

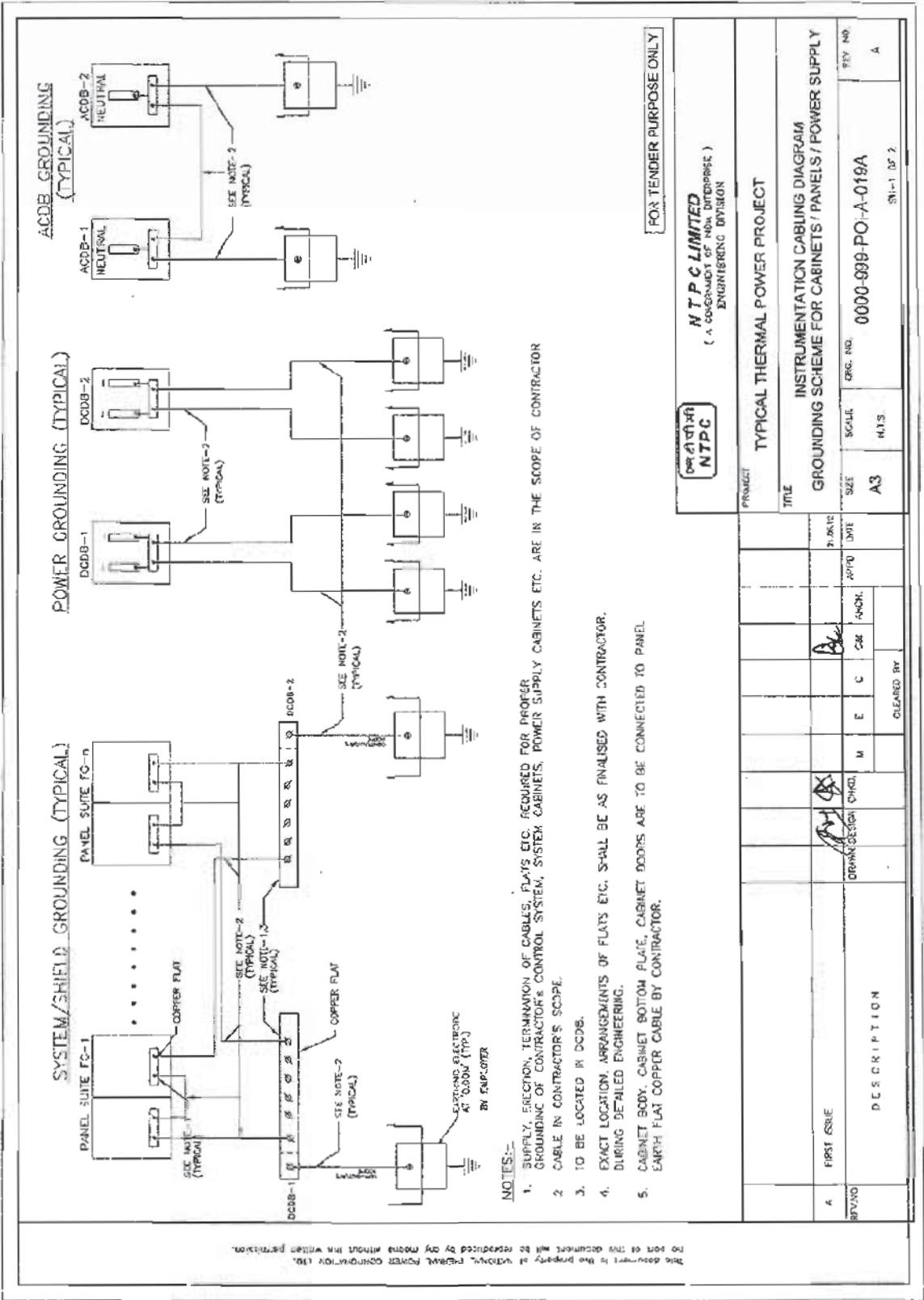


**C&I SPECIFICATION FOR
GYPSUM DEWATERING EQUIPMENT**

SECTION: C
SUB SECTION: C&I

INSTRUMENT INSTALLATION DRAWING

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

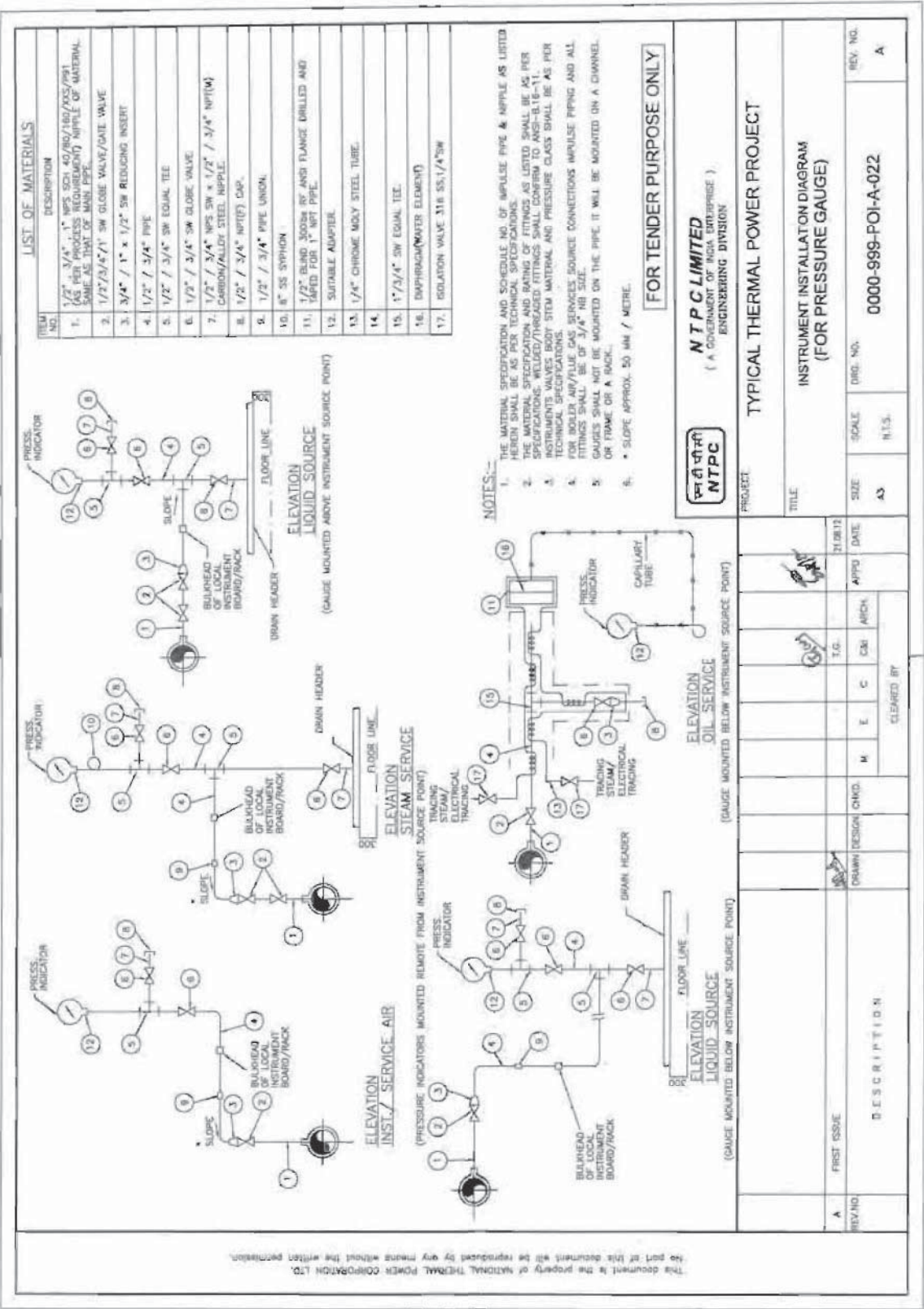




- FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

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CLAUSE NO.	TECHNICAL REQUIREMENTS			
	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:			
	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		
	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/cm ² 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.			
1.01.03	The valve manifolds of 316 SS with pressure rating suitable for intended application shall be provided as given below:			
	Manifold	Application/Measurement		
	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		
	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 .			
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			
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2		SUB-SECTION-III-C3 PCP
PAGE 1 OF 4				

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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-III-E-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. for FGD system and other system being provided under the contract shall be suitably grouped together and mounted inside (i) local instruments enclosures in case of open areas of the plant and (ii) In local instrument racks in case of covered areas. 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.		
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-III-C3 PCP	PAGE 2 OF 4

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CLAUSE NO.	TECHNICAL REQUIREMENTS	
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 enclosures shall be constructed of 3 mm sheet plate and shall be of modular construction with one or more modules and two end assemblies bolted together to form an enclosure. Double inter locking doors shall be provided. The doors shall be the three-point locking type constructed of not less than 1.6 mm thick steel. Doors shall have concealed quick removal type pinned hinges and locking handles. Door locks shall accept the same key. The instrument racks shall be free standing type constructed of suitable 5 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 for FGD system and other system being provided under the contract shall be suitably grouped together and mounted inside (i) Enclosures in case of open areas of the plant and (ii) Racks in case of covered areas. 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.	
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-III-C3 PCP PAGE 3 OF 4

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CLAUSE NO.	TECHNICAL REQUIREMENTS			
6.00.00	INSTALLATION OF OTHER INSTRUMENTS: For installation and routing of other field mounted instruments which are not covered in Cl. No. 5.00.00, please refer Cl. No 52.04.00(J) of Section-VI, Part-D, Erection Conditions of Contract (ECC) of Technical Specifications.			
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-III-C3 PCP	PAGE 4 OF 4



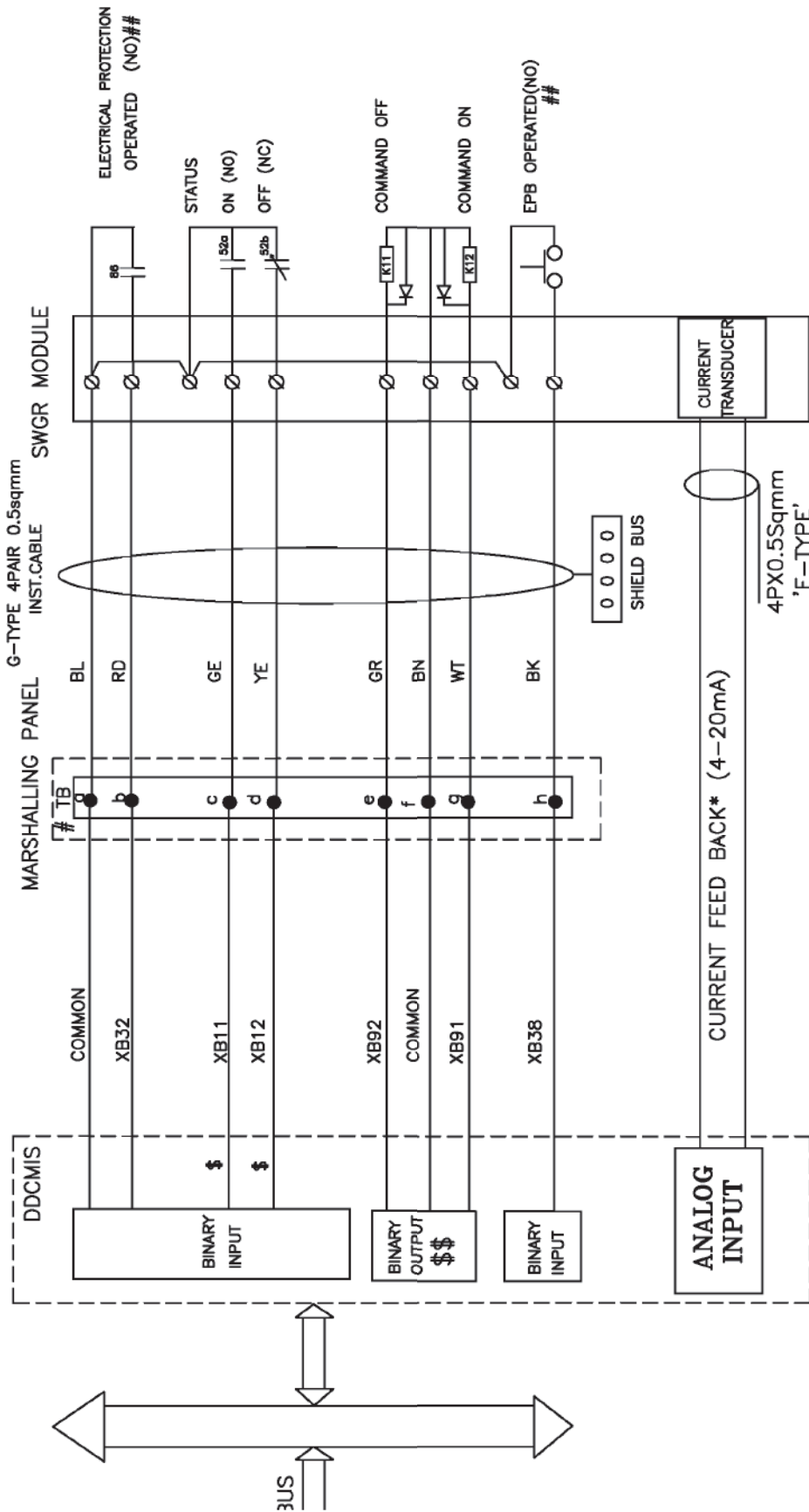
**C&I SPECIFICATION FOR
GYPSUM DEWATERING EQUIPMENT**

SECTION: C
SUB SECTION: C&I

**SIGNAL INTERFACE
BETWEEN
DRIVES AND DCS**

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

DDCMIS INTERFACE WITH HT SWITCH GEAR (HT)

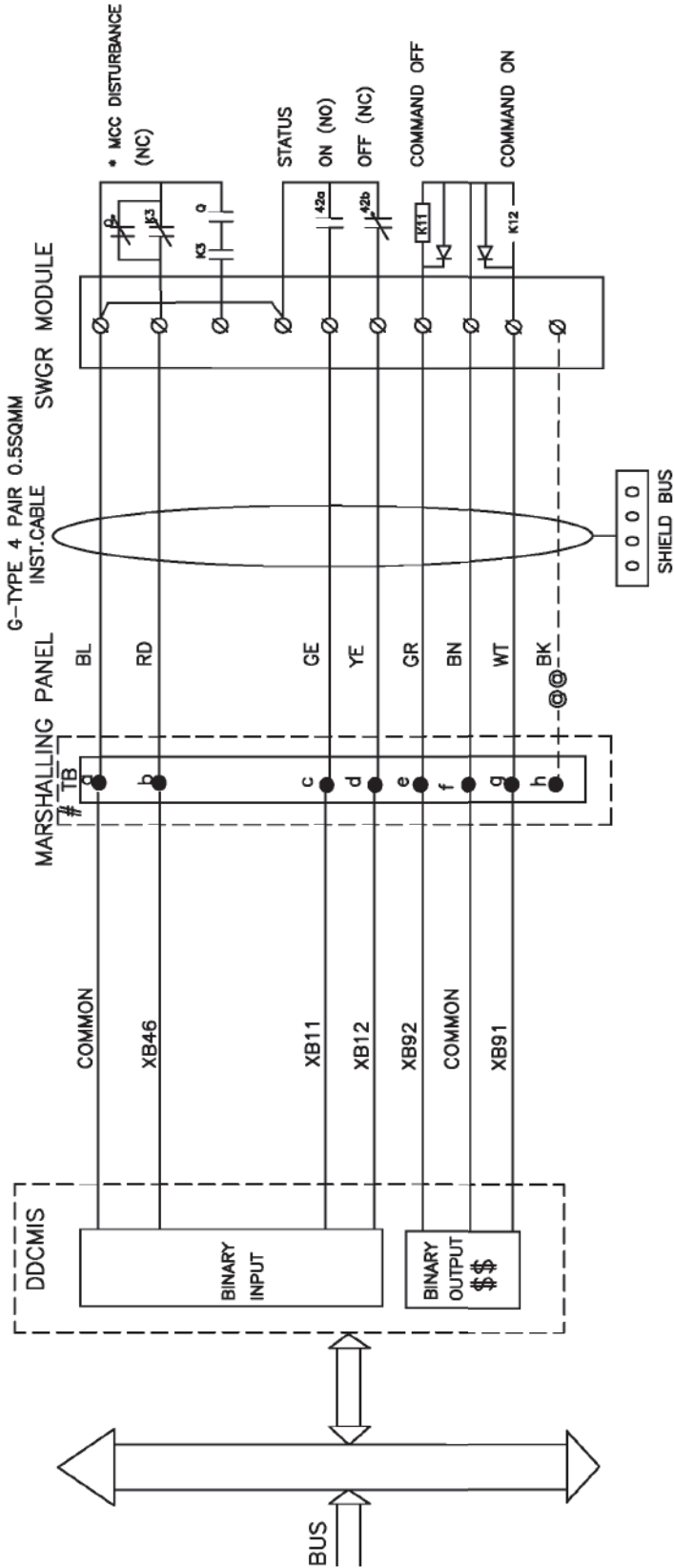


- 1 \$ REDUNDANT INPUTS FOR UNIT DDCMIS ONLY
- 2 \$\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE
- 3 # 8 LEVEL TERMINAL BLOCK
- 4 ## DI-SOE SIGNALS FOR UNIT DDCMIS ONLY
- 5 * CURRENT SIGNAL IS TO BE CONSIDERED IN DDCMIS FROM HT BREAKER FOR HT MOTORS.



3x660 MW NORTH KARANPURA (FGD PACKAGE)	DRG.NO.	PE-DM-424-145-1002
DDCMIS INTERFACE WITH HT SWITCH GEAR(HT)	SH	03 OF 10

DDCMIS INTERFACE WITH LT MCC (LT)



\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE

8 LEVEL TERMINAL BLOCK

⊗ INEACH DDCMIS POST,UNUSED TB'S ARE USED FOR SPARE CORE TERMINATION SEQUENTIALLY.

MCC DISTURBED= THERMAL O/L OPT/CONT SUPP FAIL/EPB OPTD DRIVE POWER SUPPLY OFF



3x860 MW NORTH KARANPURA
(FGD PACKAGE)

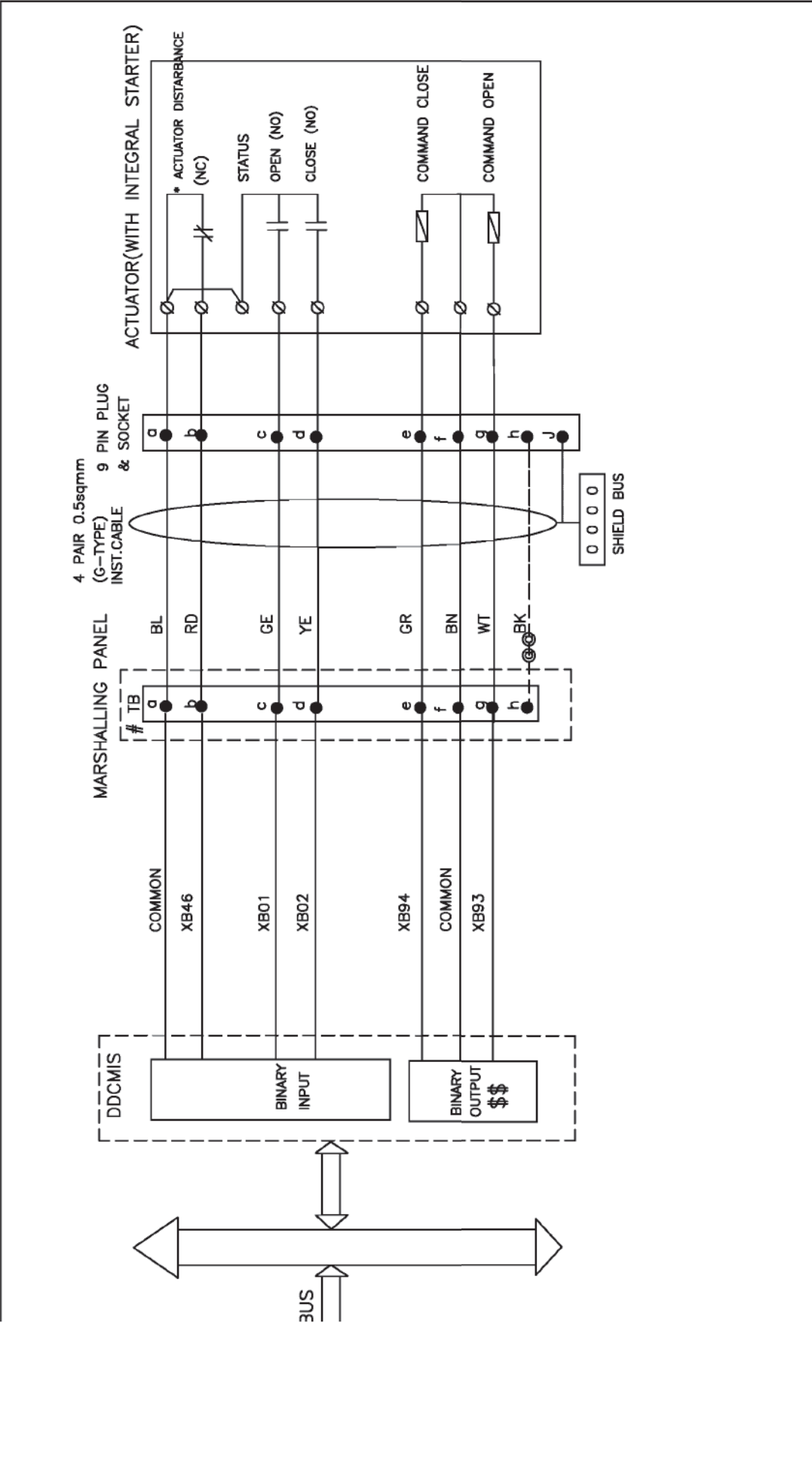
DRG.NO.

PE-DM-424-145-1002

SHT

04 OF 10

DDCMIS INTERFACE WITH BID

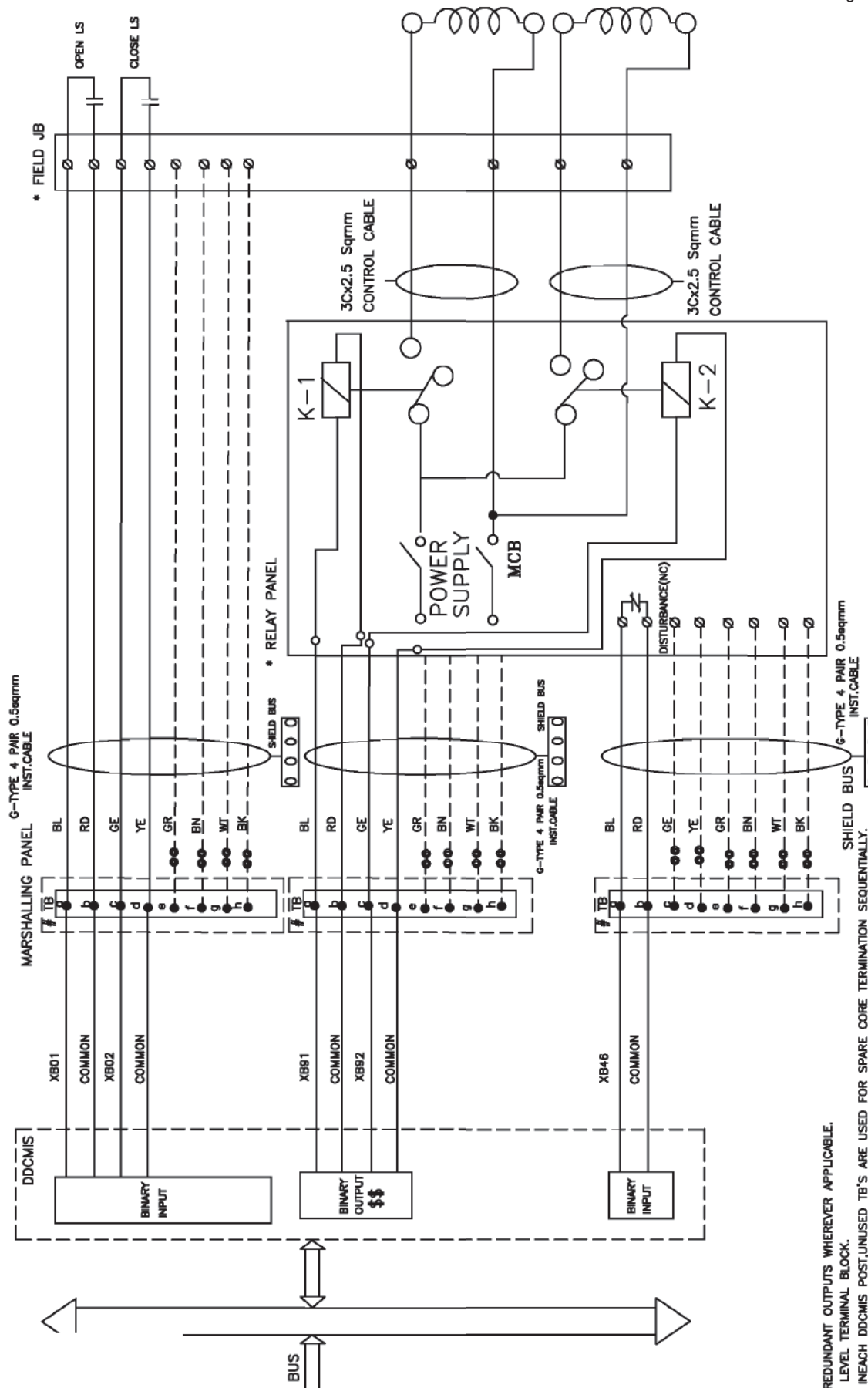


REDUNDANT OUTPUTS WHEREVER APPLICABLE
INEACH DDCMIS POST,UNUSED TB'S ARE USED FOR SPARE CORE
RMINATION SEQUENTIALLY.
DISTURBANCE=LOSS OF POWER SUPPLY(1PHASE/3PHASE)/LOSS OF
CONTROL SUPPLY/MOTOR THERMOSTAT TRIP/THERMAL OVER LOAD



3x680 MW NORTH KARANPURA (FGD PACKAGE)		DRG.NO.	PE-DM-424-145-1002
DDCMIS INTERFACE WITH BID		SHT	05 OF 10

DDCMIS INTERFACE WITH DUAL COIL SOLENOID (DSOV/L)



REDUNDANT OUTPUTS WHEREVER APPLICABLE;

LEVEL TERMINAL BLOCK.

IN EACH DDCMIS POST, UNUSED TB'S ARE USED FOR SPARE CORE TERMINATION SEQUENTIALLY.

FEEDBACKS/COMMANDS OF DSOV/SCV CAN BE GROUPED IN FIELD JB/RELAY PANEL AND MULTIPAIR/

CABLE IS TO BE USED FOR CRYPTIC SIGNALS FROM FIELD IB/BELVANGE TO WARSHAWING PANEL

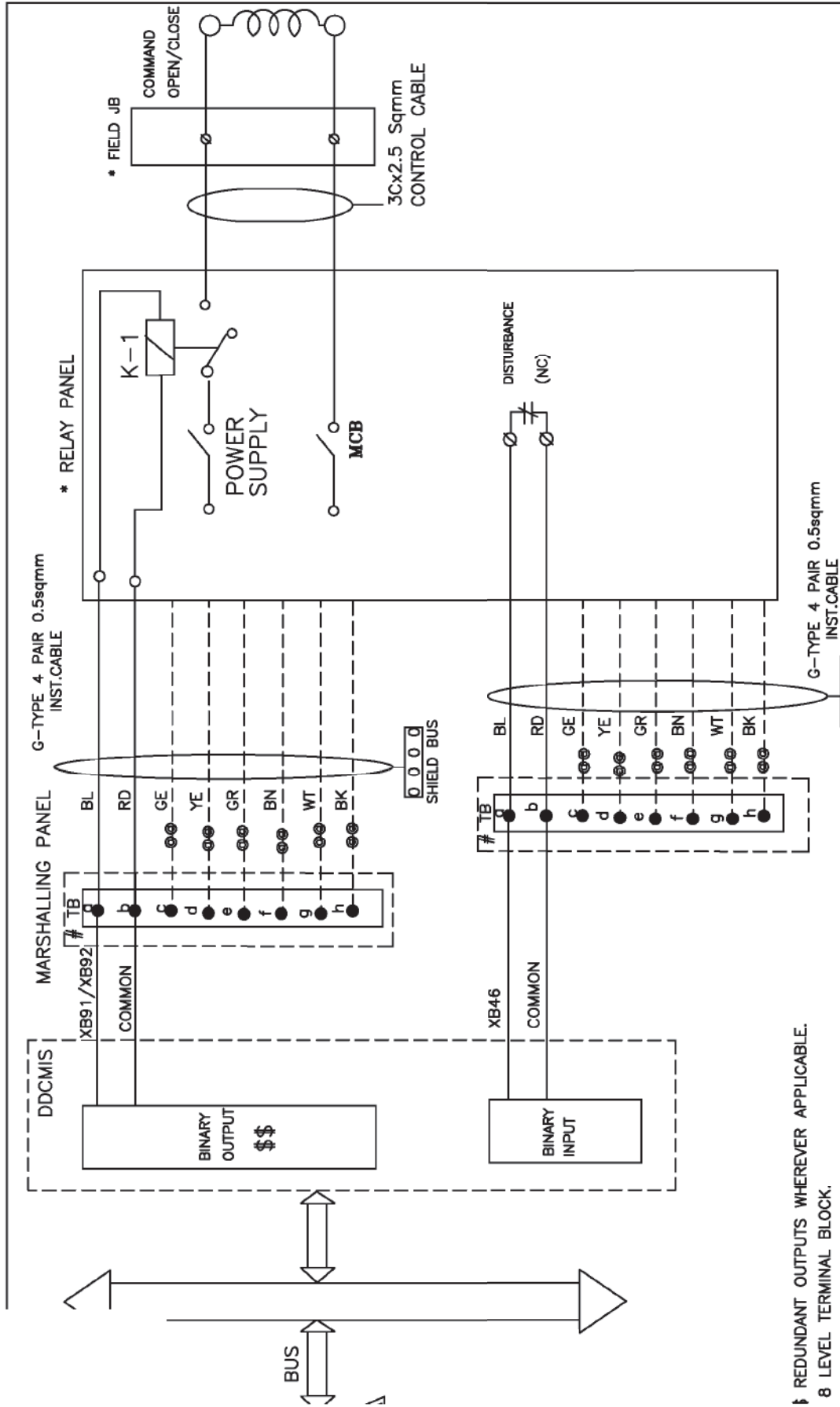
THE CABLE IS TO BE USED FOR GROUPED SIGNALS FROM
ON/OFF TYPE SOLENOID ACTUATED CONTROL VALVE

FOR ON/OFF TYPE, SOLENOID ACTUATED CONTROL VALVE.

INDEPENDENT OUTPUT FROM CONTROL SYSTEM SHALL BE PROVIDED TO PUSH-PULL TYPE

—YES, WITH DUAL COIL SOLENOIDS.

DDCMIS INTERFACE WITH SOV/O/SOV/C(WITH OUT FEEDBACKS)

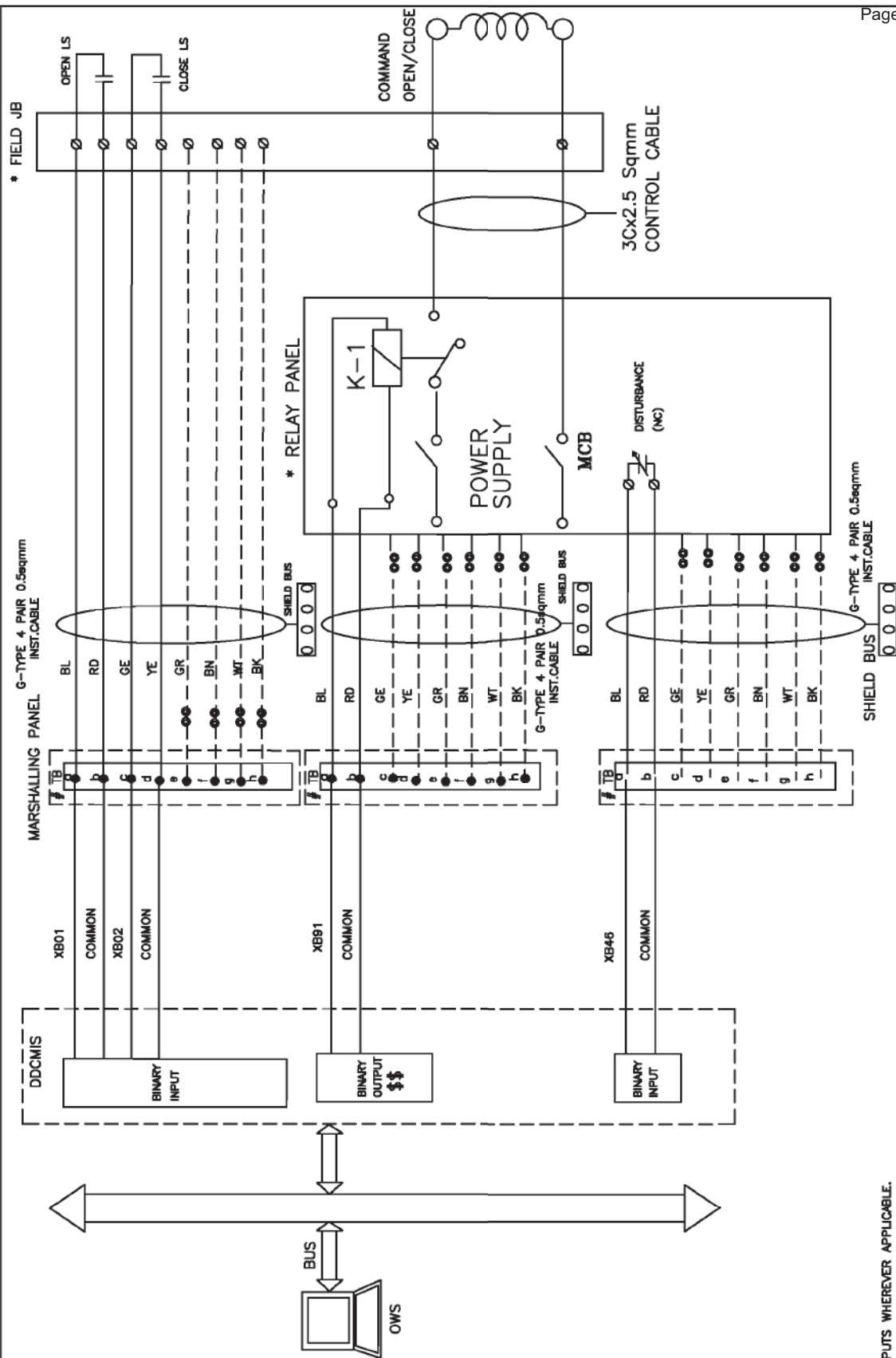


↑ REDUNDANT OUTPUTS WHEREVER APPLICABLE.
8 LEVEL TERMINAL BLOCK.

- IN EACH DDCMIS POST, UNUSED TB'S ARE USED FOR SPARE CORE TERMINATION SEQUENTIALLY.
- GROUPED SIGNALS FROM FIELD JB/RELAY PANEL TO MARSHALLING PANEL.
- OR ON/OFF TYPE, SOLENOID ACTUATED CONTROL VALVE.

	3x660 MW NORTH KARANPURA (FGD PACKAGE) DDCMIS INTERFACE WITH SOV/O/SOV/C (WITHOUT FEEDBACKS)	DRG. NO. PE-DN-424-145-ID02
	SHT 07 OF 10	

DDCMIS INTERFACE WITH SOV/O/L(WITH FEED BACKS)



REDUNDANT OUTPUTS WHEREVER APPLICABLE.
LEVEL TERMINAL BLOCK.

NEACH DDCMIS POST, UNUSED TB'S ARE USED FOR SPARE CORE TERMINATION SEQUENTIALLY.
:DBACKS/COMMANDS OF DSOV/SOV CAN BE GROUPED IN FIELD JB/RELAY PANEL AND MULTIPAIR/
CABLE IS TO BE USED FOR GROUPED SIGNALS FROM FIELD JB/RELAYPANEL TO MARSHALING PANEL
ON/OFF TYPE, SOLENOID ACTUATED CONTROL VALVE.



3x660 MW NORTH KARANPURA
(FGD PACKAGE)

DRG.NO.

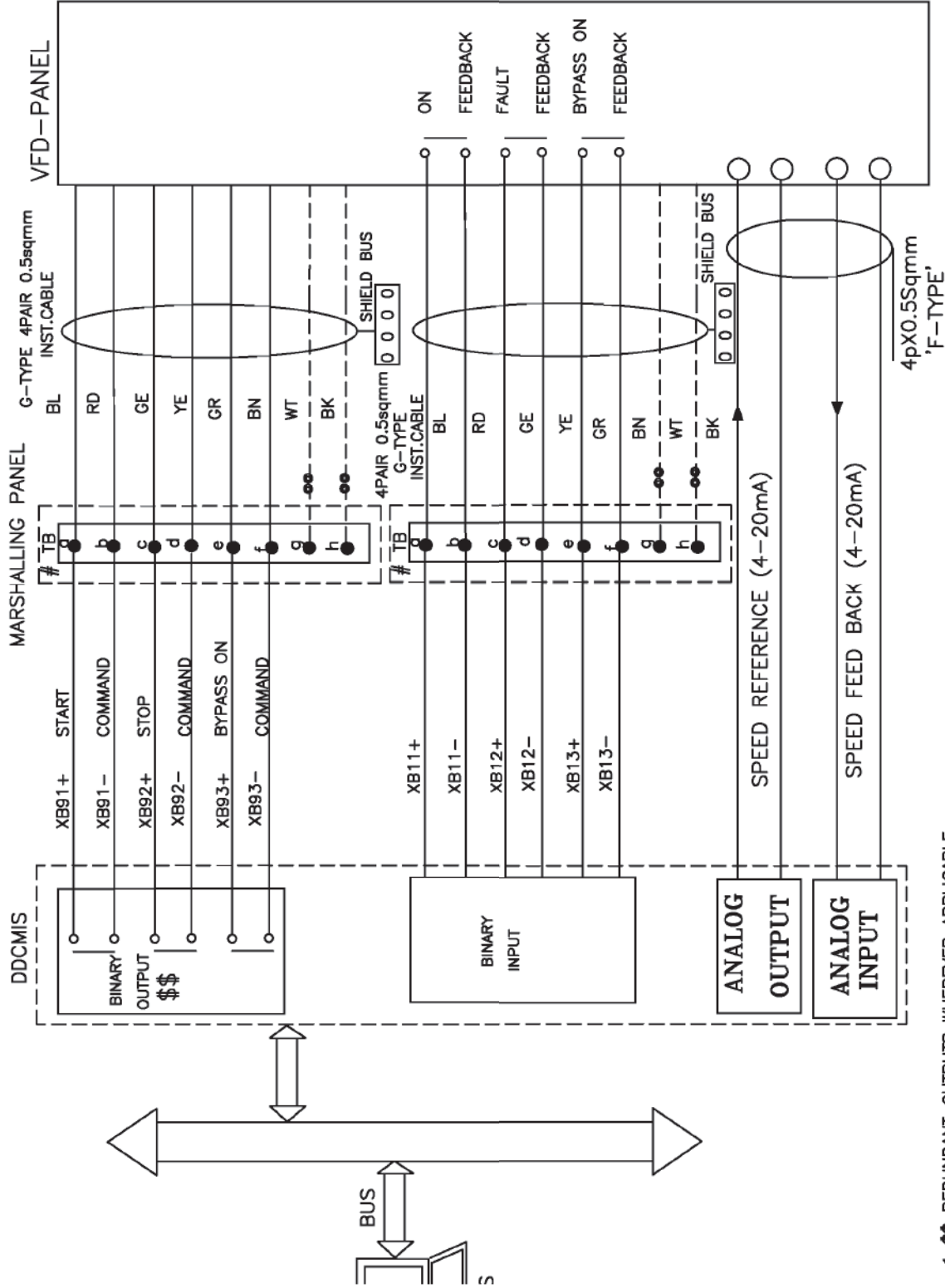
PE-DN-424-145-1002

SHT

08 OF 10

DDCMIS INTERFACE WITH SOV/O/L(WITH FEEDBACKS)

DDCMIS INTERFACE WITH VFD



- :-1 \$\$\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE
- :-2 # 8 LEVEL TERMINAL BLOCK
- :-3 @ @ IN EACH DDCMIS POST, UNUSED TB'S ARE USED FOR SPARE CORE TERMINATION SEQUENTIALLY.
- :-4 OTHER VFD SIGNALS WILL BE CONSIDERED AS PER IO LIST.



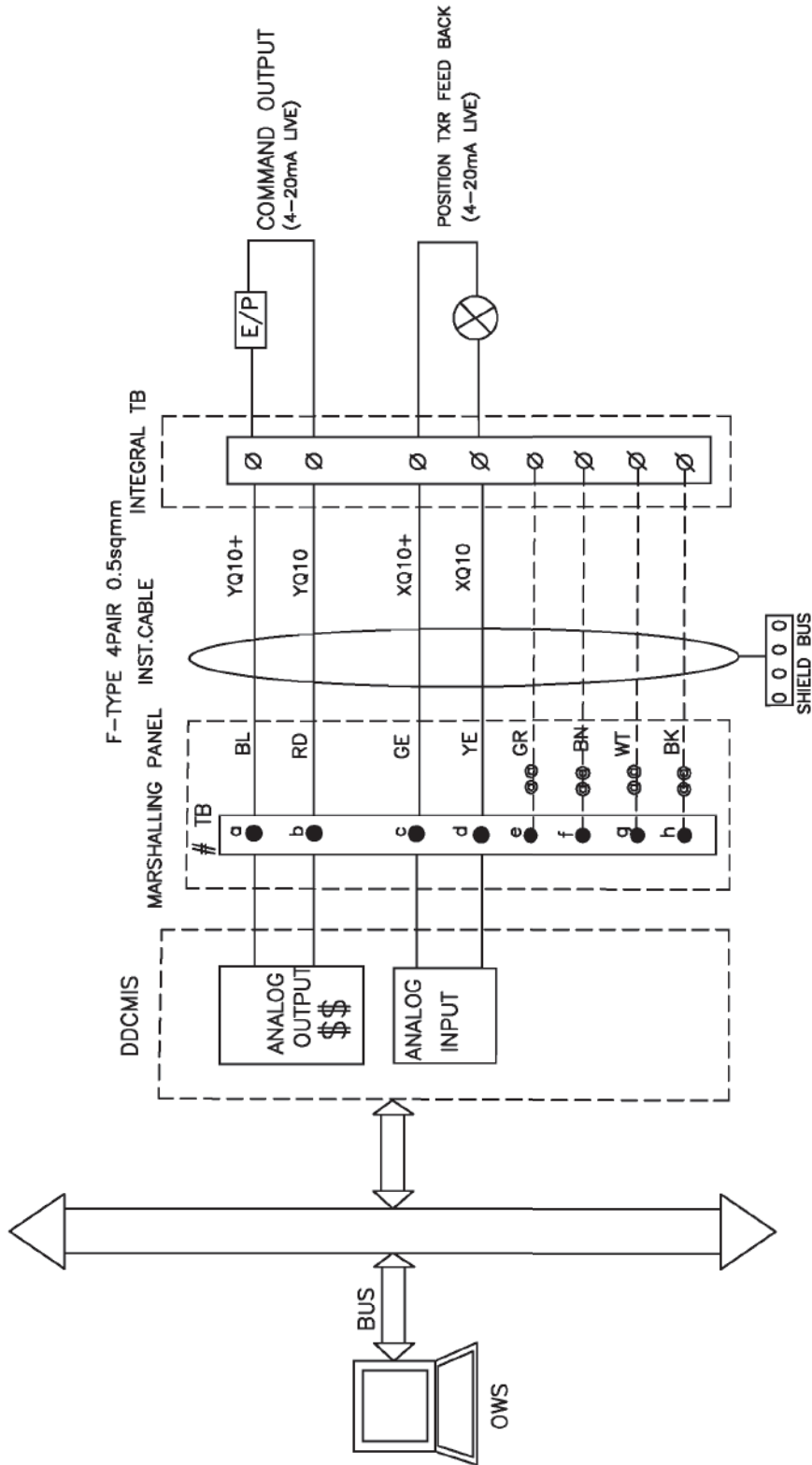
3x660 MW NORTH KARANPURA
(FGD PACKAGE)

DDCMIS INTERFACE WITH VFD

SHT 09 OF 10

DRG.NO. PE-DN-424-145-ID02

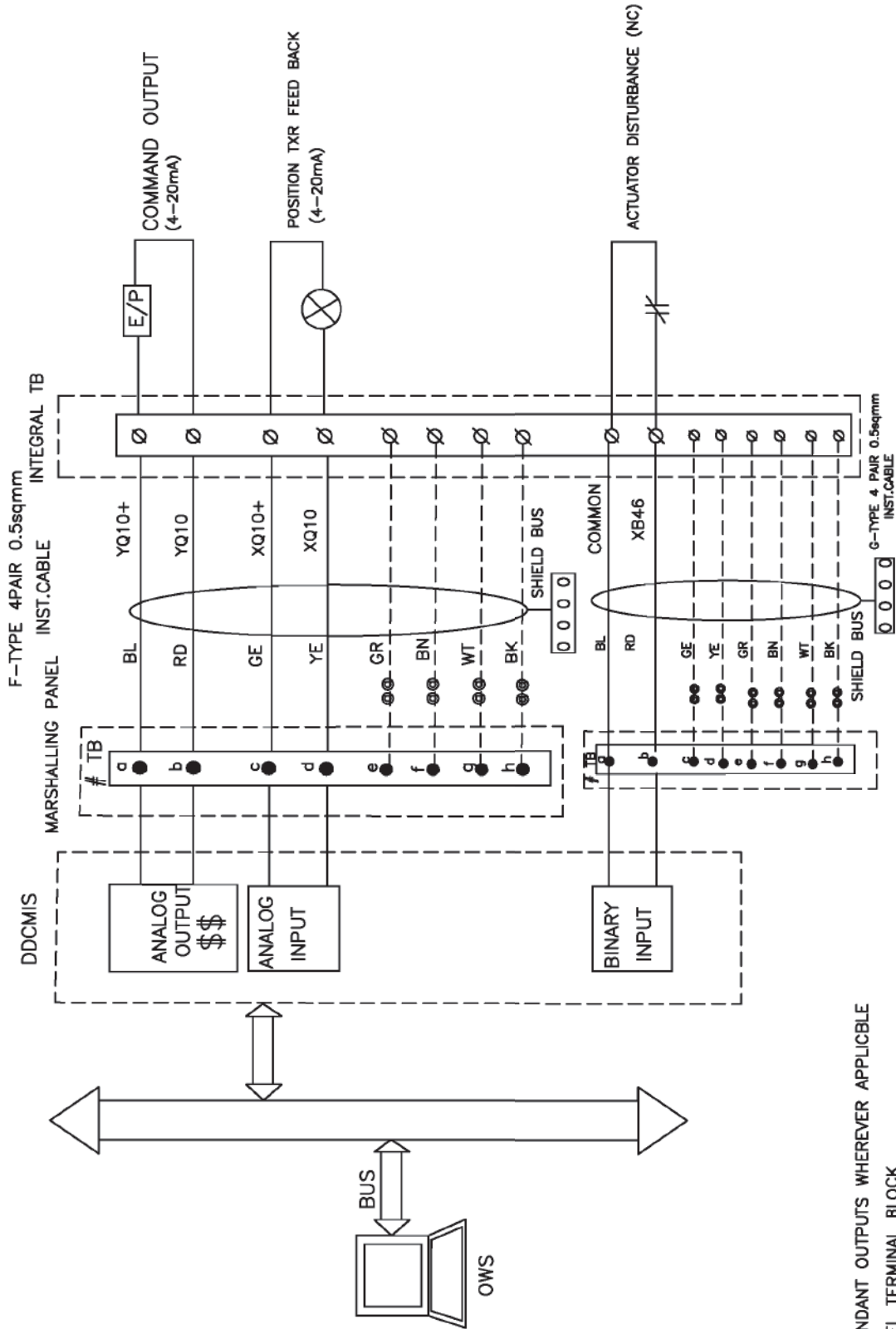
INTERFACE FOR MODULATING DRIVES - CLCS



DANT OUTPUTS WHEREVER APPLICABLE
. TERMINAL BLOCK
CH DDCMIS POST, UNUSED TB's ARE USED FOR SPARE CORE TERMINATION SEQUENTIALLY.
IDIVIDUAL & OVERALL SHIELD CABLE.

	3x660 MW NORTH KARANPURA (FGD PACKAGE)	DRG.NO. PE-DM-424-145-1002
	INTERFACE FOR MODULATING DRIVES - CLCS	SHT 10 OF 10

INTERFACE FOR MODULATING DRIVES - CLCS-M



\$\$\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE
: # 8 LEVEL TERMINAL BLOCK
} @ @ IN EACH DDCMIS POST, UNUSED TB's ARE USED FOR SPARE CORE TERMINATION.
! F-TYPE: INDIVIDUAL & OVERALL SHIELD CABLE.

	3XB00 MW NTPC PATRATU STPP PHASE-I	DRG.NO. 9686-001-406-PVI-B-1528
INTERFACE FOR MODULATING DRIVES - CLCS-M	SHT 15 OF 34	

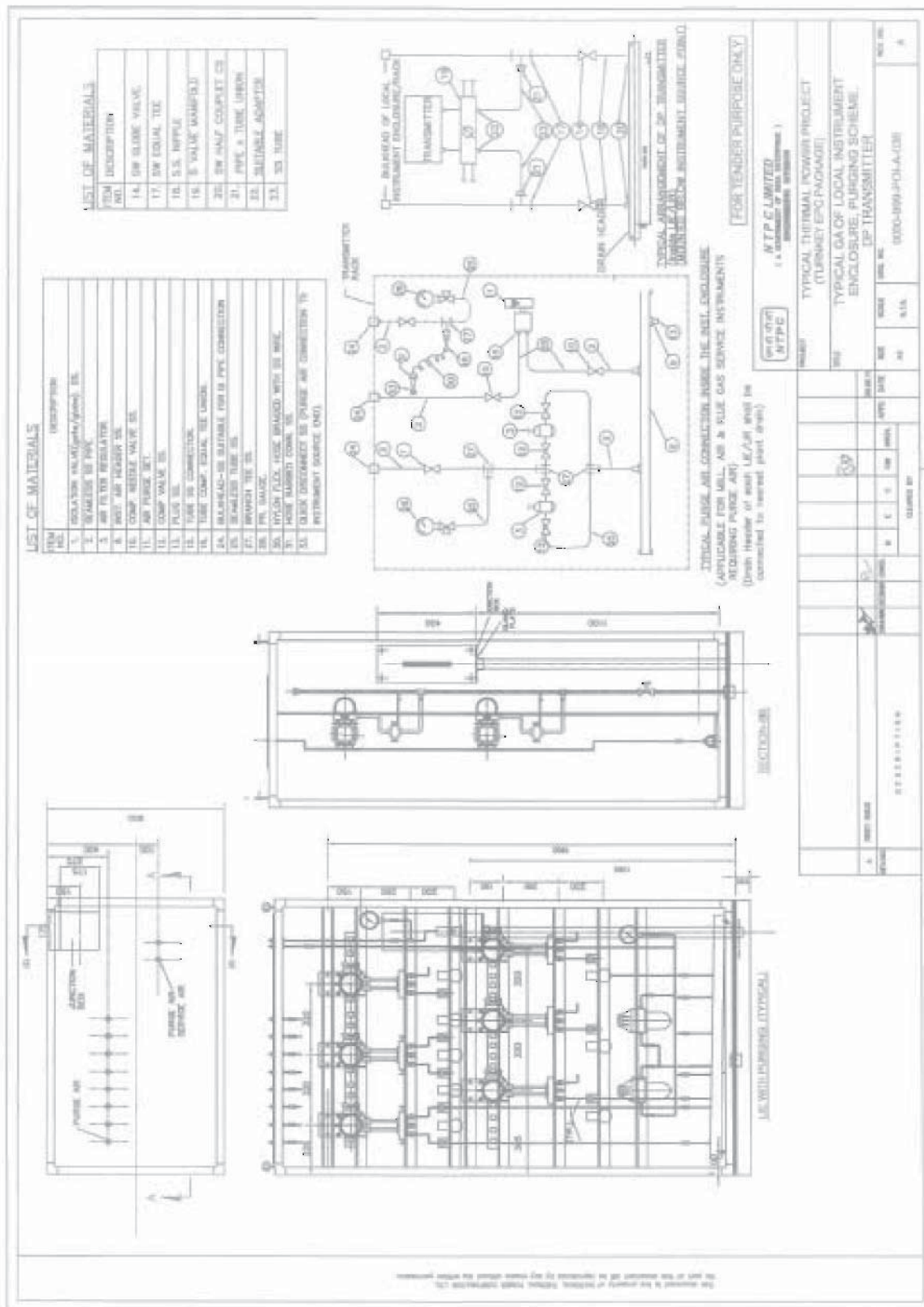


**C&I SPECIFICATION FOR
GYPSUM DEWATERING EQUIPMENT**

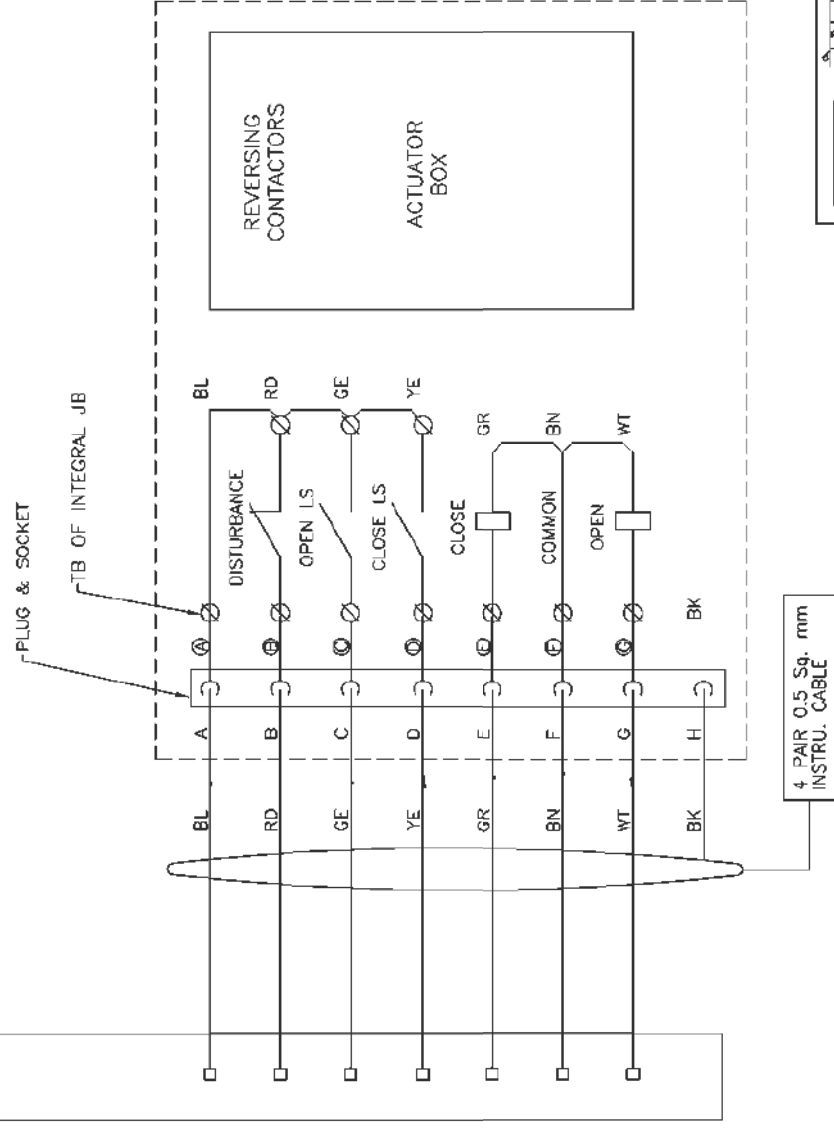
SECTION: C
SUB SECTION: C&I

**DRIVE & INSTRUMENT INTERFACE
DIAGRAM**

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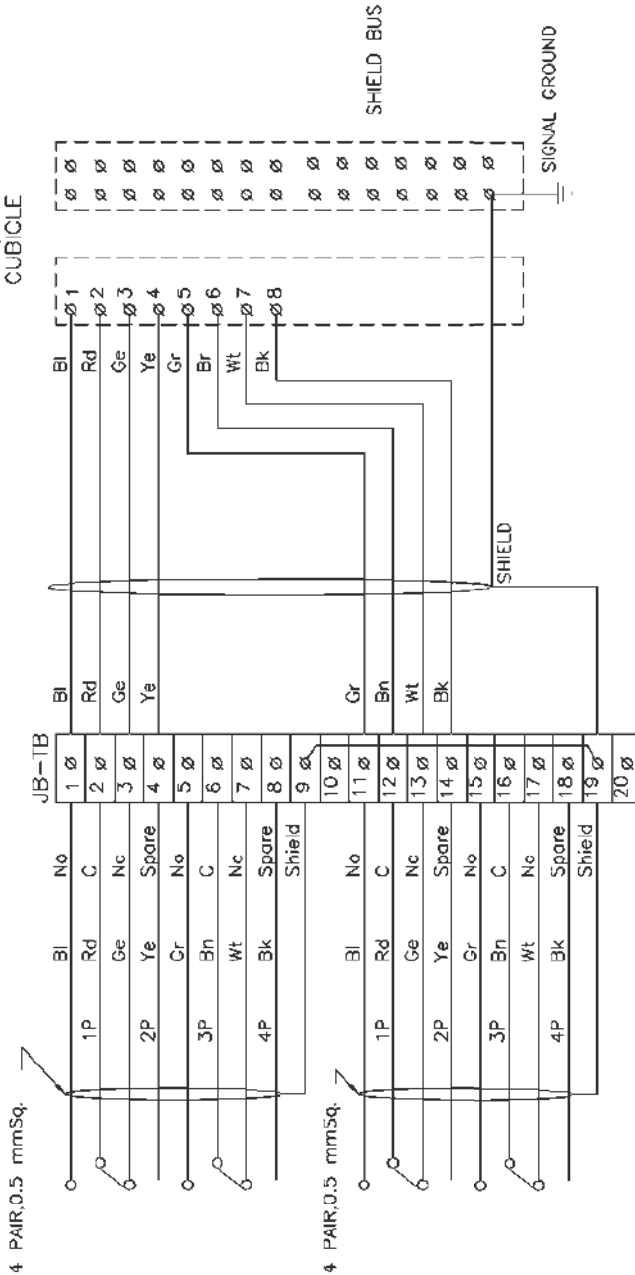
TERMINATION AT
CONTROL SYSTEM END



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INSTRU. CABLE									
NTPC नैशनल थर्मल पावर कारपोरेशन लिमिटेड National Thermal Power Corporation Ltd. (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION PROJECT TYPICAL THERMAL POWER PROJECT									
TITLE									
INTERFACING OF ACTUATORS									
D	FIRST ISSUE								21.08.12
REV.NO.									
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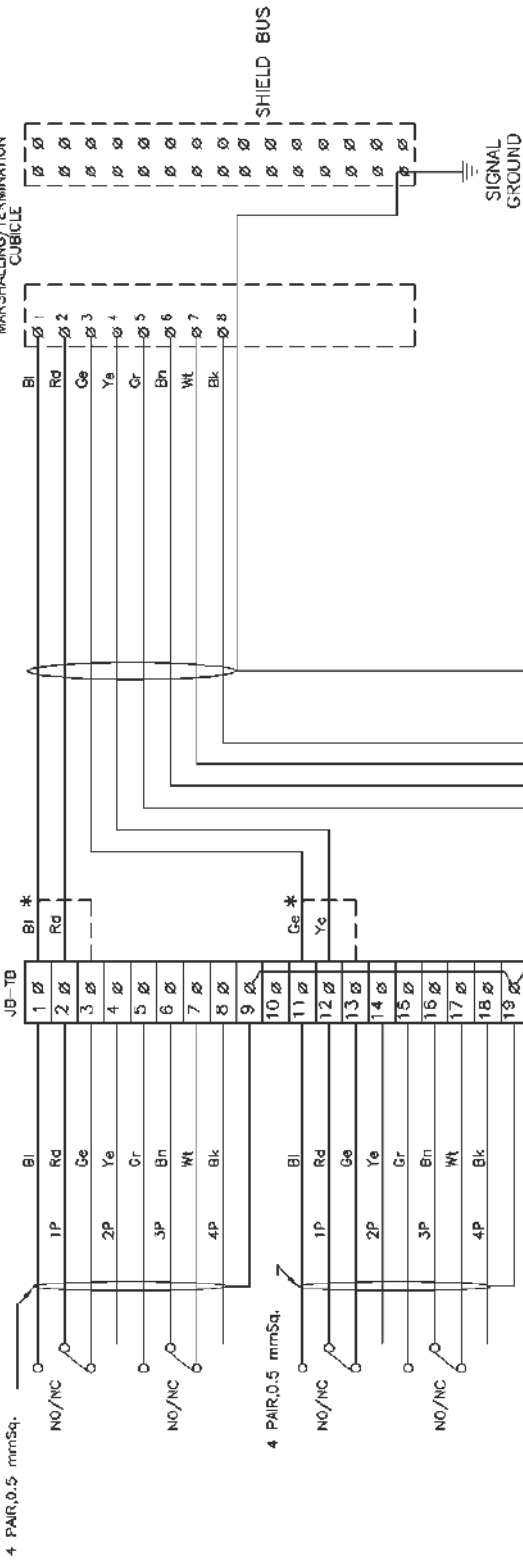
MARSHALLING/TERMINATION
CUBICLE



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										TYPICAL THERMAL POWER PROJECT									
										TITLE									
										INTERFACING OF FIELD INSTRUMENTS/ SWGR SWITCH (COC) TERMINATION DETAILS									
										REV. NO.									
										A									
										SH 01 OF 15									
										0000-999-POI-A-065									
										DRG. NO.									
										SCALE									
										NTS									
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										A3									
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										FIRST ISSUE									
										A									
										REV. NO.									

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* BI/Ge/Gr/Wt CORE SHALL BE TERMINATED IN TERMINAL 1 OR 3, 11 OR 13, 21 OR 23 AND 31 OR 33 RESPECTIVELY DEPENDING ON THE PARTICULAR TYPE OF CONTACT (NO OR NC) IS TO BE WIRED TO DDCMIS.

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ENGINEERING DIVISION

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PROJECT		TYPICAL THERMAL POWER PROJECT										
TITLE		INTERFACING OF FIELD INSTRUMENTS SWITCH TERMINATION DETAILS NO/NC										
A	FIRST ISSUE			21.08.12								
REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	CLEARED BY				REV.			
					M	E	C	C&I		ARCH.		
									DRG. NO.	0000-999-POI-A-065	SH 02 OF 15	A
										SCALE	NTS	
										SIZE	A3	

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MARSHALLING/TERMINATION
CUBICLE

4 PAIR 0.5 mmSq.

INTERNAL WIRING INT. JB
CABLE OF CV

POSITIONER	1 Ø
COMMAND	2 Ø
POS FEEDBACK	3 Ø
	4 Ø
	5 Ø
	6 Ø
	7 Ø
	8 Ø
	9 Ø

LOCAL JB

1 Ø	Bl
2 Ø	Rd
3 Ø	Ge
4 Ø	Ye
5 Ø	Gr
6 Ø	Bn
7 Ø	Wt
8 Ø	Bk
9 Ø	Shield
10 Ø	Shield

INTERNAL WIRING
CABLE

POSITIONER	1 Ø
COMMAND	2 Ø
POS FEEDBACK	3 Ø
	4 Ø
	5 Ø
	6 Ø
	7 Ø
	8 Ø
	9 Ø

11 Ø	Gr
12 Ø	Bn
13 Ø	Wt
14 Ø	Bk
15 Ø	Shield
16 Ø	Shield
17 Ø	Shield
18 Ø	Shield
19 Ø	Shield
20 Ø	Shield

Bl	Ø 1
Rd	Ø 2
Ge	Ø 3
Ye	Ø 4
Gr	Ø 5
Bn	Ø 6
Wt	Ø 7
Bk	Ø 8

Shield

SIGNAL
GROUND

SHIELD
BUS

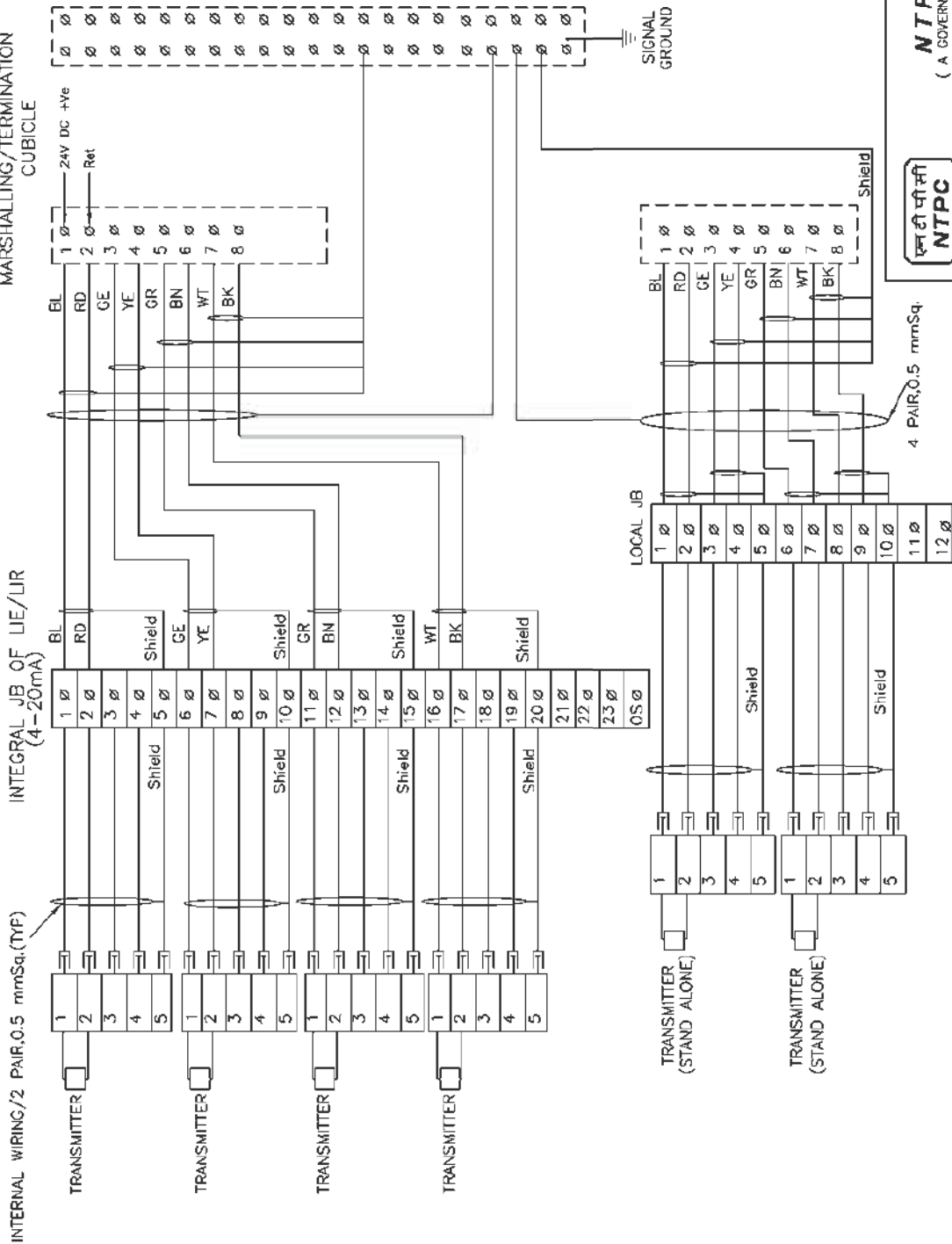
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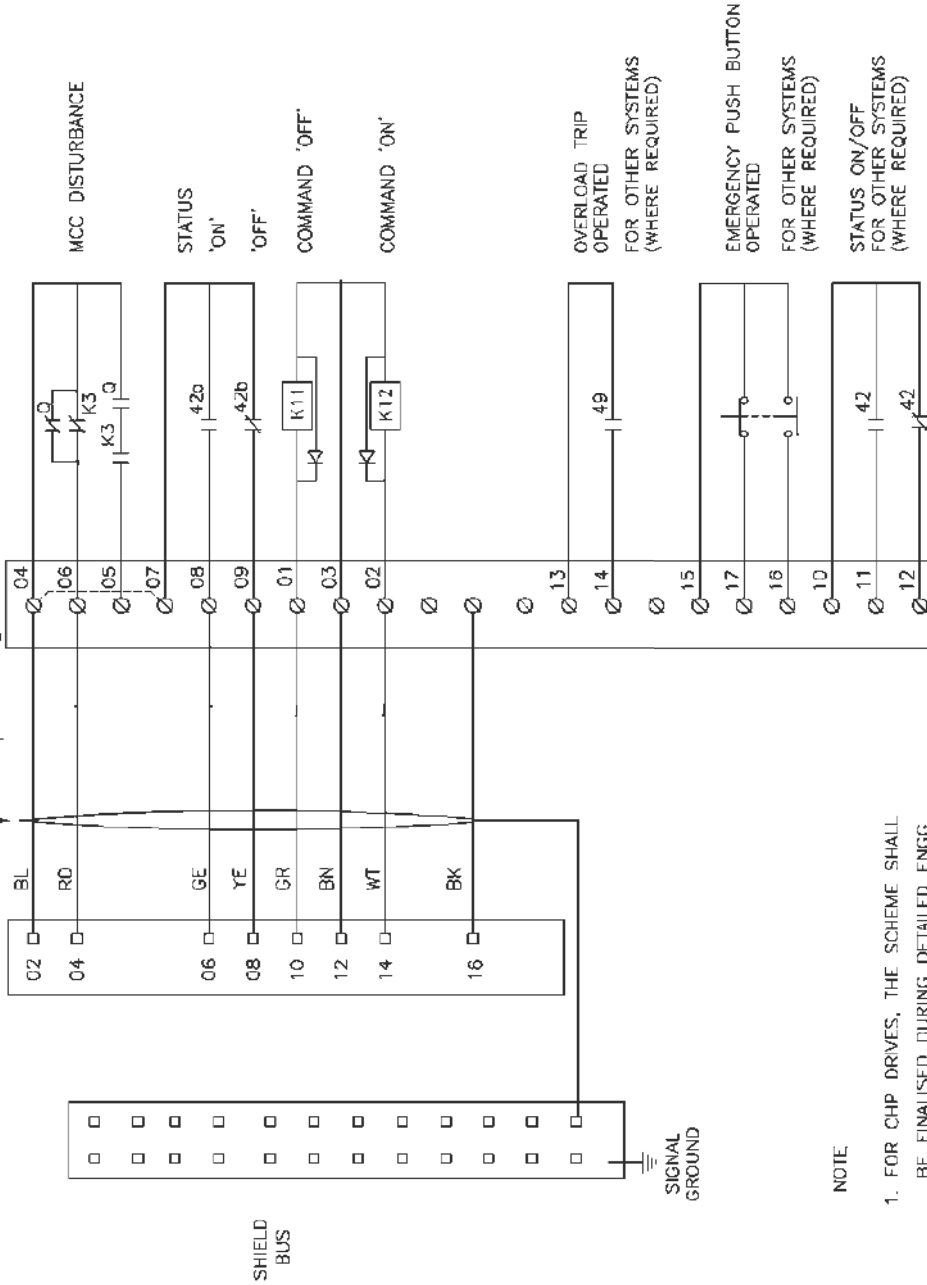
TYPICAL THERMAL POWER PROJECT															
TITLE															
INTERFACING OF FIELD INSTRUMENTS CONTROL VALVE															
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE	SIZE	SCALE	DRG. NO.	REV.
												A3	NTS	0000-999-POI-A-065	A
SH 03 OF 15															

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TYPICAL THERMAL POWER PROJECT									
INTERFACING OF FIELD INSTRUMENTS									
4-20mA									
PROJECT									
TITLE									
21.08.12									
12.1.05									
DATE									
APPO									
ARCH.									
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CLEARED BY									
CHKD.									
DESIGN									
DRAWN									
DESCRIPTION									
INTERNAL WIRING FOR LIE/LIR MOUNTED SHOWN									
WIRING OF STAND ALONE TXTR SHOWN									
FIRST ISSUE									
REV. NO.									
REV.									
B									
SH 04 OF 15									

MARSHALLING/ TERMINATION CUBICLES 4 PAIR, 0.5 Sq. mm MCC/SWGR

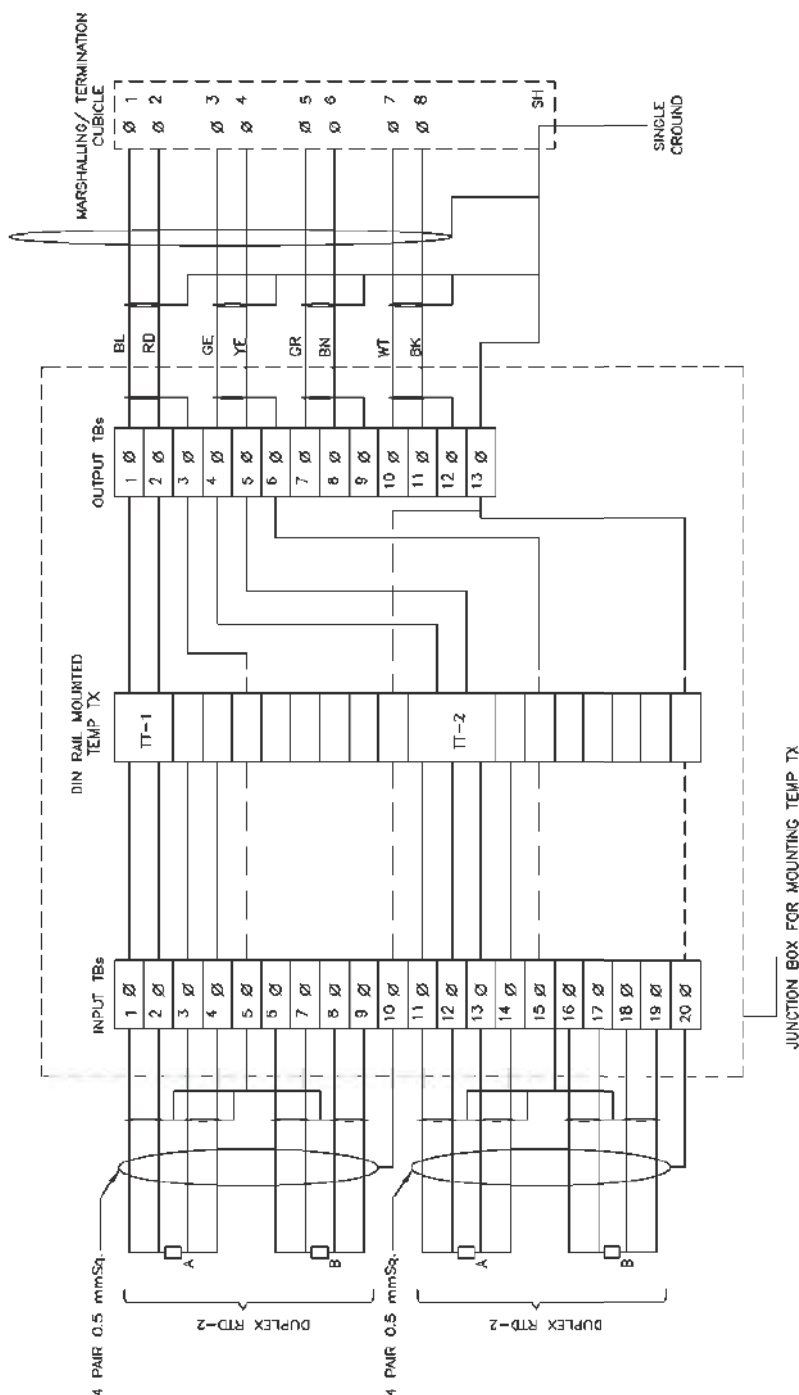


NOTE

1. FOR CHP DRIVES, THE SCHEME SHALL BE FINALISED DURING DETAILED ENGG.

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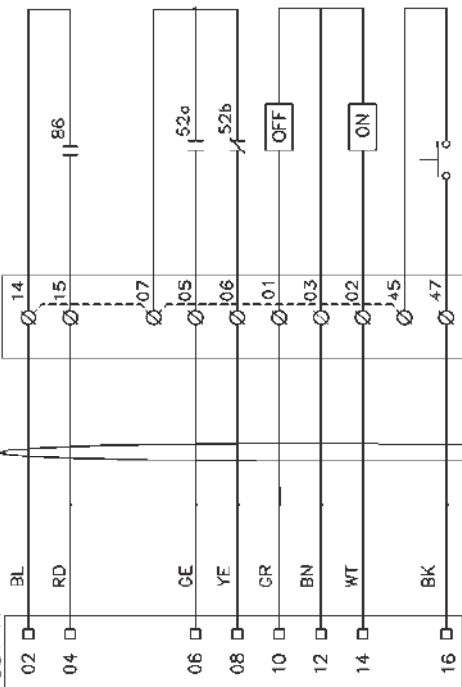


- NOTE :-
- 1) ABOVE IS THE TYP. DRG. MOUNTED TEMP TRANSMITTER FRO T/C APPLICATION. EXACT TYPE OF TEMP TRANSMITTERS SHALL BE AS PER PART-A OF SPECIFICATION.
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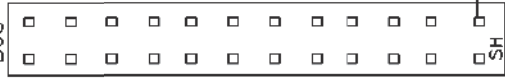
FOR TENDER PURPOSE ONLY

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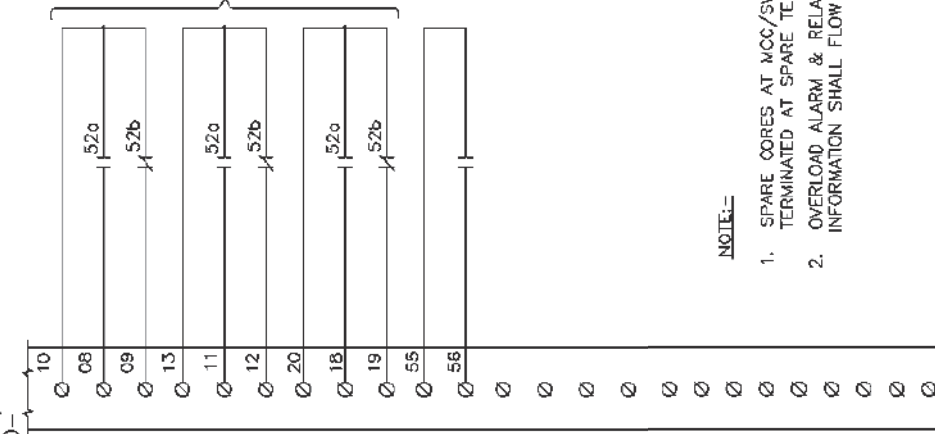
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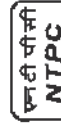
MCC/SWGR
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NOTE:-

1. SPARE CORES AT MCC/SWGR END ARE TO BE TERMINATED AT SPARE TERMINALS.
2. OVERLOAD ALARM & RELAY FAULT ALONG WITH OTHER INFORMATION SHALL FLOW THROUGH SOFT LINK.

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NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT

TYPICAL THERMAL POWER PROJECT

TITLE

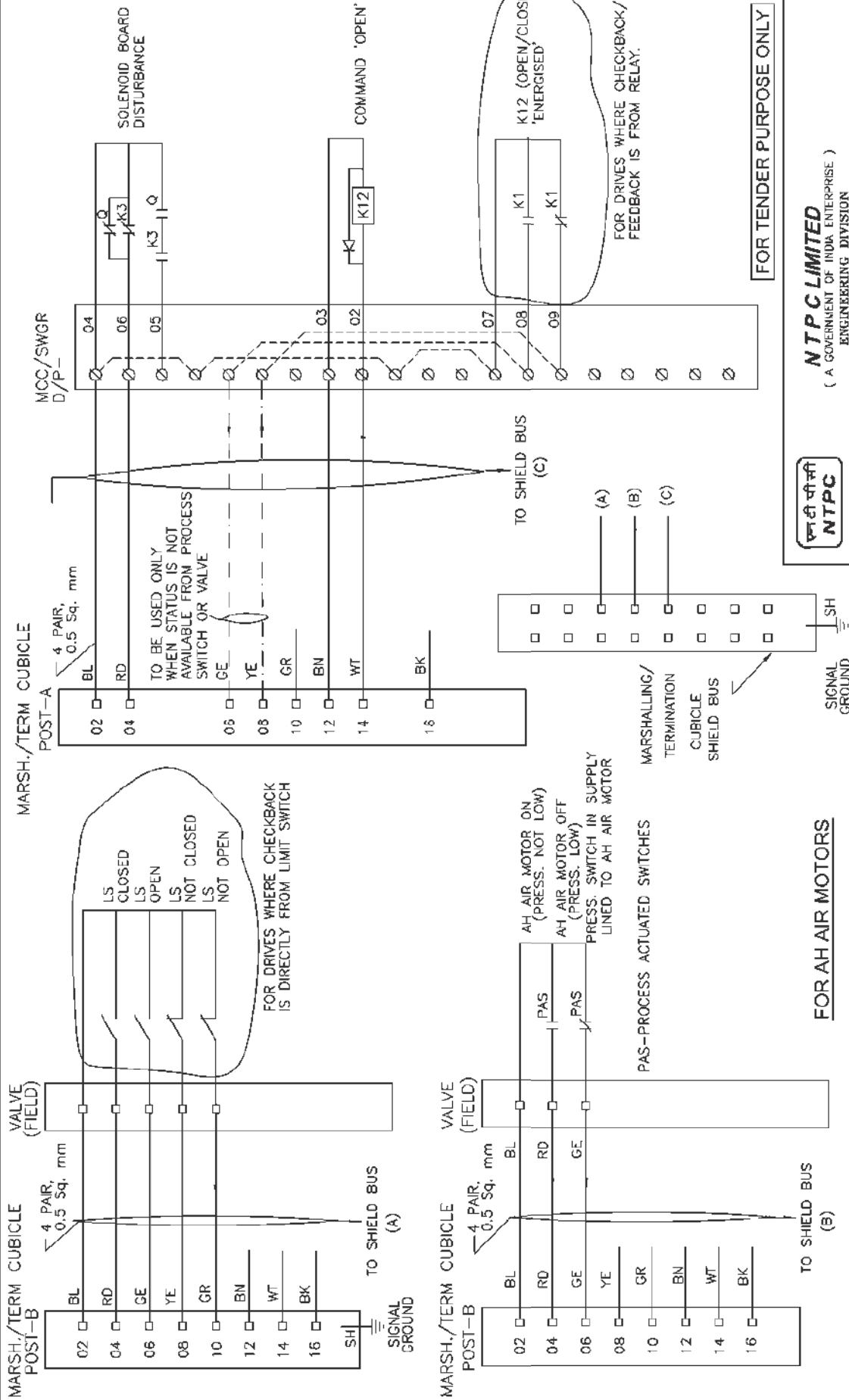
INTERFACING OF FIELD INSTRUMENTS
INTERFACE OF DDCMIS WITH MCC/SWGR/ACTUATOR
(HT MOTORS)

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	CLEARED BY				APPRO.	DATE	SCALE	DRG. NO.	REV.
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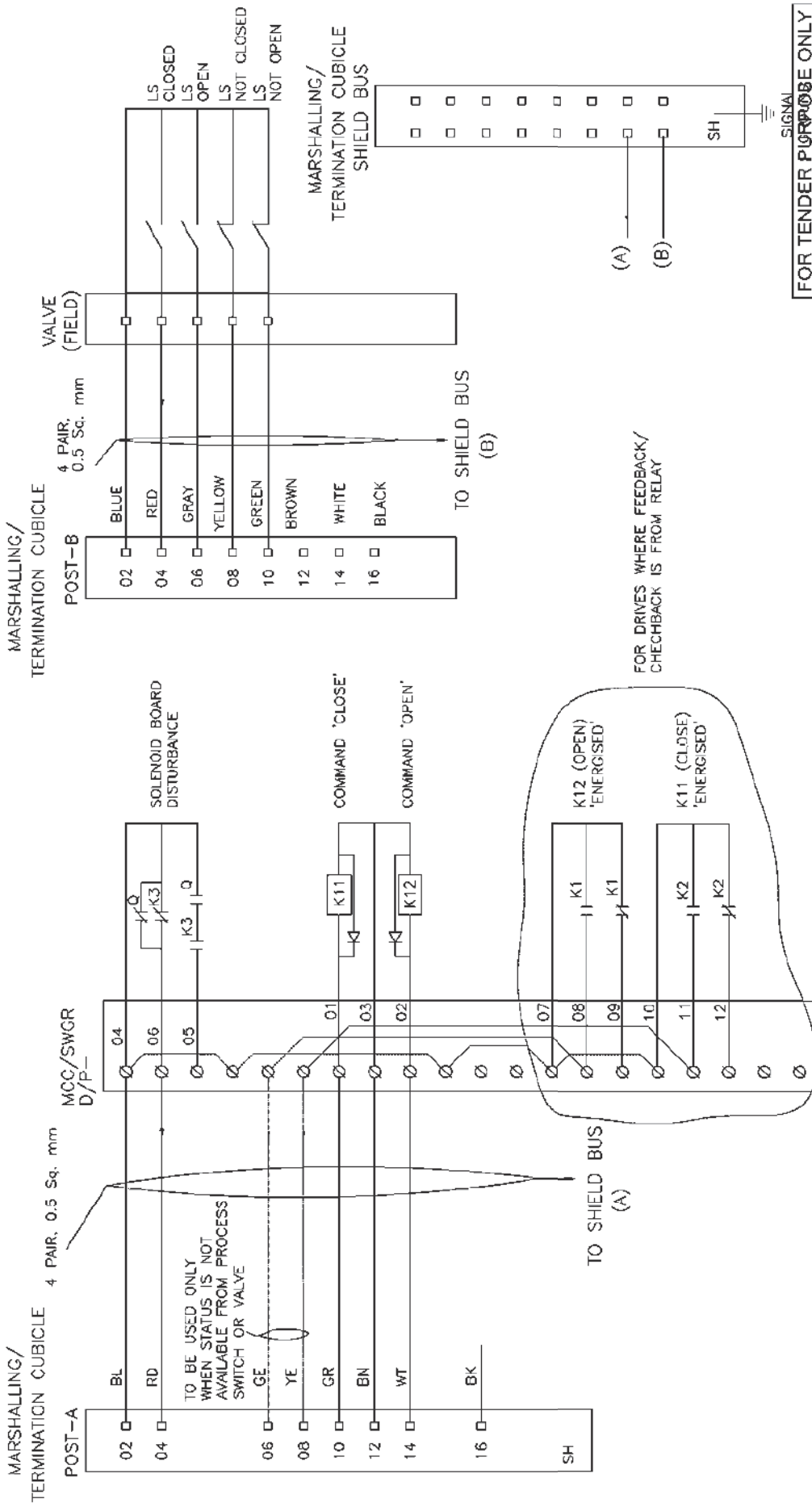
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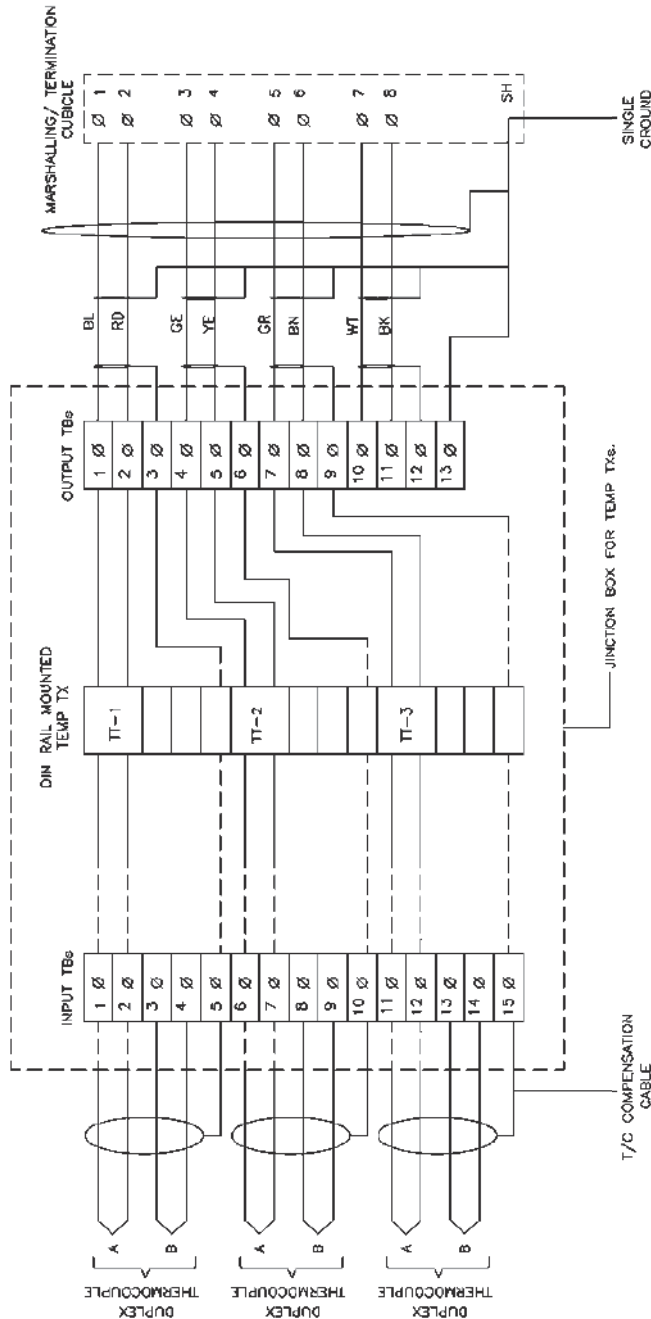
THIS IS PART OF TECHNICAL SPECIFICATION PE TS 468-571-A901 REV-00.



PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF FIELD INSTRUMENTS INTERFACE OF DDCMIS WITH MCC/SWGR/ACTUATOR (SINGLE COIL SOLENOID)	
REV. NO.	DATE	SCALE	DRG. NO.
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 - 2) THE EXACT GROUPING OF TEMP TXs SHALL BE FINISHED DURING DETAILED ENGG. STAGE.
 - 3) AFTER GLADDING OF T/C CABLES ON JB. THE CABLE PAIR OF FIRST ELEMENT WILL BE DIRECTLY CONNECTED TO TT AND THE CABLE PAIR OF SECOND ELEMENT SHALL BE WIRED TO INPUT TBs FOR FUTURE USE.
 - 4) PLEASE NOTE THAT THIS CONFIGURATION IS SHOWN FOR SINGLE INPUT DIN RAIL MOUNTED TT. FOR DUAL INPUT TT BOTH THE ELEMENT OF T/C SHALL BE CONNECTED DIRECTLY TO TT WITHOUT INPUT TBs. HOWEVER 5 NOS OF INPUT TBs ARE TO PROVIDED FOR EACH T/C FOR FUTURE USE.

FOR TENDER PURPOSE ONLY

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

SECTION: C
SUB SECTION: C&I

**QUALITY ASSURANCE FOR
INSTRUMENTS & LCP AND TYPE TEST
REQUIREMENTS**

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

CLAUSE NO.

QUALITY ASSURANCE & INSPECTION



ELECTRICAL ACTUATOR WITH INTEGRAL STARTER

Test/Attributes Characteristics														
ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING	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	Y
Note: 1) Detailed procedure of Burn-in and Elevated Temperature 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 along with relevant supporting documents. ® - Routine Test (A) - Acceptance Test Y - Test applicable														

CLAUSE NO.

QUALITY ASSURANCE & INSPECTION



Process, Connection & piping FOR C&I SYSTEMS

TESTS

ITEMS

	Visual ®	GA, BOM, Layout of component & construction feature®	Dimension ®	Paint Shade/thickness ®	Flattening, flaring, hydrotest, hardness check as per ASTM standard	Component Ratings ®	Wiring ®	Make, Model, Type, Rating®	IR & HV ®	Review of TC for instrument/devices (R)	Accessibility of TBs/Devices ®	Illumination,grounding ®	Tubing ®	Leak/Hydro test(A)	Chemical/physical properties of material (A)	Proof pressure test,Dismantling & reassembly test,Hydraulic impulse and vibration test (R)	Tests as per standards & specification
Local Instrument enclosure	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y			
Local instruments racks	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y			
Junction Box	Y	Y	Y	Y *		Y		Y	Y								
Gauge Board	Y	Y	Y	Y		Y		Y		Y			Y	Y			
Impulse pipes and tubes	Y		Y		Y			Y							Y		
Socket weld fittings ANSI B-16.11	Y		Y					Y							Y		Y
Compression fittings	Y		Y					Y						Y	Y	Y	
Instrument valves & Valve manifolds	Y		Y					Y						Y	Y		
Copper tubings ASTM B75	Y							Y									Y

*-applicable for painted junction boxes.

Note: R-Routine Test

A- Acceptance Test

Y – Test applicable

Note: 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.

CLAUSE NO.

QUALITY ASSURANCE & INSPECTION



VFD MODULE SQE_28

ATTRIBUTES / CHARACTERISTICS	Visual & Dimensional checks	Make / Type / Rating etc.	Final Inspectio n as ISS / IEC	Remarks
ITEMS/COMPONENTS, SUB SYSTEM ASSEMBLY				
HT Breaker (IEC 56)	Y	Y	Y	
DC Reactor	Y	Y		For details refer table for DC Reactor
Transformer	Y	Y		For details refer table for Transformer
Motor	Y	Y		For details refer separate table for Motor
VFD Panel	Y	Y		For details refer table for VFD
Note : 1) This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed alongwith relevant supporting documents during QP finalisation. 2) Make of all major Bought Out Items will be subject to NTPC approval.				

CLAUSE NO.

QUALITY ASSURANCE & INSPECTION



DC REACTOR								
ATTRIBUTES / CHARACTERISTICS								
ITEMS/COMPONENTS, SUB SYSTEM ASSEMBLY	Visual	Dimensional	Mech. & Chem. Property	Electrical Characteristics	Pretreatment by Seven Tank	Painting by Stove Enameling	Final Inspection as per IS-2026	Welding/NDT
Winding Material (Aluminium)	Y	Y	Y	Y				
Insulation Material	Y	Y		Y				
Sheet Steel	Y	Y	Y					
Winding	Y	Y		Y				
Fabrication of Enclosures	Y	Y			Y	Y		Y
Assembly	Y	Y						
Routine Tests	Y	Y					Y	
Note : 1) This is an indicative list of tests/checks. The manufacturer to furnish a detailed Quality Plan indicating their practice & procedure along with relevant supporting documents during QP finalisation for all items. 2) All major Bought Out Items will be subject to NTPC approval.								

CLAUSE NO.

QUALITY ASSURANCE & INSPECTION



TRANSFORMER (OIL FILLED)

Attributes / Characteristics Items/Components Sub Systems	Visual & Dimensional Checks	Mechanical properties	Electrical strength	Thermal properties	Chemical Composition	Compatibility with oil	NDT / DPT / MPI / UT	Ageing Test.	Voltage Ratio, Vector Group & Polarity, Magnetic Balance Test	Make / Type / Rating / Model / TC / General Physical Inspection.	WPS & PQR	Routine Test as per relevant test	Routine Test
Tank, H.V. & L.V. Cable Box / Flange throat	Y	Y					Y						
Conservator / Radiator / Cooler / Pipes	Y	Y					Y						
Copper Conductor (IS:191)	Y	Y	Y		Y								
Insulating Material	Y	Y	Y	Y	Y	Y							
CRGO Lamination & Built Core	Y	Y	Y		Y	Y							
Bushing / Insulator (IS:2544 / 5621)	Y	Y								Y		Y	
Gasket	Y				Y	Y		Y				Y	
Transformer Oil (IS:335 / IEC296)												Y	
Off-Circuit Tap Changer	Y									Y			
Core Coil Assembly & Pre-tanking	Y								Y				
Marshalling Box	Y	Y					Y					Y	
WTI, OTI, MOG, PRD, Breather, Terminal Connector, Bucholz Relay, Globe & Gate Valve,	Y									Y			
Welding (ASME Sect-IX)	Y										Y		
Complete Transformer (IS:2026/ IEC-60076)	Y												Y

Note: 1) This is an indicative list of tests / checks. The manufacturer is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.
2) All major Bought Out Items will be subject to NTPC approval.

CLAUSE NO.

QUALITY ASSURANCE & INSPECTION



DRY TYPE TRANSFORMER

Attributes / Characteristics Items/Components Sub Systems	Visual & Dimensional check	Mechanical properties	Electrical strength	Thermal Properties	Chemical Properties	NDT / DP / MPI	Voltage Ratio, Vector Group & Polarity	Make / Type / Rating / Model / TC / General Physical Inspection	WPS & PQR	Routine Test as per relevant standard	Measurement of capacitance & tan delta between winding	Routine Test
Enclosure door, H.V. & L.V. Cable Box / Flange Throat	Y	Y						Y				
Copper Conductor	Y	Y	Y		Y							
Insulating Material	Y			Y	Y							
CRGO Lamination & Built Core	Y											
Bushing /Insulator (IS:2544 / 5621)	Y							Y		Y		
Gasket	Y							Y		Y		
Off-Circuit Tap Changer	Y							Y				
Core Coil Assembly	Y						Y					
Marshalling Box	Y									Y		
WTI, Thermister, Terminal Connector	Y							Y				
Welding									Y			
Complete Transformer (IS:11171 / IEC 60076)	Y										Y	Y
Notes: 1) This is an indicative List of test/checks. The manufacturer is to furnish a detailed Quality Plan indicating his practice and procedure along with relevant supporting documents during QP finalization for all item. 2. All major Bought out Items will be subject to NTPC approval.												

VFD PANEL

LOT-2 PROJECTS
FLUE GAS DESULPHURISATION (FGD)
SYSTEM PACKAGE

TECHNICAL SPECIFICATION
SECTION – VI
BID DOC. NO.:CS-0011-109(2)-9

PART-B
SUB-SECTION-V-QE13
VFD MODULE

PAGE
4 OF 5

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

CLAUSE NO.

QUALITY ASSURANCE & INSPECTION



Attributes Characteristics	Item Components Sub System Assembly															
	Electrical Properties	Mechanical Properties	Chemical Properties	Dimensions / Finish	Type/ Rating/Functional check	HV/IR	Routine test as per relevant std.	Constructional Features	IS:6005 ,Seven tank process	Paint finish/ shade/thickness	Mountings / BOM/ Make, Completeness	Interlock Functional & Operation Testing / Simulation check	Degree of Protection Test	Final testing as per Relevant		
Sheet Steel (IS-513)		Y	Y	Y												
Aluminum / Copper Bus-bar (IS-5082/IS-613/IS-1987)	Y	Y	Y	Y												
Support Insulator (BS-2782/IEC-660/IS-10912)	Y	Y	Y	Y												
Control / Selector Switch (IS-6875)					Y	Y	Y									
Contactors/ MCB (IS-13947)					Y	Y	Y									
O/L Protection relays (IS-3231)					Y		Y									
C.T /V.T/ Indicating Meter (IS-2705/3156/1248)					Y	Y	Y									
Fuse/ Fuse carrier (IS-13703)					Y	Y	Y									
Terminals/lugs/pvc wires (IS-13947//IS-694)	Y			Y	Y	Y	Y									
Timers (IS-3231)					Y	Y	Y									
Push Button/ Lamp/ (IS-6875)					Y	Y	Y									
Control Transformer (IS-12021)					Y	Y	Y									
Mimic, Annunciater					Y		Y									
GASKET (IS-11149)		Y	Y	Y	Y		Y									
Fabrication								Y								
Pretreatment & Painting									Y	Y						
VFD panel										Y	Y	Y	Y	Y		
NOTE:																
1. This is an indicative list of Test/ Checks. The manufacturer to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.																
2. All major Bought Out Items will be subject to NTPC approval.																

CLAUSE NO.

QUALITY ASSURANCE & INSPECTION



MEASURING INSTRUMENTS (PRIMARY AND SECONDARY) Page- 1/2

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	Y				
2. Temp. Gauge (BS-5235)	Y	Y	Y	Y	Y				
3. Pr./D.P.Switch (BS-6134)	Y	Y	Y	Y	Y	Y			
4. Electronic Transmitter (IEC-60770)	Y	Y	Y	Y	Y	Y			
5. Temp. Switch	Y	Y	Y	Y	Y	Y			
6. Recorder (IS-9319/ANSI C-39.4)	Y	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	Y			
11. Transducer (IEC-688)	Y	Y	Y	Y	Y	Y			
12. Thermocouples (IEC – 754 / ANSI-MC-96.1)	Y	Y	Y	Y	Y	Y			
13. RTD (IEC-751)	Y	Y	Y	Y	Y	Y			
14. Thermowell	Y		Y				Y	Y	Y
R-Routine Test A- Acceptance Test Y – Test applicable									
: Note: 1) 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.									

CLAUSE NO.

QUALITY ASSURANCE & INSPECTION



MEASURING INSTRUMENTS (PRIMARY AND SECONDARY) Page- 2/2

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)
15. Cold junction compensation box	Y	Y	Y	Y					Y		
16. Orifice plate(BS-1042)	Y	Y	Y	Y*	Y	Y**	Y**			Y	Y**
17. Flow nozzle(BS-1042)	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
20. Analysers	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) 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.											

CLAUSE NO.

QUALITY ASSURANCE & INSPECTION



INSTRUMENTATION CABLE

ITEMS	TESTS											
	Conductor Resistance ® & (A)	High Voltage ® & (A)	Insulation Resistance ® & (A)	Constructional detail, dimensions (A)	Outer-Sheath/core marking, end sealing (A)	Thermal Stability (A) +	Visual, Surface finish (A) +	Electrical Parameters ** (A) +	Persulphate Test (A) +	Overall/Coverage/Continuity (A)	Swidesh chimney Test (SS-4241475) (A) ++	FRLS Test * (A) ++
1. Instrument cable twisted and shielded												
Conductor(IS-8130)	Y			Y		Y						
Insulation(VDE-207)				Y	Y	Y	Y					Y
Pairing/Twisting				Y	Y	Y						
Shielding				Y		Y			Y			
Drain wire	Y			Y		Y		Y	Y			
Inner Sheath				Y	Y	Y	Y				Y	Y
Outer Sheath				Y	Y	Y	Y				Y	Y
Over all cable	Y	Y	Y	Y	Y		Y	Y			Y	
Cable Drums(IS-10418)				Y		Y						

Note : High Temp. cables shall be subjected to tests as per VDE-207(Part-6) Compensating cables shall be checked for Thermal EMF/Endurance test as per IS 8784.

Note : This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating his practice & Procedure along with relevant supporting documents during QP finalization for all items.

Note : ® - Routine Test A - Acceptance Test Y - Test Applicable

Note : Sampling Plan for Acceptance test shall be as per IS 8784 (As applicable)

- * FRLS Tests: Oxygen / Temp Index (ASTM D-2863), Smoke Density Rating (ASTM – D 2843), HCL Emission (IEC-754-1)

- ** Characteristic Impedance, Attenuation, Mutual Capacitance, Cross Talk (As applicable)

+ Sample size will be One No. of each size/type per lot.

++ Sample size will be One No. sample for complete lot offered irrespective of size/type.

LOT-2 PROJECTS
FLUE GAS DESULPHURISATION (FGD)
SYSTEM PACKAGE

TECHNICAL SPECIFICATION
SECTION – VI
BID DOC. NO.:CS-0011-109(2)-9

PART-B
SUB-SECTION-V-QC3
INSTRUMENTATION
CABLES

PAGE
1 OF 1

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

CLAUSE NO.	QUALITY ASSURANCE & INSPECTION													एनटीपीसी NTPC
ELECTRICAL ACTUATOR WITH INTEGRAL STARTER														
Test/Attributes Characteristics ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING														
	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	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) 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														

LOT-2 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(2)-9	PART-B SUB-SECTION-V-QC7 ELECTRICAL ACTUATOR WITH INTEGRAL STARTERS	PAGE 1 OF 1
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		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN				SPEC. NO. :		DATE:				
				CUSTOMER :				QP NO.: PE-QP-999-145-1056		DATE: 07.02.2020				
				PROJECT:				PO NO.: --		DATE: --				
				ITEM: LOCAL CONTROL PANEL				SYSTEM: C&I		SECTION: C				
										SHEET 1 OF 9				
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
					M	C/N				D	M	C	N	
1		3	4	5	6		7	8	9	*	**			
1.0	RAW MATERIAL Sheet Steel (CRCA & HR)	1. Chemical Composition 2. Bend Test 3. Surface finish 4. Waviness 5. Thickness 6. Mill marking	MA CR MA MA MA MA	Chemical analysis Mech. test Visual Visual Measurement Visual	Samp le Samp le 100% 100% 100% 100%	Samp le Samp le 10% 10% 10% 10%	IS:1079 IS:513 IS:1079 IS:513 Manufacturing Standard Manufacturing Standard Approved Drg/Datasheet Drg/Datasheet Manufacturing Standard	IS:1079 IS:513 IS:1079 IS:513 Manufacturing Standard No Waviness Approved Drg/Datasheet Drg/Datasheet Manufacturing Standard	Test Certificate Test Certificate Inspection Report Inspection Report Inspection Report Inspection Report	✓ ✓ ✓ ✓ ✓ ✓	P/W P/W P/W P/W P/W P/W	V V --- --- V V		
2.0	Flats / Angles / Channels	1. Dimensions 2. Surface Defects 3. Straightness 4. Mill marking	MA MA MA MA	Measurement Visual Measurement Visual	Samp le 100% 100% 100%	Samp le 10% 10% 10%	IS:2062 Manufacturing Standard Manufacturing Standard IS:2062	IS:2062 Manufacturing Standard Manufacturing Standard Manufacturing Standard	Test Certificate Inspection Report Inspection Report Inspection Report	✓ ✓ ✓ ✓	P/W P/W P/W P/W	--- --- --- V		

BHEL			
ENGINEERING		QUALITY	
Sign & Date	Name	Sign & Date	Name
Prepared by: <i>[Signature]</i> 14/12/2010	CHETAN MALIK	Checked by: <i>[Signature]</i>	KUNDAN PRASAD
Reviewed by: <i>[Signature]</i> 09/12/2010	RK RAINA	Reviewed by: <i>[Signature]</i>	RK JAISWAL
BIDDER/ SUPPLIER			
Sign & Date	Seal		
		Doc No:	
		Reviewed by:	Sign & Date
		Approved by:	Name
			Seal
FOR CUSTOMER REVIEW & APPROVAL			

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN							SPEC. NO :		DATE:													
				CUSTOMER : PROJECT: ITEM: LOCAL CONTROL PANEL		SYSTEM: C&I		REFERENCE DOCUMENT		ACCEPTANCE NORMS		FORMAT OF RECORD		AGENCY		REMARKS										
SL. NO.		COMPONENT & OPERATIONS		CHARACTERISTICS		CLASS		TYPE OF CHECK		QUANTUM OF CHECK			7		8		9		D		M		C		N	
										M	C/N															
1	2	3	4	5	M	C/N	6	7	8	9	D	M	C	N												
3.0	Cables / Wires	1. Visual / Surface defects 2. IR and HV 3. Conductor a) Resistance b) Size c) Sheet colour 4. Type / Routine Test Certificates	MA MA MA MA	Visual Electrical Electrical Measurement Visual Verification	100% 100% 100% 100%	10% 10% 10% 10%	IS:1554 or IS:694 IS:1554 or IS:694 IS:1554 or IS:694 IS:1554 or IS:694	IS:1554 or IS:694 IS:1554 or IS:694 IS:1554 or IS:694 IS:1554 or IS:694	Inspection Report Inspection Report Inspection Report Inspection Report	✓ ✓ ✓ ✓	P/W P/W P/W P/W															
4.0	Electrical Components like Annunciator Transformers Lamps Switches PBs Contactors Relays	1. Verification at make and Type 2. Verification of Test Certificates 3. Operation / Functional check	CR CR CR	Visual Scrutiny of Type / Routine T.Cs. Electrical	Sample 100% Sample + 100%	Sample 10% Sample + 10%	Approved Drg/Datasheet Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue	Approved Drg/Datasheet Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue	Test Certificate Inspection Report Inspection Report	✓ ✓ ✓	P/W P/W P/W			+ for relay & contactors only												

BHEL					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
	<i>[Signature]</i>	CHETAN MALIK		<i>[Signature]</i>	KUNDAN PRASAD
Reviewed by:		RK RAINA	Reviewed by:	<i>[Signature]</i>	RK JAISWAL
	<i>[Signature]</i>			<i>[Signature]</i>	
BIDDER/SUPPLIER					
Sign & Date					
Seal					
Doc No:			Sign & Date		
			Name		
			Seal		
Reviewed by:					
Approved by:					
FOR CUSTOMER REVIEW & APPROVAL					

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MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN				SPEC. NO. :		DATE:			
		CUSTOMER :				QP NO.: PE-QP-999-145-1056		DATE: 07.02.2020			
		PROJECT:				PO NO.: --		DATE: --			
		ITEM: LOCAL CONTROL PANEL				SYSTEM: C&I		SECTION: C			
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
					M	C/N				M C N	
1	Timers, Space Heaters, Thermostat, Indicating meters etc.	4. I.R. 5. H.V.	MA	Electrical	100%	10%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Inspection Report	PW	@ for all components except relays & contactors.
		6. Calibration	MA	Electrical	100%	10%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Inspection Report	PW	
		7. Pick up / Drop off Voltage	MA	Electrical	100%	10%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Inspection Report	PW	
5.0	Misc. Components like Gaskets, Terminal Blocks etc.	1. Verification of Type / Make 2. Surface defects 3. IR / HV on Terminal Blocks	MA	Visual	Samp le	Samp le	Manufacturing Standard	Manufacturing Standard	Test Certificate	PW	
			MA	Visual	Samp le	Samp le	Manufacturing Standard	Manufacturing Standard	Test Certificate	PW	
			MA	Electrical	Samp le	Samp le	Manufacturing Standard	Manufacturing Standard	Test Certificate	PW	
	IN PROCESS INSPECTION										

BHEL			
ENGINEERING		QUALITY	
Sign & Date	Name	Sign & Date	Name
Prepared by: 	CHETAN MALIK	Checked by: 	KUNDAN PRASAD
Reviewed by: 	RK RAINA	Reviewed by: 	RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	Seal

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:	Sign & Date	Name	Seal

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		MANUFACTURER/ BIDDER/ SUPPLIER		STANDARD QUALITY PLAN				SPEC. NO. :		DATE:		
		NAME & ADDRESS		CUSTOMER :		PROJECT:		QP NO.: PE-QP-999-145-1056		DATE: 07.02.2020		
				ITEM: LOCAL CONTROL PANEL		SYSTEM: C&I		PO NO.: --		DATE: --		
								SECTION: C		SHEET 4 OF 9		
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY		REMARKS
					M	C/N				M	C	N
1	2	3	4	5	6		7	8	9	*	D	
6.0	Blanking / Bending / Forming	1. Dimensions 2. Surface defects after bending	MI MA	Measurement Visual	100% 100%	10% 10%	Approved Drg/Datasheet Manufacturing Standard	Approved Drg/Datasheet Manufacturing Standard	Inspection Report Inspection Report	✓ ✓	PW PW	
7.0	Nibbling / Punching	1. Cutout Sizes 2. Deburring	MI MA	Measurement Visual	100% 100%	10% 10%	Approved Drg/Datasheet Approved Drg/Datasheet	Approved Drg/Datasheet Approved Drg/Datasheet	Inspection Report Inspection Report	✓ ✓	PW PW	
8.0	ASSEMBLY Frame Assembly & Sheet fixing	1. Dimensions 2. Alignment 3. Welding Quality 4. Surface defects	MA MA MA MA	Measurement Measurement Visual Visual	100% 100% 100% 100%	10% 10% 10% 10%	Approved Drg/Datasheet Approved Drg/Datasheet Approved Drg/Datasheet Approved Drg/Datasheet	Approved Drg/Datasheet Approved Drg/Datasheet Approved Drg/Datasheet Approved Drg/Datasheet	Inspection Report Inspection Report Inspection Report Inspection Report	✓ ✓ ✓ ✓	PW PW PW PW	

BHEL			
ENGINEERING		QUALITY	
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by: <i>[Signature]</i>		CHETAN MALIK	<i>[Signature]</i>
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by: <i>[Signature]</i>	by: <i>[Signature]</i>	RK RAINA	by: <i>[Signature]</i>
		PRASAD	
		RK JAISWAL	

BIDDER/ SUPPLIER	
Sign & Date	Seal

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

		MANUFACTURER/ BIDDER/ SUPPLIER		STANDARD QUALITY PLAN				SPEC. NO. :		DATE:		
		NAME & ADDRESS		CUSTOMER :		OP NO.: PE-QP-999-145-1056		DATE: 07.02.2020				
				PROJECT:		PO NO.: --		DATE: --				
				ITEM: LOCAL CONTROL PANEL		SYSTEM: C&I		SECTION: C		SHEET 6 OF 9		
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY		REMARKS
					M	C/N				M	C	N
1	2	3	4	5	6		7	8	9			
		8. Putty Application and Rubbing after first coat of paint	MA	Visual	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	P/W	V	
		9. Paint second coat	MA	Visual, Thickness, Scratch test Colour adhesion	100%	10%	Manufacturing Standard	Manufacturing Standard	Inspection Report	P/W	V	
10.	Panel Wiring	1. Wiring Layout	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	P/W		
		2. Wiring Termination (Crimped Lugs)	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	P/W		
		3. Ferrule numbers	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	P/W		
		4. Colour of wiring	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	P/W	V	
		5. Size of Conductor	MA	Measurement	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	P/W	V	
11.	Component Mounting	1. Correct components	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	P/W		
		2. Fixing	MA	Visual	100%	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	P/W		

BHEL				BIDDER/ SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Sign & Date		Doc No:		Seal	
Prepared by:	CHETAN MALIK	Checked by:	KUNDAN PRASAD	Sign & Date	Seal	Sign & Date	Seal	Reviewed by:		Reviewed by:	
Reviewed by:	RK RAINA	Reviewed by:	RK JAISWAL	Sign & Date	Seal	Sign & Date	Seal	Approved by:		Approved by:	

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MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN				SPEC. NO. :		DATE:	
CUSTOMER :		PROJECT:				QP NO.: PE-QP-999-145-1056		DATE: 07.02.2020	
ITEM: LOCAL CONTROL PANEL		SYSTEM: C&I				PO NO.: --		DATE: --	
SL. NO.		COMPONENT & OPERATIONS		CHARACTERISTICS		CLASS		TYPE OF CHECK	
1		2		3		4		5	
QUANTUM OF CHECK		REFERENCE DOCUMENT		ACCEPTANCE NORMS		FORMAT OF RECORD		AGENCY	
M		C/N		7		8		9	
6		M		C/N		D		M C N	
12.	FINAL TESTING	1. Workmanship	MA	Visual	100%	Manufacturing Standard	Approved Drg/Datasheet	Inspection Report	At Random by BHEL, based on 100 % internal test reports by Mfr.
		2. Component layout (neatness, accessibility & safety) Mounting / Proper fixing of all components	MA	Visual	100%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	
		3. Components identification Marking / Name plates	MA	Visual	100%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	
		5. Dimensions	MA	Measurement	100%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	
		6. Door functioning	MA	Functional	100%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	
		7. Paint Shade	CR	Visual	100%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	

BHEL				BIDDER/ SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Sign & Date		Sign & Date		Sign & Date	
Prepared by:	CHETAN MALIK	Checked by:	KUNDAN PRASAD	Sign	Date	Sign	Date	Sign	Date	Sign	Date
Reviewed by:	RK RAINA	Reviewed by:	RK JAISWAL	Seal		Seal		Seal		Seal	

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

MANUFACTURER/BIDDER/SUPPLIER		STANDARD QUALITY PLAN				SPEC. NO.:		DATE:			
NAME & ADDRESS		CUSTOMER:				QP NO.: PE-QP-999-145-1056		DATE: 07.02.2020			
		PROJECT:				PO NO.: --		DATE: --			
		ITEM: LOCAL CONTROL PANEL				SYSTEM: C&I		SECTION: C			
		SYSTEM: C&I				SECTION: C		SHEET 8 OF 9			
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS	
1	2	3	4	5	6	7	8	9	**		
					M	C/N			M	C	N
					100%	10%	Approved Drg/Datasheet	Inspection Report	P/W	W	
	8. Paint Thickness	CR	CR	Measurement	100%	10%	Approved Drg/Datasheet	Inspection Report	P/W	W	
	9. Workmanship of Gaskets	MA	MA	Visual	100%	10%	Manufacturing Standard	Inspection Report	P/W	W	
	10. Wiring Layout	MA	MA	Visual	100%	10%	Approved Drg/Datasheet	Inspection Report	P/W	W	
	11. Wire Termination	MA	MA	Pulling manually	Sample	Sample	Firm termination	Inspection Report	P/W	W	
	12. Continuity	MA	MA	Electrical	100%	10%	Continuity OK	Inspection Report	P/W	W	
13.	TYPE TEST	Degree of Protection	CR	Mech. Protection	Sample	Sample	Approved Drg/Datasheet	Type Test Certificate	P/W	V	
14	ROUTINE TEST	IR before & after HV Test	CR	Electrical	100%	10%	Approved Drg/Datasheet	Inspection Report	P/W	W	

BHEL				BIDDER/SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		SIGN & DATE		SIGN & DATE		SIGN & DATE		SIGN & DATE	
Prepared by:	Signature	Name	Checked by:	Signature	Name	Reviewed by:	Signature	Name	Seal		
Reviewed by:	Signature	CHETAN MALIK	Reviewed by:	Signature	KUNDAN PRASAD	Approved by:	Signature				
	Signature	RK RAINA		Signature	RK JAISWAL						

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

MANUFACTURER/ BIDDER/ SUPPLIER		STANDARD QUALITY PLAN				SPEC. NO. :		DATE:		
NAME & ADDRESS		CUSTOMER :				QP NO.: PE-QP-999-145-1056		DATE: 07.02.2020		
PROJECT:		PROJECT:				PO NO.: --		DATE: --		
ITEM: LOCAL CONTROL PANEL		SYSTEM: C&I				SECTION: C		SHEET 9 OF 9		
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	**	
					M	C/N			M	C
15	FUNCTIONAL TEST	1. Control Logic Operation	CR	Electrical	100%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	PW	W
		2. Instrument Calibration	CR	Electrical	10%	Approved Drg/Datasheet	Approved Drg/Datasheet	Inspection Report	PW	W
		3. Temperature rise	CR	Electrical	10%	Approved Drg/Datasheet	Approved Drg/Datasheet Relevant IS.	Inspection Report	PW	W

NOTES:

- Customer's specification for painting shall be included in the technical specification. In the absence of Customer's spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
- Copies of all TC's (Test Certificates) for components shall be submitted to BHEL for verification and acceptance.
- BHEL reserves the right to conduct repeat tests, if required.

LEGENDS:

*RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION, D: DOCUMENTATION,
 ** M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, C: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, N: CUSTOMER,
 P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE
 MA: MAJOR, MI: MINOR, CR: CRITICAL

BHEL			
ENGINEERING		QUALITY	
Sign & Date	Name	Sign & Date	Name
Prepared by: <i>[Signature]</i>	CHETAN MALIK	Checked by: <i>[Signature]</i>	KUNDAN PRASAD
Reviewed by: <i>[Signature]</i>	RK RAINA	Reviewed by: <i>[Signature]</i>	RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	Seal

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:	Sign & Date	Name	Seal

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.



CLAUSE NO.	TECHNICAL REQUIREMENTS			
	TYPE TEST 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. 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 but not more than five (5) year back. (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.			
LOT-2 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(2)-9		PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS PAGE 1 OF 7



CLAUSE NO.	TECHNICAL REQUIREMENTS			
	vi) Radio frequency immunity test as per EN 50082-2 or equivalent. vii) Electromagnetic immunity as per EN 61131-2 or equivalent. Test listed at item no. v, vi, vii, above are applicable for front end cards only as defined under item (i) above.			
LOT-2 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(2)-9	PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS	PAGE 3 OF 7	

3.00.00 TYPE TEST REQUIREMENT FOR C&I SYSTEMS

SI No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
1	Elect. Metering instruments	As per standard (col 4)	IS-1248	No	Yes	
2	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes	
3	INSTRUMENTATION CABLES TWISTED & SHIELDED			No	Yes	
4	Pressure gauge	Degree of protection test	IS-2147	No	No	
		Temp interference test	IS -3624	No	No	
5	Temperature gauge	Degree of protection test	IS-2147	No	No	
6	Pressure & DP switch	Degree of protection test	IS-2147	No	No	
		As per standard (col 4)	BS 6134	No	No	
7	Level switch	Degree of protection test	IS-2147	No	No	
8	Control valves	CV Test	ISA 75.02	No	Yes	
9	Flow Nozzles & Orifice plate	Calibration	ASME PTC , BS 1042	No	Yes	
10	PLCs	All tests as per IEC-1131	IEC-601131	No	Yes	

LOT-2 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION - VI BID DOC. NO.:CS-0011-109(2)-9	PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS	PAGE 4 OF 7
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THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

Sl No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
11	Junction Box	Degree of protection test	IS-13947	No	Yes	
12	Battery charger (Not required for inbuilt chargers)	Degree of protection test	IS-13947	No	No	
		Short circuit current capability	IEC-60146-2	No	Yes	
		Temp rise test without redundant fans	Approved procedure, IEC 60146-2	No	Yes	
		SWC test	Approved procedure	No	Yes	
		Burn-in-test	Approved procedure	No	Yes	
		Efficiency	IEC-60146-2,	No	Yes	
		Audible Noise Test	IEC 60146-2	No	Yes	
		Fuse Clearing Capability	Approved procedure	No	Yes	
		Relative harmonic content	Approved procedure	No	Yes	

LOT-2 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(2)-9	PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS	PAGE 5 OF 7
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THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

Sl No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
		ESD immunity test	IEC-61000-4-2-9(1)	No	Yes	
		Radio interference	IEC 60146-2	No	Yes	
		Over Load Test on Inverter & charger	Approved procedure	No	Yes	
		Restart Test	IEC 60146-2	No	Yes	
		Output voltage tolerance	Approved	No	Yes	
		Output voltage Harmonic content	Approved procedure	No	Yes	
		Insulation test	IEC 60146	No	Yes	
		Load Tests	Approved procedure	No	Yes	
		Preliminary light load test	IEC 60146	No	Yes	
		Current division / Voltage division	IEC 60146-2	No	Yes	
13	Battery	As per standard (col 4)	IEC -623 / IS 10918 for Ni-Cd IS-1652 for Plante Lead Acid	No	Yes	
14	Voltage stabilizers	Over Load Test	Approved procedure	No	Yes	

LOT-2 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION		PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS	PAGE 6 OF 7
	SECTION – VI BID DOC. NO.:CS-0011-109(2)-9			

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

Sl No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
		Temp rise test without redundant fans	Approved procedure	No	Yes	

LOT-2 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(2)-9	PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS	PAGE 7 OF 7
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THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.



C&I SPECIFICATION FOR GYPSUM DEWATERING EQUIPMENT

SECTION: C
SUB SECTION: C&I

MANDATORY SPARES

Refer Annexure II of Sub Section D of Section I for the list of mandatory spares pertaining to C&I scope.



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

SECTION: C
SUB SECTION: C&I

SUB VENDOR LIST

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

PACKAGE WISE REGISTERED SUPPLIER LIST AS ON 19/5/2020

SI No	Package Name	Supplier Name	Supplier Communication Address	Supplier Works Address
1	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; caloc@bhgassociates.com
2	CONTROL VALVE	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 ; rkcinpvt@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
3	CONTROL VALVE	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
4	CONTROL VALVE	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
5	CONTROL VALVE	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
6	CONTROL VALVE	BOMAFA 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@bomafa-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@bomafa-india.com
7	CONTROL VALVE	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
8	CONTROL VALVE	INSTRUMENTATION LTD.	KANJIKODE WEST, PALAKKAD, PALAKKAD Phone- 2566127-130,2567128 Pincode : 678623 Email : icvldil@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 : sasadharan@ilpgt.com;mraj@ilpgt.com;gireesh@ilpgt.com, commercial@ilpgt.com;fa2@ilpgt.com;nazeera@ilpgt.com;pkv@ilpgt.com;remith@ilpgt.com
9	CONTROL VALVE	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

10	CONTROL VALVE	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
11	CONTROL VALVE	KSB MIL CONTROLS LTD.	Mr.Jacob Cherian/Mr.Geo Jolly Meladoor, Annamanada P.O. MALA, Thrissur Phone- 0480-2695700 Pincode : 680741 Email : biju_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_naul@ksb.com
12	CONTROL VALVE	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
13	CONTROL VALVE	WALDEMAR PRUSS ARMATURENFABRIK GMBH	Mr. Winfried Dremhel Schulenburgerlandstrasse 261, Hannover Phone- +49-511279260 Pincode : 30419 Email : dremhel@pruss.de; wvonel@pruss.de	Works-1->Mr. Winfried Dremhel CEO Schulenburgerlandstrasse 261, -Hannover-GERMANY Phone- +49-511279260 FAX : Pincode : 30419 Email : dremhel@pruss.de
14	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	Kaustubha Udyog,	S.No. 36/1/1, Sinhgad Road, Vadgaon Khurd, Near Lokmat Press, Pune, Phone- 020-24393577, Pincode : Email : npressure@wsnl.com	
15	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	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
16	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	SWITZER PROCESS INSTRUMENTS PVT. LTD.	Mr. V S Jayaprakash, 128, SIDCO North Phase, Ambattur Estates CHENNAI Phone- 044-26252017/2018 Pincode : 600050 Email : sales@switzerprocess.co.in	Works-1->C S Shankar 127, Sidco North Phase, Ambattur Estates, -CHENNAI-TAMIL NADU INDIA Phone- 8754491904 FAX : 044-26248849 Pincode : 600050 Email : cservice@switzerinstrument.com
17	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	GENERAL INSTRUMENTS CONSORTIUM	Mr. Amarendra Kulkarni 194/195, Gopi Tank Road, Off. Pandurang Naik Marg, Mahim Mumbai Phone- 9323195251 Pincode : 400016 Email : amarendra@general-gauges.com	
18	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	Barksdale GmbH, Germany	Michael Weileder Dorn Assenheimer, Strasse 27 Reichelsheim Phone- +91-9999107840 Pincode : D-61203 Email : msingh@barksdale.de	
19	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	DRESSER INDUSTRIES INC.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 02764-233682 Pincode : 382729 Email : Nishit_patel@ashcroftindia.com	
20	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	SOR INC.	LARRY DEGARMO/Avdhesh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com, avdhesh@sherman-india.com,	Works-1->LARRY DEGARMO/ ROY STUMBOUGH 14685 W. 105TH STREET, LENEXA -KANSAS- USA Phone- 913-888-0767 FAX : 913-888-0767 Pincode : 66215 Email : rstumbough@sorinc.com
21	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	INDFOS INDUSTRIES LIMITED	B-20-21, INDUSTRIAL AREA, MEERUT ROAD, GHAZIABAD Phone- 0120-2712016 Pincode : Email : mkto@indfos.com	

22	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	INDFOS (INDIA) LIMITED	MR.L.C.VENKATRANGAN/MR.B.KA NNAN New No.17, II Floor, Adwave Towers, Dr.Sevalia Shivaji Salai, T.Nagar Chennai Phone- +91 44 24353407 Pincode : 600017 Email : delhi@indfos.com	
23	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	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 : akm_ani@hotmail.com
24	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	BOSE PANDA INSTRUMENTS PVT.LTD.	Mr. Partha Bose 44, Saheed Hemanta Kumar Bose, Sarani, Kolkata Phone- +91 33 2548 7220 Pincode : 700074 Email : parthabosebpi@gmail.com; bosepanda@vsnl.net	Works-1->Mr. Partha Bose 44, Saheed Hemanta Kumar Bose,Sarani, -Kolkata-WEST BENGAL India Phone- +91 33 2548 7220 FAX : +91 33 2548 0429, Pincode : 700074 Email : parthabosebpi@gmail.com bosepanda@vsnl.net
25	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	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 :
26	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	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.co m	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 : gshrinivasan@forbesmarshall.com
27	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	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
28	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	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 : caloc.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
29	PRESSURE GAUGE/ DIFF.PRESSURE 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 : shikhabazra@hgurusouth.com
30	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@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
31	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	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, hkanadia@nesstech.co.in
32	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	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 : sdbnl@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 : sdbnl@vsnl.com

33	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 : shikhabazra@hgurusouth.com
34	TEMPERATURE GAUGE	GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@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
35	TEMPERATURE GAUGE	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 :
36	TEMPERATURE GAUGE	GOA THERMOSTATIC INSTRUMENTS PVT.LTD.	FLAT -B , GF, HILL CROWN APTS., COLLEGE ROAD, MAPUSA Phone- Pincode : 403525 Email : gtilworks@pyro-electric.in	Works-1->Mrs Saanvi Naik BICHOLIM, - BICHOLIM-GOA INDIA Phone- 9595855152 FAX : Pincode : 403 529 Email : saanvi.naik@thermostatic.in
37	TEMPERATURE GAUGE	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
38	TEMPERATURE GAUGE	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 : gshrinivasan@forbesmarshall.com
39	TEMPERATURE GAUGE	GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	D2/5, Mapusa Industrial Estate, Mapusa, Goa, Phone- 09326054551, Pincode : 403507, Email : sumukh@goainstruments.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@goainstruments.com
40	TEMPERATURE GAUGE	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
41	TEMPERATURE GAUGE	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@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
42	LEVEL GAUGE	TOSHNIWAL BROTHERS PVT.LTD.	WORKS:TOSHNIWAL IND.PVT.LTD, INDUSTRIAL ESTATE MAKHUPURA, AJMER Phone- 441171 Pincode : 305002 Email : toshniwalprocess@gmail.com	
43	LEVEL GAUGE	BLISS ANAND PVT. LTD.	Mr. Vikas Anand/ Mr.RGRajan 92B & 93 B, IMT MANESAR Gurgaon Phone- 0124-4366000 TO 9 Pincode : 122001 Email : sales@blissanand.com	Works-1->Mr. Bharat Kumar/ Mr. Sasi Kumar Plot No. 92B & 93B, Sec-V, IMTManesar -GURGAON-HARYANA INDIA Phone- 0124-4366000 TO 9 FAX : 0124-2290884 Pincode : 122002 Email : bharat@blissanand.com

44	LEVEL GAUGE	SIGMA INSTRUMENTS CO.	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in
45	FLOW ELEMENT	TM TECNOMATIC SPA	MR. ANTONIO NOVIELLO/Mrs. Enrica Bazzoc VIA DELLE INDUSTRIE, 36 CREMONA Phone- 39037221574 Pincode : 26100 Email : info@tmtecnomatic.com	Works-1->Mrs. Enrica Bazzocchi VIA DELLE INDUSTRIE, 36, -CREMONA- Italy Phone- 39037221574 FAX : 39037228318 Pincode : 26100 Email : sales@tmtecnomatic.com
46	FLOW ELEMENT	STAR-MECH CONTROLS (I) PVT.LTD.	SUSHILLOTAM, SUSHILLOTAM, 29/3A/3, SASANE NAGAR, HADAPSAR, PUNE Phone- 02026970450 Pincode : 411028 Email : marketing@starmech.net	Works-1->VIVEK GOTE/ MAHUNDRABANSODE Sr no.54, Plot No.110,Swami Vivekanand Industrial Est.LHADAPS -PUNE-MAHARASHTRA INDIA Phone- 02026970450 FAX : 02026970470 Pincode : 411028 Email : marketing@starmech.net
47	FLOW ELEMENT	INSTRUMENTATION LTD.	KANJIKODE WEST, PALALKKAD, PALAKKAD Phone- 2566127-130,2567128 Pincode : 678623 Email : icvldil@gmail.com;fa2@ilpgt.com	
48	FLOW ELEMENT	MICRO PRECISION PRODUCTS PVT. LTD.	Mr. Anil Bhati, H.B. No.-40, Revenue Estate, Village-Dudhola, Tehsil & Distt. Palwal FARIDABAD Phone- 9560742713;095607427 Pincode : 121002 Email : anil.bhati@wilka.com	
49	TEMP. ELEMENT	DETRIVE INSTRUMENTATION & ELECTRONICS LTD.	320, TV INDUSTIAL 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
50	TEMP. ELEMENT	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, bkanadia@nesstech.co.in
51	TEMP. ELEMENT	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@niconindia.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@niconindia.com
52	TEMP. ELEMENT	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
53	TEMP. ELEMENT	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 : caloc.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
54	TEMP. ELEMENT	GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	D2/5, Mapusa Industrial Estate, Mapusa, Goa, Phone- 09326054551, Pincode : 403507, Email : sumukh@goainstruments.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@goainstruments.com

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56	TEMP. ELEMENT	GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@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
57	TEMP. ELEMENT	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.gunta@tipl.com
58	TEMP. ELEMENT	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 : sdbhl@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 : sdbhl@vsnl.com
59	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
60	TRANSMITTERS	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.gunta@tipl.com
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65	TRANSMITTERS	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
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72	TRANSMITTERS	Honeywell Automation India Limited	Mr. Ritwiji 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
73	TEMPERATURE SWITCH	TOSHWIWA BROTHERS PVT.LTD.	WORKS:TOSHWIWA IND.PVT.LTD, INDUSTRIAL ESTATE MAKHUPURA, AJMER Phone- 441171 Pincode : 305002 Email : toshniwalprocess@gmail.com	
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75	TEMPERATURE SWITCH	INDFOS (INDIA) LIMITED	MR.L.C.VENKATRANGAN/MR.B.KA NNAN New No.17, II Floor, Adwave Towers, Dr.Sevalia Shivaji Salai, T.Nagar Chennai Phone- +91 44 24353407 Pincode : 600017 Email : delhi@indfos.com	
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82	SIGHT FLOW INDICATORS	SIGMA INSTRUMENTS CO.	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises, M.M. Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in
83	SIGHT FLOW INDICATORS	INSTRUMENTATION ENGINEERS PVT LTD	SH.N.V.RAM GOPAL/MS. N.NIHARIKA PLOTS 1,2,3, PHASE-III, IDA, JEEDIMETLA HYDERABAD Phone- 9848407365 Pincode : 500055 Email : iedelhi@ieflowmeters.com	Works-1->MR. A.V.MURTHY/MR. K.T. RAVISANKER PLOTS 1,2,3, PHASE-III, IDA, JEEDIMETLA -HYDERABAD-TELANGANA INDIA Phone- 9885107312 FAX : 040-23096401 Pincode : 500055 Email : sales@ieflowmeters.com
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91	INSTRUMENTS TUBE FITTINGS	AURA INCORPORATED	NIRAJ SHARAN/SUJIT KUMAR W- 167A, GREATER KAILASH-II NEW DELHI Phone- 9810182430 Pincode : 110048 Email : niraj@aurainc.com	
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93	INSTRUMENTS TUBE FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Mochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com	Works-1->Mr. Tansen Choudhari/Mr. Mahesh Darekar Shed No.8, Lonavla Indl.Co- op.Estate Ltd,Nagargaon, -Lonavla- MAHARASHTRA INDIA Phone- 9823951347 FAX : (02114) 271132 Pincode : 410 401 Email : factory@hyd-air.com
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97	ROTAMETER	EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.	Mr V. K. Pandit/Mr Ashish Shaha 17-20, Royal chambers, Paud Road Pune Phone- 9370469466 Pincode : 411038 Email : sales@eurekaflow.com	Works-1->Mr S. M. Alawani/Mr V. V. Deshpande J-501, M.I.D.C. Pimpri, -PUNE- MAHARASHTRA INDIA Phone- 9325751732 FAX : 020-30681731 Pincode : 411018 Email : works@eurekaflow.com
98	ROTAMETER	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 : sdhnl@vsnl.com	Works-1->Scientific Centre, S.No. 65, Hissa No. 7,By-Pass Junction, Kausa, -Mumbai- MAHARASHTRA INDIA Phone- 9892230623, FAX : 022-25491408/9 Pincode : 400 612, Email : sales@scientificdevices.com

99	LEVEL SWITCH-CAPACITANCE TYPE	SIGMA INSTRUMENTS CO.	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in
100	LEVEL SWITCH-CAPACITANCE TYPE	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-I -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : production@vautomat.com
101	LEVEL SWITCH-CAPACITANCE TYPE	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 : sdbhl@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 : sdbhl@vsnl.com
102	LEVEL SWITCH-CAPACITANCE TYPE	LEVCON INSTRUMENTS PVT. LTD.	Mr Shayak Gupta/Badal Jana Rajkamal', 7th floor, 13, Camac Street KOLKATA Phone- 0 33 2283 2766 Pincode : 700017 Email : b_jana@levcongroup.com	
103	LEVEL SWITCH-CAPACITANCE TYPE	Flow Star Engineering Pvt. Ltd.,	MR. KHALID AKHTAR/MR. TAPAN KUMAR JANA Plot No-7 F/2, Northern India Industrial 20/3, Mathura Road FARIDABAD Phone- 9818176380 Pincode : 121005 Email : khalid@flowstar.co.in	Works-1->MR. KHALID AKHTAR/MR. TAPAN KUMAR JANA Plot No-7 F/2, Northern India Complex,20/3, Mathura Road -FARIDABAD-HARYANA INDIA Phone- 0129-4069661, FAX : 0129-4069663 Pincode : 121005 Email : tkjana@flowstar.co.in
104	LEVEL SWITCH-CAPACITANCE TYPE	Pune Techtrol Pvt. Ltd.	N.P.Khatan/Sudhakar Badiger S-18, MIDC Bhosari, Pune Phone- 9850560042 Pincode : 411 026 Email : ho@punetechtrol.com	
105	LEVEL SWITCH-CAPACITANCE TYPE	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 : caloc.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 À GIDC À Phase 1, -VAPI- GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com
106	LEVEL SWITCH-CONDUCTIVITY TYPE	Sapcon Instrument Pvt Ltd.	131, PALSHIKAR COLONY Contact Person- Mr. Ashwin (9826080207) INDORE Phone- +91-731-4085751, Pincode : 452004 Email : sales@sapconinstruments.com	Works-1->Mr. Ashwin R Palshikar/Mr. Navin Bodse 131 PALSHIKAR COLONY, -INDORE-MADHYA PRADESH INDIA Phone- 9754261005 FAX : 0731-2475475 Pincode : 452004 Email : sales@sapcon.in
107	LEVEL SWITCH-CONDUCTIVITY TYPE	LEVCON INSTRUMENTS PVT. LTD.	Mr Shayak Gupta/Badal Jana Rajkamal', 7th floor, 13, Camac Street KOLKATA Phone- 0 33 2283 2766 Pincode : 700017 Email : b_jana@levcongroup.com	Works-1-> 38G, PICNIC GARDEN ROAD, - KOLKATA-WEST BENGAL INDIA Phone- FAX : Pincode : Email :
108	LEVEL SWITCH-CONDUCTIVITY TYPE	BLISS ANAND PVT. LTD.	Mr. Vikas Anand/ Mr.RGRajan 92B & 93 B, IMT MANESAR Gurgaon Phone- 0124-4366000 TO 9 Pincode : 122001 Email : sales@blissanand.com	Works-1->Mr. Bharat Kumar/ Mr. Sasi Kumar Plot No. 92B & 93B,Sec-V, IMTManesar -GURGAON-HARYANA INDIA Phone- 0124-4366000 TO 9 FAX : 0124-2290884 Pincode : 122002 Email : bharat@blissanand.com
109	LEVEL SWITCH-CONDUCTIVITY TYPE	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-I -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : production@vautomat.com

110	LEVEL SWITCH- CONDUCTIVITY TYPE	HI-TECH SYSTEMS & SERVICES LTD.	Mr. Vikash Agrawal/Mr. Tarun Debnath 119, PARK STREET , KOLKATA Phone- 033-22290045 Pincode : 700016 Email : sandeen@hitech.in	Works-1->Mr. Jitendra Kumar/Mr. Debasis Dey 82/1, Sarsuna Main Road, -KOLKATA- WEST BENGAL INDIA Phone- 9883994030 FAX : Pincode : 700061 Email : jitendra@hitech.in
111	LEVEL SWITCH- CONDUCTIVITY TYPE	RAMAN INSTRUMENTS PVT.LTD.	Mr. N R Shenoy/Mr G B Viji 8, First Floor.Plot : 160A Bait-Ush-Sharaf, 29th Road,Bandra(W) MUMBAI Phone- 09892331381 Pincode : 400050 Email : ramanbpl@vsnl.com	Works-1->NA -- Phone- FAX : Pincode : Email :
112	LEVEL SWITCH- CONDUCTIVITY TYPE	SIGMA INSTRUMENTS CO.	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in
113	LEVEL SWITCH- CONDUCTIVITY TYPE	SOR INC.	LARRY DEGARMO/Avdhesh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com, avdhesh@sherman-india.com,	Works-1->LARRY DEGARMO/ ROY STUMBOUGH 14685 W. 105TH STREET, LENEXA -KANSAS- USA Phone- 913-888-0767 FAX : 913-888-0767 Pincode : 66215 Email : rstumbough@sorinc.com
114	LEVEL SWITCH-FLOAT TYPE	Pune Techtrol Pvt. Ltd.	N.P.Khatan/Sudhakar Badiger S-18, MIDC Bhosari, Pune Phone- 9850560042 Pincode : 411 026 Email : ho@punetechtrol.com	
115	LEVEL SWITCH-FLOAT TYPE	D.K. INSTRUMENTS PVT.LTD.	N.SIKDAR/ SUMIT SIKDAR 76/2,SELIMPUR RD DHAKURIA Kolkata Phone- 033-2415-1310. Pincode : 700031 Email : rkinst@vsnl.net	
116	LEVEL SWITCH-FLOAT TYPE	V. AUTOMAT & INSTRUMENTS (P) LTD.	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDL.AREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com	Works-1->Mr. BHAGWAN SINGH/ Mr. NANDAN SINGH F-61, OKHLA INDL.AREA,PHASE-I -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : production@vautomat.com
117	LEVEL SWITCH-FLOAT TYPE	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 : sdhpl@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 : sdhpl@vsnl.com
118	LEVEL SWITCH-FLOAT TYPE	LEVCON INSTRUMENTS PVT. LTD.	Mr Shayak Gupta/Badal Jana Rajkamal', 7th floor, 13, Camac Street KOLKATA Phone- 0 33 2283 2766 Pincode : 700017 Email : b_jana@levcongroup.com	
119	LEVEL SWITCH-FLOAT TYPE	GENERAL INSTRUMENTS CONSORTIUM	Mr. Amarendra Kulkarni 194/195, Gopi Tank Road, Off. Pandurang Naik Marg, Mahim Mumbai Phone- 9323195251 Pincode : 400016 Email : amarendra@general-gauges.com	
120	LEVEL SWITCH-FLOAT TYPE	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

121	LEVEL SWITCH-FLOAT TYPE	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 : caloc.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
122	LEVEL SWITCH-FLOAT TYPE	SIGMA INSTRUMENTS CO.	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in
123	LEVEL SWITCH-FLOAT TYPE	SOR INC.	LARRY DEGARMO/Avdhesh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com , avdhesh@sherman-india.com ,	Works-1->LARRY DEGARMO/ ROY STUMBOUGH 14685 W. 105TH STREET, LENEXA -KANSAS- USA Phone- 913-888-0767 FAX : 913-888-0767 Pincode : 66215 Email : rstumbough@sorinc.com
124	INSTRUMENTS PIPE FITTINGS	VIKAS INDUSTRIAL PRODUCTS	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com	Works-1->S.R.SINGH/ NAVEEN SINGH B - 2, SECTOR - 6, -NOIDA-UTTAR PRADESH INDIA Phone- 0120-4352940 FAX : 0120-4352940 Pincode : 201301 Email : naveensingh@vsnl.com
125	INSTRUMENTS PIPE FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Mochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com	Works-1->Mr. Tansen Choudhari/Mr. Mahesh Darekar Shed No.8, Lonavla Indl.Co-op.Estate Ltd,Nagargaon, -Lonavla- MAHARASHTRA INDIA Phone- 9823951347 FAX : (02114) 271132 Pincode : 410 401 Email : factory@hyd-air.com
126	INSTRUMENTS PIPE FITTINGS	PRECISION ENGINEERING INDUSTRIES	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI Phone- 022 42631700 Pincode : 400 062 Email : peiks@vsnl.com	Works-1->ALEX BAPTIST/ K. SRINIVAS 7. SIDHAPURA INDUSTRIAL ESTATE,SV ROAD, GOREGAON(WEST) -MUMBAI-MAHARASHTRA INDIA Phone- 022-42631700 FAX : 022-40035259 Pincode : 400 062 Email : srinivas@precision-engg.com
127	INSTRUMENTS PIPE FITTINGS	AURA INCORPORATED	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI Phone- 9810182430 Pincode : 110048 Email : niraj@aurainc.com	
128	ULTRASONIC FLOW METERS	Electronet 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
129	ULTRASONIC FLOW METERS	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@adeptfluidyne.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@adeptfluidyne.com
130	ULTRASONIC FLOW METERS	FLEXIM Flexible Industriemesstechnik 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
131	ULTRASONIC FLOW METERS	Rockwin Flowmeter India Pvt. Ltd.	B-24, Site-IV, Sahibabad Industrial Area Ghaziabad, Phone- 9810129687 Pincode : 201010, Email : amiva@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

132	ULTRASONIC FLOW METERS	FLASH FORGE PVT LTD	Mr. Gautam Makker, 503, 'A'-wing, Delhi, Orchard Avenue Road, Powai Mumbai Phone- 022-42784300 Pincode : 400076 Email : hemendrapatil@f-f.co.in	Works-1-> Others M/s Endress & Hauser, Aurangabad, Maharastra -Aurangabad-MAHARASHTRA INDIA Phone- FAX : Pincode : Email : Works-2->+ Others M/s Endress & Hauser, Bhiwandi,Thane -Thane-MAHARASHTRA INDIA Phone- FAX : Pincode : Email :
133	ULTRASONIC FLOW METERS	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 Wuertemberg,-Foreign Country GERMANY Phone- 0049-726291910 FAX : Pincode : 75031 Email : carolin.schuster@nivus.com
134	FLOW ELEMENT - ORIFICE	MINCO (INDIA) PRIVATE LIMITED	Mr. Rajeev Vasudeva, D/35, TIVIM INDUSTRIAL ESTATE, KARASWADA, MAPUSA, Goa, Phone- 9313637073 Pincode : 403526, Email : nicdelhi@general-gauges.com	Works-1-> D/35,TIVIM INDUSTRIAL ESTATE, KARASWADA,MAPUSA, -Goa-Goa India Phone- 9320197825, FAX : 0832-2257262, Pincode : 403526, Email : santoshkumar@general-gauges.com
135	FLOW ELEMENT - ORIFICE	TANSA EQUIPMENTS PVT. LTD.	Mr. Vardhan Tamhankar, Unit No35/36/41,Om Anand Industrial Est. Mohanjee Sundarjee Road,Raghunath Nagar, Thane Phone- 022-25832323 Pincode : 400604 Email : tansaIndia@gmail.com	Works-1-> Others Mohanjee Sundarjee Road, Raghunath Nagar, Thane -Mumbai-MAHARASHTRA INDIA Phone- FAX : Pincode : 400604 Email :
136	FLOW ELEMENT - ORIFICE	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 : sdhnl@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 : sdhnl@vsnl.com
137	FLOW ELEMENT - ORIFICE	Electronet 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
138	FLOW ELEMENT - ORIFICE	INSTRUMENTATION LTD.	KANJIKODE WEST, PALALKKAD, PALAKKAD Phone- 2566127-130,2567128 Pincode : 678623 Email : icvldil@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 : sasadharan@ilpgt.com;mraj@ilpgt.com;gireesh@ilpgt.com, commercial@ilpgt.com;fa2@ilpgt.com;nazeera@ilpgt.com;pkv@ilpgt.com;remith@ilpgt.com
139	FLOW ELEMENT - ORIFICE	HYDROPNEUMATICS PVT. LTD.	Mr. DM Bichu G/B, Hill Crown Apts., College Road Mapusa Phone- 0832-2360364 Pincode : 403507 Email : aiavrc@hydronneumatics.co.in	Works-1->Mr. DM Bichu D2/6, Bicholim Industrial Estate, -Bicholim-Goa India Phone- 0832-2360364 FAX : 0832-2360368 Pincode : 403529 Email : aiavrc@hydronneumatics.co.in
140	FLOW ELEMENT - ORIFICE	Flow Star Engineering Pvt. Ltd.,	MR. KHALID AKHTAR/MR. TAPAN KUMAR JANA Plot No-7 F/2, Northern India Industrial 20/3, Mathura Road FARIDABAD Phone- 9818176380 Pincode : 121005 Email : khalid@flowstar.co.in	Works-1->MR. KHALID AKHTAR/MR. TAPAN KUMAR JANA Plot No-7 F/2, Northern India Complex,20/3, Mathura Road -FARIDABAD-HARYANA INDIA Phone- 0129-4069661, FAX : 0129-4069663 Pincode : 121005 Email : tkjana@flowstar.co.in
141	FLOW ELEMENT - ORIFICE	MICRO PRECISION PRODUCTS PVT. LTD.	Mr. Anil Bhati, H.B. No.-40, Revenue Estate, Village-Dudhola, Tehsil & Distt. Palwal FARIDABAD Phone- 9560742713;095607427 Pincode : 121002 Email : anil.bhati@wika.com	Works-1->Mr. SANJEEV CHAUHAN ,H.B. No.-40 Others Revenue Estate, Village-Dudhola, Tehsil & Distt. Palwal -Faridabad-Haryana India Phone- 9560742713 FAX : Pincode : 121002 Email : anil.bhati@wika.com
142	FLOW ELEMENT - ORIFICE	MINCO (INDIA) FLOW ELEMENTS PVT. LTD.	Mr. Raghavendra M. Kulkarni D2-49/50, Tivim Industrial Estate, Karaswada Mapusa Phone- 0832-2257059 Pincode : 403526 Email : gicflowelement@giconindia.com	Works-1->Mr. Raghavendra M. Kulkarni Dir D2-49/50, Tivim Industrial Estate,Karaswada - Mapusa-GOA INDIA Phone- 0832-2257059 FAX : 022-24455026 Pincode : 403526 Email : gicflowelement@giconindia.com

143	FLOW ELEMENT - ORIFICE	STAR-MECH CONTROLS (I) PVT.LTD.	SUSHILLOTAM, SUSHILLOTAM, 29/3A/3, SASANE NAGAR, HADAPSAR, PUNE Phone- 02026970450 Pincode : 411028 Email : marketing@starmech.net	Works-1->VIVEK GOTE/ MAHÚNDRA BANSODE Sr no.54, Plot No.110,Swami VIVEkanand Industrial Est.HADAPS -PUNE- MAHARASHTRA INDIA Phone- 02026970450 FAX : 02026970470 Pincode : 411028 Email : marketing@starmech.net
144	FLOW ELEMENT - ORIFICE	CHEMTROLS INDUSTRIES PVT. LTD.	Mr. K. NANDAKUMAR AMAR HILL, SAKI VIHAR ROAD, POWAI, MUMBAI Phone- 022-67151261 Pincode : 400072 Email : manikandan@chemtrols.com	Works-2->+Works -II :M/s Chemtrols Samil (I) Pvt. Ltd.,Plot No.F-43,44 Others Additional Ambemath Industrial ,M.I.D.C., Ambemath - Thane-MAHARASHTRA INDIA Phone- 22-67151261,9821014902 FAX : 91-22-28571913 Pincode : 421503 Email : manikandan@chemtrols.com
145	FLOW ELEMENT - ORIFICE	INSTRUMENTATION ENGINEERS PVT LTD	SH.N.V.RAM GOPAL/MS. N.NIHARIKA PLOTS 1,2,3, PHASE-III, IDA, JEEDIMETLA HYDERABAD Phone- 9848407365 Pincode : 500055 Email : iedelhi@ieflowmeters.com	Works-1->MR. A.V.MURTHY/MR. K.T. RAVISANKER PLOTS 1,2,3, PHASE-III,IDA, JEEDIMETLA -HYDERABAD-TELANGANA INDIA Phone- 9885107312 FAX : 040-23096401 Pincode : 500055 Email : sales@ieflowmeters.com
146	FLOW ELEMENT - ORIFICE	DYNAFLUID VALVES AND FLOW CONTROLS (P) LTD.	Mr. Yogish M. Kulkarni Plot # 23, Udyambag, Belgaum Phone- 0831-4210386 Pincode : 590008 Email : yogish@dynafluid.com	Works-1->Mr. Yogish M. Kulkarni Dir Plot # 23, Udyambag, -Belgaum-KARNATAKA INDIA Phone- 0831-4210386 FAX : 0831-4210386 Pincode : 590008 Email : yogish@dynafluid.com
147	INSTRUMENT FITTINGS	HP VALVES & FITTINGS INDIA PVT. LTD.	S. Harichandran/P.S. Pandi B-11, Mugappair Industrial Estate, CHENNAI Phone- 044 26252537 Pincode : 600037 Email : sales@hpvalvesindia.com	Works-1->S. Harichandran/ P.S. Pandi B-11, Mugappair Industrial Estate, -CHENNAI-TAMIL NADU INDIA Phone- 044-25252537 FAX : 044-26252538 Pincode : 600037 Email : sales@hpvalvesindia.com
148	INSTRUMENT FITTINGS	AURA INCORPORATED	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI Phone- 9810182430 Pincode : 110048 Email : niraj@aurainc.com	
149	INSTRUMENT FITTINGS	PRECISION ENGINEERING INDUSTRIES	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI Phone- 022 42631700 Pincode : 400 062 Email : peiks@vsnl.com	Works-1->ALEX BAPTIST/ K. SRINIVAS 7. SIDHAPURA INDUSTRIAL ESTATE,SV ROAD, GOREGAON(WEST) -MUMBAI-MAHARASHTRA INDIA Phone- 022-42631700 FAX : 022-40035259 Pincode : 400 062 Email : srinivas@precision-engg.com
150	INSTRUMENT FITTINGS	Comfit & Valve Pvt. Ltd.	Mr. Jeetu Jain/Mr. Vinay Sosa Survey No. 23/1, Part 2, Ahmedabad-Mehsana Highway Laxmipura, Nandasan Phone- 02764-267036/37 Pincode : 382705 Email : marketing@comfit.com	Works-1->Miss Sonal Pithadia/Miss Pavan Chavda Survey No. 23/1, Part 2, Ahmedabad-Mehsana Highway, Laxmipura -Nandasan-GUJARAT INDIA Phone- 8460848087 FAX : 2764-267036/37 Pincode : 382705 Email : domestic@com-fit.com
151	INSTRUMENT FITTINGS	Perfect Instrumentation Control (India) Pvt. Ltd.	MD Hussain Shaikh/Shahanawaz Khan Gala No. 168, Loheki Chwal,216/ 218, Maulana Azad Rd. Nagpada Junction Mumbai Phone- 91-9324383121 Pincode : 400008 Email : shahanawaz.khan@perfectinstrumentation.com	Works-1->Shahanawaz Khan Vishweshwar Ind. Premises Co-op Soc. Ltd,F-18/19, Pradhikaran,Bhosadi MIDC -PUNE- MAHARASHTRA INDIA Phone- 020-30694134 FAX : 022-23013010 Pincode : 411026 Email : shahanawaz.khan@perfectinstrumentation.com
152	INSTRUMENT FITTINGS	Arya Crafts & Engineering Pvt. Ltd.	Mr.Sanjay Brahman/Mr.Shyam Vazirani 102, Vora Industrial Estate No.4 Navghar, Vasai Road (E) Dist.Thane, Mumbai Phone- +91-250-2392246 Pincode : 401210 Email : arya@aryacrafts.com	
153	INSTRUMENT FITTINGS	FLUIDFIT ENGINEERS PVT. LTD.	Mr. Abbas Bhola Potia Building No. 2, Office No. 3,292, Bellasis Road,Mumbai Central (East) Mumbai Phone- 9920044113 Pincode : 400008 Email : ab@fluidfitengg.com	Works-1->Mr. Abbas Bhola Unit No. 16, Supreme Industrial Estate,Kaman Bhiwandi Road,Devdal, -Vasai East-MAHARASHTRA India Phone- 9920044113 FAX : 07303178243 Pincode : 401208 Email : ab@fluidfitengg.com

154	INSTRUMENT FITTINGS	VIKAS INDUSTRIAL PRODUCTS	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com	Works-1->S.R.SINGH/ NAVEEN SINGH B - 2, SECTOR - 6, -NOIDA-UTTAR PRADESH INDIA Phone- 0120-4352940 FAX : 0120-4352940 Pincode : 201301 Email : naveensingh@vsnl.com
155	INSTRUMENT FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Mochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com	Works-1->Mr. Tansen Choudhari/Mr. Mahesh Darekar Shed No.8, Lonavla Indl.Co-op.Estate Ltd,Nagargaon, -Lonavla- MAHARASHTRA INDIA Phone- 9823951347 FAX : (02114) 271132 Pincode : 410 401 Email : factory@hyd-air.com
156	INSTRUMENT FITTINGS	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
157	ELECTROMAGNETIC FLOW METER	V.A Valves	Mr.Vishal Jain, Udyog Nagar, Gadaipur, Jalandhar Phone- 9872626376 Pincode : 144004 Email : support@fedrelflowmeters.com	Works-1->Mr.Vishal Jain Dir Udyog Nagar, Gadaipur, -Jalandhar-PUNJAB INDIA Phone- 01812601741,9872626376 FAX : Pincode : 144004 Email : support@fedrelflowmeters.com
158	ELECTROMAGNETIC FLOW METER	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@adeptfluidyne.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@adeptfluidyne.com
159	ELECTROMAGNETIC FLOW METER	Electronet 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
160	ELECTROMAGNETIC FLOW METER	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 : sdhnl@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 : sdhnl@vsnl.com
161	ELECTROMAGNETIC FLOW METER	NIVO CONTROLS PVT. LTD.	Mr. Praveen Toshniwal 104-115, Electronic Complex, Indore Phone- 0731-4081305 Pincode : 452010 Email : sales@nivocontrols.com	Works-1->Mr. S L Sadani Others 104 - 115,Electronic Complex -Indore-MADHYA PRADESH INDIA Phone- 0731-4081307 FAX : Pincode : 452010 Email : sales@nivocontrols.com;sadanis@nivocontrols.com



NSPCL BHILAI (2X250MW)
GYPSUM DEWATERING EQUIPMENT
TECHNICAL SPECIFICATION

SPECIFICATION No: PE-TS-468-571-A901

SECTION : I

Sub Section : D

REV. 00

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TECHNICAL SPECIFICATION

LIST OF ANNEXURES ENCLOSED:

ANNEXURE-I	LIST OF MAKES OF SUB-VENDOR ITEMS
ANNEXURE-II	MANDATORY SPARE LIST
ANNEXURE-III	INSPECTION AND TESTING, QUALITY PLAN
ANNEXURE-IV	INPUT DRAWINGS (PID/ MECHANICAL LAYOUT DRAWINGS SHOWING LOCATION OF EQUIPMENT/ PLOT PLAN)
ANNEXURE-V	MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION
ANNEXURE-VI	PACKING PROCEDURE
ANNEXURE-VII	SEA-WORTHY PACKING PROCEDURE
ANNEXURE-VIII	PIPE & VALVE MATERIAL SPECIFICATION

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

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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.

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ANNEXURE-II

MANDATORY SPARES LIST

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I. MECHANICAL			THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.
Sl. NO.	PARTICULARS	QUANTITY	
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-Feed chamber and Overflow chamber	10% of each type OR 1 no. whichever is higher	
d.	Vortex finder & Apex inserts	10% of each type OR 1 no. whichever is higher	
2.	Vacuum Belt Filter		
a.	Filter Cloth	4 sets	
b.	Belt	1 sets	
c.	Vacuum Box Seals	2 sets	
d.	Drive Motor	1 no.	
3.	Vacuum Pumps		
a.	Pump Impeller Assembly	1 no.	
b.	Pump Bearing	1 set	
c.	Seals	1 set	
d.	Motor	1 no.	
4.	Vacuum Breaker Valves		
a.	Valve Assembly	1 no.	
b.	Actuator	1 no.	
5.	Slurry Pumps		
a.	Impeller Assembly	4 no. of each type and size	
b.	Complete Casing	1 no. of each type and size	
c.	Casing Liners (where replaceable liners are provided)	1 set*	
d.	Seals	4 set of each type and size	
e.	Bearings	1 no. of each type and size	
f.	Motor	1 no. of each type and size	
g.	Gear Box	1 no. of each type and size of pump	
h.	Motor-Pump Coupling	1 no. of each type	
6.	Slurry Valves	4 nos. of each type and size	

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7.	Slurry Line Bends	4 nos. of each type and size
8.	Horizontal Centrifugal Pumps	
a.	Complete Impeller Assembly	1 nos. of each type
b.	Casing Liners	1 set* of each type
c.	Bearing	1 set*
d.	Motor	1 no. of each type
e.	Pump discharge valve assembly	1 nos. of each type

Any change in size, material, design etc., which obviates one to one replacement of the part shall be considered a different type.

*Unless otherwise stated, a set shall mean complete replacement for one equipment.

Note(s):

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 is 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 on 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

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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.

II. MANDATORY SPARES - CONTROL & INSTRUMENTATION		
SI. NO.	PARTICULARS	QUANTITY
1.01.00	MEASURING INSTRUMENTS	
1.01.01	(i) Transmitters of all types and model no. (for measurement of pressure, differential pressure, flow, level, temp, etc.). This shall include magnetic/ electromagnetic flow meter, mass flow meter also.	10% or 1 no. of each type and model, whichever is more.
1.01.02	Temp Elements along with thermo-well (except winding temp elements of motor)	10% or 2 no. of each type, model & length, whichever is more.
1.01.03	(i) Process Actuated Switches (Pressure, Differential pressure, flow, level, temp) (ii) Limit switches (for pneumatic and manual valves)	10% or 2 no. of each type and model, whichever is more.
1.01.04	Local Gauges for Pressure, Differential pressure, flow, level, temp	5% or 1 no. of each type, model and range, whichever is more.
1.02.00	PROCESS CONNECTION PIPING (For Impulse Piping / Tubing and Air Supply Piping as Applicable)	
a.	Valves of all types and models	10% or 1 no. of each type, class, size and model whichever is more.
b.	2 way, 3way, 5way valve manifolds	10% or 1 no. of each type, class, size and model whichever is more.
c.	Fittings	10% or 1 packet of each type, class, size and model whichever is more.
d.	Purge meters	5% of each model or 1 no. whichever is more.
e.	Filter regulators	20% of each model or 2 nos. whichever is more.
1.03.00	CONTROL VALVES, ACTUATORS & ACCESSORIES (Following items shall be provided under this clause for all modulating control valves being supplied under this package)	
a.	Pneumatic and electro-hydraulic actuator assembly	10% or 1 no. of each type, model and rating, whichever is more.

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b.	Valve trim (including cage, plug, stem, seat rings, guide bushings etc.)	1 set for each type of control valve.
c.	Diaphragms, O’ rings, seals etc. of all types make etc.	100%
d.	Pressure Gauges of all types, make, rating etc.	10% or 2 nos. of each type whichever is more
e.	Solenoid valves (if applicable)	10% or 2 nos. of each type whichever is more
f.	Positioner units (complete unit)& accessories (link assembly)	10% or 1 no. of each type whichever is more
g.	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 Nos., whichever is more
h.	Air lock relays	10% or 2 nos. of each type whichever is more
1.04.00	PNEUMATICS ISOLATION / BLOCK VALVES, ACTUATORS & ACCESSORIES (For all ON/OFF valves supplied under this package)	
a.	Pneumatic actuator assembly	10% or 1 no. of each type, model and rating, whichever is more.
b.	Diaphragms, O’ rings, seals etc. of all types make etc.	100%
c.	Limit switches (complete unit) & accessories (link assembly)	10% or 2 Nos., whichever is more
d.	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 Nos., whichever is more
1.05.00	ELECTRICAL ACTUATORS	
a.	Actuators	1 no of each type and rating
b.	Electronic PCB of all types	10% of each type & model
c.	Absolute Encoder (replaceable part)	5% of each type & model
d.	Electronic Torque sensor	5% of each type & model
1.06.00	SOLENOID VALVES	
a.	Solenoid Valves	10% of each type, rating and model
b.	Solenoid Valve COILS	10% of each type, rating and model
1.07.00	VFD SYSTEM	
a.	Electronic cards	
	(i) Control modules	1 nos. of each type & rating
	(ii) I/O module	1 nos. of each type & rating
	(iii) Power supply modules	1 nos. of each type & rating
	(iv) Gate module including gate transformer	100% of one channel
b.	Power device (Thyristor, IGBT etc.) bridge leg	1no.(Qty. for one ph.)

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c.	Over voltage limiter and surge suppressor network	1 set
d.	Semi conductor fuses for Power device (thyristor, IGBT etc.)	1 set
e.	Power & Control fuse	25% of installed quantity
f.	Control Transformer	1 nos. of each type & rating
g.	Contactor/Breaker	1 no.
h.	CT/VT	1 nos. of each type & rating
i.	Indicating lamps	100% of each type & rating
l.	Auxiliary contactors & relays	1 no. of each type & rating
k.	Indicating lamp holder full set	15% of each type and colour
l.	Panel mounted meters	1 nos. of each type & rating
NOTE:		
1	Wherever set is mentioned, one set of the spares of that item shall be for complete replacement of that particular item for one equipment.	
2	Any fraction of a item shall mean the next higher.	
3	Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by contractor shall be the specified percentage (%) of the total population of the plant. In case, the quantity so calculated happens to be fraction, the same shall be rounded off to next higher whole number.	
4	Wherever the quantities have been indicated for each type, size, thickness, material, radius, range, etc., these shall cover all the items supplied and installed and the breakup for these shall be furnished in the bid.	
5	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.	

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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 equipments. 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 representative

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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 30 minutes. Other parts shall be tested for one and half times the maximum operating pressure, for a period not less than 30 minutes.

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 butt welding joints shall be radiographed unless otherwise stipulated.

Bidder's scope shall include to preparation of all necessary documents, co-ordination and follow up for above approval related to bidder's works. 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.

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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 40 mm 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.

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.



NSPCL BHILAI (2X250 MW)

GYPSUM DEWATERING EQUIPMENT
TECHNICAL SPECIFICATION

INSPECTION AND TESTING

SPECIFICATION No: PE-TS-468-571-A901

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REV. 00

SHEET 4 OF 7

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	

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.



NSPCL BHILAI (2X250 MW)

GYPSUM DEWATERING EQUIPMENT

TECHNICAL SPECIFICATION

INSPECTION AND TESTING

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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.			

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

	NSPCL BHILAI (2X250 MW) GYPSUM DEWATERING EQUIPMENT TECHNICAL SPECIFICATION INSPECTION AND TESTING	SPECIFICATION No: PE-TS-468-571-A901	
		SECTION : I	
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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. The charges for Inspection agency (TPIA) in India will be in BHEL scope. However, the charges for inspection outside India will be in bidder's scope.
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.

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

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A Quality Plan Doc No. PE-V0-468-571-A101 is enclosed with this specification for reference of the bidder. The Quality Plan shall be finalized during the detailed engineering.

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-AM01 REV 00.



To be read along with Section I-Sub Section D- Annexure-III
(INSPECTION AND TESTING)

SUB-SECTION-V-QM1

FLUE GAS DESULPHURISATION SYSTEM

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

LOT-2 PROJECTS
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-0011-109(2)-9



CLAUSE NO.	QUALITY ASSURANCE	एनटीपीसी NTPC		
	FLUE GAS DESULPHURISATION SYSTEM			
1.00.0	FLUE GAS DESULPHURISATION SYSTEM			
1.01.0	Mills:			
1.01.01	Raw material for shaft, coupling, gears and pinions, top and bottom races and other rotating components shall be subjected to UT. MPI/LPI shall be carried out to check surface soundness.			
1.01.02	Wear-resistant parts shall be UT/RT tested to check soundness after suitable heat treatment. Check for chemical composition, hardness and microstructure shall be carried out.			
1.01.03	Butt welds in the tube/separator/body casing of the mill shall be tested by RT and MPI. All other welds in main tube/separator shall be tested by MPI/LPI for acceptance. The tube shall be statically balanced.			
1.01.04	All gearboxes shall be run tested for adequate duration to check rise in oil temperature, noise level and vibration. Check for leak tightness of gear case also shall be performed.			
1.02.0	Feeders:			
1.02.01	Any welds in the casing/pulley fabrication shall be checked with MPI.			
1.02.02	Routine tests shall be done as per relevant Indian Standards or equivalent International Standards.			
1.02.03	All major items like plates for casing, head pulley, tail pulley, pulley shaft and major castings shall be procured with respective material test certificates.			
1.02.04	Calibration check shall be carried out on all feeders.			
1.03.0	Dampers:			
1.03.01	All the dampers shall be subjected to operational test/checks.			
1.03.02	Gas tight Dampers shall be subjected to shop leakage test to demonstrate the guaranteed tightness as per NTPC Tech Specification.			
1.04.0	PIPING, VALVE AND SPECIALITIES:			
1.04.01	All pipes and fittings shall be tested as per applicable code.			
1.04.02	All valves shall be hydraulically/Air tested for body, seat and back-seat (if applicable) as per relevant standard.			
1.04.03	NDT on valves shall be as per relevant standard.			
1.04.04	Valves shall be offered for hydro test in unpainted conditions.			
1.04.05	Functional checks of the valves for smooth opening and closing shall also be done.			
LOT-2 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(2)-9	PART-B SUB-SECTION-V-QM1 FGD SYSTEM	Page 1 of 4



CLAUSE NO.		QUALITY ASSURANCE		एनटीपीसी NTPC	
1.05.00		TANKS / VESSELS:			
1.05.01		~~Atmospheric tanks:~~			
		~~i) All welds joints shall be DP tested and complete tanks shall be water fill tested.~~			
		~~ii) All atmospheric storage tanks fabricated and erected at site shall be subjected to tests (Hydro, NDT and Vacuum) according to design code as applicable.~~			
		~~iii) Rubber lining shall be tested for hardness and spark test, as applicable.~~			
1.05.02		Pressure vessels:			
		1) NDT on weld joint shall be as per respective code requirements or the minimum as specified as below:			
		i) 100% DPT on root run of butt weld, nozzle welds and finished fillet welds.			
		ii) 10% DPT on all finished butt welds.			
		iii) 10% RT (covering all 'T'/cross joints) of butt welds.			
		2) Butt welds of dished ends shall be stress relieved and subjected to 100% RT.			
		3) Each finished vessels shall be hydraulically tested to 150% of the design pressure for a duration of 30 minutes.			
1.06.00		~~HEAT EXCHANGER/HEATER:~~			
1.06.01		~~All material shall be tested for chemical and mechanical properties and NDT as per relevant standard.~~			
1.06.02		~~NDT on welds and other checks shall be as per relevant code.~~			
1.06.03		~~Air heaters shall be subjected to dimensional and clearance checks as per standard practice~~			
1.06.04		~~Lub. oil system, drive system, soot blowing system etc. of Air heaters shall be checked suitably as per standard practice~~			
1.07.00		PUMPS:			
1.07.01		UT on shaft forgings (greater or equal to 40mm) and MPI/DPT shall be done on shafts and impeller to ensure freedom from defects.			
1.07.02		The pump casing shall be hydraulically tested at 200% of pump rated head or at 150% of shut off head, whichever is higher. The test pressure shall be maintained for at least half an hour.			
1.07.03		The pump rotating parts shall be subjected to static and dynamic balancing.			
1.07.04		All pumps shall be tested at shop for capacity, head efficiency and brake horse power at rated speed as per relevant/applicable standard.			
1.07.05		Noise and vibration shall be measured during the performance testing at shop.			
LOT-2 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(2)-9		PART-B SUB-SECTION-V-QM1 FGD SYSTEM	
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CLAUSE NO.	QUALITY ASSURANCE		एनटीपीसी NTPC
1.08.00	STRUCTURES , DUCTS, HOPPERS:		
1.08.01	All materials shall be tested for chemical and mechanical properties as per relevant standard. All plates above 40mm shall be 100% Ultrasonically tested.		
1.08.02	Visual inspection of all welds shall be performed in accordance with AWS D1.1.		
1.08.03	NDT requirements of structural steel welds shall be as under: i) 100% RT/UT on butt-welds of plate thickness$\geq$ 32mm. ii) For plates of 25mm$\leq$thickness$<$32mm-10% RT and 100% MPI. iii) For plates of thickness $<$25mm-10% MPI/LPI.		
1.08.04	Edge for shop and field weld shall be examined by MPI for plate thickness $\geq$ 32mm.		
1.09.00	VACUUM BELT FILTER SYSTEM:		
1.09.01	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.		
1.09.02	UT on shaft (if greater or equal to 40mm) and impeller shall be carried out.		
1.09.03	All vacuum pumps shall be tested at shop for capacity, power, pressure, efficiency, noise and vibration etc.		
1.09.04	Filter cloths and belts shall be tested for physical properties as per relevant standard		
1.09.05	Hydro cyclones shall be checked by visual, dimensional etc.		
1.10.00	~~SPRAY NOZZLES:~~		
1.10.01	~~Spray nozzles shall be tested for physical properties~~		
1.10.02	~~Spray nozzles also shall be subjected to performance test.~~		
1.11.00	~~AGITATORS:~~		
1.11.01	~~Rubber lining shall be tested for hardness and spark test~~		
1.11.02	~~Impellers shall be tested for dimensional and balancing check~~		
1.11.03	~~Gear Boxes shall be tested for run test as per standard practice~~		
1.12.00	FANS:		
1.12.01	Rotor components shall be subjected to ultrasonic test at mill and magnetic particle inspection / liquid penetrant examination after rough machining.		
1.12.02	Butt welds in rotor components shall be subjected to 100% RT and all welds shall be magnetic particle/dye penetrant tested after stress relieving.		
LOT-2 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(2)-9	PART-B SUB-SECTION-V-QM1 FGD SYSTEM
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CLAUSE NO.	QUALITY ASSURANCE	एनटीपीसी NTPC	
1.12.03	All rotating components and assemblies of fan shall be balanced dynamically		
1.12.04	Performance test shall be carried out on fans as per Technical specification/ Relevant standard		
1.12.05	Test for Natural Frequency and hardness of Fans blades shall be carried out as per Technical specification/ Relevant standard		
1.13.00	Thermal Insulation, Lagging & Cladding: (a) Lightly resin bonded mineral wool: LRB mattresses/sections of Rockwool/ Glasswool shall conform to & tested as per relevant clauses of Indian Standards and shall meet the requirements of NTPC data sheet. Type tests except Thermal Conductivity shall be regularly carried out once in three months, Thermal Conductivity Type Test shall be carried out minimum once in twelve months by the manufacturer. Requirements of various components like Binding wires, Lacing wires, Wire mesh, etc. shall be as per NTPC approved data sheet / as given in respective Sub-Section of Technical Requirements of Steam Generator & Auxiliaries. (b) Lagging & Cladding: All insulation shall be protected by means of an outer covering of Aluminium sheeting confirming to ASTM B-209-1060 temper H14 from reputed manufacturer meeting the requirements of NTPC data sheet.		
1.14.00	OTHER CRITICAL EQUIPMENTS:		
1.14.01	Checks/ NDTs shall be done as per relevant Indian Standards or equivalent International Standards.		
LOT-2 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(2)-9	PART-B SUB-SECTION-V-QM1 FGD SYSTEM
			Page 4 of 4

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			QUALITY PLAN				SPEC. NO : PE-TS-468-571-A901			DATE:			
				CUSTOMER : M/s NSPCL				QP NO.: PE-V0-468-571-A101			DATE: Nov, 2021			
				PROJECT: 2x250 MW, BHILLAI				PO NO.:			DATE:			
				ITEM: GYPSUM DEWATERING EQUIPMENT		SYSTEM: FGD		SECTION:			SHEET 1 of 9			
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
1.0 RAW MATERIAL (*Material shall be as per Drawing)														
1.1	Vacuum pump	Physical & Chemical for impeller, casing, shaft.	MA	Physical	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	TC	√	P	V	V	NOTE-5
		NDT of Impeller, casing, shaft, sleeve	MA	DPT	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	IR	√	P	V	V	NOTE-5
		Balancing of Rotating Parts	MA	Static & Dynamic Balancing	100%	100%	ISO 1940 Gr.6.3	ISO 1940 Gr.6.3	IR	√	P	V	V	NOTE-5
		NDT of Impeller & Shaft	MA	UT	100%	100%	ASTM A 388/ASME Sec.V	ASTM A 388/ASME Sec.V	IR	√	P	V	V	UT of shaft $\geq \phi$ 40mm NOTE-5
1.2	Speed reducer	Visual, dimensional, Run test including oil leakage, Temp.	MA	Visual	100%	100%	Approved Drawing/ Data sheet	Approved Drawing/ Data sheet	IR	√	P	V	V	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		RAJESH RANJAN	Checked by:		ASHISH PANIGRAHI
Reviewed by:		PANKAJ KR KAPSIMAY	Reviewed by:		RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

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				CUSTOMER : M/s NSPCL				QP NO.: PE-V0-468-571-A101		DATE: Nov, 2021				
				PROJECT: 2x250 MW, BHILLAI				PO NO.:		DATE:				
				ITEM: GYPSUM DEWATERING EQUIPMENT		SYSTEM: FGD		SECTION:		SHEET 2 of 9				
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	*	**		THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.	
					M	C/ N				D	M	C		N
		rise, Noise level and vibration												
1.3	AC Drive	Type, Make, Rating, Routine test.	MA	Visual	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	TC	√	P	V	V	Refer Electrical QP for details. NOTE-5
1.4	Belt	Visual & review of test certificate (Tensile, Elongation, Thickness)	MA	Visual	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	TC	√	P	V	V	
1.5	Filter Cloth	Physical Properties (Tensile, Elongation, Thickness, air permeability test, etc.)	MA	Physical	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	TC	√	P	V	V	
1.6	Water Pump/ Slurry Pump	Chem. & Mech. Properties of Impeller, Casting,	MA	Chemical Mechanical	100%	100%	Approved Drawing/Data sheet/Relevan	Approved Drawing/Data sheet/Relevan	TC	√	P	V	V	UT of shaft $\geq \phi$ 40mm *Lining if applicable

BHEL					
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				PROJECT: 2x250 MW, BHILLAI				PO NO.:		DATE:			
				ITEM: GYPSUM DEWATERING EQUIPMENT		SYSTEM: FGD		SECTION:		SHEET 3 of 9			
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**		
					M	C/ N				D	M	C	
		Shaft, Lining*					t Standard	t Standard					
		Balancing of Rotating Parts	MA	Static & Dynamic Balancing	100%	100%	ISO 1940 Gr.6.3	ISO 1940 Gr.6.3	IR	√	P	V	V
		Hydro test of casing	MA	Static pressure testing	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	IR	√	P	V	V
		NDT of Impeller, casing, shaft, sleeve	MA	DPT	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	IR	√	P	V	V
		NDT of Impeller & Shaft	MA	UT	100%	100%	ASTM A 388/ASME sec.V	ASTM A 388/ASME sec.V	IR	√	P	V	V
Hydrostatic testing of casings for 30min.at 1. times of shut-off head & 2 times pump rated head whichever ever higher.													

BHEL					
ENGINEERING			QUALITY		
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Prepared by:		RAJESH RANJAN	Checked by:		ASHISH PANIGRAHI
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				CUSTOMER : M/s NSPCL				QP NO.: PE-V0-468-571-A101		DATE: Nov, 2021				
				PROJECT: 2x250 MW, BHILLAI				PO NO.:		DATE:				
				ITEM: GYPSUM DEWATERING EQUIPMENT		SYSTEM: FGD		SECTION:		SHEET 4 of 9				
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C		N
1.7	Hydro cyclone	Visual & Dimension	MA	Visual & Measurement	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	IR	√	P	W	V	NOTE-5
1.8	Valves (Control valve & Butterfly Valve etc*)	Material certificate Hydrostatic test Seat leak test Function test DimensionS	MA	Visual	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	IR	√	P	V	V	*As applicable NOTE-5
1.9(a)	Rubber Composition	Material content	MA	Chemical	1/Batch	1/Batch	Approved Drawing/Data sheet	Approved Drawing/Data sheet	COC	√	P	V	V	
1.9(b)	Rubber lining	Spark test at accessible area	MA	Inspection check	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	IR	√	P	W	V	Spark test 10-12.5KV min.
1.10	LT Motor	Make, Rating, Type, Routine Test, Paint	MA	Visual	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	IR	√	P	V	V	For Motor up to 30KW COC Will be submitted NOTE-5

BHEL					
ENGINEERING			QUALITY		
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				CUSTOMER : M/s NSPCL				QP NO.: PE-V0-468-571-A101		DATE: Nov, 2021				
				PROJECT: 2x250 MW, BHILLAI				PO NO.:		DATE:				
				ITEM: GYPSUM DEWATERING EQUIPMENT		SYSTEM: FGD		SECTION:		SHEET 5 of 9				
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C		N
1.11	Junction Box	Type Test- Enclosure Protection Test	MA	Visual	One of Design	One of Design	IS:60529	IS:60529	IR	√	P	V	V	NOTE-5
1.12	Instruments (Transmitters, Switches, Gauges, RTD etc.)	COC/Functional Check	MA	Visual	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	TC	√	P	V	V	
2.0 FINAL INSPECTION (Vacuum belt filter assembly)														
2.1	Vacuum belt filter assembly	Dimensional	MA	Dimensional	100%	100%	Approved Drawing	Approved Drawing	IR	√	P	W	W	
		Run test(for 30 minutes)	MA	Visual, Measurement	100%	100%	Approved Drawing	Approved Drawing	IR	√	P	W	W	
2.2	All components required paints.	Paint Finish, Paint Thickness, High voltage porosity test	MA	Measurement	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	IR	√	P	W	V	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		RAJESH RANJAN	Checked by:		ASHISH PANIGRAHI
Reviewed by:		PANKAJ KR KAPSIMAY	Reviewed by:		RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			QUALITY PLAN				SPEC. NO : PE-TS-468-571-A901		DATE:				
				CUSTOMER : M/s NSPCL				QP NO.: PE-V0-468-571-A101		DATE: Nov, 2021				
				PROJECT: 2x250 MW, BHILLAI				PO NO.:		DATE:				
				ITEM: GYPSUM DEWATERING EQUIPMENT		SYSTEM: FGD		SECTION:		SHEET 6 of 9				
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C		N
2.3	Vacuum pump/ Water Pump/ Slurry Pump	Capacity, power, pressure, efficiency, noise, vibration, temperature rise	MA	Measurement	100%	100%	Approved Drawing/Data sheet	Approved Drawing/Data sheet	IR	√	P	W	V	NOTE-5
3	VACCUM TANK (RAW MATERIAL INSPECTION)													
3.1	Plates for shell and dished ends & structural	Chemical & Physical	MA	Chemical & Physical	1 /Heat	1 /Heat	Approved Data Sheet /Drawing	Approved Data Sheet /Drawing	TC	√	P	V	V	
4.0	IN PROCESS CONTROLS													
4.1	Welding (As applicable)	WPS,PQR,WPQ	CR	Visual	100%	100%	ASME Sec, IX/Relevant Standard	ASME Sec, IX/Relevant Standard	Report	√	P	V	V	

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		RAJESH RANJAN	Checked by:		ASHISH PANIGRAHI
Reviewed by:		PANKAJ KR KAPSIMAY	Reviewed by:		RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			QUALITY PLAN				SPEC. NO : PE-TS-468-571-A901		DATE:				
				CUSTOMER : M/s NSPCL				QP NO.: PE-V0-468-571-A101		DATE: Nov, 2021				
				PROJECT: 2x250 MW, BHILLAI				PO NO.:		DATE:				
				ITEM: GYPSUM DEWATERING EQUIPMENT		SYSTEM: FGD		SECTION:		SHEET 7 of 9				
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C		N
4.2	Stress Relieving	Physical	MA	Physical	100%	100%	Relevant Standard/Ma nufacturer standard	Relevant Standard/Ma nufacturer standard	HT chart	√	P	V	V	As applicable
4.3	All Weld	Weld Quality	MA	DPT	10%	10%	Relevant Standard /ASME Sec – VIII Div.1	Relevant Standard /ASME Sec – VIII Div.1	IR	√	P	W	V	
4.4	Weld quality of circumferential & longitudinal seams	Weld Defect	CR	RT- Review of documents	10%	10%	Relevant Standard /ASME Sec – VIII Div.1	Relevant Standard /ASME Sec – VIII Div.1	IR	√	P	V	V	
5.0 FINAL INSPECTION (Complete Equipment)														
5.1	Complete Equipment	Dimensional	MA	Dimension	100%	100%			Approved Drawing	√	P	W	V	NOTE-5
		Nozzle Orientation	CR	Dimension	100%	100%	Approved Drawing	Approved Drawing	IR	√	P	W	V	NOTE-5

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		RAJESH RANJAN	Checked by:		ASHISH PANIGRAHI
Reviewed by:		PANKAJ KR KAPSIMAY	Reviewed by:		RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
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FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			QUALITY PLAN				SPEC. NO : PE-TS-468-571-A901		DATE:				
				CUSTOMER : M/s NSPCL				QP NO.: PE-V0-468-571-A101		DATE: Nov, 2021				
				PROJECT: 2x250 MW, BHILLAI				PO NO.:		DATE:				
				ITEM: GYPSUM DEWATERING EQUIPMENT		SYSTEM: FGD		SECTION:		SHEET 8 of 9				
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY		REMARKS		
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
		Hydro Test	CR	Hydro Test	100%	100%	2X working PR or 1.5x design PR Whichever is higher for 30 minutes	2X working PR or 1.5x design PR Whichever is higher for 30 minutes	IR	√	P	W	V	NOTE-5
		Pneumatic Test of RF pads for soundness /leakages	CR	Pneumatic Test	100%	100%	ASME SEC – VIII /appd. Drg/appd. Datasheet	ASME SEC – VIII /appd. Drg/appd. Datasheet	IR	√	P	W	V	*as applicable NOTE-5
5.2(a)	Rubber Lining of tank	Spark test	MA	Electrical	100%	100%	Technical Spec/ Relevant standard	Technical Spec/ Relevant standard	IR	√	P	V	V	Spark test 10-12.5KV min.
5.2(b)	Rubber Lining of tank	Hardness testing	MA	Physical	100%	100%	Technical Spec/ Relevant standard	Technical Spec/ Relevant standard	IR	√	P	W	V	Shore hardness value shall be within 60. NOTE-5
5.3	Junction Box	Insulation Resistance Test High Voltage Test	MA	Electrical	100 %	10%	Approved Drawing	Approved Drawing	IR	√	P	W	V	NOTE-5

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		RAJESH RANJAN	Checked by:		ASHISH PANIGRAHI
Reviewed by:		PANKAJ KR KAPSIMAY	Reviewed by:		RK JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
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THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			QUALITY PLAN				SPEC. NO : PE-TS-468-571-A901		DATE:				
				CUSTOMER : M/s NSPCL				QP NO.: PE-V0-468-571-A101		DATE: Nov, 2021				
				PROJECT: 2x250 MW, BHILLAI				PO NO.:		DATE:				
				ITEM: GYPSUM DEWATERING EQUIPMENT		SYSTEM: FGD		SECTION:		SHEET 9 of 9				
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C		N
5.4	Painting & Marking	Paint Finish, Thickness, HV porosity test	MA	Visual	100%	100%	Appd. Drg /Data Sheet	Appd. Drg /Data Sheet	IR	√	P	V	V	NOTE-5
5.5	Packing	Proper Packing	MA	Visual	100%	100%	Technical Spec	Technical Spec	Packing List	√	P	V	V	NOTE-2,5
5.6	Quality Dossier	Document	MA	Visual	100%	100%	Compilation of documents	Compilation of documents	Quality Dossier	√	P	V	V	

LEGENDS:

*RECORDS, IDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
 ** M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, C: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, N: CUSTOMER,
 P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE
 MA: MAJOR, MI: MINOR, CR: CRITICAL
 IR: INTERNAL REPORT D: DOCUMENTATION
 RT: RADIOGRAPHY TEST UT: ULTRASONIC TEST DPT: DIE PENETRANT TEST

NOTE:

1. ORIGINAL TCS/ PHOTOCOPIES CERTIFIED IN ORIGINAL BY MILL SHALL BE FURNISHED FOR REVIEW.
2. PACKING PHOTO GRAPH IS TO BE SUBMITTED TO BHEL BEFORE DISPATCH.
3. BHEL RESERVES THE RIGHT FOR CONDUCTING REPEAT TEST, IF REQUIRED.
4. DURING TESTING ONLY CALIBRATED MEASURING AND TESTING INSTRUMENT IS TO BE USED AND. CALIBRATION CERTIFICATES ARE NEEDED TO BE FURNISHED DURING INSPECTION.
5. THESE TESTS/CHECKS ARE INDICATIVE ONLY. FURTHER TESTS MAY BE ADDED BASED ON END CUSTOMER REQUIREMENT AND WILL BE FINALISED DURING DETAILED ENGINEERING

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:		RAJESH RANJAN	Checked by:		ASHISH PANIGRAHI			Reviewed by:			
Reviewed by:		PANKAJ KR KAPSIMAY	Reviewed by:		RK JAISWAL			Approved by:			

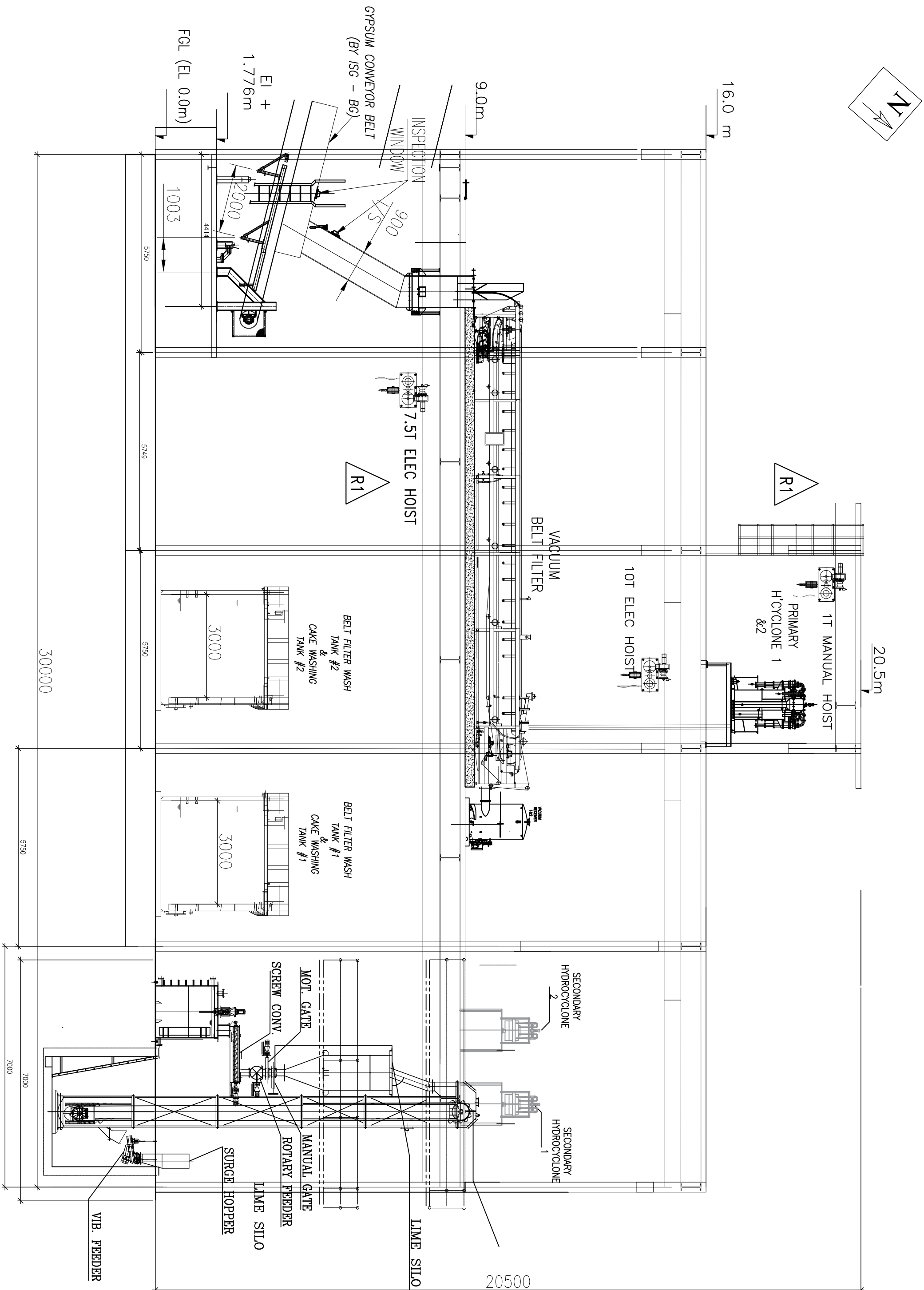
	NSPCL BHILAI (2X250 MW) GYPSUM DEWATERING EQUIPMENT TECHNICAL SPECIFICATION INPUT DRAWING LIST	SPECIFICATION No: PE-TS-468-571-A901	
		SECTION : I	
		SUB-SECTION : D	
		REV. 00	
		SHEET 1 OF 1	

ANNEXURE-IV

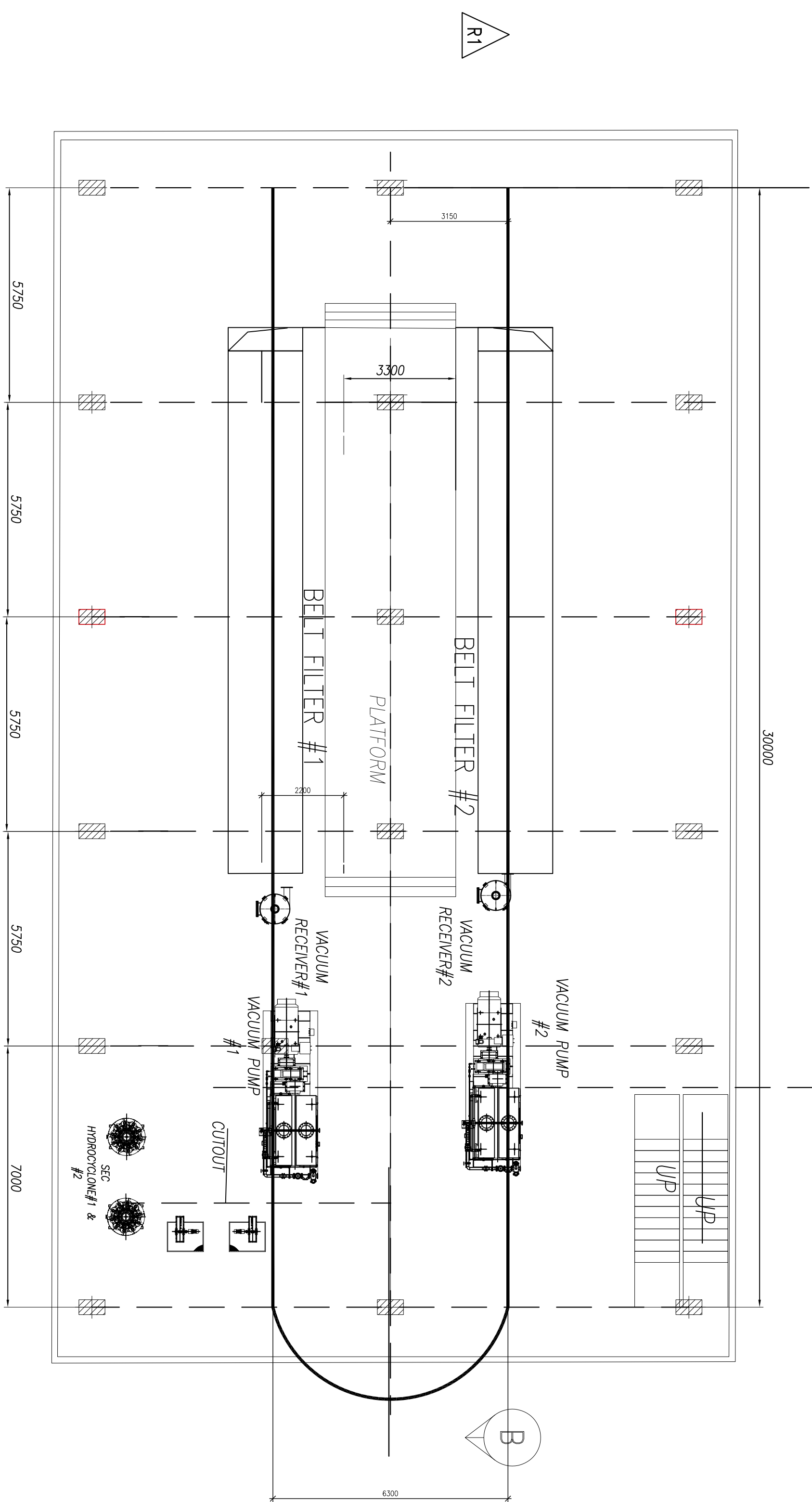
INPUT DRAWINGS/DOCUMENTS BY BHEL

Sl.No.	Drawing/Document Title	NSPCL/BHEL Drawing No.
1.	General Arrangement of Dewatering Building	PE-DG-468-571-A001
2.	P&ID - Legends & Notes	-- (Sheet 1 & 2 of 2)
3.	P&ID - Primary Hydrocyclone Feed Tank	9993-109-PVM-F-044 (Sheet 1 & 2 of 10)
4.	P&ID of Vacuum Belt filter	9993-109-PVM-F-044 (Sheet 5& 6 of 10)
5.	P&ID of Belt Filter washing Tanks & Cake washing Tanks	9993-109-PVM-F-044 (Sheet 7,8,9 & 10 of 10)
6.	P&ID of Secondary Hydrocyclone Tank	9993-109-PVM-F-044 (Sheet 3-4 of 10)
7.	Filtrate Extraction Pump Scheme	PE-FEP-00
8.	P&ID Filtrate water tank	3-FW-000-02071
9.	P&ID Waste Water System	9963-19-PVM-F-046
10.	Plant Layout of FGD System	0-FW-000-01558 (Sheet 1 of 1)

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

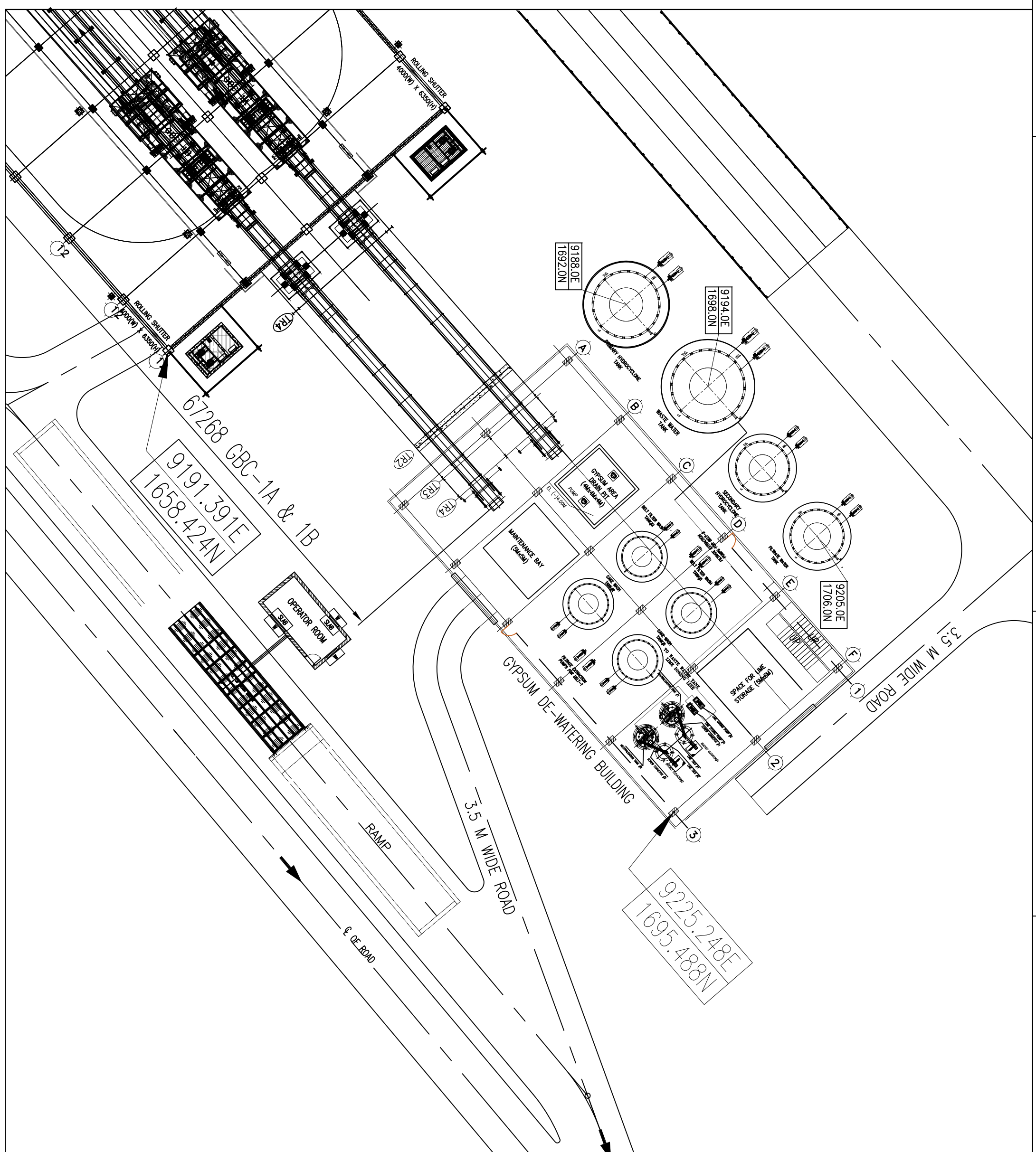


SECTION - BB

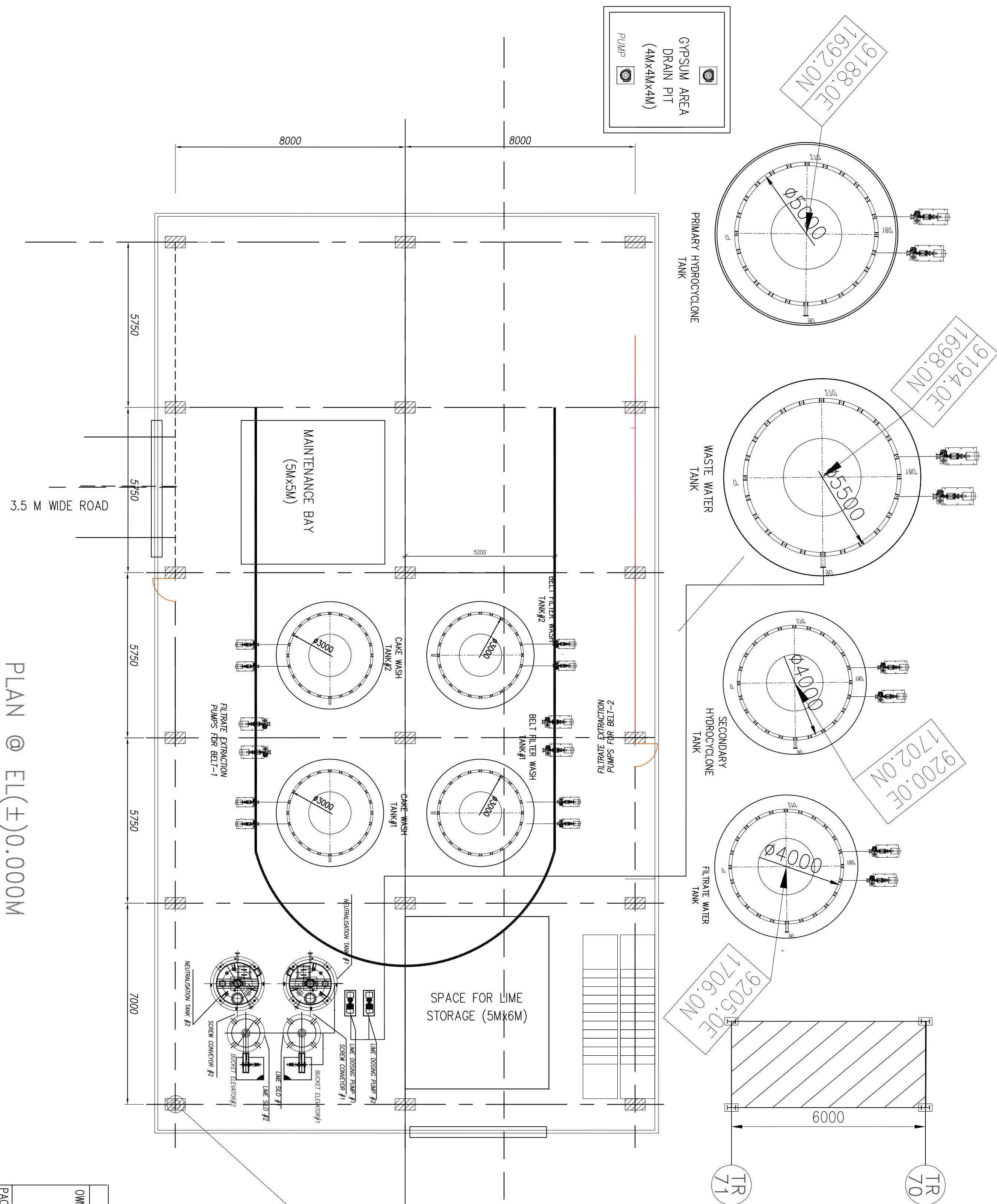


PLAN @ EL (+) 9.00M

TABLE OF REQUIREMENTS			
BAPT. NO	QTY.	DISCREPTIONS	REMARKS.
1	02	VACUUM BELT FILTER WITH ACCESSORIES	ON FIRST FLOOR EL(+9.00)
2	02	SECONDARY HYDRO CYCLONE - (SST)	ON FIRST FLOOR EL(+9.00)
3	02	NEUTRALISATION (LIME DOSSING) TANK WITH MIXER	SEPARATE FOUNDATION OR FLOOR MOUNTED AS PER CIVIL DESIGN
4	02	LIME FEED SCREW CONVERTER	THE SCREW CONVERTER WILL BE MOUNTED BELOW LIME SILO/HOPPER
5	02	LIME DOSSING SILO/HOPPER, MANUAL FEEDER & SUPPORT STRUCTURE	LIME SILO WILL BE SUPPORTED ON PLATFORM ON SUPPORTING STRUCTURE
6	02	PRIMARY HYDROCYCLONE	PRIMARY HYDRO CYCLONE WILL BE SIMILAR SUPPORTED ON FLOOR
7	02	VACUUM PUMP & MOTOR	FOUNDATION TO BE PROVIDED AS PER CIVIL DESIGN
8	02	VACUUM RECEIVER	FLOOR MOUNTED
9	02	CAKE WASH TANK	SEPARATE FOUNDATION OR FLOOR MOUNTED AS PER CIVIL DESIGN
10	02	BELT FILTER(CLOTH) TANK	SEPARATE FOUNDATION OR FLOOR MOUNTED AS PER CIVIL DESIGN
11	02	BUCKET ELEVATOR ASSY. (WITH SILO HOPPER & VIBRATING FEEDER) FOR LIME FEED	THE BUCKET ELEVATOR IS MOUNTED ON PIT FLOOR AND WILL REACH TO LIME SILO TOP THROUGH SUPPORT STRUCTURE
12	02	BAG FILTER WITH BLOWERS	BAG FILTER WILL BE SUPPORTED ON LIME SILO / PLATFORM WHICH WILL BE SUPPORTED ON FLOOR
13	02	LIME DOSSING PUMPS	FOUNDATION TO BE PROVIDED AS PER CIVIL DESIGN
14	01	PRIMARY HYDROCYCLONE FEED TANK & PUMPS WITH MOTORS	SEPARATE FOUNDATION OR FLOOR MOUNTED AS PER CIVIL DESIGN
15	01	FILTRATE WATER TANK & PUMPS WITH MOTORS	FOUNDATION TO BE PROVIDED AS PER CIVIL DESIGN
16	01	SECONDARY HYDROCYCLONE FEED TANK & PUMPS WITH MOTORS	SEPARATE FOUNDATION OR FLOOR MOUNTED AS PER CIVIL DESIGN
17	01	WASTE WATER STORAGE TANK & PUMPS WITH MOTORS	FOUNDATION TO BE PROVIDED AS PER CIVIL DESIGN
18	02	FILTRATE EXTRACTION PUMPS & MOTORS	FOUNDATION TO BE PROVIDED AS PER CIVIL DESIGN
19	02	CAKE WASH PUMPS & MOTORS	FOUNDATION TO BE PROVIDED AS PER CIVIL DESIGN
20	02	BELT/CLOTH WASH PUMPS & MOTORS	FOUNDATION TO BE PROVIDED AS PER CIVIL DESIGN
21	-	PLATFORMS FOR VIB & HYDROCYCLONES	AS SHOWN
22	02	DISCHARGE CHUTE	FOUNDATION TO BE PROVIDED AS PER CIVIL DESIGN

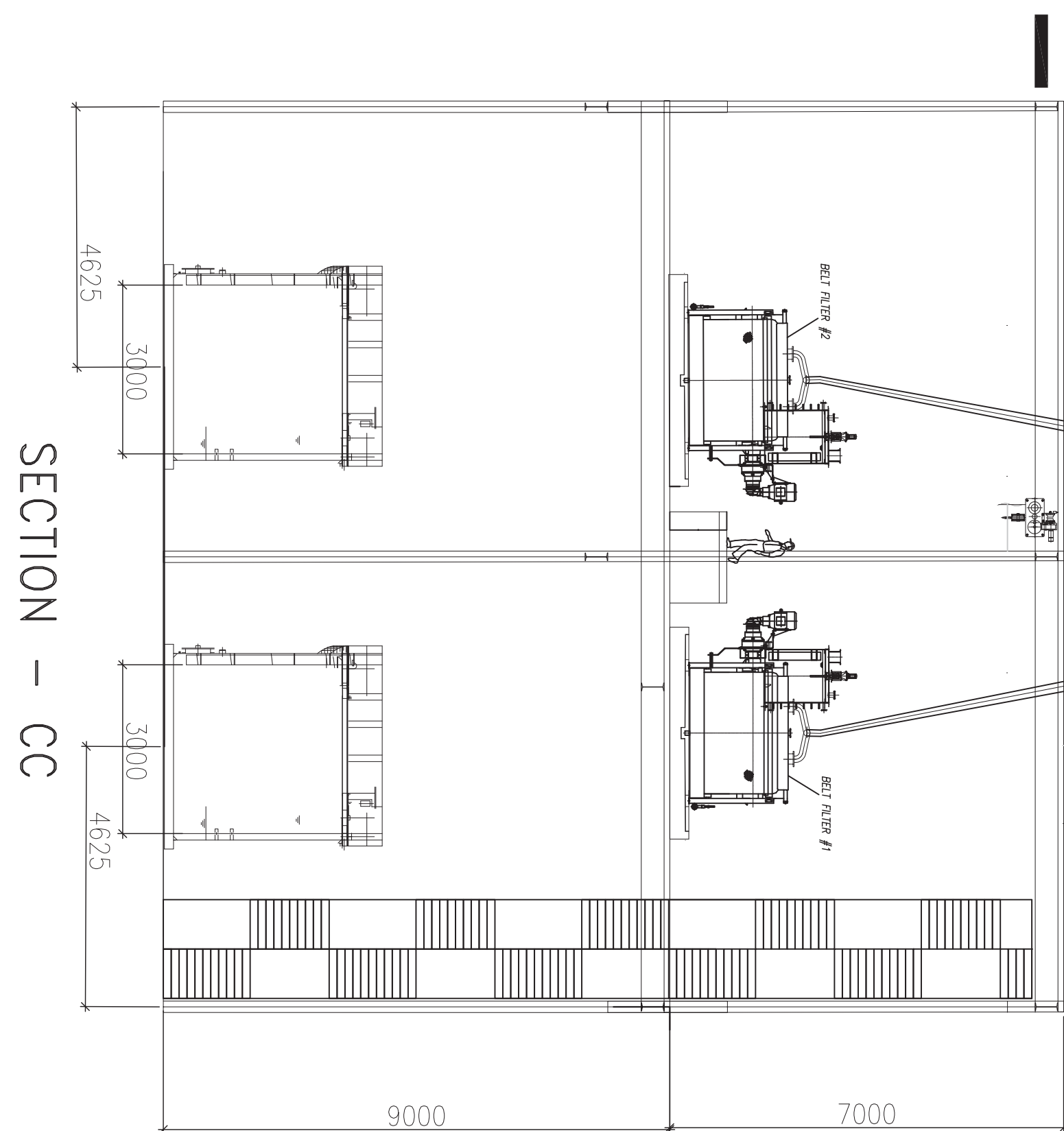
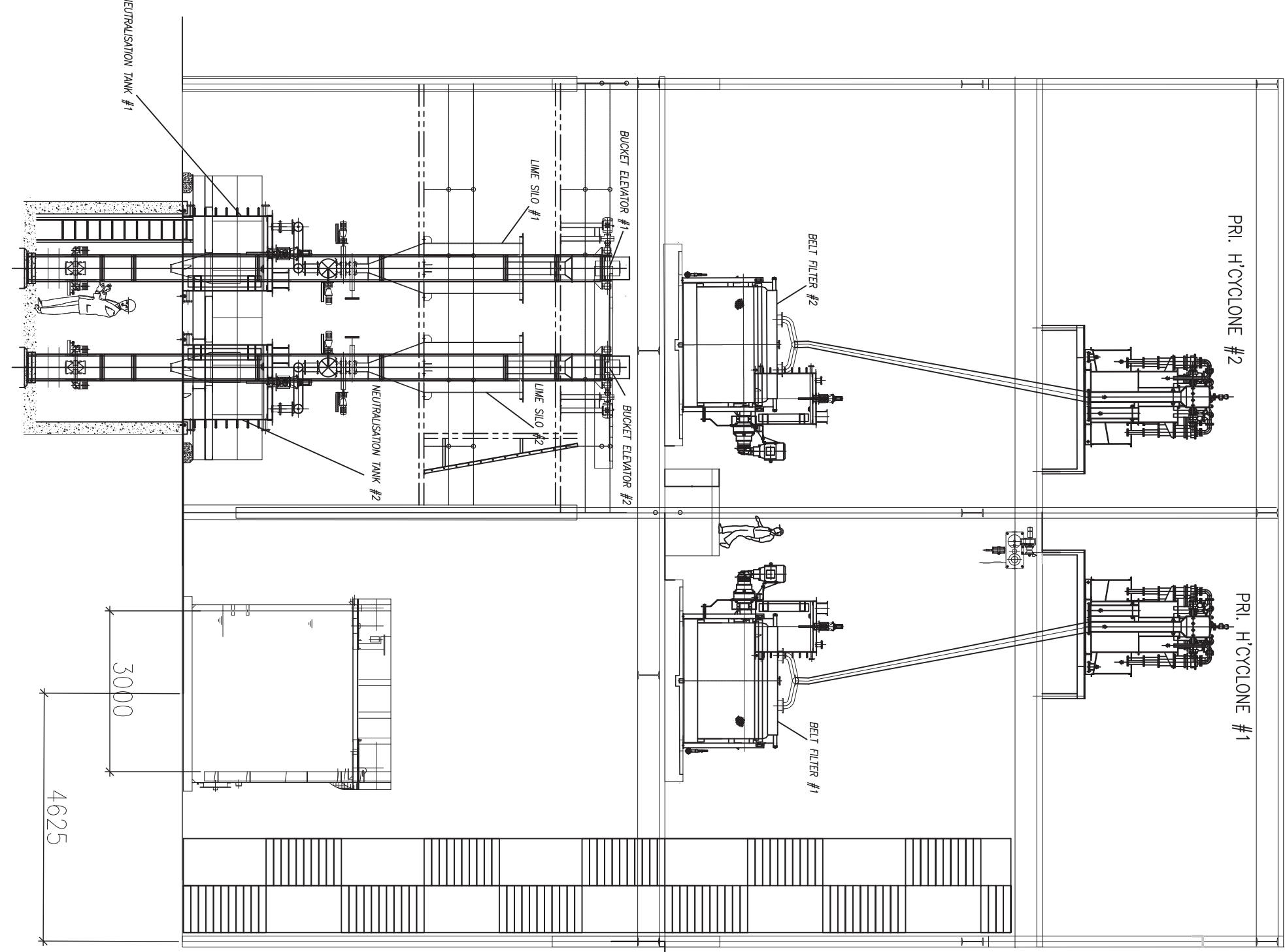
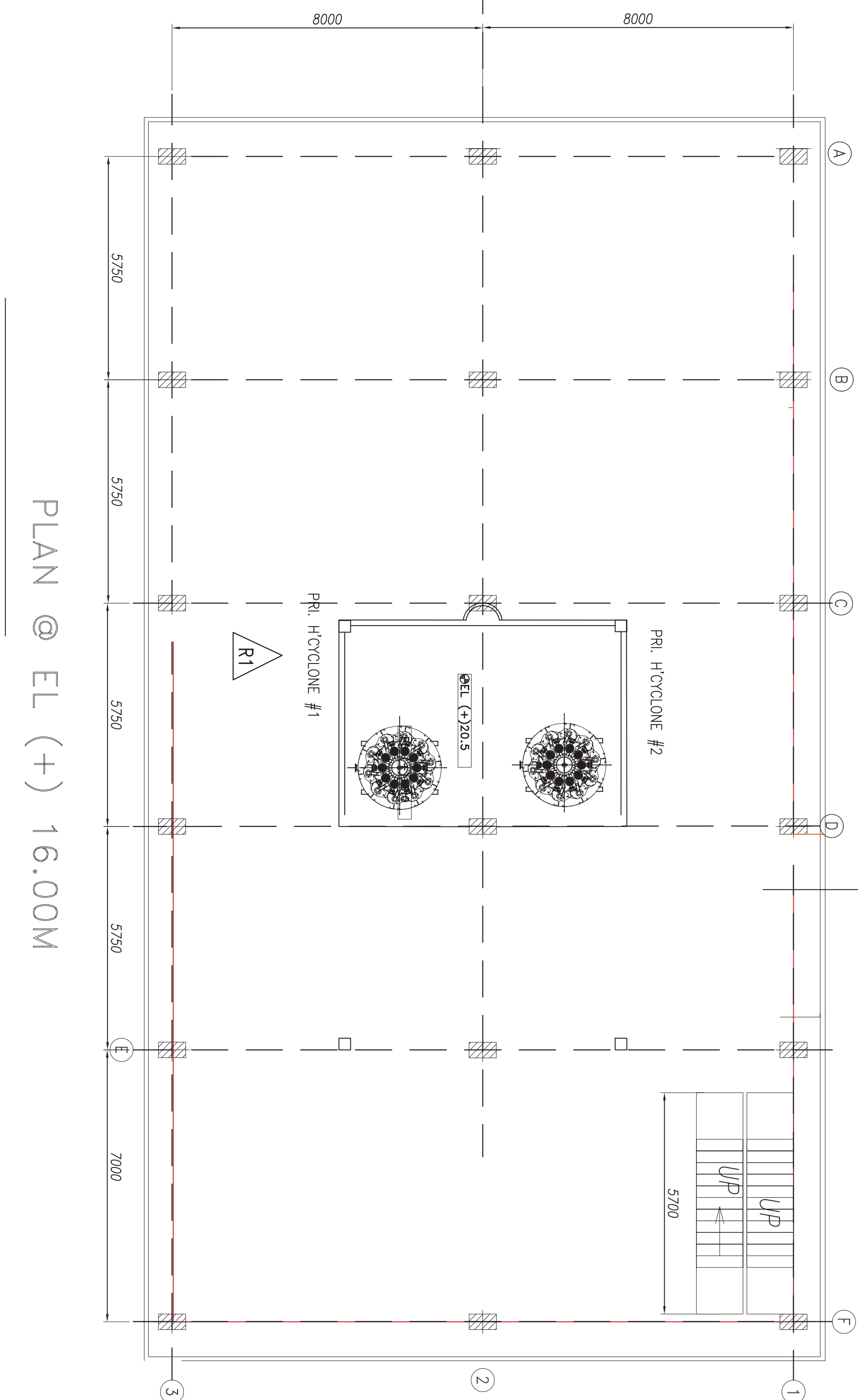
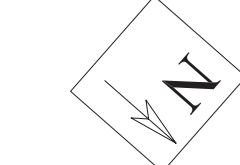


KEY PLAN



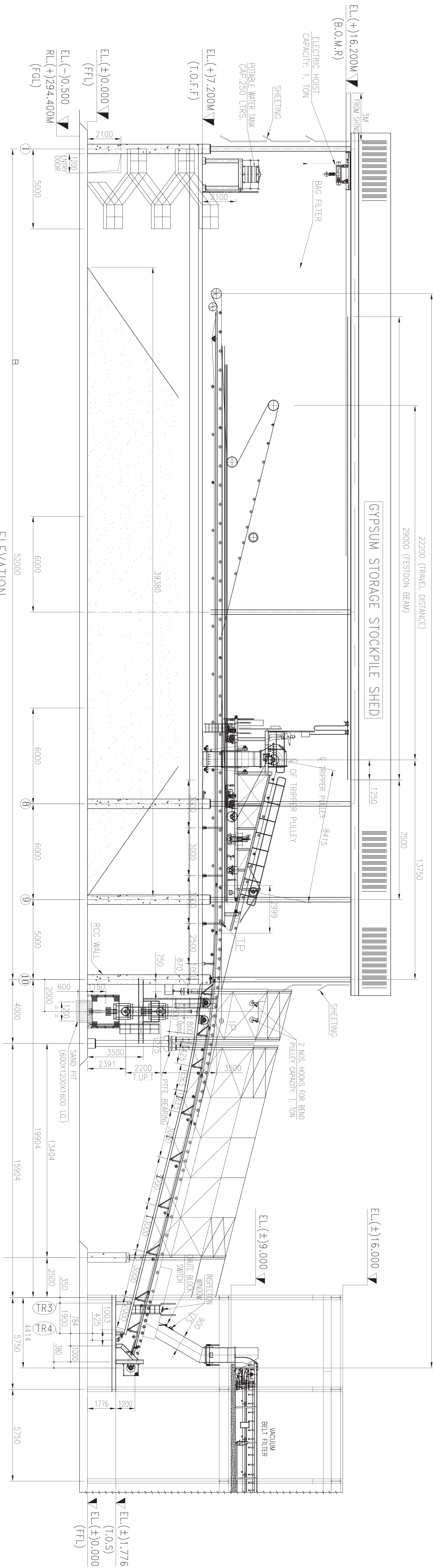
PLAN @ EL(±)0.000M

OWNER/PROJECT:		NSPCL BHILAI EXPANSION POWER PROJECT	
PACKAGE VENDOR:		NSPCL BHILAI (2X250MW) – FGD SYSTEM PACKAGE	
TITLE:		GA OF GDW BUILDING	
STATUS OF DRG.: FOR APPROVAL		NTPC DWG. NO.: 9993-109-PYM-B-048	
SCALE: BHIL JOB NO.: PE-DG-468-571-A001		SHEET NO.: 01 OF 02	
KAI DWG. NO.:		KAI REL. NO.:	
NAME		SIGN	
DATE		DATE	
DRN.		13-04-22	
CHD.		13-04-22	
APPD.		13-04-22	
REV		R2	



SECTION - AA

SECTION - CC



LIST OF REFERENCE DRAWINGS			
SL. NO	DRAWING NO.	DRAWING TITLE	AGENCY
1	9993-109-PVM--F-020	PLANT LAYOUT FOR FGD SYSTEM	PEM/BAP
2	9993-109-PVM--F-047	FLOW DIAGRAM OF LIME STONE AND GYPSUM HANDLING PLAN	PEM/VENDOR
3	9993-109-PVM-B-354	GA OF CONVEYOR GBC 1A/1B	PEM/VENDOR
4	PE-VO-468-167-A003	GA DRAWING OF PRIMARY HYDRO CYCLONE FEED TANK	PEM/VENDOR
5	PE-VO-468-167-A003	GA DRAWING OF FILTERATE WATER TANK	PEM/VENDOR
6	PE-VO-468-167-A003	GA DRAWING OF SECONDARY HYDRO CYCLONE FEED TANK	PEM/VENDOR
7	PE-VO-468-167-A003	GA DRAWING OF WASTE WATER TANK	PEM/VENDOR
8	PE-VO-468-167-A003	GA DRAWING OF BELT FILTER WASH TANKS	PEM/VENDOR
9	PE-VO-468-167-A003	GA DRAWING OF CAKE WASH (CLARIFIED WATER) TANK	PEM/VENDOR

FOR TYPICAL ARRANGEMENT OF DISCHARGE CHUTE

Notes:

- All Dimensions are in millimeters and elevations in meters.
- EL 0.0m corresponds to RL +294.9M
- This Drawings is tentative considering not-to-exceed loads. Civil drawing shall be prepared accordingly.
- Gypsum Dewatering System supplier to take of the not to exceed loads of their scope of supply.
- Seal pit dimension (*) shall be furnished by the bidder.
- Gypsum Dewatering System Supplier shall confirm the capacity and layout for handling equipments.
- Details of staircase, suitable doors, windows etc. shall be considered by Civil Designer.
- Floor openings, pipe crossings shall be finalized during detailed engineering.
- Building dimensions (building width, length and floor levels) are firm. Floor Plans shown in drawing may slightly vary as per the system requirement and shall be finalized during detail engineering.

OWNER/PROJECT:		NSPCL BHILAI EXPANSION POWER PROJECT	
PACKAGE VENDOR:		NSPCL BHILAI (2X250MW) - FGD SYSTEM PACKAGE	
TITLE:		GA OF GFW BUILDING	
STATUS OF DRG.: FOR APPROVAL		NTPC DWG. NO.: 9993-109-PYM-B-048	
SCALE: 1		BHEL JOB NO.: PE-DG-468-571-A001	
SHEET NO.: 02 OF 02		REV: R1	
DATE: 26-11-21		DATE: 26-11-21	
BY: R1		BY: R1	
CHKD: R1		CHKD: R1	
APPD: R1		APPD: R1	
KAI DWG. NO.:		KAI REL. NO.:	

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

G

H

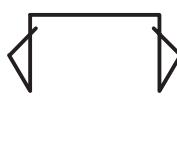
SYMBOLS FOR VALVE OPERATION

SYMBOLS	NAME
	FAILURE OPEN (THE VALVE OPENS WHEN AIR OR ELECTRICITY FOR ACTUATOR FAILS.)
	FAILURE CLOSE (THE VALVE CLOSSES WHEN AIR OR ELECTRICITY FOR ACTUATOR FAILS.)

INSULATION SYMBOLS

SYMBOLS	DESCRIPTION
H10	THERMAL INSULATION (100°C & LOWER)
H15	THERMAL INSULATION (101°C ~ 150°C)
H20	THERMAL INSULATION (151°C ~ 200°C)
H25	THERMAL INSULATION (201°C ~ 250°C)
H30	THERMAL INSULATION (251°C ~ 300°C)
H35	THERMAL INSULATION (301°C ~ 350°C)
HF	INSULATION FOR ANTI FREEZING
ET	ELECTRIC TRACE
ST	STEAM TRACE (LOW PRESSURE STEAM)
P10	PERSONAL PROTECTION (100°C & LOWER)
P15	PERSONAL PROTECTION (101°C ~ 150°C)
P20	PERSONAL PROTECTION (151°C ~ 200°C)
P25	PERSONAL PROTECTION (201°C ~ 250°C)
P30	PERSONAL PROTECTION (251°C ~ 300°C)
P35	PERSONAL PROTECTION (350°C ~ 400°C)

DELIVERY LIMITS

SYMBOLS	NAME
	BETWEEN NTPC AND CONTRACTOR BETWEEN SUB CONTRACTOR AND VENDOR

SYSTEM

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

FLUID NAME

FLUID SYMBOL	FLUID NAME	FLUID SYMBOL	FLUID NAME
AC	COMPRESSED AIR	WCS	COOLING WATER SUPPLY
AF	FLUIDIZER AIR	WCR	COOLING WATER RETURN
AI	INSTRUMENT AIR	WD	DRINKING WATER
AO	OXIDATION AIR	WP	PROCESS WATER
AS	SEAL AIR	WR	RAW WATER
DD	DUCT DRAIN	WC	Ca(OH)2 WATER
FS	FILTRATE SLURRY	WW	WASTE WATER
GS	GYPSUM SLURRY	VG	VACUUM PUMP VENT
LS	LIMESTONE SLURRY	VBG	BELT FILTER VENT GAS
		LD	LIME/LIMESTONE DEDUSTING
		LOL	LUBE OIL (LOW PRESSURE)
		LOH	LUBE OIL (HIGH PRESSURE)
		CW	CLARIFIED WATER

SERVICE CLASS

SERVICE CLASS	MATERIAL	FLUID SYMBOL
AA40	IIR RUBBER UNED PIPING	LS, WP, WC
AA60	IIR RUBBER UNED PIPING	GS,FS,WW,DD
BA01	Gr.304 STAINLESS STEEL PIPING	AI, LOL
BA02	Gr.304 STAINLESS STEEL PIPING	LOH
BA03	Gr.316L STAINLESS STEEL PIPING	WP, AO
CA01	CARBON STEEL GENERAL PIPING	AS, AO, AC, AF, LD
CC01	CARBON STEEL PRESSURE PIPING	WP, WR, WCS, WCR, V6, AA, CW
DA60	FRP PIPING (PIPE DIA UPTO 250 NB)	GS,FS,WW,DD
DA40	FRP PIPING (PIPE DIA UPTO 250 NB)	LS, WP, WC

UNIT CODE

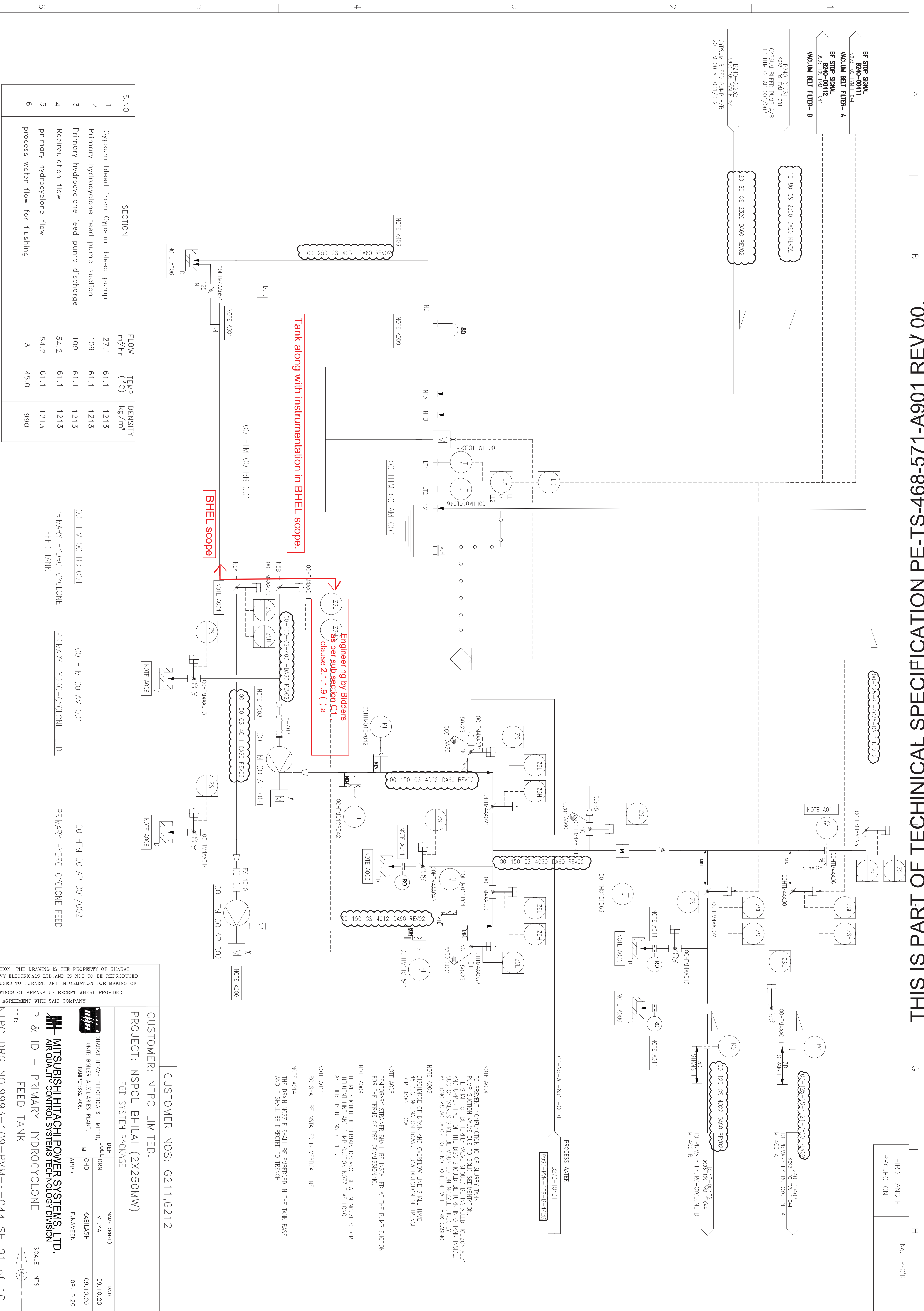
SYMBOLS	UNIT IDENTIFICATION
00	COMMON
10	UNIT-1 FGD SYSTEM AND AUXILIARIES
20	UNIT-2 FGD SYSTEM AND AUXILIARIES

EXPRESSION OF PIPING LINE



CUSTOMER NOS: G211 & G212

CUSTOMER: NTPC LIMITED. PROJECT: BHILAI (2X250MW) FCD SYSTEM PACKAGE			
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 CONSTRUCTION BY SAID COMPANY.		P & ID - LEGENDS AND NOTES	
TITLE:		SCALE : NTS	
NTPC DRG NO: ----		SH 01 of 02	
BHEL DRG NO		REV NO	
B240 - 00100		02	



A

B

C

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THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-F-15-109A-REV 00.

THIRD ANGLE
PROJECTION

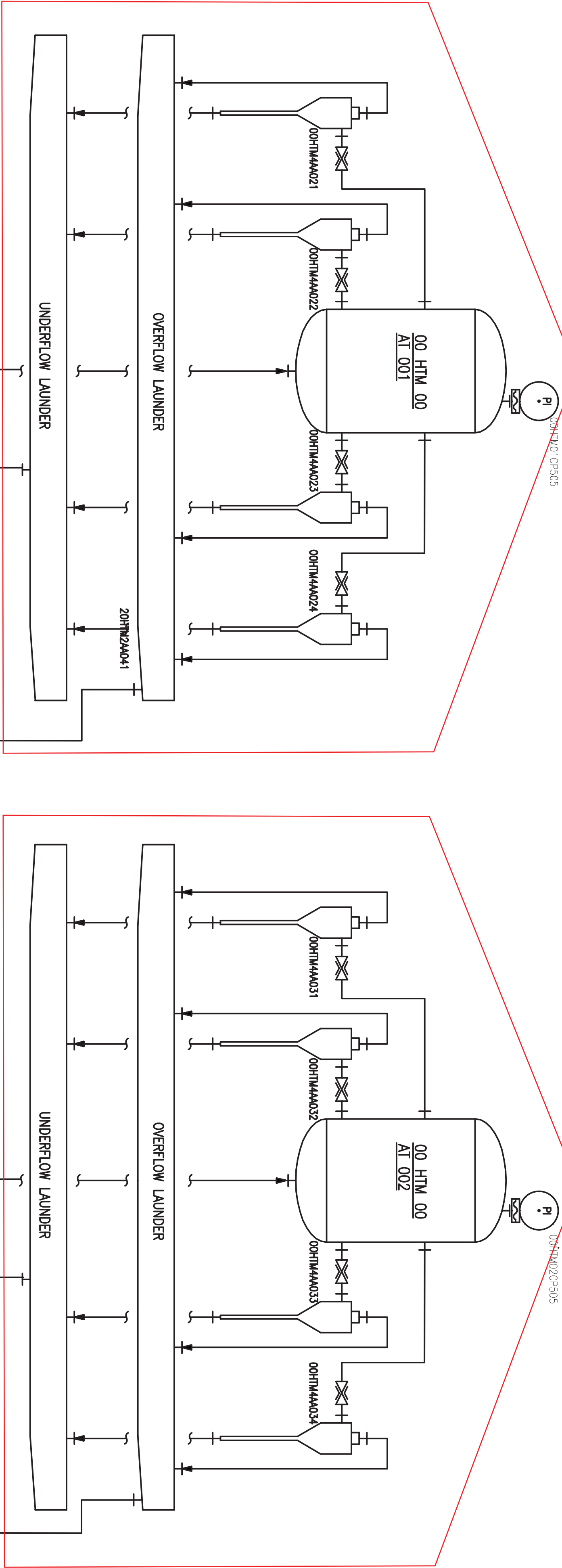
No. REQ'D

A3

Drawing No.

In Bidder scope
including U/F &O/F
Launders

In Bidder scope
including U/F &O/F
Launders



Engg & Supply by Bidder

Engineering by Bidder as
per sub section C1,
Clause 2.1.1.9 (i)a

Engg & Supply by Bidder

Engineering by Bidder as
per sub section C1,
Clause 2.1.1.9 (i)b

Engg & Supply by Bidder

Engineering by Bidder as
per sub section C1,
Clause 2.1.1.9 (i)a

Engg & Supply by Bidder

Engineering by Bidder as
per sub section C1,
Clause 2.1.1.9 (i)b

Engineering & supply by
Bidder as
per sub section C1,
Clause 2.1.1.9 (i)a

Engineering & supply by
Bidder as
per sub section C1,
Clause 2.1.1.9 (i)a

FROM PRIMARY HYDROCYCLONE FEED PUMP
B240-00401
9993-109-FW-F-044

PRIMARY HYDROCYCLONE FEED TANK
00 HTM 00 BB 001

00-125-GS-4022-D460 REV02

00 HTM 00 AT 001/002

PRIMARY HYDROCYCLONE A/B

S NO	SECTION	FLOW m ³ /hr	TEMP (°C)	DENSITY kg/m ³
1	Primary hydrocyclone feed flow	54.2	61.1	1213
2	Primary hydrocyclone underflow	22.9	61.1	1355
3	Primary hydrocyclone overflow	31.3	61.1	1109

CUSTOMER NOS: G211,G212

CUSTOMER: NTPC LIMITED.

PROJECT: NSPCL BHILAI (2X250MW)

FGD SYSTEM PACKAGE

DEPT	NAME (GHE)	DATE
BHARAT HEAVY ELECTRICALS LIMITED	VIDYA	09.10.20
UNIT: BOILER AUXILIARIES PLANT,	KABULASH	09.10.20
NUMBER: 406.	P. NAVEEN	09.10.20

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

P & ID - PRIMARY HYDROCYCLONE

SCALE : NTS

NTPC DRG NO.9993-109-PVM-F-044 SH 02 of 10

BHEL DRG NO
3-FW-000-02069

FILE NO
B240-00402

REV NO
03

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.

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THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-168-579-A-100REV 00.

S NO	SECTION	FLOW m ³ /hr	TEMP(C)	DENSITY kg/m ³
1	Gypsum slurry line to belt filter	22.9	61.1	1355
2	Gypsum outlet from belt filter to gypsum handling system	15.4	55.6	900
3	Filtrate water from vacuum receiver to filtrate water tank	10.6	54.3	998
4	Vacuum pump flow	LATER	LATER	LATER
5	Seal water to vacuum pump	11.4	45.0	990
6	Seal water return	11.4	45.0	990

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

NOTE A402
BRD SCREEN SHALL BE INSTALLED.

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

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 OBLOUQUELY.

NOTE :
PIPE SIZE ARE TENTATIVE.
PIPE SIZE WILL BE CONFIRMED AFTER VENDOR FINALISATION.

Complete system in Bidder Scope EXCEPT:
1. Piping with accessories from filtrate extraction pump to filtrate water tank. Refer scheme No. PE-FEP-00.
2.Associated drain of Vacuum Belt Filter (drip tray) to filtrate tanks.
Refer sub section C1, clause 2.1.1.9 (ii) f of the specification.

CUSTOMER NOS: G211,G212

CUSTOMER: NTPC LIMITED.
PROJECT: NSPCL BHILAI (2X250MW)
FGD SYSTEM PACKAGE



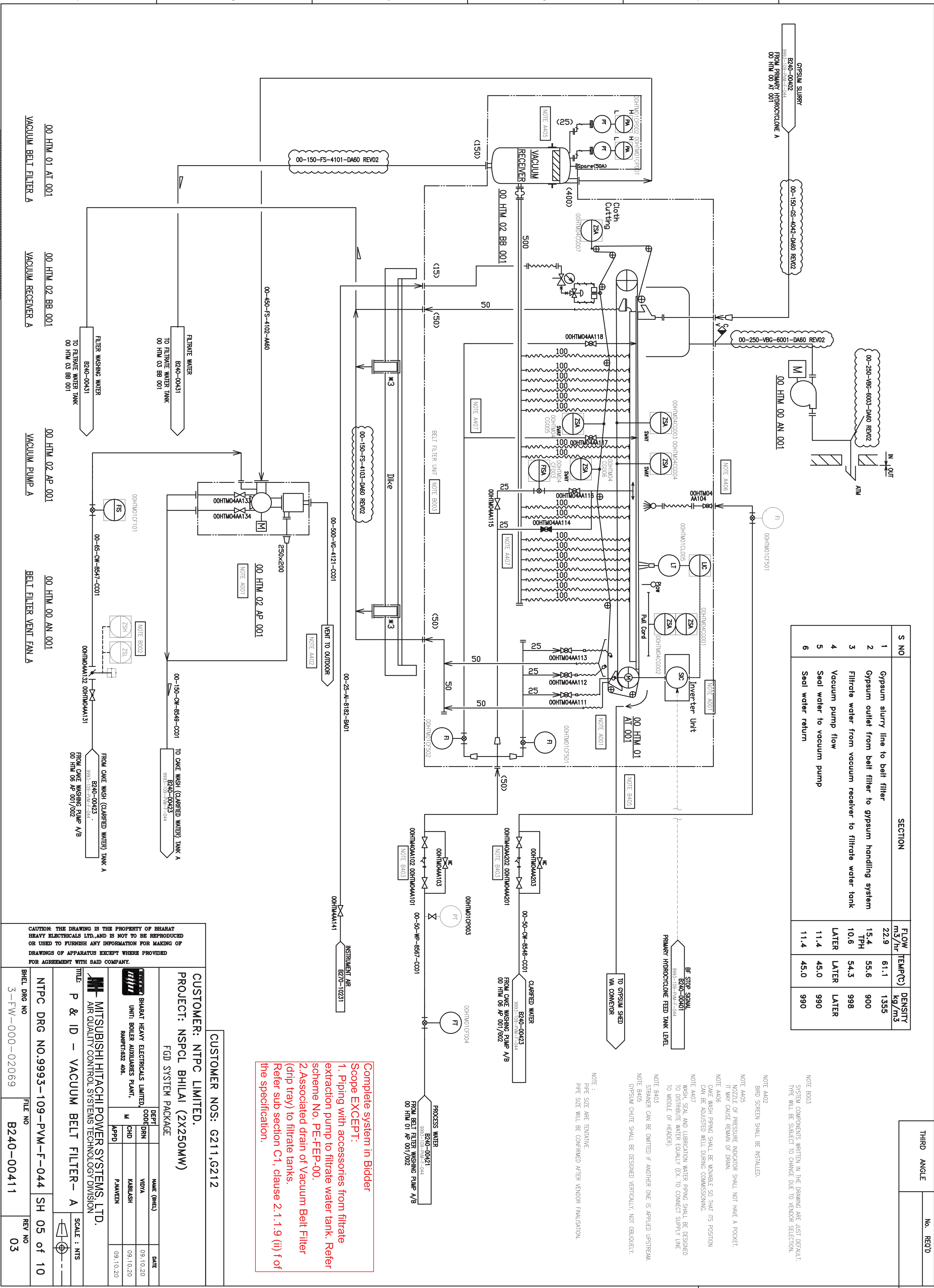
MITSUBISHI HITACHI POWER SYSTEMS, LTD.
AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION

SCALE : NTS

SH 05 of 10

FILE NO B240-00411

REV NO 03



0 1 2 3 4 5 6 7 8 9 10

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S NO	SECTION	FLOW m ³ /hr	TEMP(°C)	DENSITY kg/m ³
1	Gypsum slurry line to belt filter	22.9	61.1	1355
2	Gypsum outlet from belt filter to gypsum handling system	15.4 TPH	55.6	900
3	Filtrate water from vacuum receiver to filtrate water tank	10.6	54.3	998
4	Vacuum pump flow	LATER	LATER	LATER
5	Seal water to vacuum pump	11.4	45.0	990
6	Seal water return	11.4	45.0	990

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

NOTE B003

NOTE A402
BIRD SCREEN SHALL BE INSTALLED.

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

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

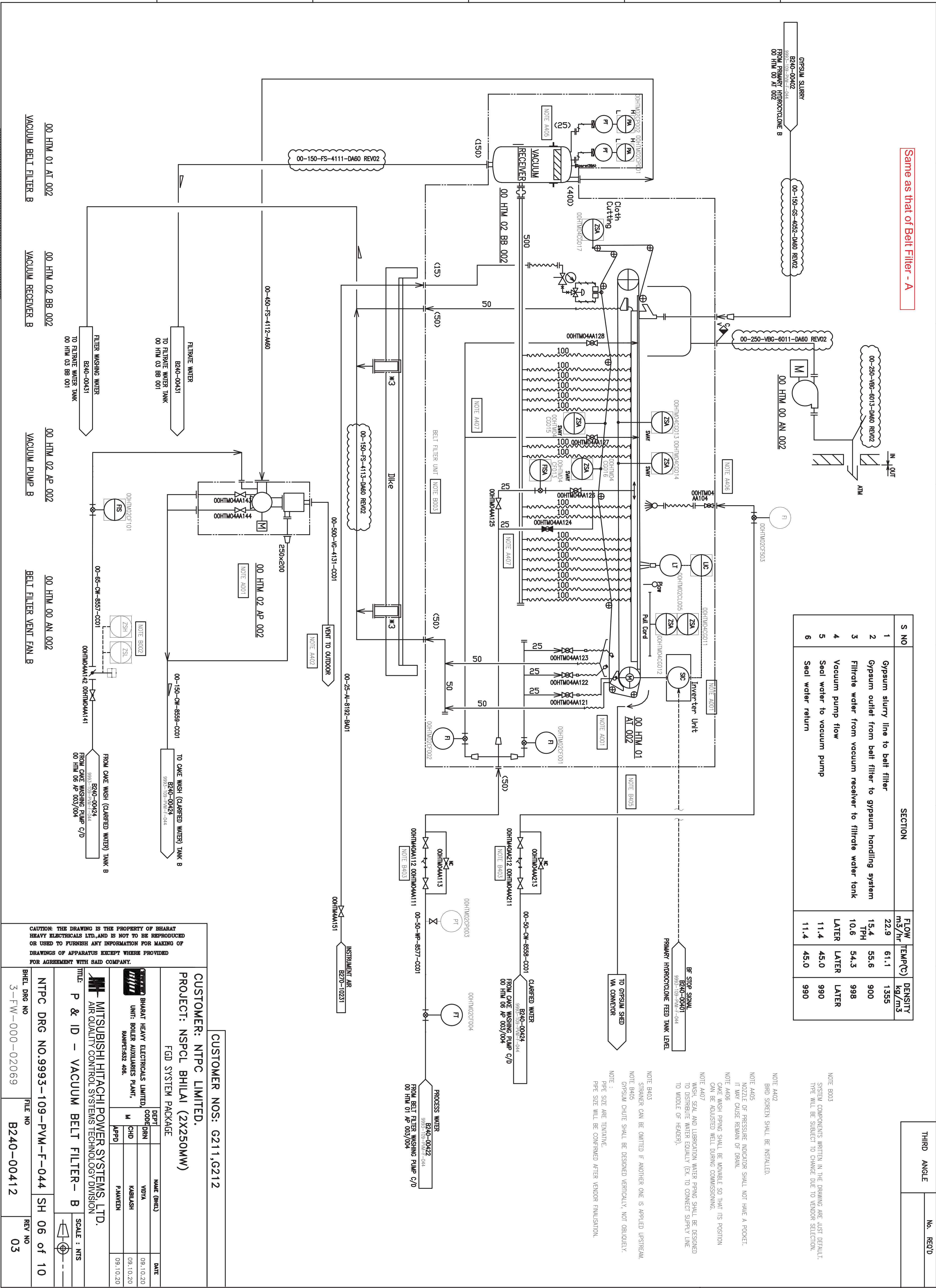
WASH, SEAL AND LUBRICATION WATER PIPING SHALL BE DESIGNED TO DISTRIBUTE WATER EQUALLY (EX. TO CONNECT SUPPLY LINE TO MIDDLE OF HEADER).

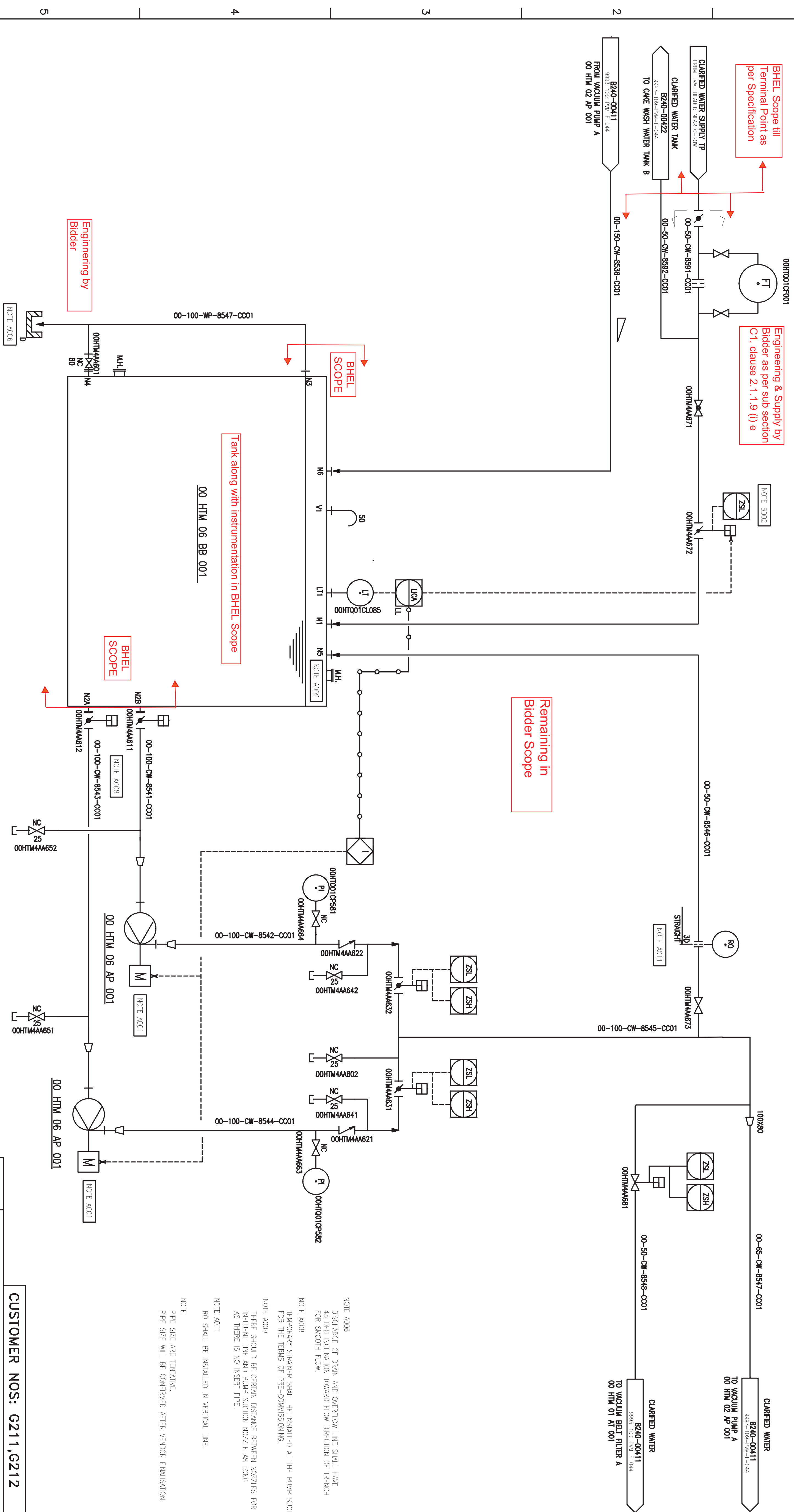
NOTE B403

STRAINER CAN BE OMITTED IF ANOTHER ONE IS APPLIED UPSTREAM.
NOTE B405

GYP SUM

PIPE SIZE ARE TENTATIVE.
PIPE SIZE WILL BE CONFIRMED AFTER VENDOR FINALISATION.





S NO	SECTION	FLOW m ³ /hr	TEMP(C)	DENSITY kg/m ³
1	Clarified water to clarified wash tank	5.72	45.0	990
2	At the suction of clarified wash pump	25	45.0	990
3	At the discharge of clarified wash pump	25	45.0	990
4	Clarified Wash water to belt filter	5.72	45.0	990
5	Vacuum pump seal water	11.4	45.0	990

00 HTM 06 BB 001

CAKE WASH (CLARIFIED WATER) TANK A

00 HTM 06 AP 001/002

CAKE WASHING PUMP A/E

CUSTOMER NOS: G211,G212

CUSTOMER: NTPC LIMITED.

PROJECT: NSPCL BHILAI (2X250MW)

FGD SYSTEM PACK

 BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOILER AUXILIARIES PLANT, RAIPUR-832 408.	DEPT	NAME (SHE)	DATE
	CODE		
	DEN	VIDYA	09.10.20
		KABILASH	09.10.20
M	CHD		09.10.20
APD		P.NAVEEN	09.10.20

MITSUBISHI AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION
HI-ACHII POWER SYSTEMS, LTD.

TITLE: P & ID - VACUUM BELT FILTER

CAKE WASH (CLARIFIED WATER)

CAKE WASH (CLARIFIED WATER)

NTBC DBC NO 0003-100-BVM-E-0144

[illegible]

3-FW-000-02069

B240-00423

03

RO SHALL BE INSTALLED IN VERTICAL LINE

AS THERE IS NO INSERT PIPE

IN LINE AND LOW LOCATION NOZZLE NO LONGER
AS THERE IS NO INSERT PIPE.

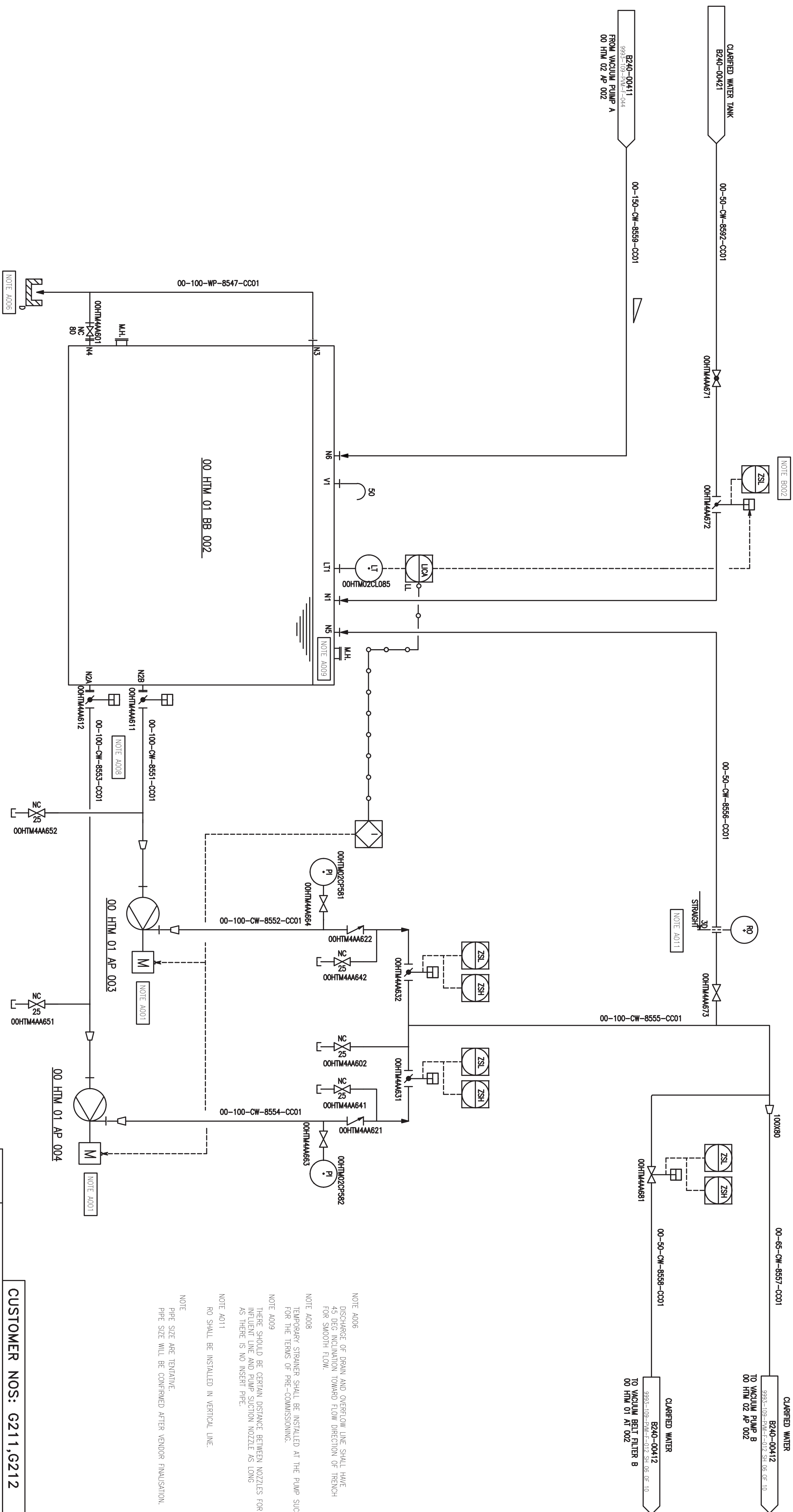
THERE SHOULD BE CERTAIN DISTANCE BETWEEN NOZZLES FOR INTELLIGENT LINE AND PUMP SUCTION NOZZLE AS LONG

FOR THE TERMS OF PRE-COMMISSIONING.

NOTE A006
DISCHARGE OF DRAIN AND OVERFLOW LINE SHALL HAVE
45 DEG INCINATION TOWARD FLOW DIRECTION OF TRENCH
FOR SMOOTH FLOW.

NOTE
PIPE SIZE ARE TENTATIVE.
PIPE SIZE WILL BE CONFIRMED AFTER VENDOR FINALISATION

Same Scope as that of Cake Wash Tank-A



S NO	SECTION	FLOW m ³ /hr	TEMP(°C)	DENSITY kg/m ³
1	Clarified water to clarified wash tank	5.72	45.0	990
2	At the suction of clarified wash pump	25	45.0	990
3	At the discharge of clarified wash pump	25	45.0	990
4	Clarified Wash water to belt filter	5.72	45.0	990
5	Vacuum pump seal water	11.4	45.0	990

00 HTM 01 BB 002

CAKE WASH (CLARIFIED WATER) TANK B

00 HTM 01 AP 003/004

CAKE WASHING PUMP C/D

RO SHALL BE INSTALLED IN VERTICAL LINE.

NOTE
PIPE SIZE ARE TENTATIVE.
PIPE SIZE WILL BE CONFIRMED AFTER VENDOR FINALISATION.

THERE SHOULD BE CERTAIN DISTANCE BETWEEN NOZZLES FOR
INFLUENT LINE AND PUMP SUCTION NOZZLE AS LONG
AS THERE IS NO INSERT PIPE.

TEMPORARY STRAINER SHALL BE INSTALLED AT THE PUMP SUCTION
FOR THE TERMS OF PRE-COMMISSIONING.

NOTE A009

45 DEGREE INCLINATION TOWARD FLOW DIRECTION OF TRENCH
FOR SMOOTH FLOW.

NOTE A008

NOTE A006
DISCHARGE OF DRAIN AND OVERFLOW LINE SHALL HAVE

CUSTOMER NOS: G211,G212

CUSTOMER: NTPC LIMITED.
PROJECT: NSPCL BHILAI (2X250MW)

FGD SYSTEM PACKAGE

BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOLLER AUXILIARIES PLANT, RAJNAGAR-652 406.				
DEPT		NAME (BHEL)	DATE	
CODE	BDN	VIDYA	09.10.20	
	CHD	KABIRASH	09.10.20	
	APPD	P.NAYEEN	09.10.20	

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

SCALE : NTS

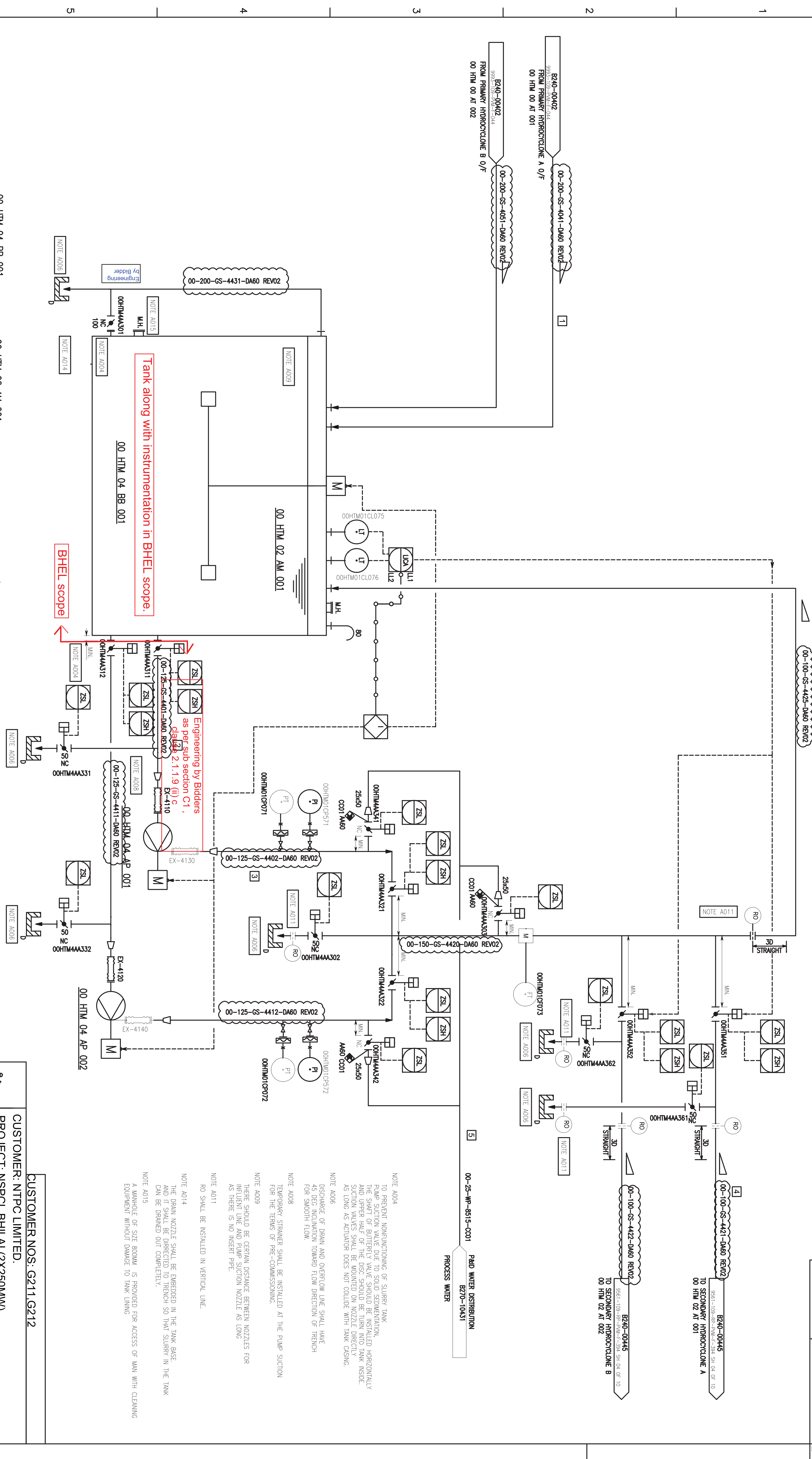
DATE WHEN (SEEKED FOR) TAKEN

NIPC DRG NO. 9993-109-FVM-f-044

Z-EW-000-02069

B240-00423

03



S NO	SECTION	FLOW m ³ /hr	TEMP (°C)	DENSITY kg/m ³
1	Primary hydrocyclone overflow	31.32	61.1	1109
2	Secondary hydrocyclone feed pump suction	63	61.1	1109
3	Secondary hydrocyclone feed pump discharge	63	61.1	1109
4	Secondary hydrocyclone flow	31.32	61.1	1109
5	Process water flow for flushing	3	45.0	990

CUSTOMER: NTPC LIMITED. PROJECT: NSPCL BHILAI (2X250MW) FID SYSTEM PACKAGE									
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.									
RECEIVED BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOILER AUXILIARIES PLANT, RANIPET-552 406.		DATE		NAME (BHEL)		DATE			
M		CODE/ORN		VIDYA		09.10.20			
APPD		CHD		KABULASH		09.10.20			
				P. JAYEEN		09.10.20			
MITSUBISHI HITACHI POWER SYSTEMS, LTD. AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION									
P & ID - SECONDARY HYDROCYCLONE									
FEED TANK									
SCALE: NTS									
NTPC DRG NO. 9993-109-PVM-F-044									
SH 03 of 10									
BHEL DRG NO									
3-FW-000-02069									
FILE NO									
B240-00441									
REV NO									
03									

A

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C

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THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-F-175-A1901 REV 00.

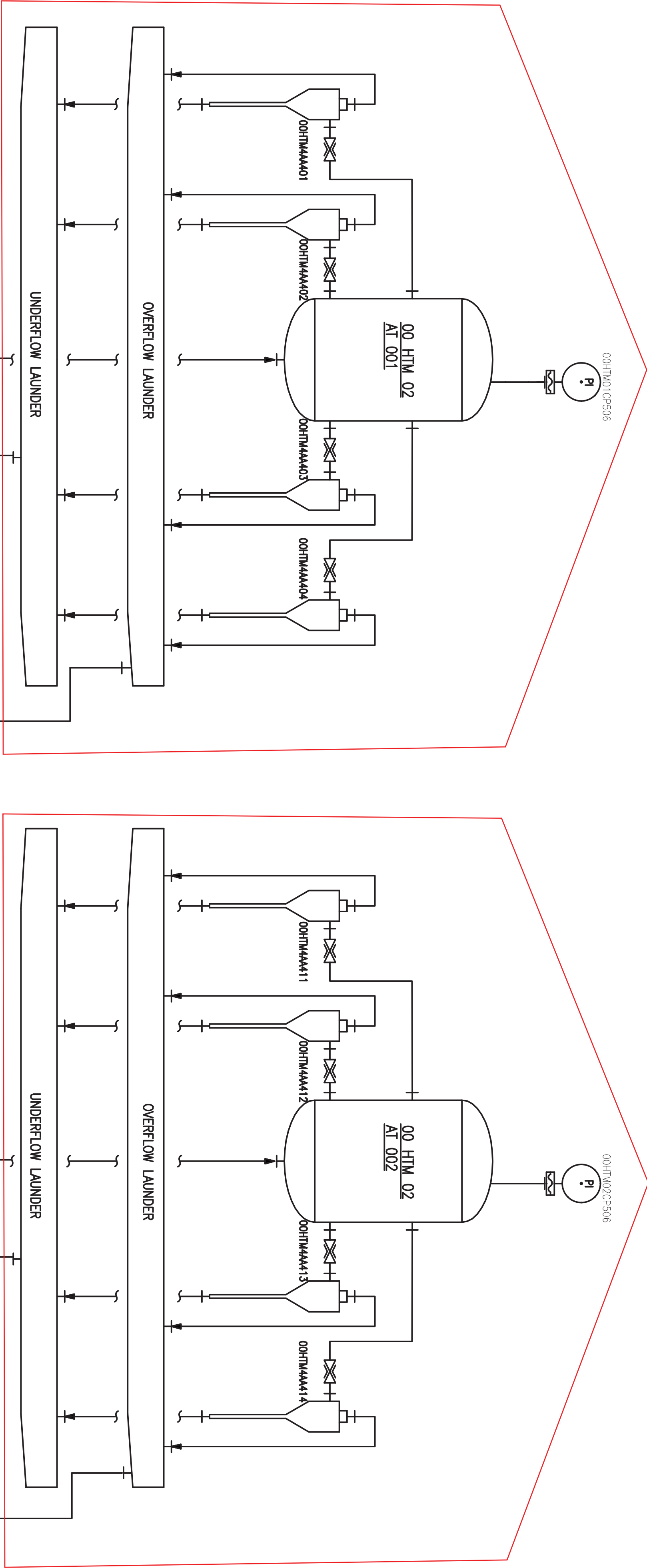
THIRD ANGLE PROJECTION	No. REQ'D
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A3

Drawing No.

In Bidder Scope including U/F & O/F Launderers

In Bidder Scope including U/F & O/F Launderers



Engg & Supply by Bidder

Engineering by Bidder as per sub section C1, clause 2.1.1.9 (ii) e

B240-00441
FROM SECONDARY WASTE WATER HYDROCYCLONE FEED TANK PUMP A/B
00 HTM 04 AP 001/002

00-100-GS-4421-DM60 REV02

Engineering by Bidder as per sub section C1, clause 2.1.1.9 (ii) e

Engg & Supply by Bidder

B240-00451
TO WASTE WATER STORAGE TANK
00 HTM 05 BB 001

4

Engineering by Bidder as per sub section C1, clause 2.1.1.9 (ii) d

2

00-100-GS-4442-DM60 REV02

B240-00431
TO FILTRATE WATER TANK
00 HTM 03 BB 001

B240-00441
FROM SECONDARY WASTE WATER HYDROCYCLONE FEED TANK PUMP A/B
00 HTM 04 AP 001/002

00-100-GS-4422-DM60 REV02

5

CONFIDENTIAL & PROPRIETARY INFORMATION

CUSTOMER NOS: G211,G212

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	31.3	61.1	1109
2	Secondary hydrocyclone underflow	11.7	61.1	1267
3	Secondary hydrocyclone overflow	19.6	61.1	1020

6

CUSTOMER: NTPC LIMITED.
PROJECT: NSPCL BHILAI (2X250MW)
FGD SYSTEM PACKAGE

BHARAT HEAVY ELECTRICALS LIMITED,
UNIT: BOILER AUXILIARIES PLANT,
RAIPUR, INDIA

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

P & ID - SECONDARY HYDROCYCLONE

NTPC DRG NO.9993-109-PVM-F-044

SH 04 of 10

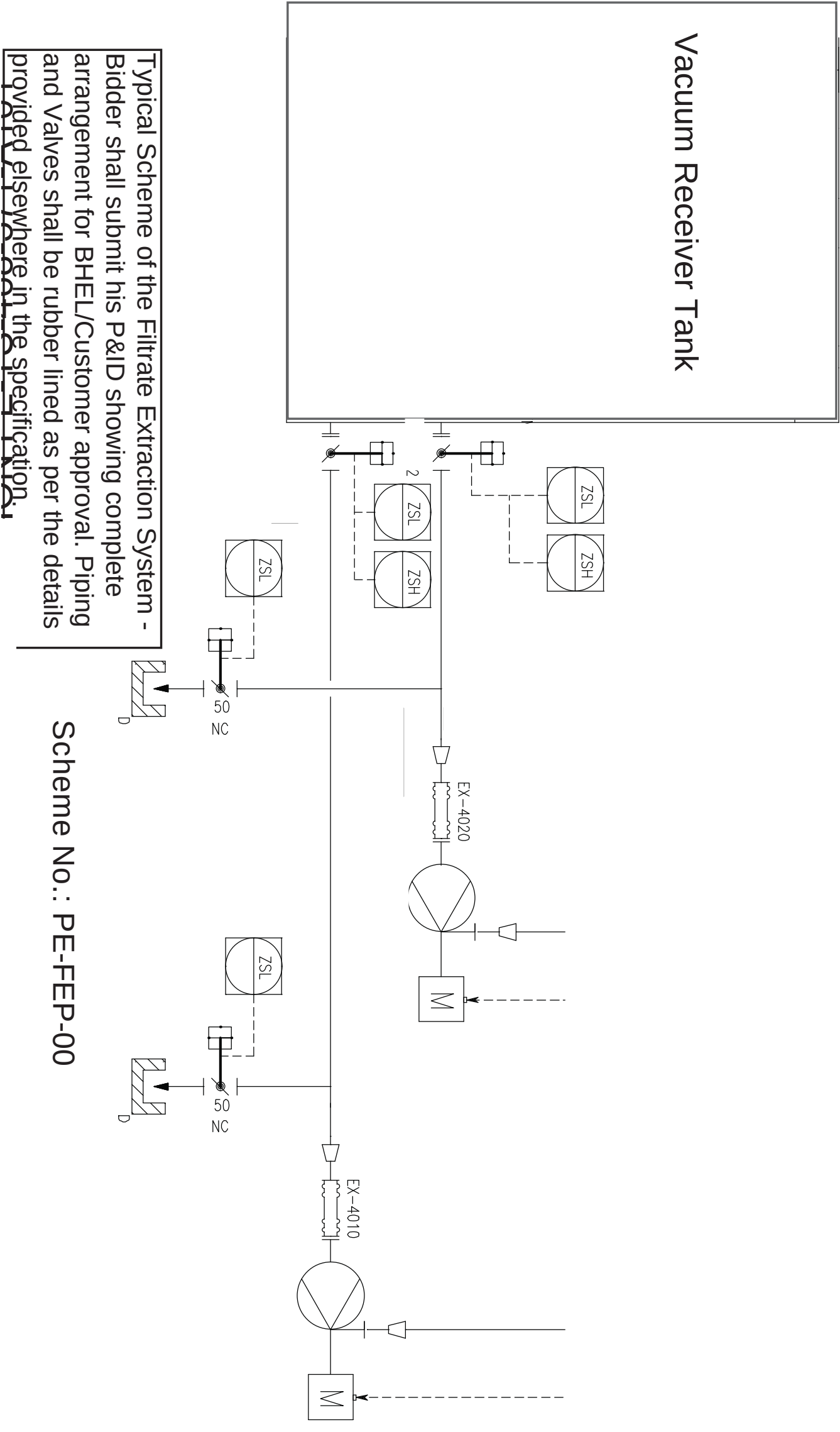
BHEL DRG NO
3-FW-000-02069

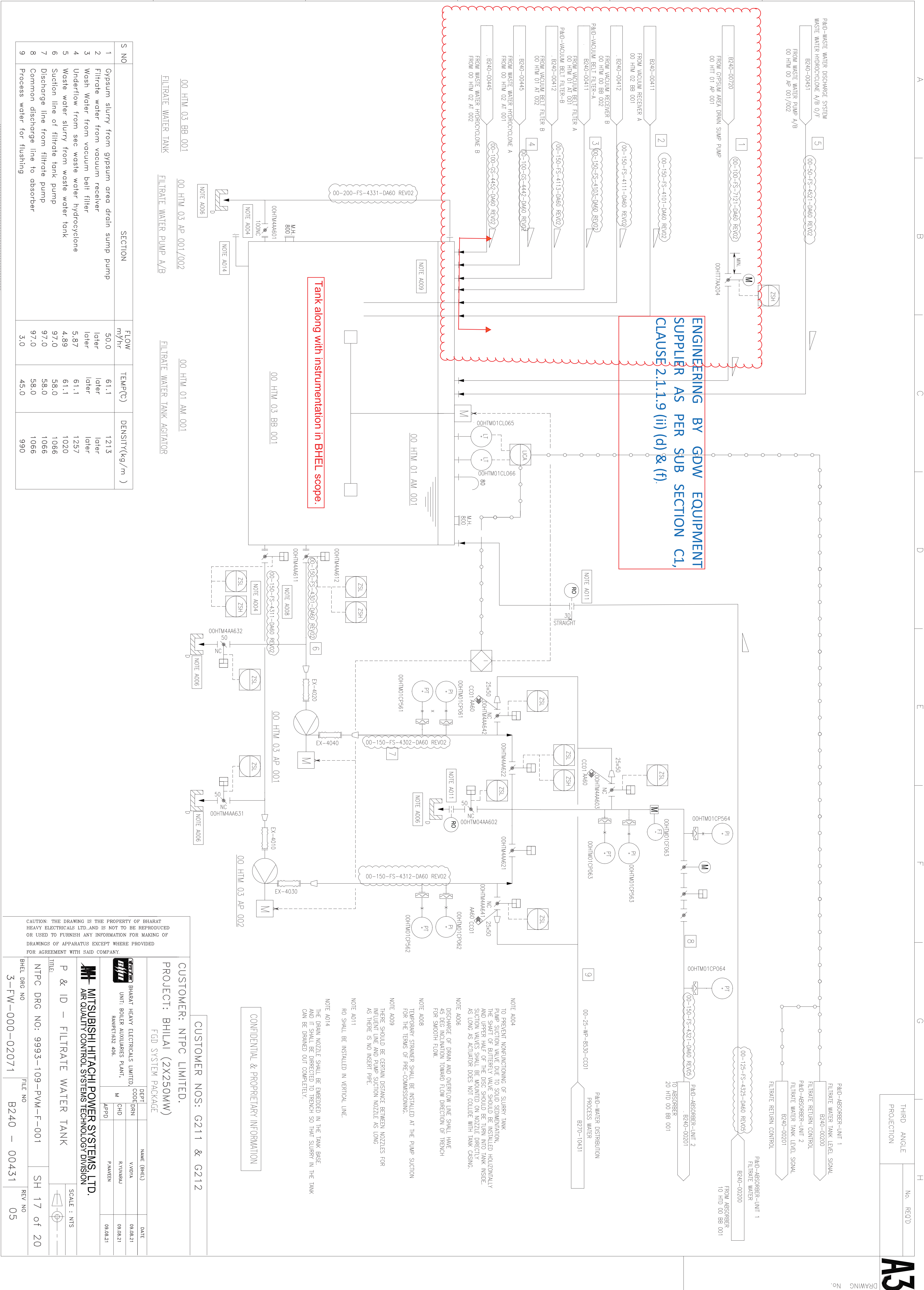
FILE NO
B240-00445

REV NO
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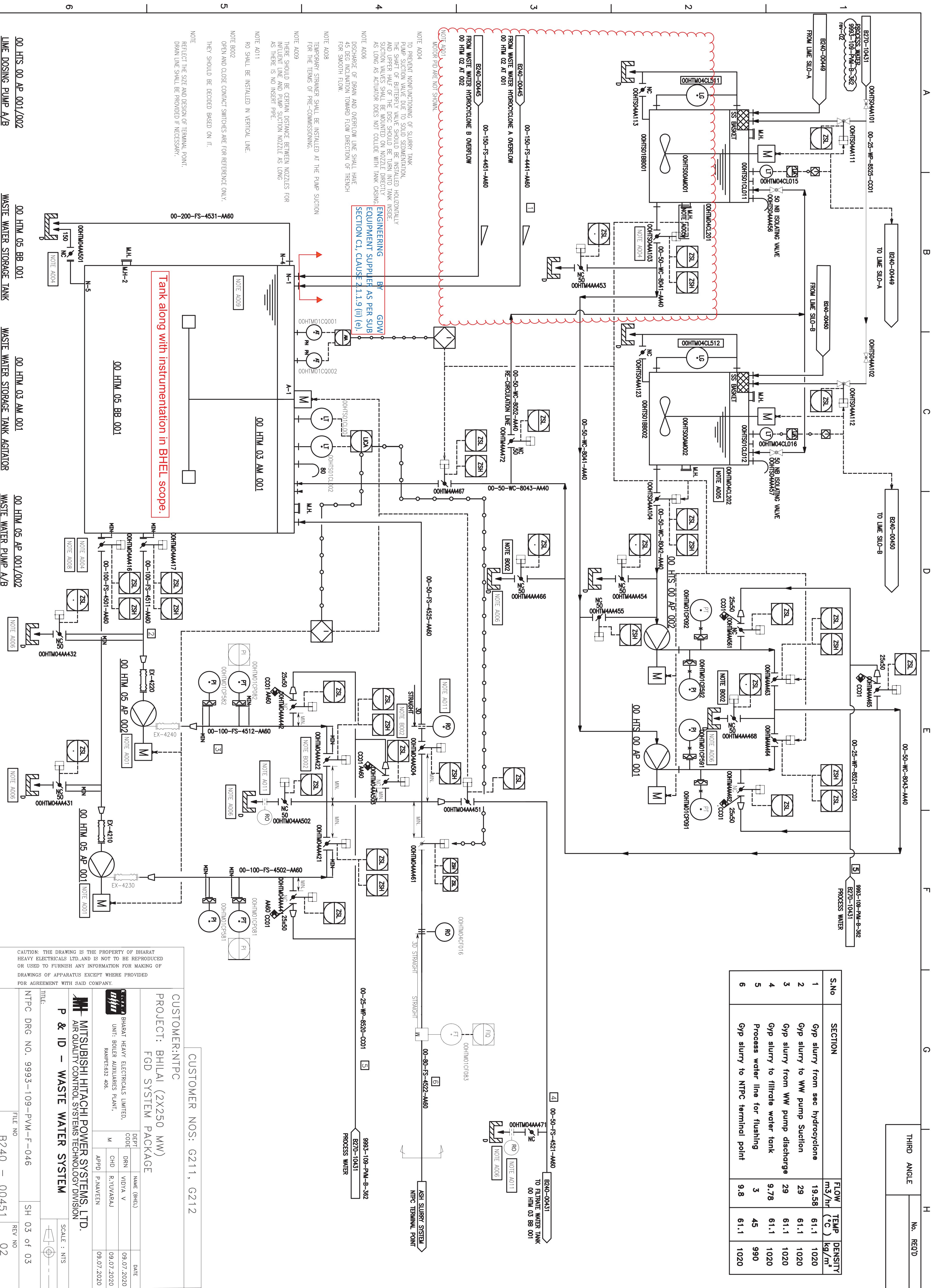
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Bidder scope after the Pump Discharge is limited to the Engineering of the Piping up to the Filtrate Water Tank as per Clause 2.1.1.9 (ii) f of Sub-section C1, Section-I of this specification.





G		H	
S.No	SECTION	THIRD ANGLE	No. REQD
1	Gyp slurry from sec hydrocyclone		
2	Gyp slurry to WW pump Suction		
3	Gyp slurry from WW pump discharge		
4	Gyp slurry to filtrate water tank		
5	Process water line for flushing		
6	Gyp slurry to NTPC terminal point		



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.

 BHAT HEAVY ELECTRICALS LIMITED. UNIT: BOLLER AUXILIARIES PLANT, RAIPUR-332 408.		CUSTOMER: NTPC PROJECT: BHILAI (2X250 MW) FGD SYSTEM PACKAGE	
DEPT	NAME (BHEL)	DATE	
CODE	DEN	09.07.2020	
M	VIDYA V	09.07.2020	
	R.VIVARANU	09.07.2020	
APPO	PAVANEN	09.07.2020	

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

P & ID - WASTE WATER SYSTEM

SCALE : NTS

NTPC DRG NO. 9993-109-PVM-F-046

03 of 03

B240

02

	NSPCL BHILAI (2X250 MW)		SPECIFICATION No: PE-TS-468-571-A901	
	GYPSUM DEWATERING EQUIPMENT		SECTION : I	
	technical SPECIFICATION		SUB-SECTION : D	
	MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION		REV. 00	
			SHEET 1 OF 6	

SECTION-I

SUB-SECTION-D

ANNEXURE-V

MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.

	NSPCL BHILAI (2X250 MW) GYPSUM DEWATERING EQUIPMENT technical SPECIFICATION MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION	SPECIFICATION No: PE-TS-468-571-A901	
		SECTION : I	
		SUB-SECTION : D	
		REV. 00	
		SHEET 2 OF 6	

Drawings/Drawings to be submitted by the bidder

SN	Doc / Drawing No.	Drawing Title	Remarks		No. of weeks from LOB
			Type*		
1	PE-V0-468-571-A901	Sub-Vendor List of Components for GDE.	Primary	Basic Engineering drawings/ Documents (Primary drawings/ documents)	10
2	PE-V0-468-571-A902	Manufacturing Quality plan of GDE	Primary		10
3	PE-V0-468-571-A903	P & I Diagram with Bill of quantity (BOQ) of GDE.	Primary		10
4	PE-V0-468-571-A904	Control Philosophy of GDE.	Primary		10
5	PE-V0-468-571-A905	Design Philosophy of complete GDE.	Primary		10
6	PE-V0-468-571-A906	General Arrangement Drawing of Gypsum Dewatering Equipment (Showing layout of all the equipments of GDE in the building)	Primary		10
7	PE-V0-468-571-A907	Sizing calculations of (a) VBF, (b) Vacuum Receiver, (c) Vacuum Pump, (d) Belt Wash Pump, (e) Cake wash Pumps, (f) Drives and (g) other Accessories for GDE.	Primary		10
8	PE-V0-468-571-A908	General Arrangement Drawings of VBF including cross-sectional details, foundation plan and load details.	Primary		10
9	PE-V0-468-571-A909	Datasheet of Vacuum Belt Filter & all accessories of GDE.	Primary		10
10	PE-V0-468-571-A910	Piping Layout (Integral-Vendor Scope) with supports & fixing arrangement with BOQ for GDE.	Primary		10
11	PE-V0-468-571-A911	Piping Layout (Non Integral - BHEL Scope) with supports & fixing arrangement with BOQ for GDE.	Primary		10
12	PE-V0-468-571-A912	Instrument schedule along with GA & Data sheet for GDE.	Secondary		
13	PE-V0-468-571-A913	Data Sheet of Instruments of GDE	Secondary		
14	PE-V0-468-571-A914	Valve schedule for GDE.	Secondary		
15	PE-V0-468-571-A915	GA & Data sheet of Valves for GDE.	Secondary		

		NSPCL BHILAI (2X250 MW) GYPSUM DEWATERING EQUIPMENT technical SPECIFICATION MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION		SPECIFICATION No: PE-TS-468-571-A901		
				SECTION : I		
				SUB-SECTION : D		
				REV. 00		
				SHEET 3 OF 6		
16	PE-V0-468-571-A916	Piping Isometric (Integral-Vendor Scope) with supports & fixing arrangement with BOQ for GDE.	Secondary		THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-468-571-A901 REV 00.	
17	PE-V0-468-571-A917	Piping Isometric (Non Integral - BHEL Scope) with supports & fixing arrangement with BOQ for GDE.	Secondary			
18	PE-V0-468-571-A918	Block logic diagram & Inter-Connection drawing of GDE.	Secondary			
19	PE-V0-468-571-A919	General Arrangement Drawings of (a) Vacuum Pump, (b) Vacuum Receiver, (c) Hydrocyclones (Primary & Secondary), (d) Belt Wash Pump, (e) Cake Wash Pump & (f) Vent Fan, along with cross sectional details, foundation plan and loading details.	Secondary			
20	PE-V0-468-571-A920	Cable Schedule of GDE.	Secondary			
21	PE-V0-468-571-A921	Electrical load List for GDE.	Secondary			
22	PE-V0-468-571-A922	Local Panel Control Circuit Diagram of GDE.	Secondary			
23	PE-V0-468-571-A923	General Arrangement Drawing & Data sheet of Motors for GDE.	Secondary			
24	PE-V0-468-571-A924	T-S & Performance curves of Vacuum Pump for GDE.	Secondary			
25	PE-V0-468-571-A925	I/O List (Drives & Instruments) of GDE.	Secondary			
26	PE-V0-468-571-A926	Utility Consumption of GDE.	Secondary			
27	PE-V0-468-571-A927	Schedule for Lubrication and other Consumables.	Secondary			
28	PE-V0-468-571-A928	Painting Schedule of GDE	Secondary			
29	PE-V0-468-571-A929	Bill of Material (BOM) of complete GDE for Main Supply	Secondary			
30	PE-V0-468-571-A930	Mandatory Spare List & BBU of GDE	Secondary			
31	PE-V0-468-571-A931	Platform Drawing of GDE with detailed BOQ	Secondary			
32	PE-V0-468-571-A932	Overall space and headroom requirement with details of handling during Erection, operation & maintenance of the equipments of GDE	Secondary			

	NSPCL BHILAI (2X250 MW) GYPSUM DEWATERING EQUIPMENT technical SPECIFICATION MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION	SPECIFICATION No: PE-TS-468-571-A901	
		SECTION : I	
		SUB-SECTION : D	
		REV. 00	
		SHEET 4 OF 6	

33	PE-V0-468-571-A933	Erection & Commissioning Manual of GDE including- i. Installation and assembly procedure of complete GDE ii. Pre-Commissioning Check List of GDE	Secondary		PE-TS-468-571-A901 REV 00.
34	PE-V0-468-571-A934	Operation & Maintenance (O&M) Manual of GDE including Transportation and Storage Specification for GDE Components	Secondary		
35	PE-V0-468-571-A935	Schedule of Start-up & Commissioning Spares for GDE	Secondary		
36	PE-V0-468-571-A936	List of Special tools & Tackles for GDE	Secondary		
37	PE-V0-468-571-A937	Monthly Progress Report for GDE	Secondary		
38	PE-V0-468-571-A938	Packing List for complete GDE	Secondary		
39	PE-V0-468-571-A939	Performance Test Procedure of GDE	Secondary		

*Manufacturing Clearance to be given to the Vendor based on approval of 'Primary' Drawings.

*Secondary drawings are to be submitted within 2-3 weeks after approval of relevant primary drawings.

Notes:

1. The above drawing list is tentative and shall be finalized with the successful bidder after placement of order. While some of the drawings indicated above may not be applicable, some additional drawings may also be required based on scope of work.
2. Drawings shall be prepared in Auto-Cad/3D Modelling software latest edition, as applicable. Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified elsewhere in the specification.
3. Only manual calculation with authentic supporting literature (e.g. extracts of hand Book/ standard/codes) shall be acceptable. All design calculations and drawings shall be in SI system only.
4. All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.:

THIS IS PART OF TECHNICAL SPECIFICATION

	NSPCL BHILAI (2X250 MW) GYPSUM DEWATERING EQUIPMENT technical SPECIFICATION MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION	SPECIFICATION No: PE-TS-468-571-A901	
		SECTION : I	
		SUB-SECTION : D	
		REV. 00	
		SHEET 5 OF 6	

a) All drawings and documents shall indicate the list of all reference drawings including General Arrangement.

b) All drawings shall include / show plan, elevation, side view, cross-section, skin section, blow-up view; all major self-manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.

c) Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names.

d) All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

e) Drawings/ documents to be submitted for purchaser's review/ approval shall be under Revision A, B, C... etc. while drawings /documents to be submitted thereafter for customer's approval after purchaser's approval shall be under R-0, 1, 2, 3 etc.

f) Drawings and documents not covered above but required to check safety of machines/ equipment/ system, shall be submitted during detailed engineering stage without any commercial implication.

g) All drawings shall include "B.O.M" and indicate quantity, material of construction, make along with IS/BS No., Technical parameters, dimensions, hardness, machining symbol and tolerance, requirement of radiography and hydraulic tests, painting details, elevation, side view, plan, skin section and blow-up view for clarity.

h) All drawings shall be prepared as per BHEL's title block and shall bear BHEL's drawing No. Documents marked for submission to BHEL's Customer shall also bear BHEL's Customer's drawing No.

i) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

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j) Bidder to follow the following the drawing submission schedule:

- 1st submission of drawings from date of LOI as per the submission schedule.
- Every revised submission incorporating comments – within 7 days.

k) Bidder to submit revised drawings complete in all respects incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder’s account. For any clarification/ discussion required to complete the drawings, the bidder shall depute his personal to BHEL for across the table discussions/ finalizations/ submissions of drawings.

l) Supply time period specified in the NIT under the title “Delivery Schedule” shall be reduced by the time period equivalent to the delay attributable in submission/ Re-submission of drawing/documents beyond stipulated time frame.

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