESSURE MEASUREMENT USING PRESS / DP TRANSMITTERS
(INST./SERVICE, DIRTY AIR/FLUE GAS))

REV. NO. A

SCALE N.T.S.

SIZE A3

DATE 21.08.12

APPD T.G.

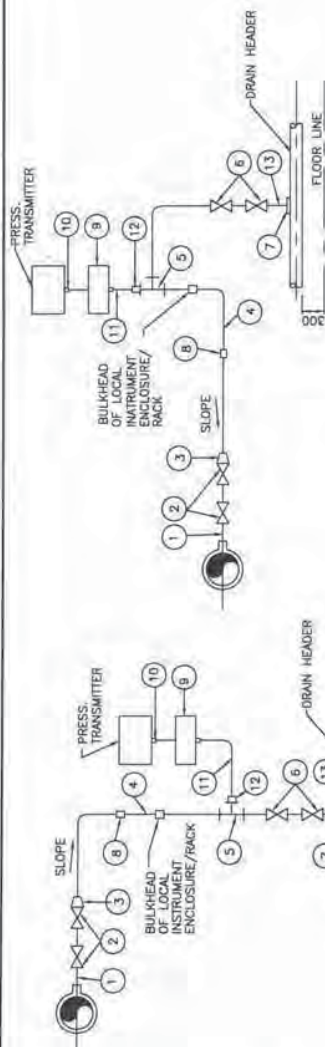
ARCH. C&I

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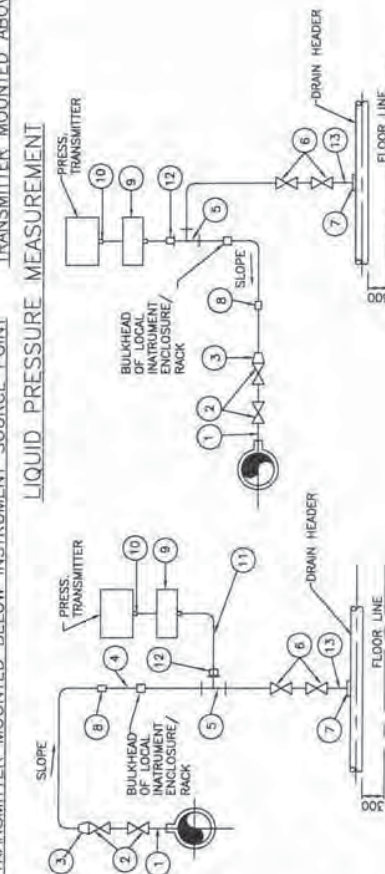
DESCRIPTION

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ITEM NO.	DESCRIPTION
1.	1/2" 3/4" NPS SCH. 80/160 XS/P91 NIPPLE OF MATERIAL SAME AS THAT OF MAIN PIPE.
2.	3/4"x1" SW GLOBE VALVE.
3.	3/4"x1" TO 1/2" REDUCING INSERT
4.	1/2" NPS PIPE
5.	1/2" SW EQUAL TEE
6.	1/2"SW GLOBE VALVE.
7.	1/2"NPS SCH. 80/160 SWx1/2"CS AS COUPLER
8.	1/2" PIPE UNION
9.	2/3 VALVE MANIFOLD (FOR DETAIL SEE DRAWING RG-0358-102-F01-A-023).
10.	SUITABLE ADAPTER
11.	SS TUBE
12.	1/2" PIPE x 1/2" TUBE UNION
13.	1/2"NPS SCH.80/160 SWx1/2" NPT(M) CS/AS NIPPLE



ELEVATION		ELEVATION
TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT	TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT	
711	13	



ELEVATION
VACCU PRESSURE MEASUREMENT

NOTES:-

1. SAME NOTES UNDER DRG. NO. 0000-999-POI-A-023.
2. FOR VACUUM APPLICATION OTHER PORT OF TRANSMITTER SHALL BE KEPT OPEN TO ATMOSPHERE.

FOR TENDER PURPOSE ONLY

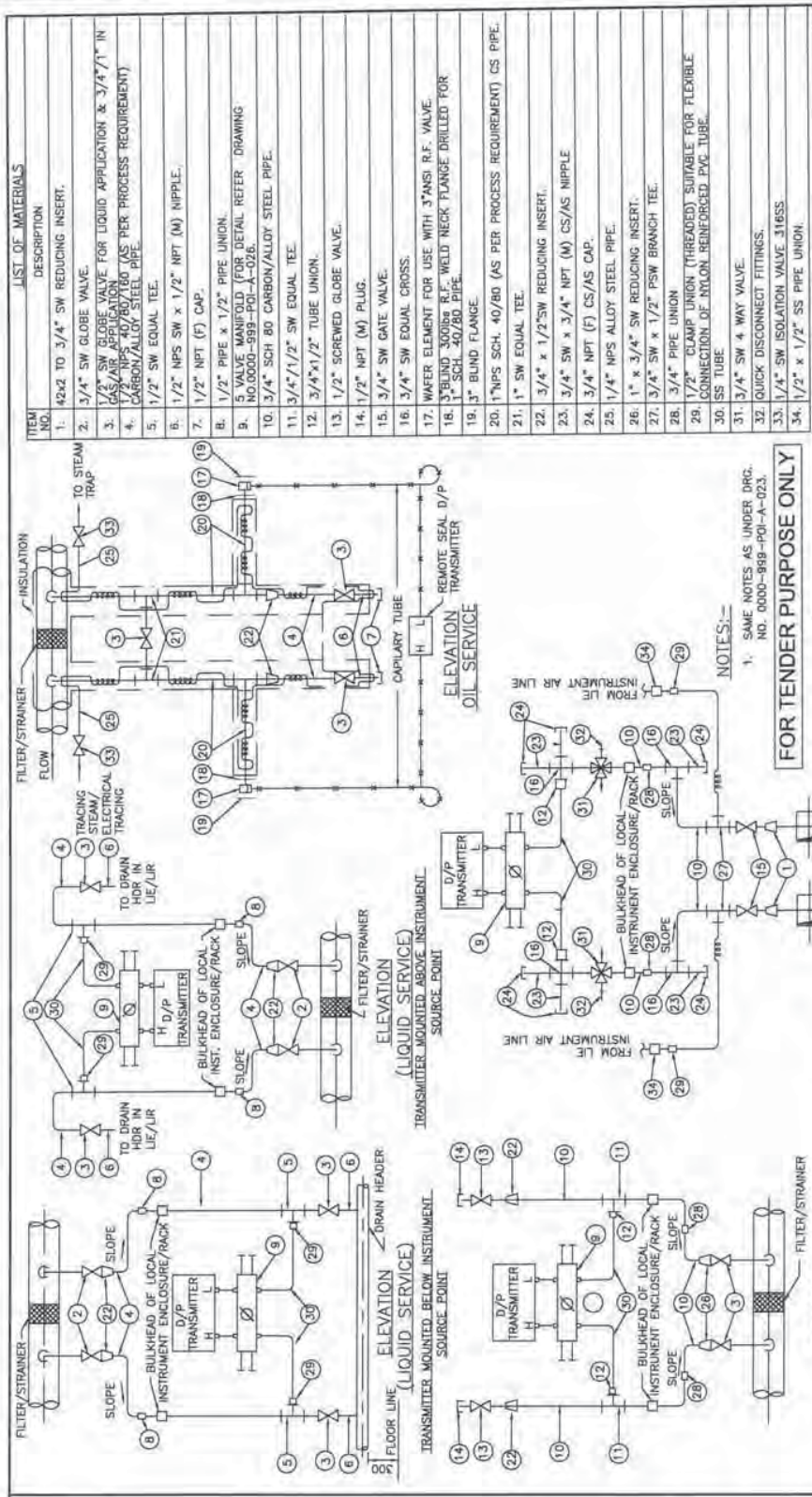


NTPC LIMITED
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ENGINEERING DIVISION

TYPICAL THERMAL POWER PROJECT

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NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION		PROJECT TYPICAL THERMAL POWER PROJECT	
TITLE INSTRUMENT INSTALLATION DIAGRAM DIFF. PRESS. MEASUREMENT (LIQUID, OIL, AIR/GAS SERVICE)		REV. NO. A	
SCALE N.T.S.		DRG. NO. 0000-999-POI-A-030	
DATE 21/08/12		APPD T.G.	
CHKD M		ARCH C&I	
DESCRIPTION		CLEARED BY	

Page 289 of 426

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC									
	PROCESS CONNECTION AND PIPING											
1.00.00	PROCESS CONNECTION PIPING											
1.01.00	The Contractor shall provide, install and test all required material for completeness of Impulse Piping System and Air Piping System as per the requirements of this Sub-Section on as required basis for the connection of all instruments and control equipments of entire plant.											
1.01.01	IMPULSE PIPING, TUBING, FITTINGS, VALVES AND VALVE MANIFOLDS											
1.01.02	All impulse pipes shall be of seamless type conforming to ANSI B36.10 for schedule numbers. The size of impulse pipe shall be ½" for Steam & Water Application and ¾" for Air & Flue Gas applications. The rating of material of impulse pipes, tubes, fittings, valves and their installation thereof shall conform to the latest edition of standards as per following table: <table><tr><td>Impulse Pipes, Tubes (Material, Rating)</td><td>ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70</td></tr><tr><td>Valves (Material, Pr. Class, Size)</td><td>ASTM A182/ASTM A105 as per ASME 16.34</td></tr><tr><td>Fittings (Size, Rating, Material)</td><td>ANSI B31.1, ANSI B31.1a, ASME B16.11-2009</td></tr><tr><td>Installation Schemes</td><td>BS 6739-2009, ANSI/ISA 77.70</td></tr></table> Stainless steel tube shall be provided inside enclosures & racks from tee connection to valve manifold and then to instrument. The source shut-off (primary process root valve) and blow down valve shall be of 1/2 inch size globe valve type for all applications except for air and flue gas service wherein no source shut-off valves are to be provided. Two root valves are to be used wherever pressure is more than 40 Kg/cm² or Temp>280 °C. The end connections of valves shall be of socket welded type. Typical installation scheme of DP Transmitter (inside LIE/LIR) mounted below instrument source point is indicated in Drg. No. 0000-999-POI-A-036. Same scheme with necessary changes shall be applied for other instruments.				Impulse Pipes, Tubes (Material, Rating)	ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70	Valves (Material, Pr. Class, Size)	ASTM A182/ASTM A105 as per ASME 16.34	Fittings (Size, Rating, Material)	ANSI B31.1, ANSI B31.1a, ASME B16.11-2009	Installation Schemes	BS 6739-2009, ANSI/ISA 77.70
Impulse Pipes, Tubes (Material, Rating)	ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70											
Valves (Material, Pr. Class, Size)	ASTM A182/ASTM A105 as per ASME 16.34											
Fittings (Size, Rating, Material)	ANSI B31.1, ANSI B31.1a, ASME B16.11-2009											
Installation Schemes	BS 6739-2009, ANSI/ISA 77.70											
1.01.03	The valve manifolds of 316 SS with pressure rating suitable for intended application shall be provided as given below: <table><tr><th>Manifold</th><th>Application/Masurement</th></tr><tr><td>2 Valve</td><td>Pressure measurements using pressure transmitters/pressure switches</td></tr><tr><td>3 Valve</td><td>Pressure measurements using differential pressure transmitter/ switches</td></tr><tr><td>5 Valve</td><td>Differential Pressure, Flow and Level Measurements</td></tr></table> For Pr./D.P gauges, two-way globe/gate valve shall be provided on each impulse line to the instrument in Fluid/Air & Flue Gas applications respectively .				Manifold	Application/Masurement	2 Valve	Pressure measurements using pressure transmitters/pressure switches	3 Valve	Pressure measurements using differential pressure transmitter/ switches	5 Valve	Differential Pressure, Flow and Level Measurements
Manifold	Application/Masurement											
2 Valve	Pressure measurements using pressure transmitters/pressure switches											
3 Valve	Pressure measurements using differential pressure transmitter/ switches											
5 Valve	Differential Pressure, Flow and Level Measurements											
2.00.00	AIR SUPPLY PIPING											
2.01.01	All pneumatic piping, fittings, valves, air filter cum regulator, purge rotameter and other accessories required for instrument air for the various pneumatic devices/ instruments shall be provided. This will include as a minimum air supply to pneumatically operated control valves, actuators, instruments, continuous and intermittent purging requirements etc.											
2.02.00	Instrument air and Service air supply shall be provided for continuous and intermittent purging respectively for all transmitters of mill, dirty air and flue gas applications. Purging Scheme shall be as per Drg. No. 0000-999-POI-A-036.											
2.03.00	The Contractor shall also provide SS Tubing and associated fittings (screwed type) of suitable sizes for all pneumatic equipments/actuators (including supply air, signal air and output to actuators) conforming to ANSI 31.1 and 31.3 standard. All other air supply lines shall be of mild steel hot dipped galvanized inside and outside as per IS-1239, heavy duty											
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-06 PROCESS CONNECTION AND PIPING	PAGE 1 OF 3								

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
	with threaded ends. Fittings for air supply line shall be of forged carbon steel A234 Gr. WPB galvanized inside and outside, screwed as per ASA B2.1. Dimensions of fittings shall be as per ASA B16.11 of rating 3000 lbs. Air supply piping shall be adequately sloped to prevent accumulation of condensed water within the pipe. The air supply headers, sub-headers and branch pipes shall be supported properly by clamps or supports.		
2.04.00	The instrument/service air supply to each equipment/devices requiring air supply shall be provided by a well designed air distribution scheme comprising of 2" GI Pipe Header feeding 1" GI Pipe sub-header feeding ½" pipe at each equipment/device. Instrument air filters cum regulator set with mounting accessories shall be provided for each pneumatic device requiring air supply except for Ash Handling System wherein it shall be provided on instrument air header at each location.		
2.05.00	All the isolation valves in the air supply line shall be gate valves as per ASTM B62 inside screw rising stem, screwed female ends as per ASA B2.1. Valve bonnet shall be union type & trim material shall be stainless steel, body rating 150 pounds ASA. The valve sizes shall be ½ inch to 2 inch.		
2.06.00	Instrument air filters cum regulator set with mounting accessories shall be provided for pneumatic device requiring air supply. The filter regulators shall be suitable for 10-kg/ sq.cm max. Inlet pressure. The filter shall be of size 5 microns and of material sintered bronze. The air set shall have 2-inch size pressure gauge and built in filter housing blowdown valve. The end connection shall be as per the requirement to be finalized during detailed engineering.		
3.00.00	INSTALLATION AND ROUTING		
3.01.01	All instrument piping, tubing and its accessories shall be supported in a safe manner to prevent excessive vibrations and anchored sufficiently to prevent undue strain on connected equipment. Impulse piping shall be supported at an interval not exceeding 1.5 meters. The slope of the impulse pipe from the process connection to the instrument shall be as per ANSI/ISA 77.70 latest edition and BS 6739-2009. All impulse piping shall be installed to permit free movement due to thermal expansion. Wherever required expansion loops shall be provided. Condensate pots shall be provided for all level measurements in steam and water services, all flow measurement in steam services and for flow measurements in water services above 120 Deg. C. Colour coding of all impulse pipes shall be done by the Contractor in line with the colour coding being followed for the parent pipes.		
4.00.00	SHOP AND SITE TESTS		
4.01.01	The equipment and work performed as per this Sub-section shall be subject to shop and site test as per requirements of Sub-section-IIIE-04 (Quality Assurance & Inspection) other applicable clauses of this Sub-section and Employer approved quality assurance plan.		
4.01.02	Hydrostatic and Pneumatic leakage tests shall be performed on all pipes, tubing and systems and shall conform to ANSI B31.1.		
5.00.00	LOCAL INSTRUMENT ENCLOSURE AND RACKS All transmitters, switches etc. in Boiler Turbine Generator measurements (except for all fuel oil applications) shall be suitably grouped together and mounted inside (i) local instruments enclosures in case of open areas of the plant like boiler area, etc. and (ii) In local instrument racks in case of covered areas like Turbine/Generator area. The GA of LIE with purging indicated in the Drg. No. 0000-999-POI-A-036 is to be followed by contractor. The GA of LIR shall be similar to LIE except for front/rear doors and side panels.		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-06 PROCESS CONNECTION AND PIPING
			PAGE 2 OF 3

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
5.01.00	The internal layout shall be such that the impulse piping/ blow down lines are accessible from back side of the enclosure / rack and the transmitters etc. are accessible from front side for easy maintenance. Bulkheads, especially designed to provide isolation from process line vibration shall be installed on instrument enclosures/racks to meet the process sensing line connection requirement. Vibration dampeners shall be installed for each enclosure / rack. The Degree of Protection of LIE and JB of LIE/LIR shall be IP-55. The instrument racks shall be free standing type constructed of suitable 3 mm thick channel frame of steel and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel, and extended beyond the ends of the rack. Enclosures/Racks shall be reinforced as required to ensure true surface and to provide adequate support for instruments and equipment mounted therein. Centre posts or any member which would reduce access shall not be provided. Contractor shall provide not more than three variants for LIE/LIR with respect to max. no. transmitters mounted in each LIE/LIR.			
	ENCLOSURE / RACKS FOR DUAL I/P TEMPERATURE TRANSMITTERS All Dual Input temperature transmitters in Boiler Turbine Generator measurements shall be suitably grouped together and mounted inside (i) Enclosures in case of open areas of the plant like boiler area, etc. and (ii) Racks in case of covered areas like Turbine/Generator area. Integral JB shall be provided with each Enclosure and Rack. The internal layout shall be such that the transmitters are accessible from both front and back side of the enclosure / rack for easy maintenance. Enclosure/ Racks shall be of robust and rugged design. Vibration dampeners shall be installed for each enclosure / rack. The Degree of Protection of Enclosure and JB shall be IP-55. Enclosure and Racks shall be free standing type. Enclosures/Racks shall be reinforced as required to ensure true surface and to provide adequate support for instruments and equipment mounted therein. Contractor shall provide not more than five variants for Enclosure/ Rack with respect to max. no. transmitters mounted in each Enclosure/ Rack. However, the maximum number of Transmitters that can be grouped in one Enclosure/ Rack shall be decided during detail Engineering.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-06 PROCESS CONNECTION AND PIPING	PAGE 3 OF 3



**C&I SPECIFICATION FOR
GYPSUM DEWATERING SYSTEM**

SECTION: C4
SUB SECTION: C&I

SUB VENDOR LIST

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NTPC		PROJECT : Patratu STPS Phase-I (3 x 2100MW)					LIST OF ITEMS REQUIRING QP					REVISION NO : 00	
		PACKAGE : EPC PACKAGE					APPROVAL & ACCEPTABLE					DATE : 28.04.2017	
		CONTRACTOR : BHEL Ltd					VENDOR AS APPROVED BY						
		CONTRACT NO : CS-9585-001-2											
No.	Major Equipment	Inspected Category	QP No. 9585-001-QV1	QP Submittal Q SCH	QP Approval val SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub QP	Remark	
						KOSO	Japan / Nask	DR					
						Nakagata	Japan	DR					
						Parco Spa	USA	DR					
						Yamatake	Japan	DR					
						BOPP & ROUTHIER	Germany	DR					
						KSB MIL	Awaye	DR					
						CCI	USA/Austria	A					
						Dressor Maschinen	Korea	A					
						HOTAI	France	A					
						EMERSON (Fisher)	USA/France	A					
						Sempell	Japan	A					
						KOSO	Germany	A					
						LESUE	USA	DR					
						CCI	Singly	A					
						Parco Spa	USA	DR					
						WEIR VALVES and Controls	UK	DR					
						KOSO	Nasa	DR					
						KSB MIL	Awaye	DR					
						Emerson Process Management	Chennai	A					
						BOVAFSA Special valve solutions	Almatabad	DR					
						PAI Ltd.	China	DR					
						Suzhou delon enery science and technology co. Ltd.	USA/Switzerland/Kor	A					
						CCI	es	A					
						Tyco Sempell	Germany	A					
						EMERSON (Fisher)	USA/France/Japan /	A					
						Dressor Maschinen	Chennai	A					
						KOSO	Japan	A					
						HOTAI	Germany	A					
						CCI	Singly	A					
						Six Copos Vulcan	USA	A					
						Dressor	Combarore	A					
							Palakkad	A					
						KSB MIL	Awaye	A					
						KOSO	Palakkad	A					
						EMERSON	Chennai	A					
						Flow Servis	Bangalore	A					
						Copos Vulcan	UK	A					
						Leslie	USA	A					
						Parco Spa	Italy	A					
						KOSO	Nask	A					
21	Control Valve (other than Sr. No. - 17 to 20)											Ms BHEL will forward only three proposals after details review of NTPC Technical specification requirements.	

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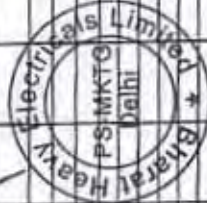
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NTPC		PROJECT : Patrauli STPS Phase-I (3 X800MW)				LIST OF ITEMS REQUIRING QP				REVISION NO : 03		
		PACKAGE : EPC PACKAGE				APPROVAL & ACCEPTABLE				DATE : 28.04.2017		
		CONTRACTOR : BHEL Ltd				VENDOR AS APPROVED BY						
		CONTRACT NO : CS-3555-001-2										
No.	Major Equipment	QP Inspected Category	QP No. 001-QV	QP No. 001-QV	QP No. 001-QV	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub QR	Remark
		Y										
		III				Levocon	Kolkata	A				
		III				DR Instrument	Kolkata	A				
		III				Khrona Marshal	Pune	A				
		III				Chemtel	India	DR				
		III				V Automation	NewDelhi	DR				
		III				Gaugas Bourdon	Parvel	A				
		III				Magnetrol	Belgium	A				
		III				Ashcroft	Germany	A				
		III				Auxitrol	UK	A				
		III				Meroid	USA	A				
		III				Delta Control	UK	A				
		III				Marum	USA	A				
		+				Sunlig Corporation		DR				
33	Condensing Pits	III				Main Contractor Approved Sources		A				
34	Electric to Pneumatic converter	III				IMI NORGEN	India	A			Sub QR	Make : WATSON SMITH
		III				F&F child	USA	A				
		+				ABB	India	A				
		+				SMC Pneumatics	Noida	DR				
		+				P & F	Bangalore	DR				
		+				Fairchild India Pvt. Ltd	Noida	DR				
		+				FESTO	Bangalore	DR				
35	Conduits lead coated (Flexible)	III				Plica	Chennai	A				Main contractor can propose additional vendor for this item
		III				Bansal laboratories	BHOPAL	A				
30	Intelligent Battery charger 24V DC & DCDB (BIRMS)	II				Chabiol Electricals	Jalgaon	A			Sub QR	Modules from EMERSON
		II				Eitech	Gurgaon	A				Modules from ELTEK
		II				MasTech	Jalgaon	A				Modules from ELTEK
		II				Emerson	India	A				
		II				MasTech (Series Modules)	Jalgaon	A				
		+				HBL Power Systems	India	DR				
		+				Dubaut	India	DR				
		+				Chabiol Electricals (Chabiol Modules)	Jalgaon	DR				
		+				Harczi Hi Rel	Gandhinagar	DR				
		+				Station Power Controls Pvt. Ltd.	Noida	DR				
		+				Chabiol Power Systems (cabinets)	India	DR				
		+				Amerasia	Tirupatt	DR				
		+				Koltron Power Electronics	Tiruvandram	DR				
												M/s BHEL will forward only five proposals after details review of NTPC Technical specification requirements.

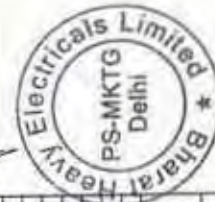
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M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.

NTPC		PROJECT : Patralu STPS Phase-I (3 X600MW)				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE				REVISION NO : 00		
		PACKAGE : EPC PACKAGE				VENDOR AS APPROVED BY				DATE : 26.04.2017		
		CONTRACTOR : BHEL Ltd										
		CONTRACT NO : CS-9588-001-2										
No.	Major Equipment	QP Inspected Category	QP No. 9545-001-QV	QP Submits SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub QR	Remark
37	Battery House Monitoring System	-	-	-	-	Universal Instrument manufacturing co P Ltd	India	DR				
		-	-	-	-	Hind Research Ltd	India	DR				
		III	-	-	-	Emerson	Mumbai	A				
		III	-	-	-	Blank SGS Pvt Ltd	Gurgaon	A				
		-	-	-	-	B Tech Inc	USA	DR				
		III	-	-	-	Hitachi Hi Rel	Gandhinagar	A				
		-	-	-	-	Hiparkas	Germany	DR				
		-	-	-	-	Hitachi Hi Rel	Gandhinagar	DR				
38	Battery(NI-cd)	I	-	-	-	AMCO SAFT	Bangalore	A				
		II	-	-	-	SAFT	France/Sweden	A				
		I	-	-	-	NBL POWER	Hyderabad	A				
		II	-	-	-	Hopokua	Germany	A				
39	Socket weld fittings	III	-	-	-	BHEL Approved Sources	Raigarh	A				Carbon steel only
40	Impulse pipe & tubes	II	-	-	-	Maharashtra Seamless	Japan	A				
		II	-	-	-	Sanitomon Kawasaki Nippon	Japan	A				
		II	-	-	-	TPS TECHINTUBE	Germany	A				
		II	-	-	-	Velvac & manestmann	Germany	A				
		II	-	-	-	BHEL	Toddy	A				
		II	-	-	-	Trourey and Calver	France	A				Makes shall be as per approved list (Sr. No. 41)
		II	-	-	-	ISMT	Ahmadnagar	A				Carbon steel only.
		II	-	-	-	Sandox		A				For SS only
		-	-	-	-	TUBACES	Spain	DR				
		-	-	-	-	Saltgitter Mannesmann International	Germany	DR				
		-	-	-	-	Jindal saw	India	DR				
		II	-	-	-	Rafinament Metal and Tubes	Ahmadabad	A				SS only
		II	-	-	-	Heavy metals and Tubes	Ahmadabad	A				SS and CS only.
41	Completion fittings	III	-	-	-	Shubhashmi Metal and Tubes	Mumbai	DR				
		III	-	-	-	Parker	USA	A				
		III	-	-	-	Precision	Mumbai	A				
		III	-	-	-	Asich	Mumbai	A				
		III	-	-	-	Fluid control Pvt. Ltd.	Pune	A				Femleas are to be hardened at Exim Holland for pressure above 9000 psi.
		III	-	-	-	HP Valves and fittings	CHENNAI	A				Femleas are to be hardened at Exim Holland for pressure above 9000 psi.
		III	-	-	-	Excel hydro	Mumbai	A				Femleas are to be hardened at Exim Holland for pressure above 9000 psi.
		III	-	-	-	Swagelok	USA	A				
		III	-	-	-	Parham	Mumbai	A				
		III	-	-	-	Valprosa	Kolkata	DR				
		-	-	-	-	AURA INC	New Delhi	DR				
		-	-	-	-	Prima Engineers		DR				
		-	-	-	-	Arya Craft		DR				



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PROJECT : Parvati STPS Phase-I (3 X 800MW)		LIST OF ITEMS REQUIRING QP		REVISION NO : 00							
PACKAGE : EPC PACKAGE		APPROVAL & ACCEPTABLE		DATE : 26.04.2017							
CONTRACTOR : BHEL Ltd		VENDOR AS APPROVED BY									
CONTRACT NO : CS-9595-001-2											
No.	Major Equipment	QIP Inspected on Category	QIP No. 9595- 001-QV Q	QIP Submis- sion SCH	QIP Approval SCH	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub QR	Remark
		I				Pholes Cable	DR *				
		I				Incab	DR *				
		I				Gupta Power Infrastructure Ltd.	A				
		I				Lepp cables	DR				
		I				Lion cable	DR				
		I				RR Kabel	DR				
		I				Ganacab	DR				
		I				KEC International	DR				
		I				Advance cable Technologies	DR				
		I				Surya Electricals Ltd.	DR				
		I				Special Cable	DR				
		I				CMI	DR				
		I				Gayatri Cables	DR				
		I				Associate Cables	DR				
		I				Radiant RSCC Specialty	DR				
		I				AFAR Industries	DR				
		I				Yongtara Cable	DR				
		I				Mansfield cables co. Ltd.	DR				
		I				Servel India Pvt. Ltd.	DR				
		I				TC Communication Pvt. Ltd.	DR				
		I				Auma	A				
		I				Umforge	A				
		I				Relong	A				
		I				Limiteq	A				
		I				Ridtek	A				
		I				Japan	A				
		I				Bangalore	A				
		I				USA	A				
		I				Germany	A				
		I				China	A				
		I				USA	A				
		I				Germany	DR				
		I				Germany	DR				
		I				USA	A				
		I				SIPROS Abririk GmbH	A				
		I				AIB	DR				
		I				Microprecision	A				
		I				SEIKO	A				
		I				TECHNOMAT	A				
		I				Industriegesellschaft	A				
		I				Stammach	A				
		I				WISE Control	A				
		I				USA	DR				
		I				Germany	DR				
		I				USA	A				
		I				Germany	A				
		I				Germany	DR				
		I				Fairdahl	A				
		I				Austria	A				
		I				Italy	A				
		I				India	A				
		I				Paigat	A				
		I				Pune	A				
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NTPC		PROJECT : Patratu STPS Phase-I (3 X800MW) PACKAGE : EPC PACKAGE CONTRACTOR : BHEL Ltd				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY				REVISION NO : 00 DATE : 28.04.2017	
No.	Major Equipment	QP Inspect on Category	QP No. 3555- 001-QVI Q	QP Submis- sion SCH	QP Appro val SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub-SCH	SS Approval Sub OR	Remark
49	High Temp. cable (PTFE/FE/P)	I				MINCO India Flow Elements Pvt. Ltd	GOA	A			
		*				SAMEL	Korea	DR			
		*				MINCO	GOA	DR			
		*				Engg. Specialties	Kolkata	DR			
		*				Pyroelectric	Mumbai	DR			
		*				Hydropneumatics	Madras / GOA	DR			
		*				ASIAN INDUSTRIAL VALVES	Chennai	DR			
		*				Dynaford valves Pvt. Ltd.	Belgium	DR			
		*				Habia cables	Sweden	A			
		II				Lapp cables	Germany	A			
		II				Karpen cables	Germany	A			
		II				TEW & C	USA	A			
		II				Thermo-Electra Bv	Netherlands	A			
		II				Habia cables	China	A			
		II				Thermocables	Hyderabad	A			
		II				Templants	Udaipur	A			
		II				Dellon Cables	Fardabail	DR			
		*				RJ Cables	Roorkee	DR			
50	Flow aplis cable	II				HFCL	Goa	A			Previously known as D Link / Smartlink, Goa
		II				R&M	Switzerland	A			
		II				Akash Fibre	Bhavad	A			
		II				Finclax	Pune/Goa	A			
		II				Birta Ericson	Rewa	A			
		II				Molex	UK	A			
		II				Coming	USA	A			
		II				Schneider	GOA	A			
		*				RPG Cables	India	DR			
		*				Uniflex Cables	India	DR			
		*				Tennison	India	DR			
51	Pneumatic Actuator (Power Cylinder s. g. FOR SADC)	II				Dong Woo Valve Control Co. LTD	Korea	A			
		II				Shin Hwa Engineering Co. LTD	Korea	A			
		I				Instrumentation Limited	Philippines	A			
		I				Kellon	Cochin(Malapp)	A			
		*				SMC Pneumatics	Noida	A			
		*				Roller	Mumbai	A			
		*				Emerson Process Management	Chennai	DR			
		*				MIL Controls	Alanya	DR			
		*				Festo	Bangalore	DR			
		*				IMI Normen	Heida	DR			
52	Level switch capacitance type	III				ENDRESS & HOUSER	Aurangabad	A			
		III				MAGNETROL	BELGIUM	A			
		III				SBEM	PUNE	A			
		III				PUNE TECHTROL	PUNE	A			



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PROJECT : Patrauli STPS Phase-I (3 X 800MW)				LIST OF ITEMS REQUIRING QP				REVISION NO : 00			
PACKAGE : EPC PACKAGE				APPROVAL & ACCEPTABLE				DATE : 26.04.2017			
CONTRACTOR : BHEL Ltd				VENDOR AS APPROVED BY							
CONTRACT NO : CS-9555-081-2											
No.	Major Equipment	QIP (Inspection Category)	QIP No. of 5565- 001-QVI SCH	QIP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub OR	Remark
53	Transducer	II			LEVCON	KOLKATA	A				
		III			Nivo Controls	Indore	A				
		*			V AUTOMAT	New Delhi	DR				
		*			D K Instrument	Kolkata	DR				
		*			Siemens	Germany	DR				
		*			ABB	Korea	DR				
		*			Rossmuyl	Korea	DR				
		II			AE	Mumbai	A				
		II			Southern Transducer	Chennai	A				
		II			Elster	Mumbai	A				
		III			Camille Bauer	Germany	A				
		III			Mettrel	Germany	A				
		II			Rishab	Nash	A				
		*			Pyrotech	Udaipur	DR				
		*			Melbus	Gandhinagar	DR				
		III			SIEMENS	Germany	DR				
		III			EMERSON	Mumbai	A				
		III			EMERSON	Pune	A				
		III			Nisach Hi-Rel	Gandhinagar	A				
		III			APC	Bangalore	A				
		III			APLAI	Mumbai	A				
		III			Della	Gurgaon	DR				
		*			Powertech	Bangalore	DR				
		*			TUBAS ENGG PVT LTD.,		DR				
		*			BANGALORE		DR				
		*			Grid power conversion Pvt Ltd.		DR				
		*			Schneider	Bangalore	DR				
		III			EMERSON (Solartron mobility)	UK	A				
		II			Hi Tech	Kolkata	A				
		III			Varway	USA	A				
		III			LEVELSTATE	UK	A				
		II			Raman Instruments	Delhi	A				
		*			BI-REL	Tiruch	DR				
		*			IGEMA	Germany	DR				
		III			ENDRESS & HOUSER	ALIRANGABAD	A				
		III			MAGNETROL	BELGIUM	A				
		III			LEVCON	KOLKATA	A				
		III			SEMI	PUNE	A				
		III			Centronics semil	Madurai	A				
		III			NAKATTA	JAPAN	A				
		III			Sigma Industries	Mumbai	A				
		III			D K Instrument	KOL KATA	A				
		III			PURE TECHTROL	PUNE	A				
		III			V AUTOMAT	NEW DELHI	A				
		*			WAREE	WAPI	DR				
		III			LEVELSTATE	UK	A				
55	Level switch- cond type									Sub OR	Levelstate, UK System
											Emerson (Mobvay) System
58	Level switch- Final/Displacer Type									Sub OR	



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PROJECT : Patratu STPS Phase-I (3 X900MW) PACKAGE : EPC PACKAGE CONTRACTOR : BHEL Ltd										LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY					REVISION NO : 00 DATE : 28.04.2017	
CONTRACT ID NO : CS-82EE-001-3																
S/N.	Major Equipment	QP Inspection Category	QP No. 9285- 601-QVI Q	QP Submis sion SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub QR	Remark				
57	Air filter regulator	I				Gauges Bourdon (OIC)	Pune	A								
		II				Nican Scientific Process	Mumbai	DR								
		III				Fairchild	USA	A								
		IV				Sharo Nergin	Mumbai	A								
		V				SMC Pneumatics	MOIDA	A								
		VI				Emerson (Asco)	Chennai	A								
		VII				Festo	Bangalore	A								
		VIII				Flacka	Chennai	A								
		IX				Divya Control Elements	Gujarat	DR								
58	Copper tubing/Braze connectors	I				Main Contractor approved Sources		A								
59	Coupling / Interlocking relays	II				PARAMOUNT	BANGALORE	A								
		III				OMRON		A								
		IV				OEN		A								
		V				JON	Bareilly	A								
		VI				ELSTA	SWITZERLAND	A								
		VII				Schneider	Germany	DR								
		VIII				Siemens	Germany	DR								
		IX				Phoenix	Germany	DR								
		X				Pender		DR								
		XI				Rohlex	Vadodara	A								
60	Sole-noid valve	II				Ancon	Mumbai	A			Sub QR					
		III				Heron	Germany	A								
		IV				IMI NORGEN	GERMANY	A								
		V				Jaffarson	Argentina	A								
		VI				Asco	CHINA USA	A								
		VII				Festo	Bangalore	A								
		VIII				SMC	Noida	A								
		IX				Parker	Brand Name	A								
		X				Schneider	Germany	DR								
		XI				Newcon Industries Pvt. Ltd.		DR								
61	Lube oil control valve - Self Regulating	II				NUOVO PIGNONE	ITALY	A								
		III				EMERSON SAMSON	CHEMIA GERMANY / PUNE	A								
		IV				Furber Marshall arca Int. Ltd.	Pune	A								
62	Guided wave/Radar type level transmitter	II				MagnaTrol	Belgium	A			Sub QR					
		III				Enderess & Hoysner	Germany	A								
		IV				Emerson Process Management	Aurangabad	A								
		V				ABBX-Tech	Sweden/ PANNAH	A								
		VI				Suprema Technology	USA	A								
		X				Yokogawa	Thane	A								
		XI				ABB	Japan	DR								
		XII				IR & F	India	DR								
		XIII				IR & F	Bombay	DR								

APPROVED

28.04.2017

Maha Mrs Siemens, Canada

87-4051

Asadov,

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 C & M
 Deptt.
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PROJECT : Patratu STPS Phase-I (3 X800MW)				LIST OF ITEMS REQUIRING QP								
PACKAGE : EPC PACKAGE				APPROVAL & ACCEPTABLE								
CONTRACTOR : BHEL Ltd				VENDOR AS APPROVED BY								
CONTRACT NO : CS-3558-001-3												
No.	Major Equipment	QP Inspect on Category	QP No. 5585- 001-QV1 Q SCH	QP Submis sion SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub QP	Remark	
		*			Kircho	France	DR					
		*			HONEYWELL	Pune	DR					
		*			Voga	Germany / India	DR					
		*			Siemens	India	DR					
		*			SIEM	Pune	DR					
					Main Contractor will propose the vendors during detail Engineering							
63	Maintenance and Calibration Equipment	III			BUDENBERG	UK	A					
		III			DRESSOR (ASHCROFT)	USA/Germany	A					
		III			Wika	Germany	A					
		III			WISE Control	Pune	A					
		III			Nagano KENKO	Korea	A					
		III			H.Guru South India	Japan	A					
		III			A.M. Instruments	Bangalore	A					
		III			NUOVA FIMA	Kolkata	A					
		III			Goa Thermotonic	ITALY	A					
		III			Geca Instrument Industries	Goa	A					
		III			Baumert	Goa	A					
		III			Precision mass products Pvt. Ltd.	Vazir	A					
		III			H. Guru	Gandhinagar	A					
		III			Baumert	Risra Muradpur	A					
		III			Forbes Marshall	Vapi	A					
		III			Ganges Bourdon (GIC)	Hyderabad	A					
		*			Konica	Panvel	DR					
		*			Prodecinc	Korea	DR					
		*			Wineta Gauge	USA	DR					
		*			Walchandnagar Industries Ltd.	Udhavd	DR					
		II			Nasatech	Vapi	A					
		III			US Gauge	USA	DR					
		III			Main contractor approved sources							
		III			Weldmuller	Germany	A					
		III			Phoenix	Germany / India	A					
		III			Wago	Germany / India	A					
		III			Emmer	Vadodara	A					
		III			BHEL Approved Sources							
		I			GE Intelligent platforms							
		I			ABB	Bangalore	A					
		I			Schneider	Bangalore	A					
		I			Rockwell	Nash	A					
		I			Siemens	Sachinbad	A					
		I			HONEYWELL	Nash	A					
		I			ABB	Pune	A					
69	SMART POSITIONER (Make)	I										

REVISION NO : 03

DATE : 28.04.2017

CE Mark only

CE Mark only

Not BHEL will forward only two proposals after details review of NTPC Technical specification requirements.

To be completed in Central Value QP.

M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.

CE Mark only

To be covered in Control Valve OP.

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PROJECT : Patra STP Phase-I (3 X 800MW)												
PACKAGE : EPC PACKAGE												
CONTRACTOR : BHEL Ltd												
CONTRACT NO : CS-355-001-3												
LIST OF ITEMS REQUIRING QP												
APPROVAL & ACCEPTABLE												
VENDOR AS APPROVED BY												
REVISION NO : 00												
DATE : 26.04.2017												
Nm.	Major Equipment	QP Inspect on	QP H/o	QP Subm on	QP Appro val	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub-SCH	SS Approval SCH	Sub QR	Remark
		Y				Mitsubishi						
		Y				Siemens						
		Y				Siemens						
		Y				Yokogawa						
		Y				EMERSON (Fisher Rotamount)						
		Y				METSO						
		Y				Yamatake						
		Y				Moore						
70	ROTAMETER	Y				TRAC	HYDRABAD	A			Sub QR	
		Y				FLUCKA	HYDRABAD	A				
		Y				EUREKA	CHENNAI	A				
		Y				SCIENTIFIC DEVICES	PUNE	A				
		Y				FLOW STAR	MUMBAI	A				UP TO 300 NB
		Y				TOKYO KEISO	FARIDABAD	A				
		Y				Flowtech Instrument Services	JAPAN	A				
		Y				Smit Chemical	Vadodra	OR				
		Y				Gaucha Bourdon	MUMBAI	OR				
		Y				Tetra Equipment Pvt. Ltd.	Parvel	OR				
71	SINGLE AND MULTI POINT TEMPERATURE RECORDER (Microprocessor based)	Y				YOKOGAWA INDIA	Thane	OR				Make Yokogawa, Japan
		Y				CHIND CORPORATION	BANGALORE	A				
		Y				EUROTHERM	JAPAN	A				
		Y				EUROTHERM	UK	A				
		Y				YOKOGAWA	INDIA	OR				
		Y				ABB	JAPAN	A				
		Y				FUJI	UK / GERMANY	A				
		Y				HONEYWELL	JAPAN	A				
		Y				GE BENTLY NEVEDA	USA /	A				ALL TSI VENDORS ARE ALSO ACCEPTABLE
72	Reverse Rotation Indicator (RRI)	Y				SHINKAWA	NETHERLAND	A			Sub QR	
		Y				P & F	USA	A				
		Y				Mem contractor approved sources	JAPAN	A				
73	Instrument Tube Fittings (Ab)	Y				HACH	Bangalore	A				
74	pH/Conductivity Analyser	Y				YOKOGAWA	Switzerland / USA	A				
		Y				ABB	Bangalore / Japan	A			Sub QR	Make Yokogawa-Japan
		Y				EMERSON	UK / USA	A				
		Y				Thermo orion	Parents	A				
		Y				Forbes Marshall	Pune	OR				
75	PADO	Y				Main Contractor will propose the vendors during detail Engineering.	USA / Ireland	A				Recognizable brand
76	DEW Point Sensor / meter / Moisture Measuring System	Y				GE Sensing	UK	A				
		Y				Michell Instrument	UK	A				
		Y				Shaw	UK	A				



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PROJECT : Patra STPS Phase-I (3 X800MW)										LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE				REVISION NO : 00	
PACKAGE : EPC PACKAGE										VENDOR AS APPROVED BY				DATE : 18.04.2017	
CONTRACTOR : BHEL Ltd															
CONTRACT NO : GS.0165-001-2															
No.	Major Equipment	QP No. (as per 001-QV) SCH	QP No. (as per 001-QV) SCH	QP No. (as per 001-QV) SCH	QP No. (as per 001-QV) SCH	QP No. (as per 001-QV) SCH	QP No. (as per 001-QV) SCH	QP No. (as per 001-QV) SCH	QP No. (as per 001-QV) SCH	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub QR	Remark
										USA	A				through Spectrum automation
										Sweden / Japan	DR				
										USA	DR				
										Mumbai	DR				
										India	DR				
										Germany	DR				
										Bangalore	A				
										BANGALORE	A				
										Udaipur	A				
										Bangalore	A				
										Bangalore	DR				
										Japan	DR				
										Pondicherry	DR				
										USA	DR				
										USA	DR				
										Gurgaon	DR				
										Bangalore	A				
										Sweden	A				With Bosch Software
										USA	DR				With Bosch Software
										Sweden	A				With Milestone Software
										Udaipur	A				
										India	A				
										Bangalore	A				
										Pondicherry	DR				
										New Delhi	DR				
										Gandhi Nagar	A				For Non mosaic mounting
										Germany	A				
										UK	A				
										Japan	A				
										Germany	A				
										Germany	A				
										Japan	A				
										Germany	A				
										Germany	A				
										Udaipur	DR				
										Mumbai	DR				
										Bangalore	DR				
										Pune	DR				
										Chennai	DR				
										UK	A				
										Germany	A				
										Germany	A				
										Ireland	A				
										UK	A				



18.04.2017
 PS-MKTG
 Delhi
 Bharti Heavy Electricals Limited
 PS-MKTG
 Delhi
 Bharti Heavy Electricals Limited

PROJECT : Patrauli STPS Phase-I (3 X100MW)												
PACKAGE : EPC PACKAGE												
CONTRACTOR : BHEL Ltd												
CONTRACT NO : GS-1111-001-2												
LIST OF ITEMS REQUIRING QP												
APPROVAL & ACCEPTABLE												
VENDOR AS APPROVED BY												
REVISION NO : 02												
DATE : 24.04.2017												
No.	Major Equipment	QP Inspect on Category	QP No. 9585-001-QW1-Q	QP Submis sion SCH	QP Appro val SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Sub QR	Remark
82	Electrical Indicating Instruments (Mosaic Compatible)	II				Forbes Marshall	Pune	A				Main kit from M/s Codel, UK
		III				Siemens	Germany	A				
		III				Geissen / Melreval / Camille Bauer	Germany	A				
		III				Ganz	Germany	A				
		III				Wolpert Messgeräte	Germany	A				
83	Flue Gas Analyser (CO)	III				Codel	UK	A			Sub QR	Analysar from M/s Emerson, Germany / USA
		III				Emerson Process Management	Pawane	A				Lead Collaboration Div
		III				Land Instrument International	UK	A				
		III				Sick Mahlak	Germany	A				
		III				Siemens	Germany	A				
84	Flue Gas Analyser (CO2)	*				Codel	UK	DR			Sub QR	
		*				Sick Mahlak	Germany	DR				
		*				Kilnake Procal Ltd.	Germany	DR				
85	Flue Gas Analyser (SO2 and NOx)	III				Sick Mahlak	Germany	A			Sub QR	Analysar from M/s Emerson, Germany / USA
		III				Emerson Process Management	Pawane	A				
		III				Siemens	Germany	A				
		III				Fuji Electric	Japan	A				
		*				Yokogawa	Japan	DR				
		*				Codel	UK	DR				
		*				ABB	Gloucestershire	DR				
86	Flue Gas Analyser (O2 Analyser (HT))	II				SECO	Chennai	A			Sub QR	Main Contractor Can propose additional vendor for this item
		III				Marathon Monitor	USA	A				
87	Flue Gas Analyser (O2 Analyser (LT))	III				Emerson (Rosemount)	Pawane	A			Sub QR	Make EMERSON, USA
		III				Forbes Marshall	Pune	A				Make Emtec, Germany : Model
		III				ICE	Mumbai	A				Deltec 5000 series
		III				Yokogawa	Bangalore	A				Make Analtek, USA
		III				ABB	Bangalore	A				Make Yokogawa, Japan
		*				AMETEK (P and AI division)	Singapore	DR				Make ABB, UK
		*				Emtec	Germany	DR				
		*				Fuji Electric	Japan	DR				
		*				Telidyne	USA	DR				
88	Flue Gas Analyser Panel	I				Chemtrol	Goa	A			Sub QR	
		I				Emerson Process Management	Navi Mumbai	A				
		I				Pyrotech	Udaipur	A				
		I				Analytical Instrument Company	Kota	A				Analysar from M/s Fuji, Japan
		I				Yokogawa	Bangalore	DR				
		I				Adago	Mumbai	A				
		*				Marvel Enrgo Company	Chennai	DR				



19.04.16

SUB VENDOR LIST (PERMANENT CATEGORY) AS ON 12/19/2019 2:58:38 PM

SI No	Package Name	Supplier Name	Supplier Communication Address	Supplier Works Address
1	Cold Junction Compensation Box (CJCB)	CREATIVE INSTRUMENTS & CONTROLS	NO-17/1, 1ST FLOOR, 11TH CROSS 1ST K BLOCK, RAJAJINAGAR, BANGALORE-560010 Phone- Pincode : Email : crinstruments@gmail.com	
2	CONTROL VALVE	Valvitalia S.P.A. ,	Mr. Salvatore Ruggeri Via Tortona 69, Rivanazzano (Pavia) Phone- +39-03839459875 Pincode : 27055 Email : dario.torluccio@valvitalia.com	Works-1->Mr. Salvatore Ruggeri Via Tortona 69,Rivanazzano (Pavia) - Italy Phone- +39-03839459875 FAX : Pincode : 27055 Email : dario.torluccio@valvitalia.com; diego.poletti@valvitalia.com; sales@bhgassociates.com
		R.K.CONTROL INSTRUMENTS PVT. LTD.	PLOT NO.A-250, OPP.POLICE STATION, WAGLE INDUSTRIAL ESTATE, THANE Phone- 25820943/2331 Pincode : 400604 Email : rkcipl@vsnl.com ; rkcinpt@bol.net.in	Works-1->SAVITH KUMAR PLOT NO. A-250, OPP.POLICE STATION,WAGLE INDUSTRIAL ESTATE, THANE -THANE- MAHARASHTRA INDIA Phone- 022-66060942 FAX : 022-25820801 Pincode : 400 604 Email : rkadmin@rkcipl.co.in
		Mascot Valves Pvt. Ltd.	166-167 GIDC Naroda Ahmedabad Phone- 0792282 1619 Pincode : 382330 Email : dom.sales@mascotvalves.com	Works-1->Varun Patel Dir 166-167 ,GIDC Naroda -Ahmedabad- GUJARAT India Phone- 0792282 1619 / 3369 FAX : Pincode : 382330 Email : dom.sales@mascotvalves.com
		EMERSON PROCESS MANAGEMENT CHENNAI LIMITED	147, KARAPAKKAM VILLAGE, CHENNAI Phone- 23722184, 23716242 Pincode : 600096 Email : jatinder.singh@emerson.com	Works-1->Mr. Rangarajan (Head - Lean and Manufact 147,Karapakkam Village, -Chennai-TAMIL NADU India Phone- 0444903 4395 FAX : Pincode : 600097 Email : Rangarajan.M@emerson.com
		Severn Glocon India Pvt. Ltd.	F96 & F97, Sipcot Industrial Park, Irungattukottai, Chennai, Phone- 044-47104200, Pincode : 602117, Email : info@severnglocon.co.in,	Works-1->Mr. K.Kaushik, F96 & F97, Sipcot Industrial Park,Irungattukottai, -Chennai-TAMIL NADU India Phone- 044-47104200, FAX : 044-47100073, Pincode : 602117, Email : info@severnglocon.co.in
		BOMAFSA SPECIAL VALVE SOLUTIONS PVT LTD	Mr. K.M. Anklesaria/ R. M. Anklesaria Plot No: 285/2, Panchratna Estate, Near Ramol Bridge, Vatva Ahmedabad Phone- 079-40083825 Pincode : 382445 Email : info@bomafsa-india.com	Works-1->Mr. K.M. Anklesaria/ Mr. R.M. Anklesaria Dir Plot No: 285/2, Panchratna Estate, Near Ramol Bridge, Vatva, -Ahmedabad- GUJARAT INDIA Phone- 079-40083825 FAX : Pincode : 382445 Email : info@bomafsa-india.com
		FORBES MARSHALL ARCA PVT.LTD.	A-34/35, MIDC ESTATE, H-BLOCK, PIMPRI, PUNE, Phone- 020-27442020, Pincode : 411018 Email : mnadgaundi@forbesmarshall.com	Works-1->Mr. Sanjeev Shinde A-34/35 MIDC Estate,H Block, Pimpri, -Pune-MAHARASHTRA India Phone- 9323176406 FAX : 020-27442040 Pincode : 411018 Email : sshinde@forbesmarshall.com
		INSTRUMENTATION LTD.	KANJIKODE WEST, PALAKKAD, PALAKKAD Phone- 2566127-130,2567128 Pincode : 678623 Email : icvdlil@gmail.com;fa2@ilpgt.com	Works-1->D.SASIDHARAN, AGM(Works&PPC) KANJIKODE WEST, -PALAKKAD-KERALA INDIA Phone- 0491-2566536 FAX : 0491-2566135 Pincode : 678623 Email : sasidharan@ilpgt.com;mrj@ilpgt.com;gireesh@ilpgt.com, commercial@ilpgt.com;fa2@ilpgt.com;nazeera@ilpgt.com;pkv@ilpgt.co m;remith@ilpgt.com
		Koso India Private Limited,	H 33 & 34, MIDC, Ambad, Nashik, Phone- 09650233433 Pincode : 422010, Email : jetmal.gour@koso.co.in	Works-1->P.J.ASHOK KUMAR/SEEMA ANAND Control Valve Division, H-33&34, MIDC, Ambad, -Nashik-MAHARASHTRA INDIA Phone- 91 944 744 3198 FAX : 0491 - 5269914 Pincode : 422010 Email : pja@koso.co.in;enquiry@koso.co.in Works-2->P.J.ASHOK KUMAR/SEEMA ANAND J-1,MIDC,Ambad -Nashik-MAHARASHTRA INDIA Phone- 91 944 744 3198 FAX : 0491 - 5269914 Pincode : 422010 Email : pja@koso.co.in;enquiry@koso.co.in
		SAMSON CONTROLS PVT. LTD.	Mr. Atul raje-MD D 281, MIDC Ranjangaon Ta Shirur Pune Phone- 02067246600 Pincode : 412220 Email : sales@samsoncontrols.net	Works-1-> Others D 281, MIDC Ranjangaon -Pune-MAHARASHTRA India Phone- 02067246600,8554997963 FAX : Pincode : 412220 Email : sales@samsoncontrols.net
		KSB MIL CONTROLS LTD.	Mr.Jacob Cherian/Mr.Geo Jolly Meladoor, Annamanada P.O. MALA, Thrissur Phone- 0480-2695700 Pincode : 680741 Email : bjiu.simon@ksb.com	Works-1->Mr.Biju Simon/Mr.Jose Paul Meladoor, Annamanada, -Thrissur-KERALA INDIA Phone- 9447555500 FAX : 91 480 2890952 Pincode : 680741 Email : jose.paul@ksb.com
		SUZHOU DELAN ENERGY SCIENCE & TECHNOLOGY CO., LTD.	No 566 Fangqiao Road Caohu Industrial Park, Xiangcheng Economic Development Zone, Suzhou Phone- 008618012776062 Pincode : 215143 Email : jeanielei@delan-valve.com	Works-1->Mr. Zong Xin CEO No 566 Fangqiao Road Caohu Industrial Park,Xiangcheng E. Z. -Suzhou-Foreign Country CHINA Phone- 008618012776062 FAX : Pincode : 215143 Email : jeanielei@delan-valve.com
		WALDEMAR PRUSS ARMATURENFABRIK GMBH	Mr. Winfried Dremhel Schulenburgelandstrasse 261, Hannover Phone- +49-511279260 Pincode : 30419 Email : dremhel@pruss.de; vogel@pruss.de	Works-1->Mr. Winfried Dremhel CEO Schulenburgelandstrasse 261, -Hannover- GERMANY Phone- +49-511279260 FAX : Pincode : 30419 Email : dremhel@pruss.de
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		H.GURU INDUSTRIES	Mr. G. D. Hazra/Mr. P. K. Mitra 10 B, HO-CHI-MINH SARANI, KOLKATA Phone- 033 2282 2463 / 1637 Pincode : 700071 Email : mguru@vsnl.net	Works-1->NA NA -- Phone- FAX : Pincode : Email :
		FORBES MARSHALL (HYD) LTD.	MR SAILESH PATALAY/MR. M K SRINIVASAN PLOT NO.A-19/2, & T-4/2, IDA, NACHARAM, HYDERABAD Phone- 9849913704 Pincode : 500 076 Email : mksrinivasan@forbesmarshall.com	Works-1->MR G.SRINIVASAN/MR ANUJ MALPANI PLOT NO:A-19/2 & T-4/2,I.DA. NACHARAM , -HYDERABAD-TELANGANA INDIA Phone- 09866550762 FAX : 040 27152193 Pincode : 560076 Email : ashrinivasan@forbesmarshall.com
		PRECISION MASS PRODUCTS PVT. LTD.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com	Works-1->Mr. Hitesh Parmar/Mr. Hitesh Parmar Plot No.2306, Phase II, GIDC Chhatral, -Kalol-GUJARAT INDIA Phone- 9327359227 FAX : 02764-233440 Pincode : 382729 Email : hitesh.parmar@ashcroftindia.com

		Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 A GIDC A Phase 1, -VAPI-GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com
		H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	32,INDUSTRIAL SUBURB YESWANTHAPUR BANGALORE Phone- 080-23370300, Pincode : 560022 Email : info@hgurusouth.com	Works-1->Shikha Hazra/ Shyamal Hazra 32, Industrial Suburb,Yeshwanthpur -BANGALORE-KARNATAKA INDIA Phone- 080-23370300 FAX : 080-23379890 Pincode : 560022 Email : shikhaazra@hgurusouth.com
		GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gjcdelhi@general-gauges.com,	Works-1->Gauge Bourdon India Pvt. Ltd., Plot No-4, 5, 6,Jawahar Co-operative Industrial Estate, -Kalamboli Taluka Panvel-MAHARASHTRA India Phone- 022-27421095, FAX : 022-27421901, Pincode : 410209, Email : info@general-gauges.com
		Nesstech Instruments Private Limited	26/2, G Type, Global Industrial Park Near Nahuli Railway Crossing, Valvada Vapi Phone- 9920576002 Pincode : 396105 Email : sales@nesstech.co.in	Works-1-> Others 26/2, G Type, Global Ind. Park Near Nahuli Railway Crossing, -Vapi-GUJARAT INDIA Phone- 9920576002 FAX : Pincode : 396105 Email : sales@nesstech.co.in, bkpadia@nesstech.co.in
		SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Center, Others By-Pass Junction,Near Kalsekar College kausa, mumbra,Thane -Mumbai-MAHARASHTRA INDIA Phone- 022-25491409,9892230623 FAX : Pincode : 400612 Email : sdbpl@vsnl.com
12	TEMP. ELEMENT	DETRIVE INSTRUMENTATION & ELECTRONICS LTD.	320, TV INDUSTRIAL ESTATE, OFF.DR.A.BESANT ROAD, BEHIND GLAXO, WORLI, MUMBAI Phone- 24934125,24938403 Pincode : 400025 Email : trivtech@vsnl.com	Works-1->Mr. A.D.Solomon J-14, MIDC, TARAPORE, BOISER STN., -THANE-MAHARASHTRA India Phone- FAX : Pincode : Email : trivtech@vsnl.com
		Nesstech Instruments Private Limited	26/2, G Type, Global Industrial Park Near Nahuli Railway Crossing, Valvada Vapi Phone- 9920576002 Pincode : 396105 Email : sales@nesstech.co.in	Works-1-> Others 26/2, G Type, Global Ind. Park Near Nahuli Railway Crossing, -Vapi-GUJARAT INDIA Phone- 9920576002 FAX : Pincode : 396105 Email : sales@nesstech.co.in, bkpadia@nesstech.co.in
		Thermal Instrument India Pvt. Ltd.	Mr. Raghavendra M. Kulkarni 194/195, Gopi Tank Road Behind Citylight Cinema,Mahim Mumbai Phone- 09322664709 Pincode : 400016 Email : ramk@giconindia.com	Works-1->Mr. Raghavendra M. Kulkarni Survey No. 250A/B, Post-Mangaon,Tal.- Kudal, Dist.- Sindhudurg, --MAHARASHTRA India Phone- 09322664709 FAX : 022-24455026 Pincode : 416519 Email : ramk@giconindia.com
		Tempsens Instrument (I) Pvt Ltd	MR. V.P.RATHI/MR. HEMANT RATHI B-188A ROAD NO.5 , M.I.A UDAIPUR Phone- 09352420069 Pincode : 313003 Email : info@tempsens.com	Works-1->Mr. S.D Deval B-188A ROAD NO.5 ,M.I.A -UDAIPUR- RAJASTHAN INDIA Phone- 9352501530 FAX : 0294-3057750 Pincode : 313003 Email : deval@tempsens.com
		Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 A GIDC A Phase 1, -VAPI-GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com
		GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	D2/5, Mapusa Industrial Estate, Mapusa, Goa, Phone- 09326054551, Pincode : 403507, Email : sumukh@ggoainstruments.com.	Works-1->Mr. S.G. Dixit D2/5, Mapusa Industrial Estate, -Mapusa-GOA INDIA Phone- 09326054551 FAX : 0832-2262331 Pincode : 403 507 Email : sumukh@ggoainstruments.com
		PYRO ELECTRIC INSTRUMENTS GOA PVT.LTD.	M. D. BICHU/R. M. BICHU G.B. HILL CROWN APARTMENTS, COLLEGE ROAD, MAPUSA Phone- 9326114601 Pincode : 403507 Email : priyanka.marketing@pyro-electric.in	Works-1->A A KULKARNI/ VINOD C G PLOT NO. 71,BICHOLIM INDUSTRIAL ESTATE -BICHOLIM-GOA INDIA Phone- 9326114409 FAX : 91 832 2363381 Pincode : 403529 Email : pyroworks@pyro-electric.in
		GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gjcdelhi@general-gauges.com,	Works-1->Gauge Bourdon India Pvt. Ltd., Plot No-4, 5, 6,Jawahar Co-operative Industrial Estate, -Kalamboli Taluka Panvel-MAHARASHTRA India Phone- 022-27421095, FAX : 022-27421901, Pincode : 410209, Email : info@general-gauges.com
		TOSHNIWAL INDUSTRIES PVT. LTD.,	Industrial Estate, Makhupura, Ajmer, Phone- 9352009000, Pincode : 305002, Email : info@tipl.com,	Works-1-> Khasra No.: 218-230& 235, Industrial Estate,Makhupura, -Ajmer-RAJASTHAN India Phone- 9887865856, FAX : 0145-2695174, Pincode : 305002, Email : rajeev.gupta@tipl.com
		SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Center, Others By-Pass Junction,Near Kalsekar College kausa, mumbra,Thane -Mumbai-MAHARASHTRA INDIA Phone- 022-25491409,9892230623 FAX : Pincode : 400612 Email : sdbpl@vsnl.com
13	TEMPERATURE GAUGE	H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	32,INDUSTRIAL SUBURB YESWANTHAPUR BANGALORE Phone- 080-23370300, Pincode : 560022 Email : info@hgurusouth.com	Works-1->Shikha Hazra/ Shyamal Hazra 32, Industrial Suburb,Yeshwanthpur -BANGALORE-KARNATAKA INDIA Phone- 080-23370300 FAX : 080-23379890 Pincode : 560022 Email : shikhaazra@hgurusouth.com
		GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gjcdelhi@general-gauges.com,	Works-1->Gauge Bourdon India Pvt. Ltd., Plot No-4, 5, 6,Jawahar Co-operative Industrial Estate, -Kalamboli Taluka Panvel-MAHARASHTRA India Phone- 022-27421095, FAX : 022-27421901, Pincode : 410209, Email : info@general-gauges.com
		H.GURU INDUSTRIES	Mr. G. D. Hazra/Mr. P. K. Mitra 10 B, HO-CHI-MINH SARANI, KOLKATA Phone- 033 2282 2463 / 1637 Pincode : 700071 Email : mguru@vsnl.net	Works-1->NA NA -- Phone- FAX : Pincode : Email :
		GOA THERMOSTATIC INSTRUMENTS PVT.LTD.	FLAT -B , GF, HILL CROWN APTS., COLLEGE ROAD, MAPUSA Phone- Pincode : 403525 Email : gttilworks@pyro-electric.in	Works-1->Mrs Saanvi Naik BICHOLIM, -BICHOLIM-GOA INDIA Phone- 9595855152 FAX : Pincode : 403 529 Email : saanvi.naik@thermostatic.in
		A.N. INSTRUMENTS PVT. LTD.	MARKETING DIVISION, 5th FLOOR, 59-B, CHOWRINGHEE ROAD, KOLKATA Phone- 24757784,22472509 Pincode : 700020 Email : anidel@bol.net.in	Works-1->Mr. Gautam Mukherjee Kusumba,Sonarpur Station Road,P.O. -Narendrapur, -Kolkata-WEST BENGAL INDIA Phone- 9836878855 FAX : 033-24342748 Pincode : 700103 Email : gkm_ani@hotmail.com
		FORBES MARSHALL (HYD) LTD.	MR SAILESH PATALAY/MR. M K SRINIVASAN PLOT NO.A-19/2, & T-4/2, IDA, NACHARAM, HYDERABAD Phone- 9849913704 Pincode : 500 076 Email : mksrinivasan@forbesmarshall.com	Works-1->MR G.SRINIVASAN/MR ANUJ MALPANI PLOT NO:A-19/2 & T-4/2,I.D.A. NACHARAM , -HYDERABAD-TELANGANA INDIA Phone- 09866550762 FAX : 040 27152193 Pincode : 560076 Email : oshrinivasan@forbesmarshall.com
		GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	D2/5, Mapusa Industrial Estate, Mapusa, Goa, Phone- 09326054551, Pincode : 403507, Email : sumukh@ggoainstruments.com.	Works-1->Mr. S.G. Dixit D2/5, Mapusa Industrial Estate, -Mapusa-GOA INDIA Phone- 09326054551 FAX : 0832-2262331 Pincode : 403 507 Email : sumukh@ggoainstruments.com
		PRECISION MASS PRODUCTS PVT. LTD.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com	Works-1->Mr. Hitesh Parmar/Mr. Hitesh Parmar Plot No.2306, Phase II, GIDC Chhatral, -Kalol-GUJARAT INDIA Phone- 9327359227 FAX : 02764-233440 Pincode : 382729 Email : hitesh.parmar@ashcroftindia.com

		Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 A GIDC A Phase 1, -VAPI-GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com
14	TRANSMITTERS	YOKOGAWA INDIA LIMITED,	PLOT NO.96, ELECTRONICS CITY COMPLEX, HOSUR ROAD, BANGALORE, Phone- 080-41586000, Pincode : Email : uday.shankar@in.yokogawa.com,	Works-1-> PLOT NO.96, ELECTRONICS CITY COMPLEX, HOSUR ROAD, -BANGALORE-KARNATAKA INDIA Phone- 080-41586000, FAX : 080-28521442, Pincode : Email : uday.shankar@in.yokogawa.com
		ABB INDIA LIMITED	MR. RAJIV GOVIL 14, MATHURA ROAD, FARIDABAD Phone- 09971085678 Pincode : 121003 Email : vijin.swami@in.abb.com	
		V. AUTOMAT & INSTRUMENTS (P) LTD.	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDLAREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com	Works-1->Mr. BHAGWAN SINGH/ Mr. NANDAN SINGH F-61, OKHLA INDLAREA, PHASE-1 -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : production@vautomat.com
		Pune Techtrol Pvt. Ltd.	N.P.Khatan/Sudhakar Badiger S-18, MIDC Bhosari, Pune Phone- 9850560042 Pincode : 411 026 Email : ho@punetechtrol.com	
		TOSHNIWAL INDUSTRIES PVT. LTD.,	Industrial Estate, Makhupura, Ajmer, Phone- 9352009000, Pincode : 305002, Email : info@tipl.com,	Works-1-> Khasra No.: 218-230& 235, Industrial Estate,Makhupura, -Ajmer-RAJASTHAN India Phone- 9887865856, FAX : 0145-2695174, Pincode : 305002, Email : rajeev.gupta@tipl.com
		Endress + Hauser (India) Pvt. Ltd.,	Mr. Prakash Vaghela 215-216, DLF Tower 'A', Jasola District Centre, New Delhi, Phone- 9717593001, Pincode : 110025, Email : prakash.vaghela@in.endress.com,	Works-1-> M-171 to 173, MIDC, Waluj, -Aurangabad-MAHARASHTRA India Phone- 9881000474, FAX : 0240-2555179, Pincode : 431136, Email : Narendra.Kulkarni@wetzler.endress.com
		SBEM PVT. LTD.	MR.N.K. BEDARKAR/MR. VISHWANATH KARANDIK 39, ELECTRONIC CO.OP. ESTATE, PUNE SATARA ROAD PUNE, Phone- 912041030100 Pincode : 411009 Email : newdelhi@sbem.co.in	Works-1->MR. MOHAN PADWAL 691/A/2,BIBWEWADI INDL ESTATE -PUNE-MAHARASHTRA INDIA Phone- 918600042374 FAX : 912024215670 Pincode : 411037 Email : wm@sbem.co.in
		PANAM ENGINEERS	Mr. Santosh Shukla 203, Jaisingh Business,Parsiwada, Sahar road,Andheri(East), Mumbai, Phone- 9892179529, Pincode : 400099, Email : santosh@panamengineers.com,	Works-1->Mr. Santosh Shukla Others R-628,TTC Industrial Area, MIDC Rabale, -Navi Mumbai-MAHARASHTRA India Phone- 9821350761, FAX : 022-27695559, Pincode : 400701, Email : sales@panamengineers.com
		SMART INSTRUMENTS LTD, BRAZIL	Agents: Digital Electronic Ltd. 74/11 'C' Cross Road MIDC Andheri (East) MUMBAI Phone- 28208477 Pincode : 400093 Email : corp@delbvy.roams.ems.vsnl.net.in	
		SIEMENS LIMITED	Dr. Armin Bruck/Sandeep Mathur 130, Pandurang Budhkar Marg Worli Mumbai Phone- 0124 383 7377 Pincode : 400018 Email : ankit.varshney@siemens.com	Works-1->Ankit Varshney Kalwa Works, Thane-Belapur Road, Thane, -MUMBAI-MAHARASHTRA INDIA Phone- FAX : Pincode : 400708 Email :
		Moore Industries International Inc.	Leonard.W. Moore/ Matt Moren 16650 Schoenborn St. North Hills Phone- +1 818 830 5548 Pincode : 91343 Email : mmoren@miinet.com	Works-1->Matt Moren/Gina Cruz 16650 Schoenborn St., North Hills -CALIFORNIA- USA Phone- +1 818 894 7111, ext FAX : +1 818 830 5588 Pincode : 91343 Email : gcruz@miinet.com
		EMERSON PROCESS MANAGEMENT (INDIA) PVT.LTD.	Mr. Amit Patthankar/Vikram Raj Singh 206-210,BALARAMA BUILDING 2ND FLR. BANDRA EAST MUMBAI Phone- 9619121500 Pincode : 400051 Email : vikramraj.singh@emerson.com	Works-1->Kalpesh Chandan/Hrishikesh Aghor Plot No. A 145/4 TTC IND AREA,MIDC, PAWANE, -NAVI MUMBAI-MAHARASHTRA INDIA Phone- 9619688001 FAX : 022-66736000 Pincode : 400 705 Email : Kalpesh.chandan@emerson.com
		Honeywell Automation India Limited	Mr. Ritvij Kulkarni 917, INTERNATIONAL TRADE TOWER, NEHRU PLACE, NEW DELHI Phone- 9890200584 Pincode : 110019 Email : rajesh.chaudhary@honeywell.com	Works-1->Mr.Kedar Tillu 53, 54, 56 & 57,Hadapsar Industrial Estate -PUNE-MAHARASHTRA INDIA Phone- 9665034625 FAX : 020 66039905 Pincode : 411013 Email : kedar.tillu@honeywell.com
		NIVO CONTROLS PVT. LTD.	Mr. Praveen Toshniwal 104-115, Electronic Complex, Indore Phone- 0731-4081305 Pincode : 452010 Email : sales@nivocontrols.com	Works-1->Mr. Praveen Toshniwal 104-115, Electronic Complex, -Indore-MADHYA PRADESH India Phone- 0731-4081305 FAX : 0731-255075 Pincode : 452010 Email : sales@nivocontrols.com
15	ULTRASONIC FLOW METERS	Electonet Equipments Pvt Ltd.	Mr. Rajendra Nagaonkar/MD, Plot No. 84, 85 & 86, Tiny Industrial Estate Kondhwa Budruk, Pune Phone- 9822015256 Pincode : 411048 Email : ho@eeplindia.com	Works-1-> Others Plot No. 84, 85 & 86, Tiny Industrial Estate, Kondhwa Budruk -Pune-MAHARASHTRA INDIA Phone- 20-26932039 FAX : 20-26934122 Pincode : 411048 Email : ho@eeplindia.com
		Adept Fluidyne Pvt. Ltd.	Vinayak Gadre Plot No 4,S.No.17/1-B Kothrud Industrial Estate Pune Phone- 020 25464551 Pincode : 411038 Email : info@adepthfluidyne.com	Works-1-> Plot No 4,S.No.17/1-B Kothrud Industrial Estate -Pune-MAHARASHTRA india Phone- 020 25464551 FAX : Pincode : 411038 Email : info@adepthfluidyne.com
		FLEXIM Flexible Industriesstechnik GmbH	Boxberger Str., 4, Berlin Berlin Phone- 0049 30 93 66 76 60 Pincode : 12681 Email : info@flexim.de	Works-1-> Others Boxberger Str. 4, -Berlin- GERMANY Phone- 0049 30 93 66 76 60 FAX : Pincode : 12681 Email : info@flexim.de
		Rockwin Flowmeter India Pvt. Ltd.	B-24, Site-IV, Sahibabad Industrial Area Ghaziabad, Phone- 9810129687 Pincode : 201010, Email : amiya@rockwin.com	Works-1->MR Rajiv PRAKASH B-24, Site-IV, Sahibabad Industrial Area, -Ghaziabad-UTTAR PRADESH India Phone- 9810129687 FAX : 01202895450 Pincode : 201010, Email : rajiv@rockwin.com
		FLASH FORGE PVT LTD	Mr. Gautam Makker, 503, 'A'-wing, Delphi, Orchard Avenue Road, Powai Mumbai Phone- 022-42784300 Pincode : 400076 Email : hemendrapatil@f-f.co.in	Works-1-> Others M/s Endress & Hauser, Aurangabad, Maharashtra -Aurangabad-MAHARASHTRA INDIA Phone- FAX : Pincode : Email : Works-2->+ Others M/s Endress & Hauser, Bhiwandi,Thane -Thane-MAHARASHTRA INDIA Phone- FAX : Pincode : Email :
		NIVUS GMBH	Mr. Marcus Fischer Im Taele 2, D - 75031 Eppingen Phone- 00491712233770 Pincode : Email : carolin.schuster@nivus.com	Works-1->Mr. Marcus Fischer CEO Im Taele 2, Eppingen, -Baden Wuerttemberg, -Foreign Country GERMANY Phone- 0049-726291910 FAX : Pincode : 75031 Email : carolin.schuster@nivus.com

Note:

1. The above sub-vendor list is tentative & reference only. However Sub-Vendor List is subject to BHEL/end user approval without any commercial/ delivery implication.

2. New Sub-Vendor if proposed by Vendor during contract stage shall subject to BHEL/ end user approval without any commercial/ delivery implication.

ANNEXURE 1
FORMAT FOR PROVENNESS CERTIFICATE

Award/Contract Agreement/
Order enclosed

Sl.No.	Item Description	Plant No.1
5.00.00	INSTRUMENTS (PRIMARY & SECONDARY)	
(i)	Type of Instrument	
(ii)	Make / Model	
(iii)	Name of Power Station (Location & Address)	
(iv)	Unit Size (MW)	
(v)	Commissioning date	
	Whether above instruments have atleast one (1) year satisfactory operation in one (1) power station having unit rating of 200 MW or above.	Yes/No
(vi)	Client's certificate attached	Yes/No

Signature of authorized signatory.....



3x800 MW PATRATU TPS

**GYPSUM DEWATERING SYSTEM
TECHNICAL SPECIFICATION**

SUB-VENDOR LIST

SPECIFICATION NO. PE-TS-434-571-A001

SECTION : I

SUB-SECTION : D

REV 00

SHEET 1 OF 1

ANNEXURE-I

- 1. REFER ELECTRICAL AND C&I SPECIFICATION FOR APPLICABLE SUB-VENDOR LIST FOR THE RELEVANT ITEMS.**
- 2. THE LIST OF ALL BOUGHT OUT ITEMS WITH MAKES AND COUNTRY OF ORIGIN AND CONTACT DETAILS OF THE MANUFACTURERS TO BE MENTIONED ALONG WITH OFFER TO BE SUBMITTED IN THE FORMAT ATTACHED IN SECTION III AS AN INFORMATION TO BHEL.**
- 3. ACCEPTANCE OF MAKES SHALL BE SUBJECT TO BHEL/ END CUSTOMER ACCEPTANCE DURING THE DETAILED ENGINEERING WITHOUT COST AND DELIVERY IMPLICATION TO BHEL.**



3x800 MW PATRATU TPS

SPECIFICATION NO. PE-TS-434-571-A001

GYPSUM DEWATERING SYSTEM

SECTION : I

SUB-SECTION : D

**TECHNICAL SPECIFICATION
MANDATORY SPARES LIST**

REV 00

SHEET 1 OF 3

ANNEXURE-II

MANDATORY SPARES LIST



3x800 MW PATRATU TPS

SPECIFICATION NO. PE-TS-434-571-A001

GYPSUM DEWATERING SYSTEM

SECTION : I

SUB-SECTION : D

TECHNICAL SPECIFICATION
MANDATORY SPARES LIST

REV 00

SHEET 2 OF 3

Sl. No.	DESCRIPTION	Qty.
I.	MECHANICAL	
1	Hydro-cyclones (Gypsum Primary Dewatering, Secondary Waste Water and any other Hydrocyclone)	
a.	Hydro-cyclone Isolation Valve	10% of each type OR 1 no. whichever is higher
b.	Hydro-Cyclone	10% of each type OR 1 no. whichever is higher
c.	Hydro-Cyclone rubber lining	10% of each type OR 1 no. whichever is higher
2	Vacuum Belt Filter	
a.	Filter Cloth	2 sets
b.	Belt(if applicable)	1 sets
c.	Vacuum Box Seals	2 sets
d.	Drive Motor (if applicable)	1 no.
3	Vacuum Breaker Valves	
a.	Valve Assembly	1 no.
b.	Actuator	1 no.
4	Horizontal Centrifugal Pumps	
a.	Complete Impeller Assembly	1 no. of each type
b.	Casing Liners	1 set* of each type
c.	Bearing	2 set*
d.	Motor	1 no. of each type
e.	Pump discharge valve assembly	1 no. of each type
5	For Integral Piping as defined in specification	
a.	Slurry Valves	2 no. of each type & size
b.	Slurry Line Bends	2 no. of each type & size
II.	MEASURING INSTRUMENTS	
i	Electronic Transmitters	
a.	Transmitters of all types, ranges and model no. (for the measurement of Pressure, differential pressure flow, level, etc.)	10% or 1 no. of each type and model, whichever is more
b.	1.2 Level Transmitters (Ultrasonic/ radar type)	50% of each type and length, including sensors
ii	Temperature elements	
a.	RTD's of each type and length (with head assembly, terminal block & nipple)	10% or 2 nos. of each type and length, whichever is more
b.	Thermocouples of each type like K-type, R-type, metal etc.(with head assembly, terminal block & nipple)	10% or 2 nos. of each type and length, whichever is more
c.	Thermowell for application like mill outlet temperature and SH/RH/Eco/ flue gas temp. in furnace	10% or 2 nos. of each type and length whichever is more
d.	Temperature transmitters	10% of each type & model

	3x800 MW PATRATU TPS GYPSUM DEWATERING SYSTEM TECHNICAL SPECIFICATION MANDATORY SPARES LIST	SPECIFICATION NO. PE-TS-434-571-A001	
		SECTION : I	
		SUB-SECTION : D	
		REV 00	
		SHEET 3 OF 3	

iii	Local Indicators like temperature gauges, pressure gauges, differential pressure gauges, flow gauges, flow meters etc.,	5% or 1 no. of each make, model and type whichever is more (to be divided to various ranges in proportion to main of all make, model, type population)
iv	Process Actuated Switch Devices Includes all types of Pressure, differential pressure, flow, temperature, differential temperature, level switch Devices	5% or 1 no. of each type and model whichever is more
v	PD Type Flow Transmitters	1 no. of each type & model
vi.	Any other instrument (If applicable)	10% or 1 no. of each type and model whichever is more

Note:

1. One set means 100% complete replacement of the particular component/equipment, as mentioned i.e., Set for the particular equipment, would include all components required to replace the item. For example, a set of bearing shall include all hardware normally required while replacing the bearings. It is further, intended that the assembly / sub-assembly which have different orientation (like left hand or right hand, top or bottom), different direction of rotation or mirror image positioning or any other reasons which result in maintaining two different sets of the spares to be used for the subject assembly / sub-assembly, these shall be considered as different types of assembly/sub-assembly.

2. Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc. these shall cover all the items supplied and installed.

3. In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.

4. Any item which is quoted as "not applicable" in the above list and is found to be "applicable" at a later date shall be supplied by the Bidder without any commercial implications. The Bidder shall note that if there in any change/ variation in equipment/ system during detail engineering which causes any change/ variation in the essential spares quantity, the same shall be supplied without any commercial implications. The price indicated for the mandatory spares shall be considered for the purpose of evaluation.

5. Mandatory spares shall not be dispatched before dispatch of corresponding main equipment. The spares shall be treated and packed for a long storage under the climatic condition prevailing at site.

6. All spares supplied under this contract shall be strictly interchangeable with parts for which they are intended for replacements. These spares should include all mounted accessories like components, boards, add or items, fitting, connectors etc. and be complete in all respects so that the replacement of the main items by these spares does not require any additional item. The vendors must conform the pair to pair compatibility of each electrical spares modules with the modules should be supplied in the original package. All electronic modules should be pre-set and/or pre-programmed for ready use at site. Alternatively, suitable instruction sheet indicating the details of required PCB jumper position, BCD which is setting, EPROM/PROM listing etc should be packed along with each module. Also a caution mark sign should be put on all such module which needs pre-setting/pre-programming before putting them in to service. The spare shall be treated and properly packed for long term storage.

7. Each spare shall be clearly marked and labelled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification.

	3x800 MW PATRATU TPS TECHNICAL SPECIFICATION GYPSUM DEWATERING SYSTEM INSPECTION AND TESTING	SPECIFICATION No: PE-TS-434-571-A001	
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ANNEXURE- III

1.01.00 INSPECTION AND TESTS DURING MANUFACTURE

- 1.01.01 The method and techniques to be used by the Bidder for the control of quality during manufacture of all plant and equipment shall be agreed with the Owner.
- 1.01.02 The Owner's general requirements with respect to quality control and the required shop tests are set out elsewhere in this specification.
- 1.01.03 Before any item of plant or equipment leaves its place of manufacture, the Owner shall be given the option of witnessing inspections and tests for compliance with the specification and related standards.
- 1.01.04 Advance notice shall be given to the Owner as agreed in the Contract, prior to the stage of manufacture being reached, and the piece of plant must be held at this stage until the Owner has inspected the piece, or has advised in writing that inspection is waived. If having consulted the Owner and given reasonable notice in writing of the date on which the piece of plant will be available for inspection, the Owner does not attend, the Bidder may proceed with manufacturing having forwarded to the Owner duly certified copies of his own inspection and test results.
- The owner's representative shall have at all reasonable times access to bidder's or his sub-vendor's premises and shall have power to inspect/ examine materials and workmanship or equipment under manufacture.
- The Bidder shall forthwith forward to the engineer duly certified copies of the Test Certificates in six copies (one to the Purchaser and five to the Consulting Engineer) for approval. Further nine (9) copies of Shop Test Certificates shall be bound with Instruction Manuals referred to elsewhere in the specification.
- For electrical equipment, routine tests as per relevant IS/International standard as detailed in the specification are to be carried out on all equipment. Type tests are also to be carried out on selected equipment as detailed in the specifications of the electrical equipment concerned.
- 1.01.05 Under no circumstances, any repair or welding of castings be carried out without the consent of the Engineer. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Engineer.
- 1.01.06 All the individual and assembled rotating parts shall be statically and dynamically balanced at the works. Where accurate alignment is necessary for component parts of machinery normally assembled on site, the Bidder shall allow for trial assembly prior to dispatch from place of manufacture.
- 1.01.07 All materials used for the manufacture of equipment covered under this specification shall be of tested quality. Relevant test certificates shall be made available to the Purchaser. The certificates shall include tests for mechanical properties and chemical analysis of

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representative material. Equipment or parts coming under any statutory Regulations shall be certified by a Competent Authority under the regulations in the specified format.

1.01.08 All pressure parts connected to pumping main shall be subjected to hydraulic testing at a pressure of 150% of shut-off head for a period not less than one hour. Other parts shall be tested for one and half times the maximum operating pressure, for a period not less than one hour.

1.01.09 All necessary non-destructive examinations shall be performed to meet the applicable code requirements.

1.01.10 All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section-IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination magnaflux and ultrasonic testing shall be employed wherever necessary/ recommended by the applicable code. At least 10% of all major but welding joints shall be radiographed unless otherwise stipulated.

Statutory payments in respect of IBR approvals including inspection shall be made by the bidder. Bidder’s scope shall include to preparation of all necessary documents, co-ordination and follow-up for above approval. Owner shall only forward assistance/endorsement of documents /design /drawings /reports/records to be submitted for approval as stipulated/ required by Statutory Authorities till registration of the unit and clearance for commercial operation.

1.02.00	PERFORMANCE TESTS AT SITE
----------------	----------------------------------

1.02.01 The full requirements for testing the system shall be agreed between the Owner and the Bidder prior to Award of Contract. The completely erected System shall be tested by the Bidder on site under normal operating conditions. The Bidder shall also ensure the correct performance of the System under abnormal conditions, i.e. the correct working of the various emergency and safety devices, interlocks, etc.

1.02.02 The Bidder shall provide complete details of his normal procedures for testing, for the quality of erection and for the performance of the erected plant. These tests shall include site pressure test on all erected pipe work to demonstrate the quality of the piping and the adequacy of joints made at site.

1.02.03 The Bidder shall furnish the quality procedures to be adopted for assuring quality from the receipt of material at site, during storage, erection, pre-commissioning to tests on completion and commissioning of the complete system/equipment.

All Statutory testing / clearance is in Bidder’s scope including payment of all fees, etc. as required.



3x800 MW PATRATU TPS

SPECIFICATION No: PE-TS-434-571-A001

**TECHNICAL SPECIFICATION
GYPSUM DEWATERING SYSTEM**

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INSPECTION AND TESTING

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1.03.00	SPECIFIC INSPECTION REQUIREMENT FOR COMPONENTS/EQUIPMENTS
1.	Hydro-cyclones
a.	Visual
b.	Dimensional etc.
2.	Pumps :
c.	All pressure parts shall be hydraulically tested at 150% of the shut-off head or 200% of rated head, whichever is higher for 30 minutes. No leakage is allowed.
d.	Impeller and rotor shall be first statically balanced and then dynamically balanced according to ISO 1940 (in the case of impellers this shall be done before and after mounting of the service rotor shaft).
e.	Vibration levels measured on the non-rotating parts shall not exceed the zone limit "B" as defined in ISO 10816 at steady conditions and shall not exceed the zone limit "C" as defined in ISO 10816 at transient conditions.
f.	List of Non-Destructive test over and above the material test are as follows: Casing: Material test, Magnetic particle (MPI), DP and Hydro test, as applicable Impeller- DPT and MPI as applicable Shaft- Ultrasonic (UT), DPT and MPI Sleeve- DP and Hardness test/ Manufacturer's recommendation Mechanical Seal- Manufacturer's recommendation. Base Plate- Stress relieving of weld. Replaceable Rubber liner- Shore Hardness, Class and Type certificate
g.	Vibration test and Noise level test shall be witnessed at shop. (as already stated above.)
h.	Mechanical running and the performance test shall be conducted for Pump at the Bidder's works before dispatch or where the test facilities are available. All pumps to be performance tested as per Hydraulic Institute Standard/Indian Standard. Performance test to include check for noise, vibration level and temperature rise.
i.	The Bidder shall conduct performance test for the remaining pump and submit the reports.
3.	Vacuum Belt Filters:
a.	Impeller, casing and shaft of vacuum pumps shall be tested for chemical and mechanical properties as per relevant standard. All plates above 40mm shall be 100% Ultrasonically tested.
b.	UT on shaft (if greater or equal to 40mm) and impeller shall be carried out.
c.	All vacuum pumps shall be tested at shop for capacity, power, pressure, efficiency, noise and vibration etc.
d.	Filter cloths and belts shall be tested for physical properties as per relevant Standard.



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4.	General Inspection Requirements to be considered are as below:			
1.	Sl.No.	Item	Inspection & Test Item	Remarks
	1.	Hydro-cyclones	Material certificate check	
			Dimensional Inspection	
	2.	Pumps	Material certificate check	Shaft & impeller only
			Dimensional inspection	
			Non-destructive testing	DPT on shaft & impeller
			Hydrostatic test	
			Balancing Test	Static & dynamic
			Performance test	Incl. Noise & Vibration
	3.	Motors	Material certificate check	
			Non Destructive Testing	
			Dimensional inspection	
			Balancing Test	Static & dynamic
			Function test	
	4.	Vacuum Belt filter (with Accessories)	Material certificate check	
			Dimensional inspection	
			Function test	Short time no load test
	5.	Vacuum Receiver	Material certificate check	
			Dimensional inspection	
			Hydrostatic Test	
	6.	Belt Filter Vent Fan	Material certificate check	
			Dimensional inspection	
			Performance Test	
	7.	Conveyor & Silo Extraction Device	Material certificate check	
			Dimensional inspection	
			Function Test	Short time no load test
	8.	Rubber lining Pipe	Dimensional inspection	
			Visual Inspection	
			Spark Test	
	9.	Flow Nozzles	Material certificate check	
			Dimensional Inspection	



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	10.	Control Panel	Insulation Resistance Test	
			Dielectric Strength Test	
			Function Test	
			Dimensional Inspection	
	11.	Control valve & valves	Material certificate check	
			Hydrostatic test	
			Seat leak test	
			Function test	
			Dimensional Inspection	
	12.	RTD	Material certificate check	
			Performance test	
			Hydrostatic test	
	13.	Shut off valve	Material certificate check	
			Hydrostatic test	
			Seat Leak test	
			Function Test	
			Dimensional Inspection	
	14.	Flow meter	Material certificate check	
			Calibration Test	
			Dimensional Inspection	
			Hydrostatic test	
	15.	Butterfly Valve	Material Certificate check	
			Non-destructive testing	
			Hydrostatic test	
			Operation test	Motorized valve only
2.	Valves and Specialties shall be tested as per relevant standards / codes. Seat Leakage and hydraulic test to be carried out as per relevant standards /codes.			
3.	Pipes and fittings shall be tested as per relevant standards/ codes			
4.	MQP (Manufacturing Quality Plan) shall be submitted by the bidder along with the technical offer. Above mentioned item-wise inspection requirement is tentative only and shall be mutually discussed and finalized during detail engineering.			



3x800 MW PATRATU TPS

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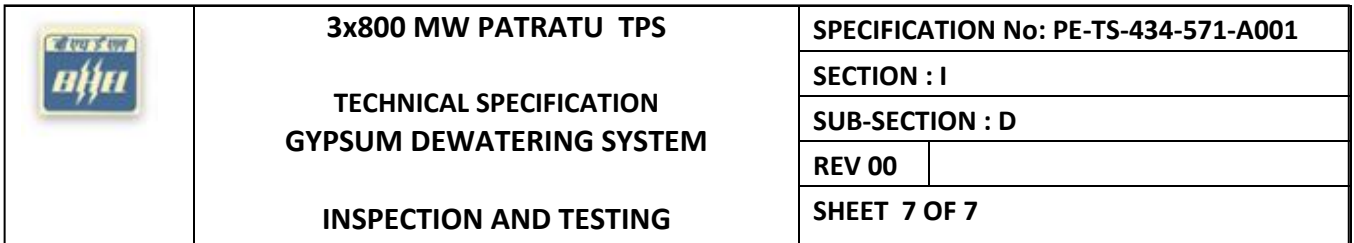
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INSPECTION AND TESTING

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5.	Bidder shall furnish written copies of shop production, fabrication and quality test procedures and drawings to be used for review by BHEL / BHEL's Customer prior to manufacture. Inspection of above mentioned tests by BHEL/ BHEL's Customer representative at bidder's works is envisaged
6.	The Bidder shall furnish performance test procedure along with standard. The test procedure will be reviewed and approved by the BHEL / BHEL's Customer.
7.	A dynamic balancing certificates stating that the rotating assembly has been balanced dynamically shall be sent to BHEL/ BHEL's Customer within one (1) week of the successful completion of balancing.
8.	Vibration levels shall be measured during shop running/performance tests.
9.	For surfaces with rubber lining, Welding shall be visually inspected to verify the absence of rough area and unacceptable transition between surfaces which prevent the adequate adherence of rubber. The acceptance criteria shall be as per latest standard.
10.	For surfaces with rubber lining, degree of cleaning shall be visually checked before the application of the coating. There must be no area with oxidation, dirt or partially or generalized corrosion defects.
11.	Test certificates shall be issued for each lot of raw material used in the coating, corresponding to specific weight and traction resistance.
12.	For surfaces with rubber lining, adherence test shall be conducted on production samples. Adherence test shall be conducted on the actual surface through hammering. In order to verify the absence of air pockets (or) surface without adherence.
13.	For surfaces with rubber lining, Coating thickness shall be checked at 100%. A High voltage porosity test will be conducted on 100 % of the coated surface.
14.	Equipment shall not be released for shipment, until shop tests data and performance tests curves have been approved by Owner.
15.	Bidder should furnish performance guarantee as per applicable standard guarantee for the design, manufacture, material and safe operation of the equipment's.
16.	BHEL/BHEL's Customer of their authorized third party inspection agency representative shall witness the test at Bidder's works and a notice of minimum three (3) weeks shall be given for attending the inspection.
17.	Bidder to arrange all calibrated gauges, Instruments during inspection at works and also during performance test at site. All inspection, measuring and test equipment(s) used by Bidder shall be calibrated (<i>at accredited laboratory, as applicable</i>) periodically depending on its use and criticality of the test/measurement to be done. The Bidder shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by the Owner. Wherever asked specifically, the Bidder shall re-calibrate the measuring/test equipment in the presence of Project Manager/Inspector.
18.	Mechanical running test shall be carried out for Vacuum Belt Filter, Vacuum Pump & Belt Filter wash Pump. Bidder to arrange Motor for the shop test and inspection.
19.	In case, order is placed on a foreign vendor (i.e. supplies from outside India), vendor will tie-up with BHEL approved inspection agency on their own cost and carry out inspection as per the Quality Plan approved by BHEL/ BHEL's Customer. Vendor shall furnish BHEL the inspection reports and other documents required as per approved Quality plan duly signed by the Inspection Agency after their witness for our review and acceptance.

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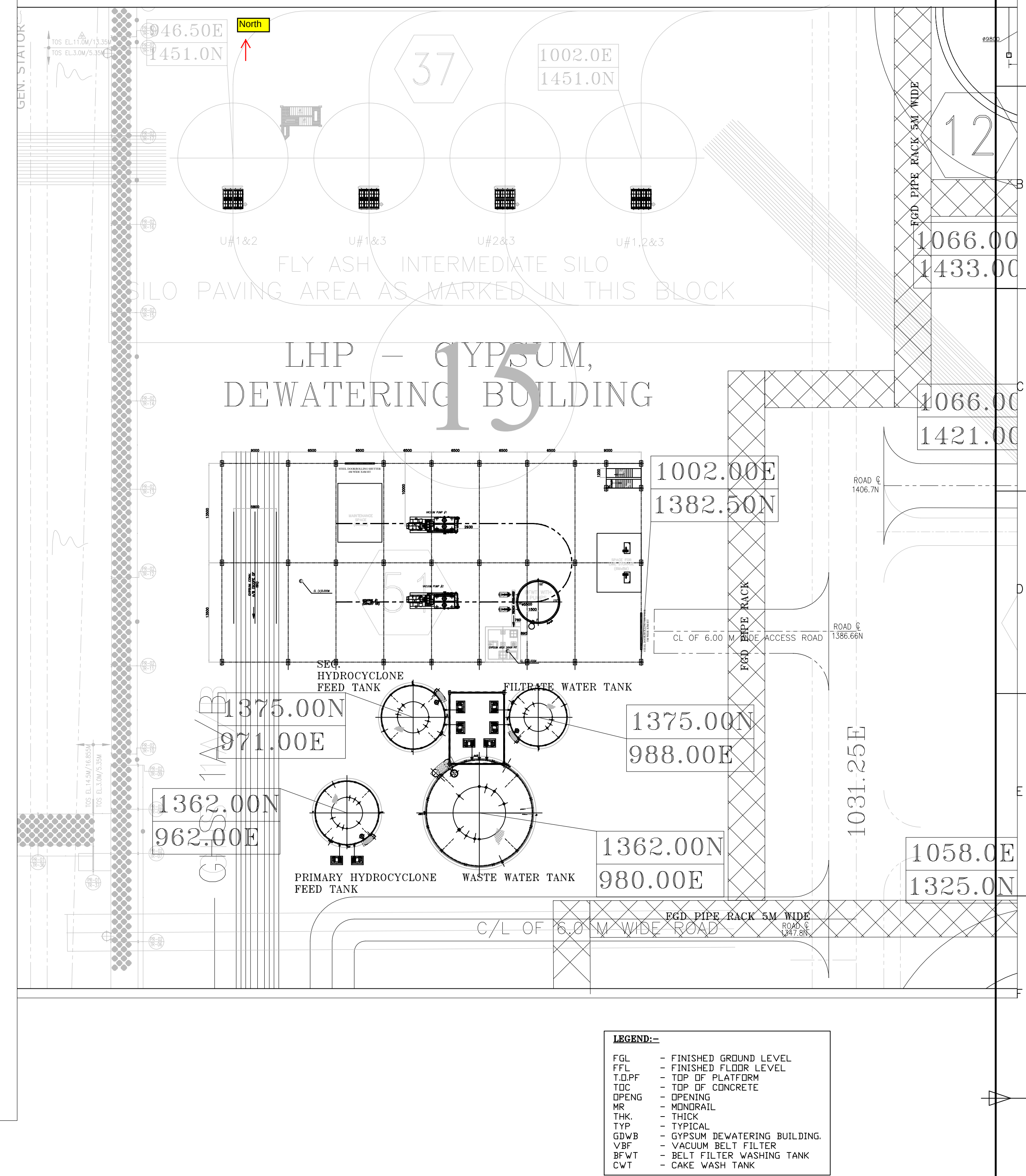
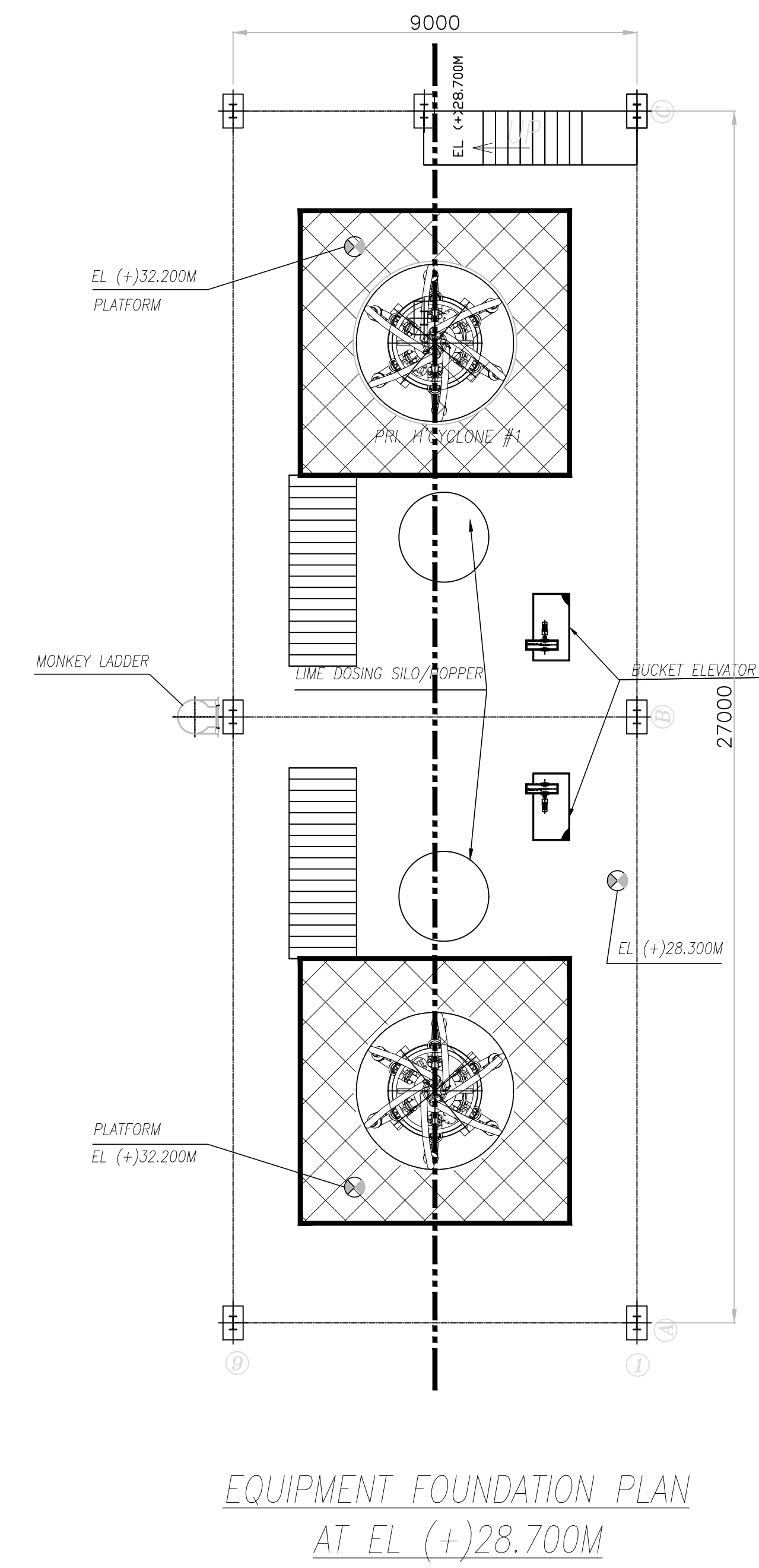
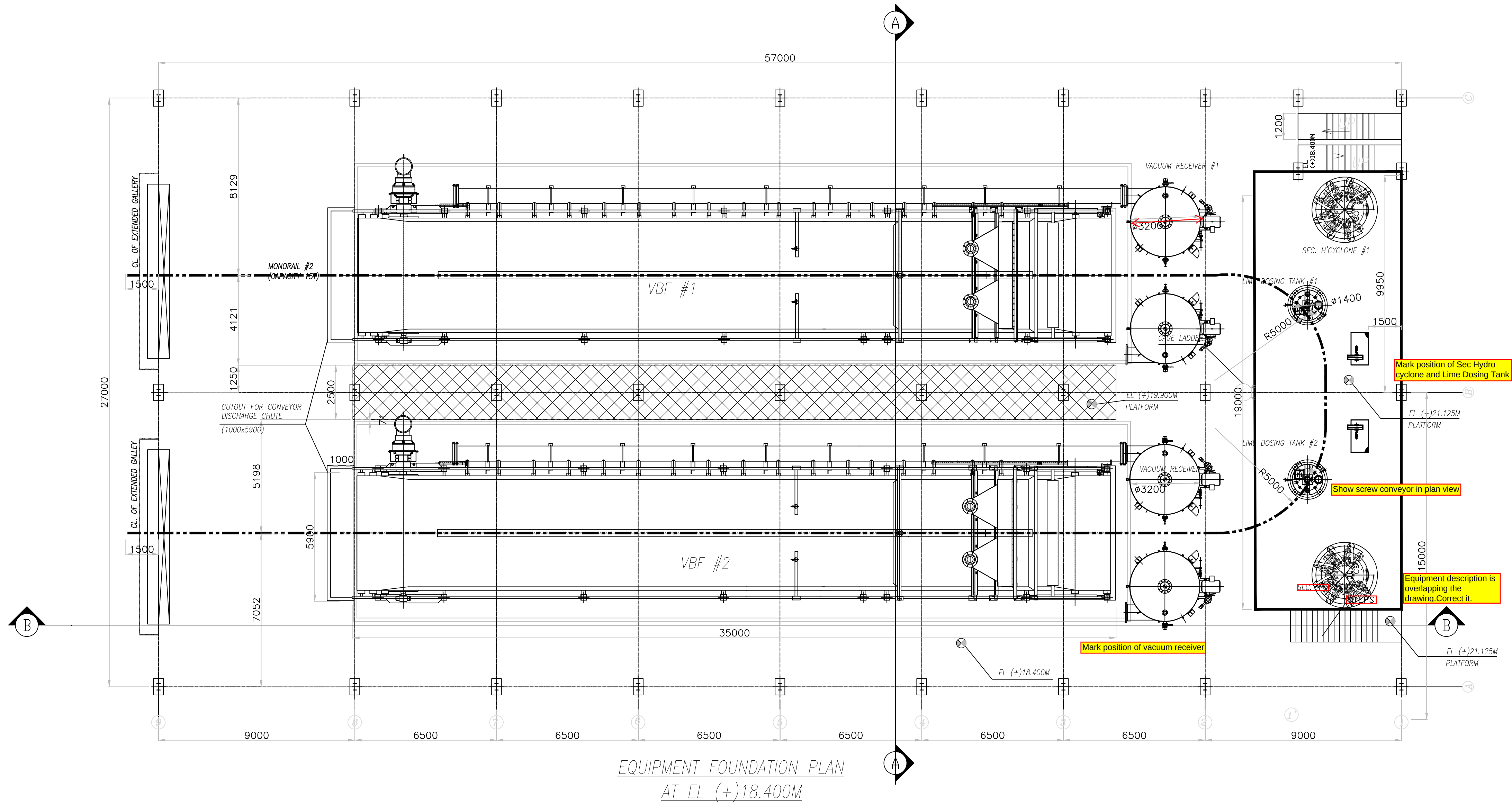
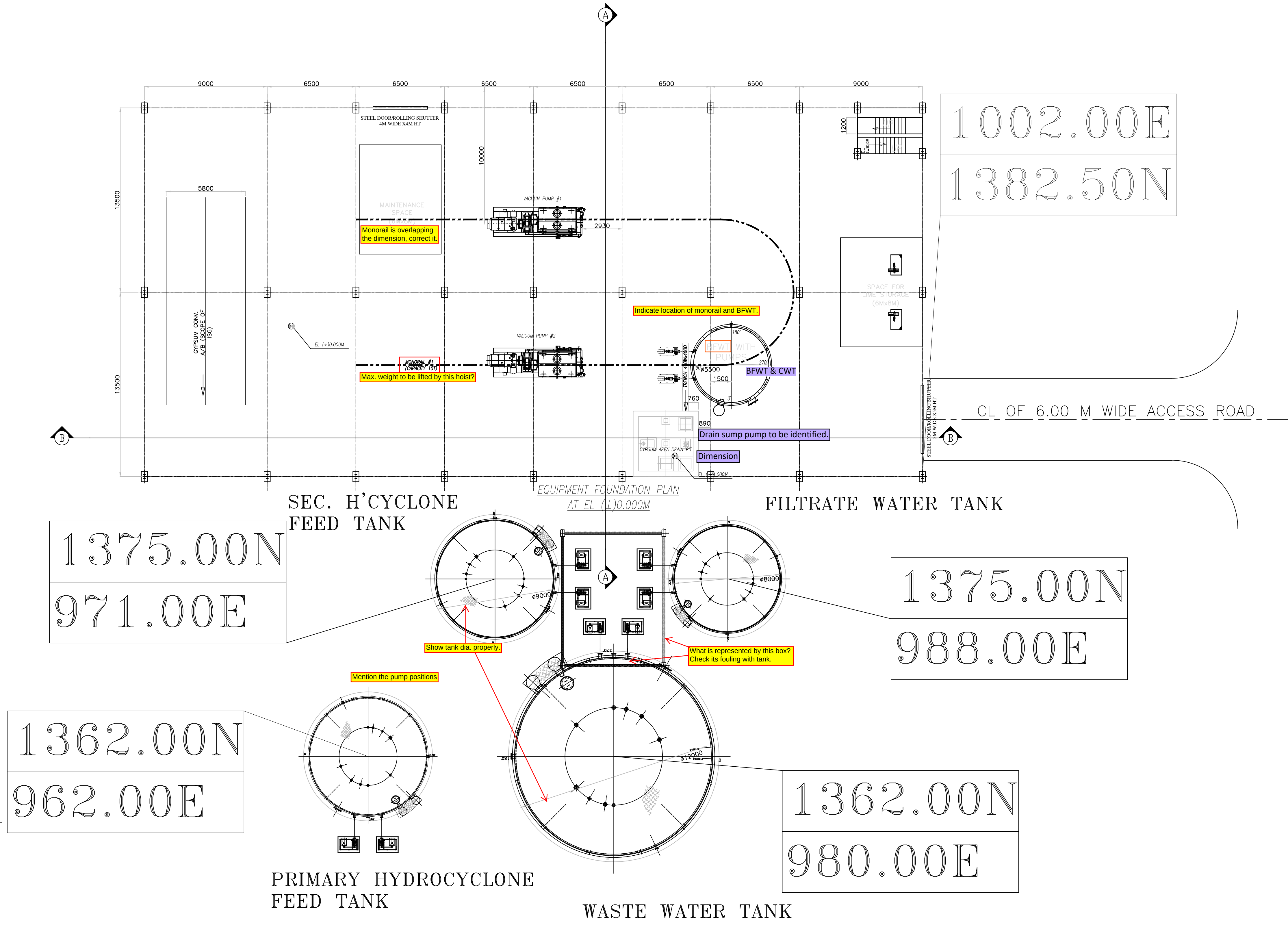
3x800 MW PATRATU TPS
GYPSUM DEWATERING SYSTEM
TECHNICAL SPECIFICATION
INPUT DRAWING LIST

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ANNEXURE-IV

INPUT DRAWINGS BY BHEL

Sl.No.	Drawing Title	PVUNL/NTPC Drawing No.
1.	General arrangement of Dewatering building	9585-001-109-PVM-B-046
2.	P&ID - Primary Hydrocyclone with Dewatering System along with write up	9585-001-109-PVM-F-011
3.	P&ID - Legends & Notes	9585-001-109-PVM-F-025
4.	P&ID of Secondary Hydrocyclone along with write up	9585-001-109-PVM-F-026
5.	P&ID of Vacuum Belt filter	9585-001-109-PVM-F-029
6.	Plant Layout of FGD System	9585-001-109-PVM-F-001
7.	Plot Plan	9585-001-999-POC-F-001



LIST OF EQUIPMENTS					
EQPT NO	NOS	DISCRIPTIONS	APPX WEIGHT OF EACH EQPT UNDER OPERATION	LOCATION	REMARKS.
1	02	VACUUM BELT FILTER	140 MT	DN FIRST FLOOR EL(+18.400	THE EQUIPMENT COLUMNS WILL BE SUPPORTED ON THE FLOOR
2	02	SECONDARY HYDRO CYCLONE	10 MT (INCLUDING SUPPORTING PLATFORMS)	DN FIRST FLOOR EL(+18.400	THE EQUIPMENT HAS 4 COLUMNS WHICH WILL BE SUPPORTED ON THE FLOOR
3	02	LIME DOSING TANK	25MT (COMBINED WEIGHT INCLUDING SUPPORTS)	DN FIRST FLOOR EL(+18.400	THE SCREW CONVEYER AND LIME DOSING TANK WILL BE SUPPORTED ON PLATFORM WHICH WILL BE SUPPORTED ON FLOOR
4	02	LIME FEED SCREW CONVEYER	10 MT	DN FIRST FLOOR EL(+18.400	
5	01	LIME DOSING SILO/HOPPER	10 MT	FLOOR OPENING ON SECOND FLOOR EL(+28.900) Common	SUPPORTED ON PERIPHERY OF THE FLOOR OPENING
6	02	PRIMARY HYDROCYCLONE	15MT (INCLUDING SUPPORTING PLATFORMS)	DN SECOND FLOOR EL(+28.700	PRIMARY HYDRO CYCLONE WILL BE SUPPORTED ON PLATFORM WHICH WILL BE SUPPORTED ON FLOOR
7	02	VACUUM PUMP	20MT	GROUND FLOOR @ EL(+0.000	FOUNDATION TO BE PROVIDED AS PER CIVIL DESIGN
8	04	VACUUM RECEIVER	10MT	FIRST FLOOR @ EL(+18.400	FLOOR MOUNTED
9	02	BELT FILTER(CLOTH) WASH TANK	AS PER LOADING DRG	GROUND FLOOR @ EL(+0.000	SEPARATE FOUNDATION OR FLOOR MOUNTED AS PER CIVIL DESIGN
10	02	BUCKET ELEVATOR FOR LIME FEED	3T	FROM GROUND FLOOR TO SECOND FLOOR	OPENING IN FLOOR LEVEL DTD EL(+18.400 AND EL(+28.900
11	01	CAKE WASH TANK	AS PER LOADING DRG	GROUND FLOOR @ EL(+0.000	SEPARATE FOUNDATION OR FLOOR MOUNTED AS PER CIVIL DESIGN

- NOTES:
- ALL DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS IN METRES.
 - EL (+0.000) IS FFL OF POWER HOUSE BUILDING WHICH CORRESPONDS TO RL (+071.50M)
 - THE EQUIPMENT MACHINERY SIZES SHOWN IN THE DRAWING IS INDICATIVE ONLY AND WILL BE CONFIRMED AFTER VENDOR DATA. THE MAXIMUM ANTICIPATED SIZE AND LOADING IS PROVIDED IN THE DRAWING.
 - FLOOR OPENINGS, PIPE CROSSINGS SHALL BE CONFIRMED DURING DETAIL ENGINEERING.
 - FLOOR ELEVATION TO BE CONSIDERED AS PER PRIMARY FINAL LEVEL WILL BE FIXED AFTER EQUIPMENT FINALIZATION.
 - DETAILS OF STAIRCASE, SUITABLE DOORS, WINDOWS, VENTILATORS SHALL BE CONSIDERED BY CIVIL DESIGNER FOR GYPSUM DEWATERING BUILDING.

Reference drawings:
FGD PLANT LAYOUT SHEET DRAWING NO. SFW-000-00560

REV.	DATE	ALT.D	CHKD.	APPD.
01	29-10-2019	RL	PADHI	VV SUNDAR

REVISED AS PER NTPC COMMENTS

CUSTOMER NOS: R4R3, R4S3, R4S4

NTPC DRG NO: 9585-001-109-PVM-B-046

CUSTOMER: PATRATU VIDYUT UTPADAN NIGAM LIMITED

PROJECT: 3x800 MW PATRATU SUPER THERMAL POWER PROJECT - FGD SYSTEM PACKAGE

DATE: 16.09.19

UNIT: BOILER AUXILIARIES PLANT, ANNEHTADU AHS

SCALE: 1 NTS

DRAWING NO: 0-FW-000-01089

SHEET 1 OF 2

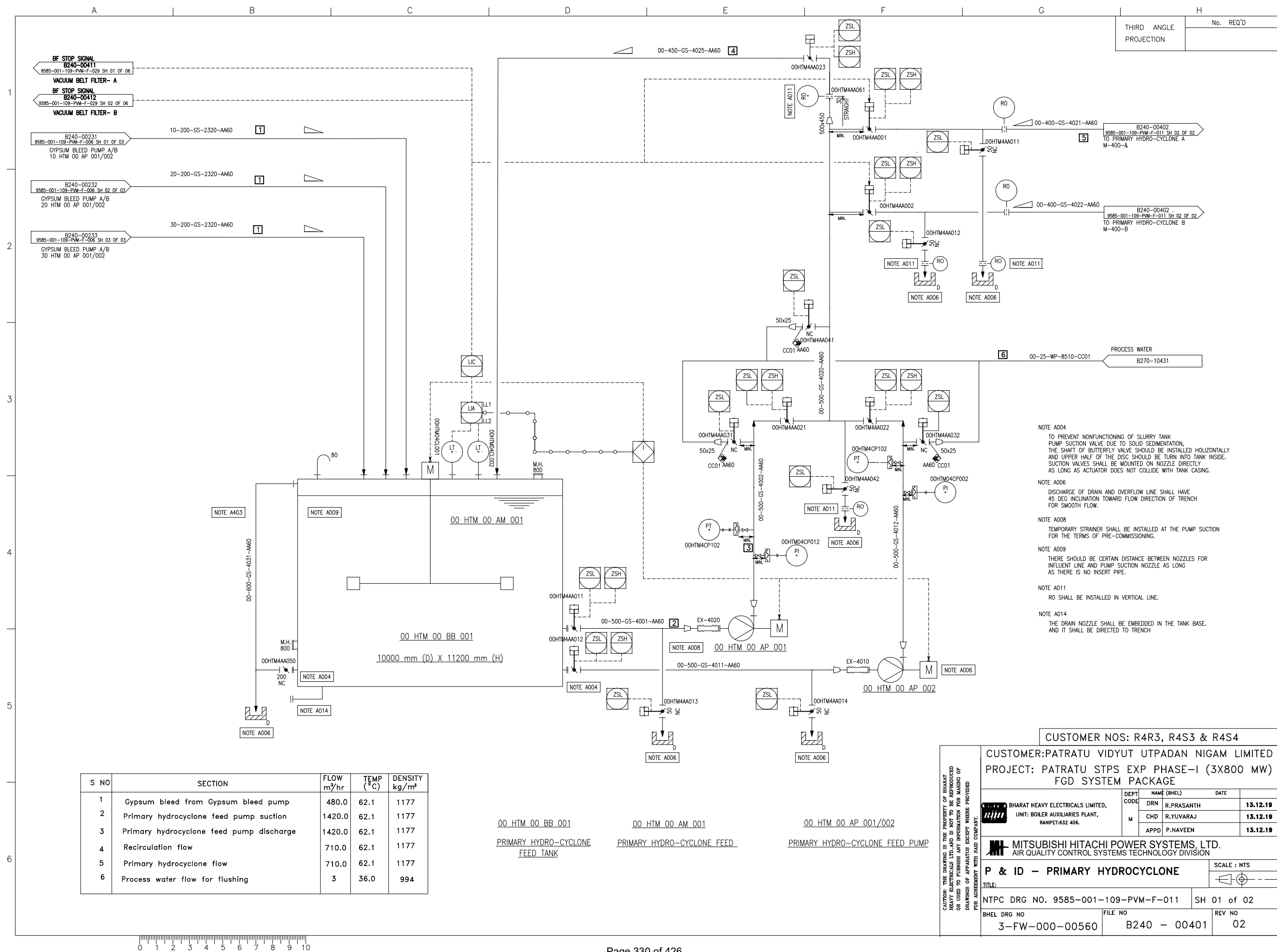
REV. 01



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS IN METRES.
2. EL (±0.00M) IS FFL OF POWER HOUSE BUILDING WHICH CORRESPONDS TO RL (+375.50M)
3. THE EQUIPMENT MACHINERY SIZES SHOWN IN THE DRAWING IS INDICATIVE ONLY AND WILL BE CONFIRMED AFTER VENDOR DATA. THE MAXIMUM ANTICIPATED SIZE AND LOADING IS PROVIDED IN THE DRAWINGS.
4. FLOOR OPENINGS, PIPE CROSSINGS SHALL BE CONFIRMED DURING DETAIL ENGINEERING.
5. FLOOR ELEVATION TO BE CONSIDERED AS PRELIMINARY. FINAL LEVEL WILL BE FIXED AFTER EQUIPMENT FINALIZATION.
6. DETAILS OF STAIRCASE, SUITABLE DOORS, WINDOWS, VENTILATORS SHALL BE CONSIDERED BY CIVIL DESIGNER FOR GYPNUM CEILINGING BUILDING.

REVISÉD AS PER NTPC COMMENTS



A3

DRAWING No.

THIRD ANGLE
PROJECTION

No. REQ'D

- NOTE A004
TO PREVENT NONFUNCTIONING OF SLURRY TANK PUMP SUCTION VALVE DUE TO SOLID SEDIMENTATION, THE SHAFT OF BUTTERFLY VALVE SHOULD BE INSTALLED HORIZONTALLY AND UPPER HALF OF THE DISC SHOULD BE TURN INTO TANK INSIDE. SUCTION VALVES SHALL BE MOUNTED ON NOZZLE DIRECTLY AS LONG AS ACTUATOR DOES NOT COLLIDE WITH TANK CASING.
- NOTE A006
DISCHARGE OF DRAIN AND OVERFLOW LINE SHALL HAVE 45 DEG INCLINATION TOWARD FLOW DIRECTION OF TRENCH FOR SMOOTH FLOW.
- NOTE A008
TEMPORARY STRAINER SHALL BE INSTALLED AT THE PUMP SUCTION FOR THE TERMS OF PRE-COMMISSIONING.
- NOTE A009
THERE SHOULD BE CERTAIN DISTANCE BETWEEN NOZZLES FOR INFLUENT LINE AND PUMP SUCTION NOZZLE AS LONG AS THERE IS NO INSERT PIPE.
- NOTE A011
RO SHALL BE INSTALLED IN VERTICAL LINE.
- NOTE A014
THE DRAIN NOZZLE SHALL BE EMBEDDED IN THE TANK BASE. AND IT SHALL BE DIRECTED TO TRENCH

CUSTOMER NOS: R4R3, R4S3 & R4S4

CUSTOMER: PATRATU VIDYUT UTPADAN NIGAM LIMITED
PROJECT: PATRATU STPS EXP PHASE-I (3X800 MW)
FGD SYSTEM PACKAGE

DEPT CODE	NAME (BHEL)	DATE
DRN	R.PRASANTH	13.12.19
CHD	R.YUVARAJ	13.12.19
APPD	P.NAVEEN	13.12.19

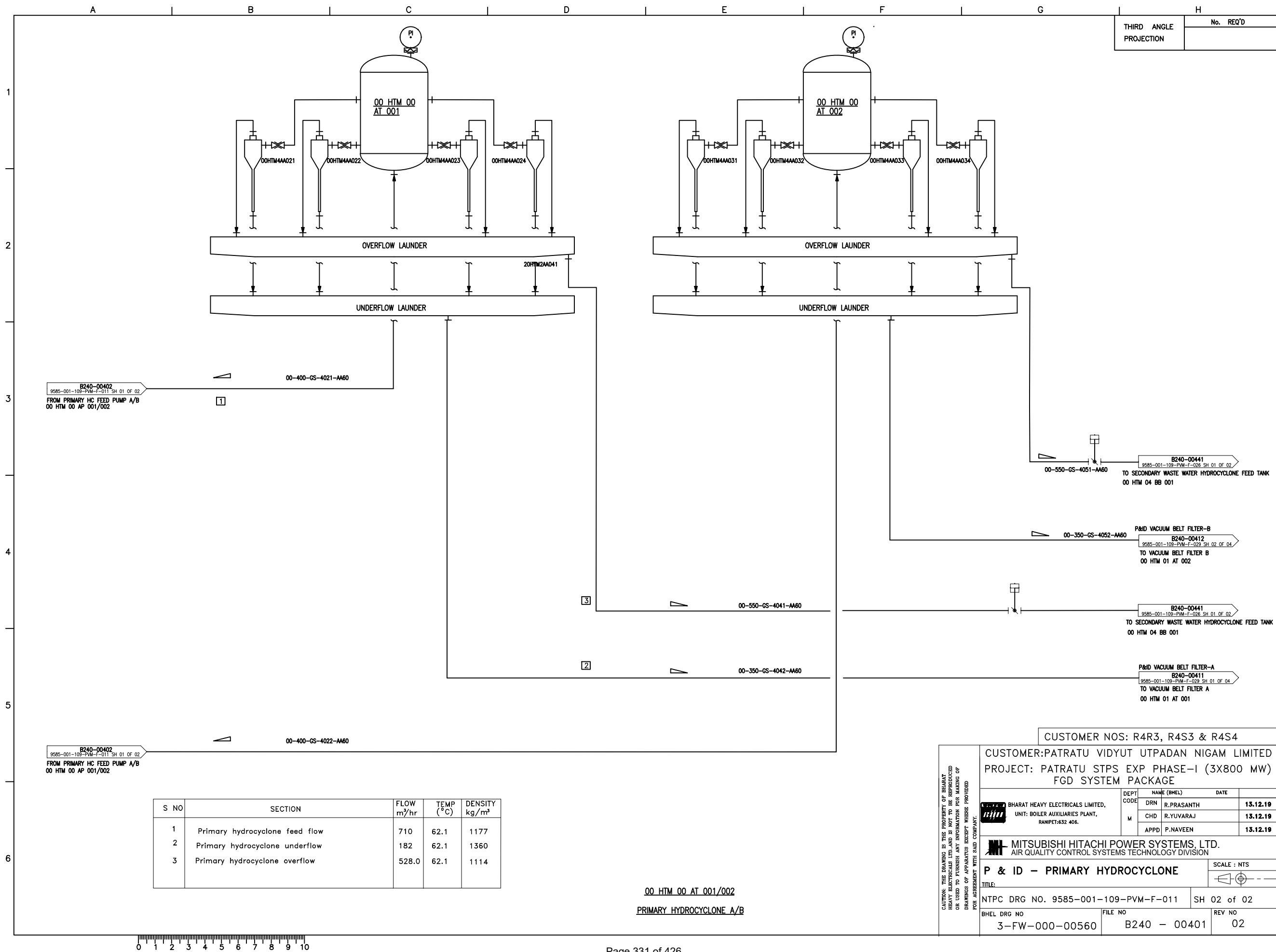
MITSUBISHI HITACHI POWER SYSTEMS, LTD.
AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION

P & ID - PRIMARY HYDROCYCLONE

TITLE:

NTPC DRG NO. 9585-001-109-PVM-F-011 SH 01 of 02

BHEL DRG NO	FILE NO	REV NO
3-FW-000-00560	B240 - 00401	02



A3
DRAWING No.

SYMBOLS	NAME
	TO ABSORBER AREA DRAIN SUMP
	TO GYPSUM AREA DRAIN SUMP
	TO LIMESTONE AREA DRAIN SUMP

SYMBOLS	NAME
	STEAM TRAP
	AIR TRAP
	Y-STRAINER
	T-STRAINER
	TEMPORARY STRAINER
	REDUCER
	EXPANSION JOINT
	DUCT EXPANSION JOINT
	FLEXIBLE HOSE
	SPOOL PIECE
	VENT
	HOSE CONNECTION
	BLIND FLANGE
	REDUCING FLANGE
	CAP (BW)
	CAP (SCR)
	TRENCH
	SIGHT GLASS
	SILENCER
	ORIFICE
	DIAPHRAGM
	MAGNETIC FLOW METER
	VORTEX FLOW METER
	PH METER
	FILTER
	MANHOLE
	PITOT TUBE
	SAMPLING POT
	SAMPLING NOZZLE

NUMBER	NAME
1	FLUE GAS SYSTEM
2	SO ₂ ABSORPTION OXIDATION SYSTEM
3	REHEATING SYSTEM
4	GYPSUM DEWATERING HANDLING SYSTEM
5	LIMESTONE PREPARATION SYSTEM
6	BLANK
7	SUMP SYSTEM
8	UTILITY SYSTEM

SYMBOLS	UNIT IDENTIFICATION
00	COMMON
10	UNIT-1 FGD SYSTEM AND AUXILIARIES
20	UNIT-2 FGD SYSTEM AND AUXILIARIES

Diagram illustrating the structure of a 10-digit identification code (10-200-GS-200-1-AA60-HF) with field descriptions:

- 10**: UNIT CODE
- 200**: NOMINAL PIPE SIZE (mm)
- GS**: FLUID SYMBOL
- 2**: SYSTEM
- 00**: SERIAL NUMBER
- 1**: SUFFIX NUMBER
- AA60**: PIPING SERVICE CLASS
- HF**: INSULATION CLASS

BHEL DRG NO	FILE NO	REV NO
3-FW-000-00567	B240 - 00001	00

CONFIDENTIAL & PROPRIETARY INFORMATION

INSTRUMENT ABBREVIATION

	FIRST-LETTER		SUCCEEDING-LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		BLANK	BLANK	BLANK
C	BLANK			CONTROL	
D	BLANK	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	BLANK		GLASS, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	BLANK	MOMENTARY			MIDDLE, INTERMEDIATE
N	BLANK		BLANK	BLANK	BLANK
O	BLANK		ORIFICE, RESTRICTION		
P	PRESSURE, VACUUM		POINT(TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

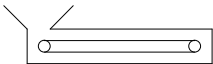
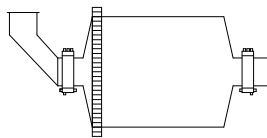
INSTRUMENT SYMBOLS

SYMBOLS	NAME
	FIELD MOUNTED
	FOR CONTROL ROOM
	FOR LOCAL CONTROL PANEL
	FOR DCS
	INTERLOCK LOGIC

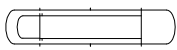
PNEUMATIC VALVE ACTUATOR

CODE NO.	ACTUATION
FLXXWA-D	DOUBLE SOLENOID NO LIMIT SWITCH
FLXXWA-DL	DOUBLE SOLENOID WITH LIMIT SWITCH
FLXXWA-S	SINGLE SOLENOID NO LIMIT SWITCH
FLXXWA-SL	SINGLE SOLENOID WITH LIMIT SWITCH

MACHINARY SYMBOLS

SYMBOLS	NAME
	PUMP
	FAN / BLOWER
	AGITATOR (FLAT BLADE)
	AGITATOR (PROPELLOR)
	ROTARY VALVE
	CRUSHER
	BELT FEEDER
	BELT FILTER
	BALL MILL
	CYCLONE
	MIST ELIMINATOR

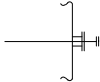
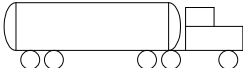
EQUIPMENT SYMBOLS

SYMBOLS	NAME
	BAG FILTER
	SILO
	SLIDE GATE
	TANDEM LOUVER DAMPER (MULTIVANE)
	SINGLE STAGE LOUVER DAMPER (MULTIVANE)
	LOUVER DAMPER (SINGLE VANE)
	DISTRIBUTION BOX (3WAY)
	DISTRIBUTION BOX (2WAY)
	SUMP
	HEAT EXCHANGER
	SHELL AND TUBE HEAT EXCHANGER
	AIR DRYER
	FILTER
	SPRAY NOZZLE

DRIVER SYMBOLS

SYMBOLS	NAME
	AIR MOTOR
	ELECTRIC MOTOR

OTHER SYMBOLS

SYMBOLS	NAME
	INSERT PIPE / LANCE
	CHUTE
	TRUCK

CONFIDENTIAL & PROPRIETARY INFORMATION

CUSTOMER NOS: R4R3, R4S3 & R4S4

CUSTOMER: PATRATU VIDYUT UTPADAN NIGAM LIMITED
PROJECT: PATRATU STPS EXP PHASE-I (3X800 MW)
FGD SYSTEM PACKAGE

 BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOILER AUXILIARIES PLANT, RANIPET:632 406.	DEPT	NAME (BHEL)	DATE	
	CODE	DRN	R YUVARAJ	29.04.19
	M	CHD	P NAVEEN	29.04.19
		APPD	V KESAVAN	29.04.19

 **MITSUBISHI HITACHI POWER SYSTEMS, LTD**
AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION

P & ID - LEGENDS & NOTES (2/2)

TITLE:

NTPC DRG NO. 9585-001-109-PVM-F-025

SH 02 of 02

BHEL DRG NO

3-FW-000-00567

FILE NO

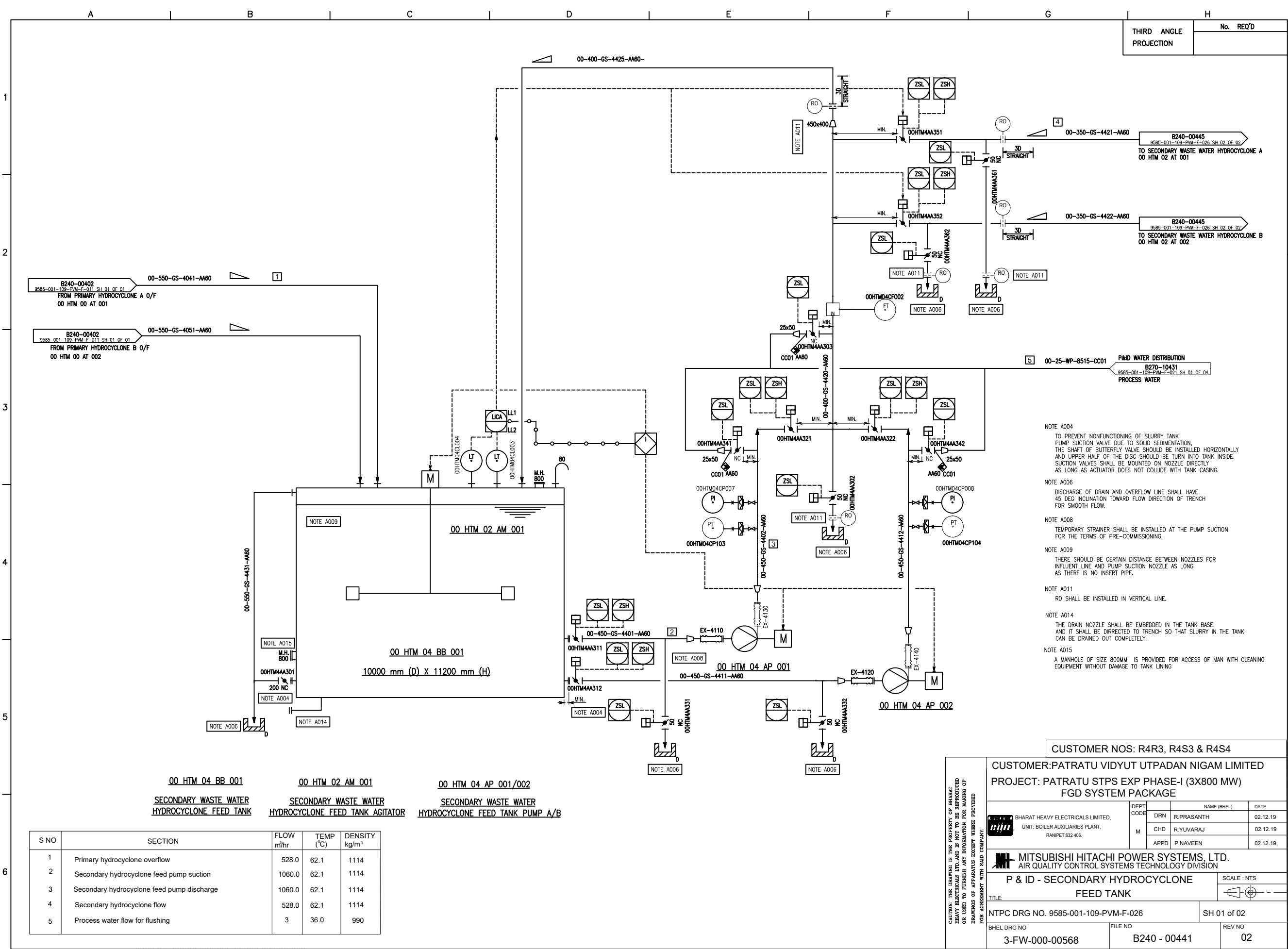
B240 - 00002

REV NO

00

CAUTION: THE DRAWING IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD. AND IS NOT TO BE REPRODUCED OR USED TO FURNISH ANY INFORMATION FOR MAKING OF DRAWINGS OF APPARATUS EXCEPT WHERE PROVIDED FOR AGREEMENT WITH SAID COMPANY.





S NO	SECTION	FLOW m ³ /hr	TEMP (°C)	DENSITY kg/m ³
1	Primary hydrocyclone overflow	528.0	62.1	1114
2	Secondary hydrocyclone feed pump suction	1060.0	62.1	1114
3	Secondary hydrocyclone feed pump discharge	1060.0	62.1	1114
4	Secondary hydrocyclone flow	528.0	62.1	1114
5	Process water flow for flushing	3	36.0	990

00 HTM 04 BB 001
SECONDARY WASTE WATER
HYDROCYCLONE FEED TANK

00 HTM 02 AM 001
SECONDARY WASTE WATER
HYDROCYCLONE FEED TANK AGITATOR

00 HTM 04 AP 001/002
SECONDARY WASTE WATER
HYDROCYCLONE FEED TANK PUMP A/B

CUSTOMER NOS: R4R3, R4S3 & R4S4

CUSTOMER: PATRATU VIDYUT UTPADAN NIGAM LIMITED
PROJECT: PATRATU STPS EXP PHASE-I (3X800 MW)
FGD SYSTEM PACKAGE

	BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOILER AUXILIARIES PLANT, RANIPET-632 406.	DEPT CODE M		NAME (BHEL)	DATE
			DRN	R.PRASANTH	02.12.19
			CHD	R.YUVARAJ	02.12.19
			APPD	P.NAVEEN	02.12.19

MITSUBISHI HITACHI POWER SYSTEMS, LTD.
AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION

P & ID - SECONDARY HYDROCYCLONE
FEED TANK

SCALE: NTS

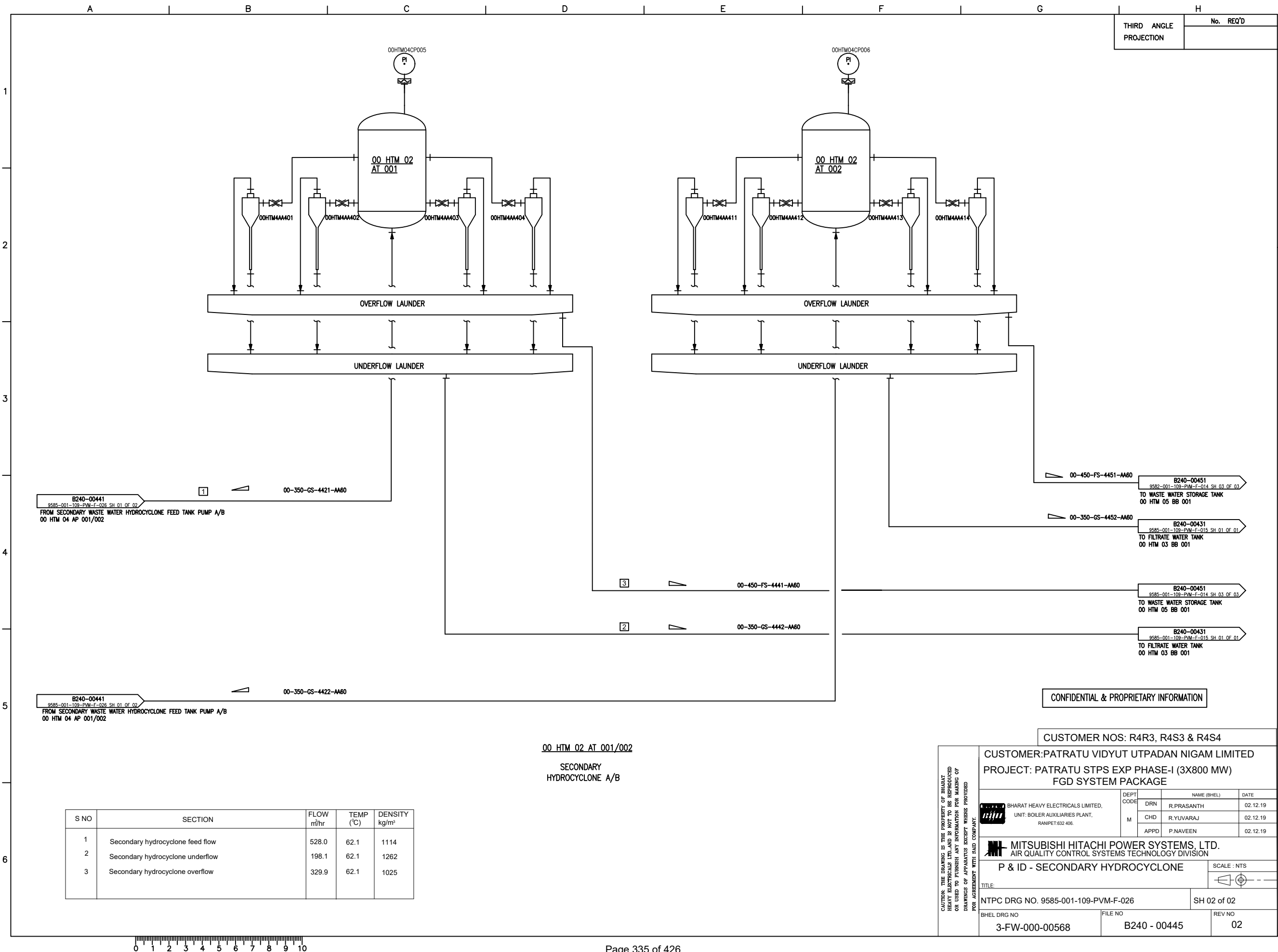
NTPC DRG NO. 9585-001-109-PVM-F-026

SH 01 of 02

BHEL DRG NO
3-FW-000-00568

FILE NO
B240 - 00441

REV NO
02



THIRD ANGLE PROJECTION

No.	REQ'D

A3

DRAWING No.

B240-00441
9585-001-109-PVM-F-026 SH 01 OF 02
FROM SECONDARY WASTE WATER HYDROCYCLONE FEED TANK PUMP A/B
00 HTM 04 AP 001/002

00-350-GS-4421-AA60

00-450-FS-4451-AA60

B240-00451
9582-001-109-PVM-F-014 SH 03 OF 03
TO WASTE WATER STORAGE TANK
00 HTM 05 BB 001

00-350-GS-4452-AA60

B240-00431
9585-001-109-PVM-F-015 SH 01 OF 01
TO FILTRATE WATER TANK
00 HTM 03 BB 001

00-450-FS-4441-AA60

B240-00451
9585-001-109-PVM-F-014 SH 03 OF 03
TO WASTE WATER STORAGE TANK
00 HTM 05 BB 001

00-350-GS-4442-AA60

B240-00431
9585-001-109-PVM-F-015 SH 01 OF 01
TO FILTRATE WATER TANK
00 HTM 03 BB 001

B240-00441
9585-001-109-PVM-F-026 SH 01 OF 02
FROM SECONDARY WASTE WATER HYDROCYCLONE FEED TANK PUMP A/B
00 HTM 04 AP 001/002

00-350-GS-4422-AA60

CONFIDENTIAL & PROPRIETARY INFORMATION

CUSTOMER NOS: R4R3, R4S3 & R4S4

00 HTM 02 AT 001/002
SECONDARY
HYDROCYCLONE A/B

S NO	SECTION	FLOW m ³ /hr	TEMP (°C)	DENSITY kg/m ³
1	Secondary hydrocyclone feed flow	528.0	62.1	1114
2	Secondary hydrocyclone underflow	198.1	62.1	1262
3	Secondary hydrocyclone overflow	329.9	62.1	1025

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CUSTOMER: PATRATU VIDYUT UTPADAN NIGAM LIMITED			
PROJECT: PATRATU STPS EXP PHASE-I (3X800 MW) FGD SYSTEM PACKAGE			
DEPT CODE	DRN	R.PRASANTH	02.12.19
	CHD	R.YUVARAJ	02.12.19
	APPD	P.NAVEEN	02.12.19
MITSUBISHI HITACHI POWER SYSTEMS, LTD. AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION			
P & ID - SECONDARY HYDROCYCLONE			
TITLE:			
NTPC DRG NO. 9585-001-109-PVM-F-026		SH 02 of 02	
BHEL DRG NO	FILE NO	REV NO	
3-FW-000-00568	B240 - 00445	02	



THIRD	ANGLE	No.	REQ'D

A3

DRAWING No.

S NO	SECTION	FLOW m ³ /hr	TEMP(°C)	DENSITY kg/m ³
1	Gypsum slurry line to belt filter	181.7	62.1	1360
2	Gypsum outlet from belt filter to gypsum handling system	122.9 TPH	53.2	900
3	Filtrate water from vacuum receiver to filtrate water tank	169.9	62.1	1006
4	Vacuum pump flow	LATER	LATER	LATER
5	Seal water to vacuum pump	93	36.0	990
6	Seal water return	93	36.0	990

NOTE B003
SYSTEM COMPONENTS WRITTEN IN THE DRAWING ARE JUST DEFAULT.
TYPE WILL BE SUBJECT TO CHANGE DUE TO VENDOR SELECTION.

NOTE A402
BIRD SCREEN SHALL BE INSTALLED.

NOTE A405
NOZZLE OF PRESSURE INDICATOR SHALL NOT HAVE A POCKET.
IT MAY CAUSE REMAIN OF DRAIN.

NOTE A406
CAKE WASH PIPING SHALL BE MOVABLE SO THAT ITS POSITION
CAN BE ADJUSTED WELL DURING COMMISSIONING.

NOTE A407
WASH, SEAL AND LUBRICATION WATER PIPING SHALL BE DESIGNED
TO DISTRIBUTE WATER EQUALLY (EX. TO CONNECT SUPPLY LINE
TO MIDDLE OF HEADER).

NOTE B403
STRAINER CAN BE OMITTED IF ANOTHER ONE IS APPLIED UPSTREAM.

NOTE B405
GYPSUM CHUTE SHALL BE DESIGNED VERTICALLY, NOT OBLIQUELY.

CUSTOMER NOS: R4R3, R4S3 & R4S4

CUSTOMER: PATRATU VIDYUT UTPADAN NIGAM LIMITED
PROJECT: PATRATU STPS EXP PHASE-I (3X800 MW)
FGD SYSTEM PACKAGE

DEPT CODE	NAME (BHEL)	DATE
DRN	R.PRASANTH	02.12.19
CHD	R.YUVARAJ	02.12.19
APPD	P.NAVEEN	02.12.19

MITSUBISHI HITACHI POWER SYSTEMS, LTD.
AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION

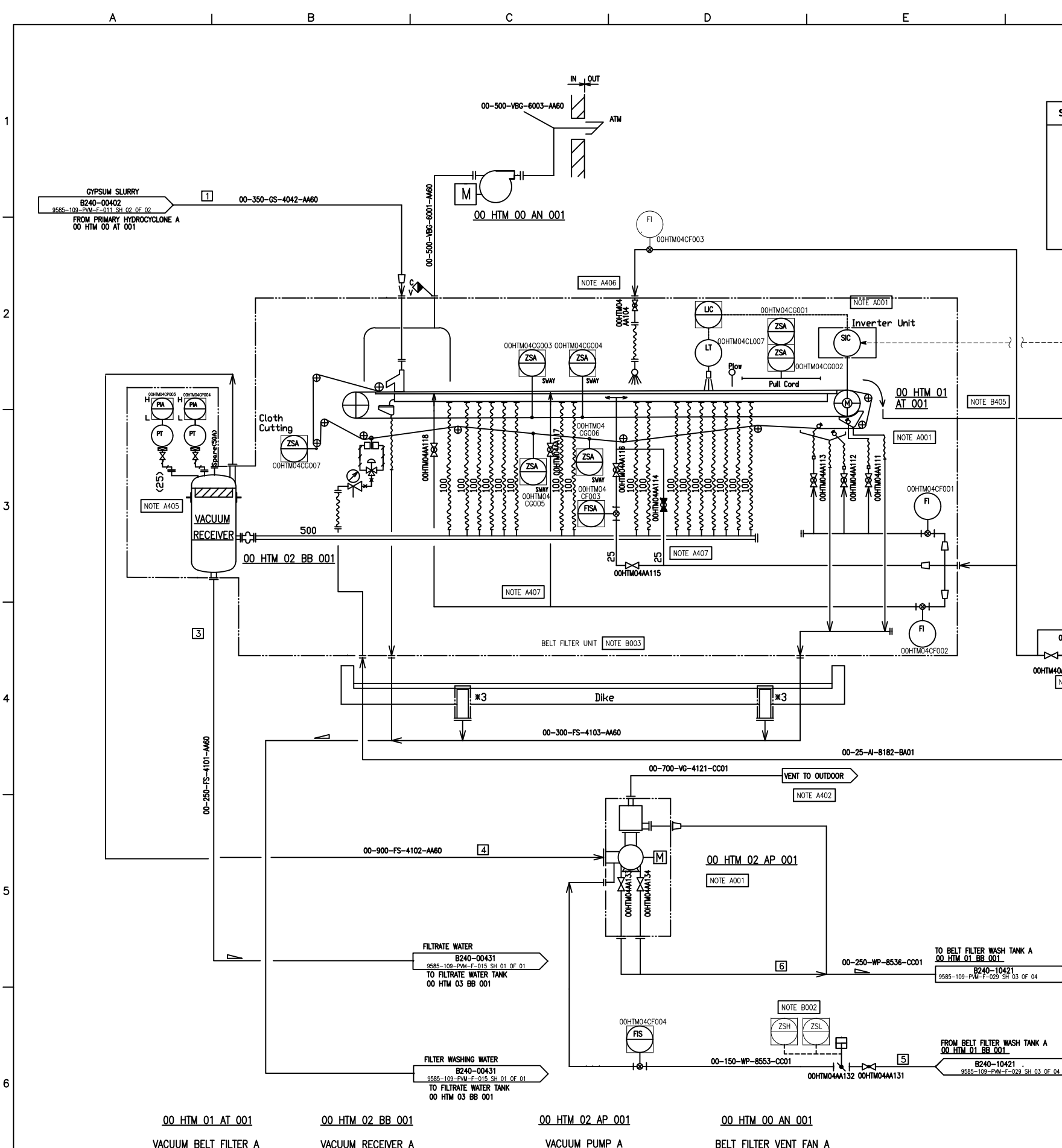
P & ID - VACUUM BELT FILTER- A

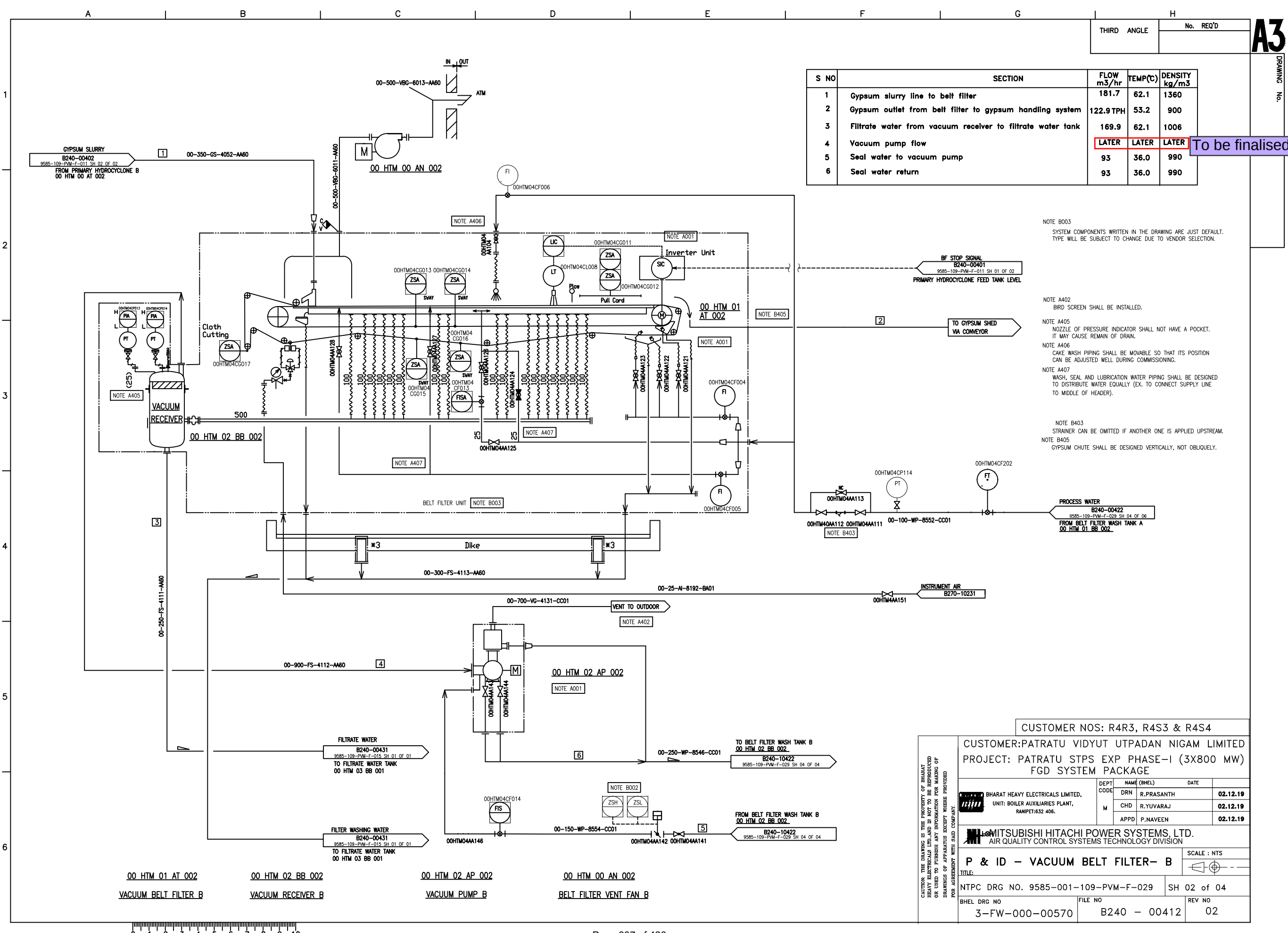
SCALE: NTS

NTPC DRG NO. 9585-001-109-PVM-F-029 SH 01 of 04

BHEL DRG NO. 3-FW-000-00570 FILE NO. B240 - 00411 REV NO. 02

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S NO	SECTION	FLOW m ³ /hr	TEMP(°C)	DENSITY kg/m ³
1	Gypsum slurry line to belt filter	181.7	62.1	1360
2	Gypsum outlet from belt filter to gypsum handling system	122.9 TPH	53.2	900
3	Filtrate water from vacuum receiver to filtrate water tank	169.9	62.1	1006
4	Vacuum pump flow	LATER	LATER	LATER
5	Seal water to vacuum pump	93	36.0	990
6	Seal water return	93	36.0	990

To be finalised

NOTE B003
SYSTEM COMPONENTS WRITTEN IN THE DRAWING ARE JUST DEFAULT.
TYPE WILL BE SUBJECT TO CHANGE DUE TO VENDOR SELECTION.

NOTE A402
BIRD SCREEN SHALL BE INSTALLED.

NOTE A405
NOZZLE OF PRESSURE INDICATOR SHALL NOT HAVE A POCKET.
IT MAY CAUSE REMAIN OF DRAIN.

NOTE A406
CAKE WASH PIPING SHALL BE MOVABLE SO THAT ITS POSITION
CAN BE ADJUSTED WELL DURING COMMISSIONING.

NOTE A407
WASH, SEAL AND LUBRICATION WATER PIPING SHALL BE DESIGNED
TO DISTRIBUTE WATER EQUALLY (EX. TO CONNECT SUPPLY LINE
TO MIDDLE OF HEADER).

NOTE B403
STRAINER CAN BE OMITTED IF ANOTHER ONE IS APPLIED UPSTREAM.

NOTE B405
GYPSUM CHUTE SHALL BE DESIGNED VERTICALLY, NOT OBLIQUELY.

CUSTOMER NOS: R4R3, R4S3 & R4S4

CUSTOMER: PATRATU VIDYUT UTPADAN NIGAM LIMITED
PROJECT: PATRATU STPS EXP PHASE-I (3X800 MW)
FGD SYSTEM PACKAGE

DEPT CODE	NAME (BHEL)	DATE
DRN	R.PRASANATH	02.12.19
CHD	R.YUVARAJ	02.12.19
APPD	P.NAVEEN	02.12.19

MITSUBISHI HITACHI POWER SYSTEMS, LTD.
AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION

P & ID - VACUUM BELT FILTER- B

NTPC DRG NO. 9585-001-109-PVM-F-029 SH 02 of 04

BHEL DRG NO 3-FW-000-00570 FILE NO B240 - 00412 REV NO 02