
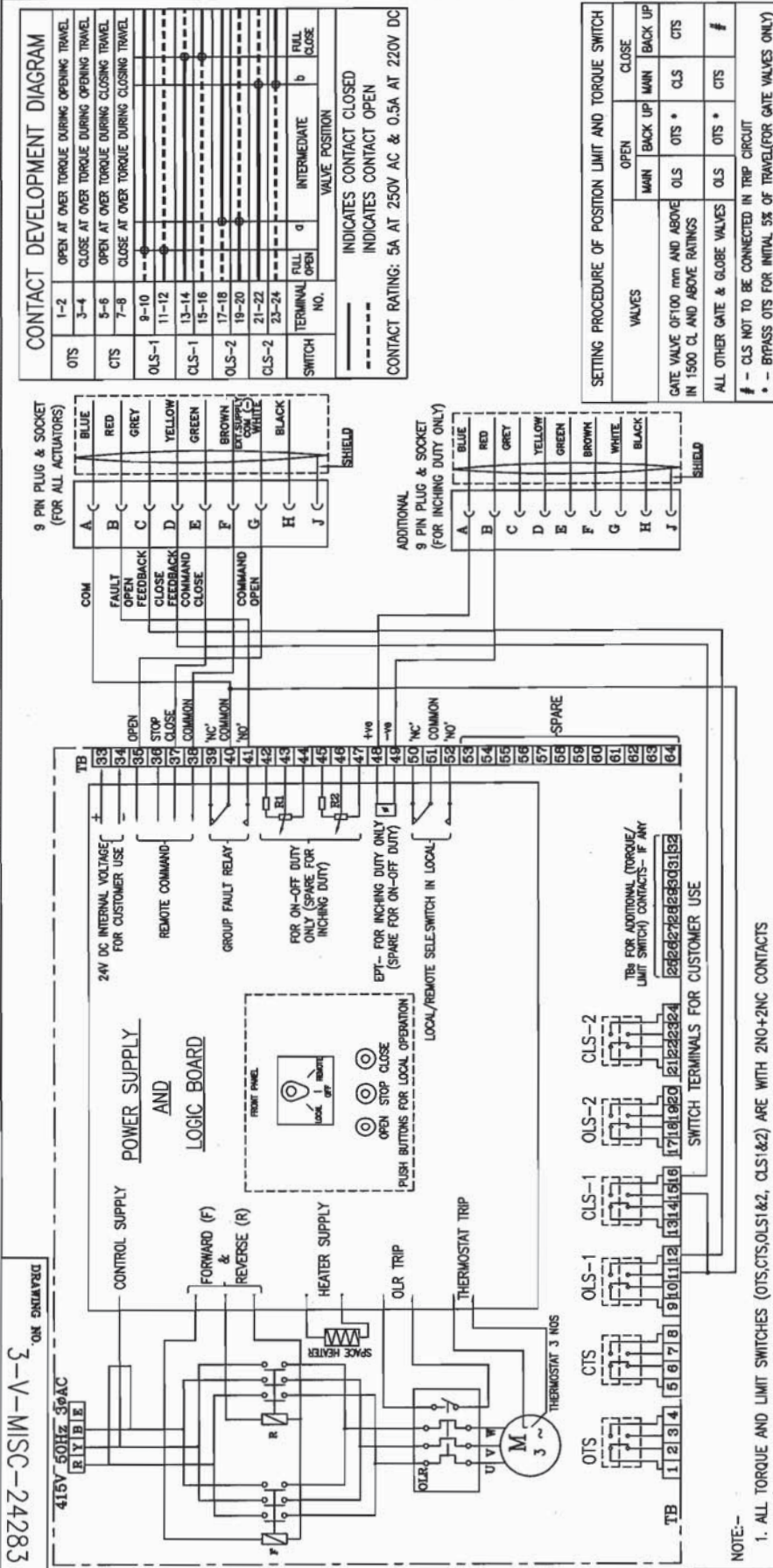


748360/2022/PS-PEM-MAX

FORM NO. PEM-6666-0		SPECIFICATION FOR MOTORISED VALVE ACTUATOR			
		REV. NO.	01	DATE:	11.05.2018
		SHEET	4 OF		4
		Data Sheet A & B			
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)		
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY	_____ Kg.		
NOTES:					
<ol style="list-style-type: none"> SCOPE: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY. CODES & STANDARDS: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH: IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691 AND IS-4722 TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C. CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED. THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION. THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE. THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +3% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%. THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING. <p>\$\$ TORQUE SWITCH & LIMIT SWITCH SHALL ACT INDEPENDENT OF EACH OTHER. TANDEM OPERATION IS NOT ACCEPTABLE.</p> <p>## EPOXY PAINT IS RECOMMENDED FOR COASTAL AREAS.</p> <ol style="list-style-type: none"> IT SHALL BE POSSIBLE TO OPERATE THE ACTUATOR LOCALLY. LOCKABLE LOCAL/REMOTE SELECTION SHALL BE PROVIDED ON THE ACTUATOR. POSITION INDICATOR SHALL BE PROVIDED FOR 0 TO 100 % TRAVEL WIRING SHALL BE SUITABLE VOLTAGE GRADE COPPER WIRE. 					
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL	
	Madhav gupta	Mayank kesharwani	Bharat Singh	NAME	
	01.03.02018 01.	03.2018	01.03.2018	SIGNATURE	
DATE					
NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @= TO BE FILLED BY ES					

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.



CONTACT DEVELOPMENT DIAGRAM

OTS	1-2	OPEN AT OVER TORQUE DURING OPENING TRAVEL				
CTS	3-4	CLOSE AT OVER TORQUE DURING OPENING TRAVEL				
	5-6	OPEN AT OVER TORQUE DURING CLOSING TRAVEL				
	7-8	CLOSE AT OVER TORQUE DURING CLOSING TRAVEL				
OLS-1	9-10					
	11-12					
CLS-1	13-14					
	15-16					
OLS-2	17-18					
	19-20					
CLS-2	21-22					
	23-24					
SWITCH NO.	TERMINAL NO.	FULL OPEN	d	INTERMEDIATE	b	FULL CLOSE

INDICATES CONTACT CLOSED
 - - - - - INDICATES CONTACT OPEN
 CONTACT RATING: 5A AT 250V AC & 0.5A AT 220V DC

SETTING PROCEDURE OF POSITION LIMIT AND TORQUE SWITCH

VALVES	OPEN		CLOSE	
	MAIN	BACK UP	MAIN	BACK UP
GATE VALVE OF 100 mm AND ABOVE	OLS	OTS *	CLS	CTS
IN 1500 CL AND ABOVE RATINGS				
ALL OTHER GATE & GLOBE VALVES	OLS	OTS *	CLS	CTS

- CLS NOT TO BE CONNECTED IN TRIP CIRCUIT
 * - BYPASS OTS FOR INITIAL 5% OF TRAVEL (FOR GATE VALVES ONLY)

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT
 ELECTRICAL VALVE ACTUATORS (AC) WITH INTEGRAL STARTERS FOR NTPC PROJECTS
 (DRAWN FOR INTERMEDIATE POSITION OF VALVES)

BHARAT HEAVY ELECTRICALS LTD.
 UNIT: HIGH PRESSURE BOILER PLANT, THERCOPALJAL-680054.

DEPT: 358-121
 SCALE: NTS
 CODE: -
 TITLE: WIRING DIAGRAM (TERMINAL PLAN) FOR ACTUATOR WITH INTEGRAL STARTER WITH PLUG & SOCKET FOR NTPC PROJECTS

REV: DATE: ALTERED: CTD & APPD

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in the interest of any other company.

DRY N.P.ESWAR	SIGN N.P	DATE 17.03.05	NO. OF VAR. 17.03.05
CHED D.DINAKARAN	D.D	17.03.05	
APPD K.ARUNACHALAM	K.A	17.03.05	

REFERENCE INFORMATIONS

CARD CODE	U 01
DRAWING NO.	3-V-MISC-24283
REV	0

Page 6 of 6

- NOTE:-**
- ALL TORQUE AND LIMIT SWITCHES (OTS,CTS,OLS1&2, CLS1&2) ARE WITH 2NO+2NC CONTACTS. ANY SPARE CONTACTS WHICH ARE NOT USED INTERNALLY ARE TO BE TERMINATED IN TBS 25-32.
 - CTS - TORQUE SWITCHES FOR CW ROTATION (CLOSE)
 - OTS - TORQUE SWITCHES FOR CCW ROTATION (OPEN)
 - OLS-1, OLS-2 - LIMITSWITCHES FOR POSITION OPEN
 - CLS-1, CLS-2 - LIMITSWITCHES FOR POSITION CLOSE
 - EPT - ELECTRONIC POSITION TRANSMITTER (CONTACTLESS TYPE, FOR INCHING DUTY)
 - R1-R2-POTENTIOMETER 2 x 100 OHMS (FOR ON-OFF DUTY)
 - FOR COMMANDS & EPT EITHER INTERNALLY GENERATED 24 VDC OR EXTERNAL SUPPLY OF 24VDC CAN BE USED
 - M - MOTOR 3φ 415V 50 Hz AC SUPPLY
 - TORQUE SWITCH BYPASS WITH LIMITSWITCH BOTH ON OPEN & CLOSE DIRECTION TO BE DONE INTERNALLY.

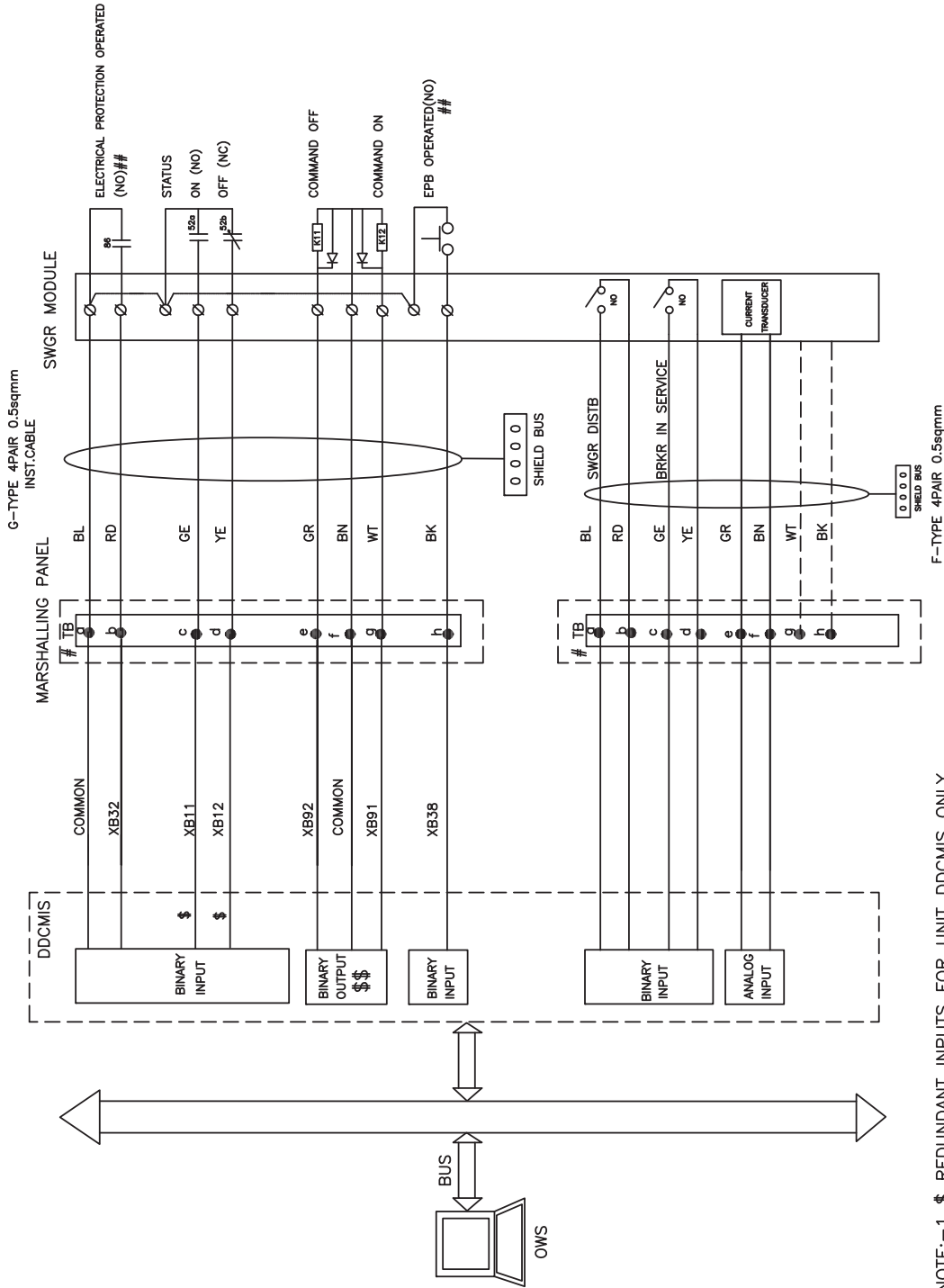


**C&I SPECIFICATION FOR
GYPSUM DEWATERING EQUIPMENT**

SECTION: C4
SUB SECTION: C&I

**SIGNL EXCHANGE BETWEEN DRIVES &
DCS**

DDCMIS INTERFACE WITH HT SWITCH GEAR (HT)



- NOTE: -1 \$ REDUNDANT INPUTS FOR UNIT DDCMIS ONLY
- NOTE: -2 \$\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE
- NOTE: -3 # 8 LEVEL TERMINAL BLOCK
- NOTE: -4 ## DI-SOE SIGNALS FOR UNIT DDCMIS ONLY
- NOTE: -5 CURRENT SIGNAL IS TO BE CONSIDERED IN DDCMIS FROM HT BREAKER FOR FD, ID, PA, MILL MOTORS, CHP HT CONVEYORS, BFP, CEP, HT DRIVES FOR FGD



3X800 MW NTPC PATRATU
STPP PHASE-I

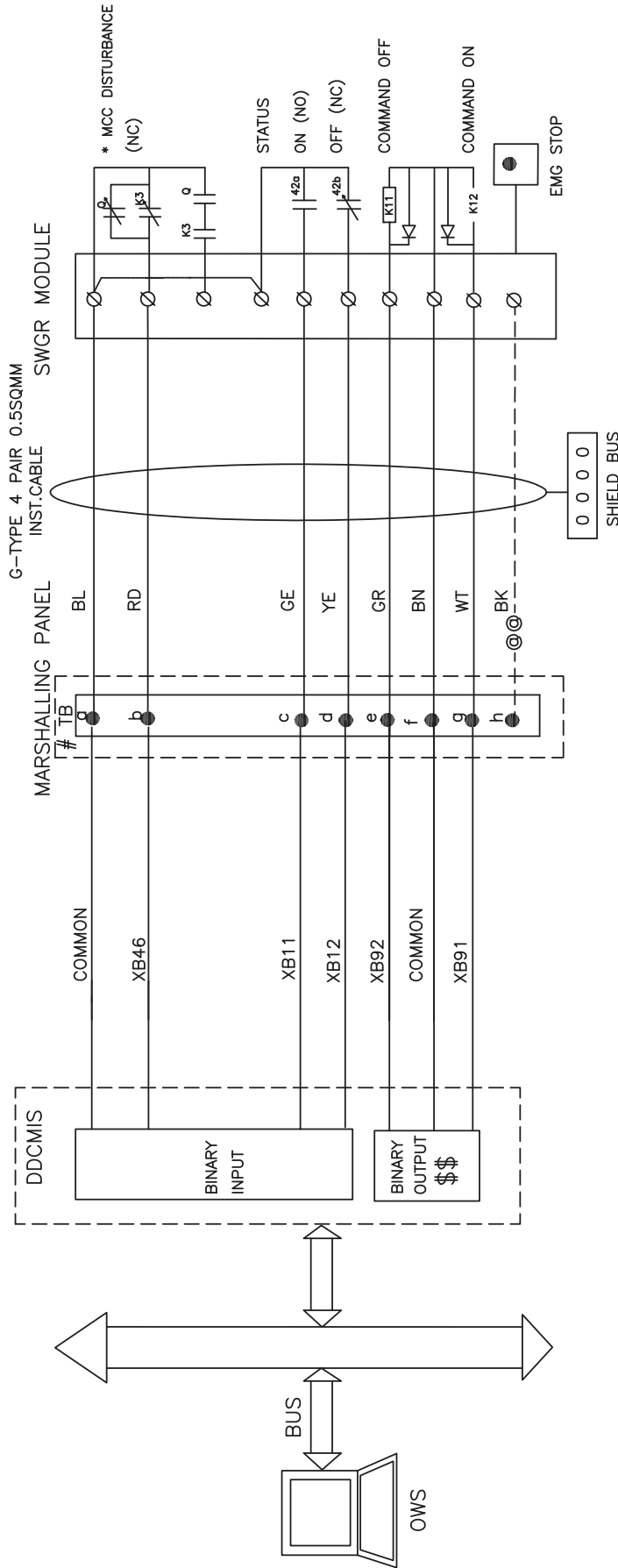
DRG. NO. 9585-001-405-PVI-B-152B

DDCMIS INTERFACE WITH HT SWITCH GEAR(HT)

SH 04 OF 34



DDCMIS INTERFACE WITH LT MCC (LT)

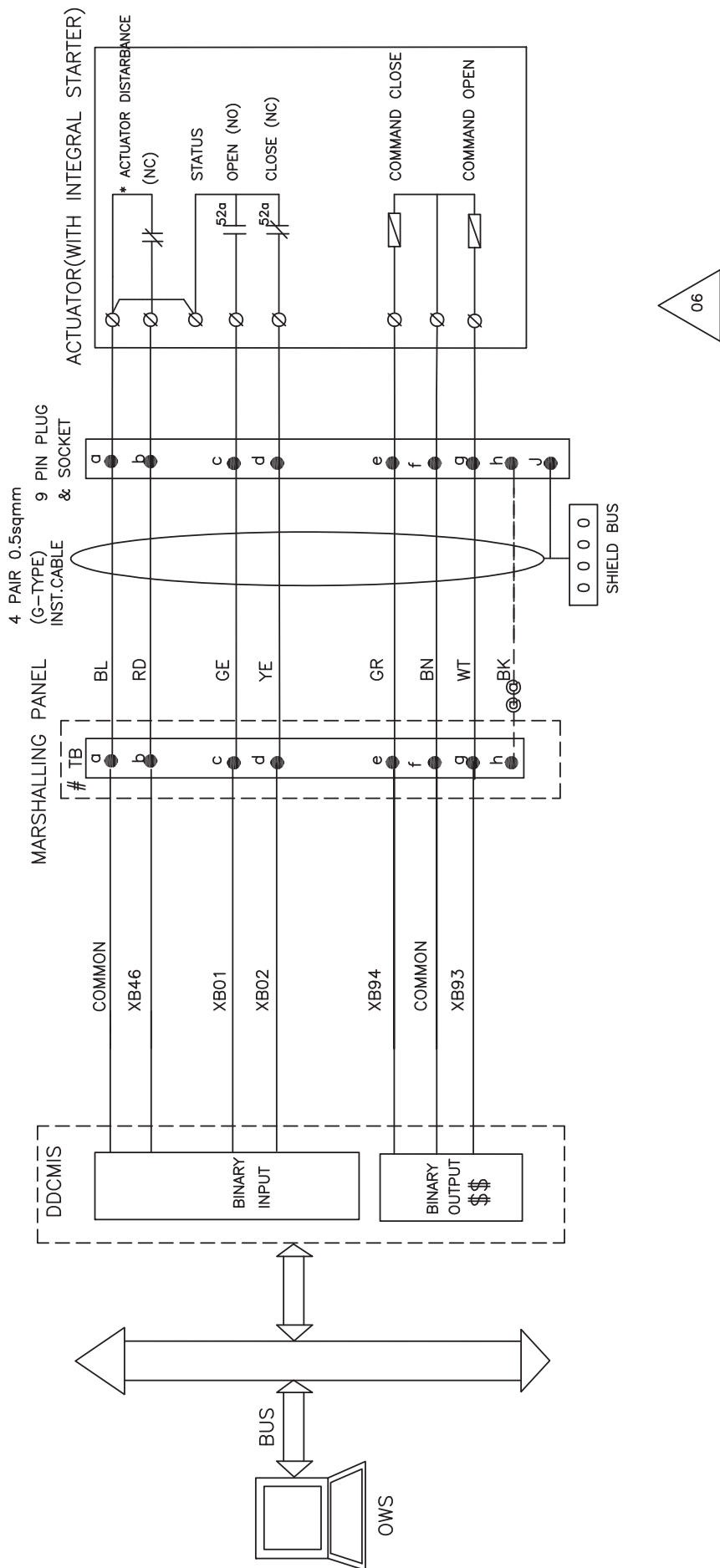


- NOTE:-1 \$\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE
- NOTE:-2 # 8 LEVEL TERMINAL BLOCK
- NOTE:-3 @@ INEACH DDCMIS POST,UNUSED TB'S ARE USED FOR SPARE CORE TERMINATION SEQUENTIALLY.
- NOTE:-4 * MCC DISTURBED= THERMAL O/L OPT/CONT SUPP FAIL/EPB OPTD /DRIVE POWER SUPPLY OFF



3X800 MW NTPC PATRATU STPP PHASE-I	DRG.NO. 9585-001-405-PVI-B-152B
DDCMIS INTERFACE WITH LT MCC (LT)	SHT 05 OF 34

DDCMIS INTERFACE WITH BID/MOV/MOD



NOTE:-1 \$\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE
 NOTE:-2 # 8 LEVEL TERMINAL BLOCK

NOTE:-3 @ @ IN EACH DDCMIS POST, UNUSED TB'S ARE USED FOR SPARE CORE TERMINATION.
 NOTE:-4 * DISTURBANCE=LOSS OF POWER SUPPLY(1PHASE/3PHASE)/LOSS OF CONTROL SUPPLY/MOTOR THERMOSTAT TRIP/THERMAL OVER LOAD/TORQUE SWITCH OPERATED, LOCAL/OFF/REMOTE SWITCH IN LOCAL/OFF POSITION



3XB00 MW NTPC PATRATU STPP PHASE-I

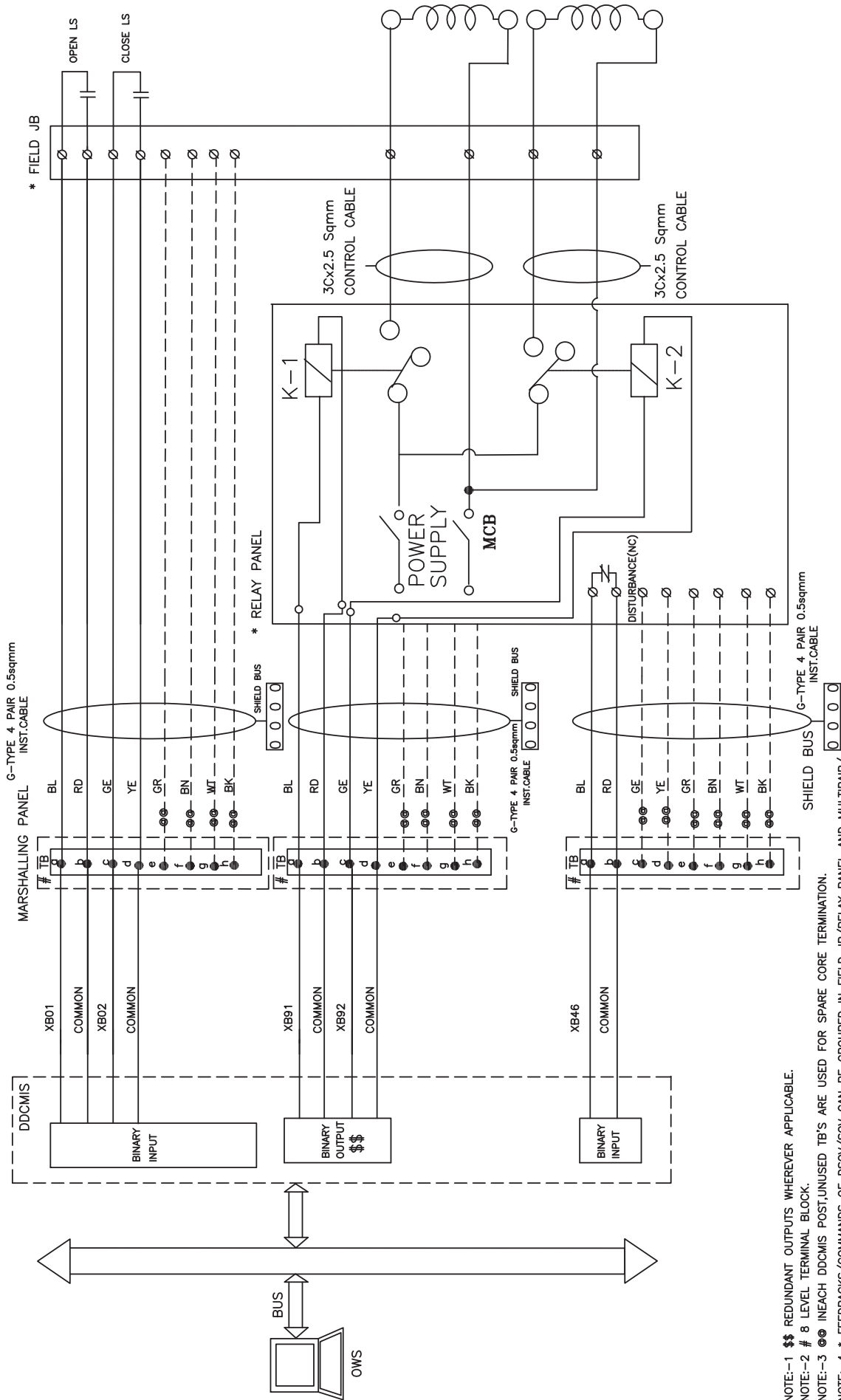
DWG. NO. 9585-001-405-PVI-B-152B

DDCMIS INTERFACE WITH BID

06 OF 26

SHT

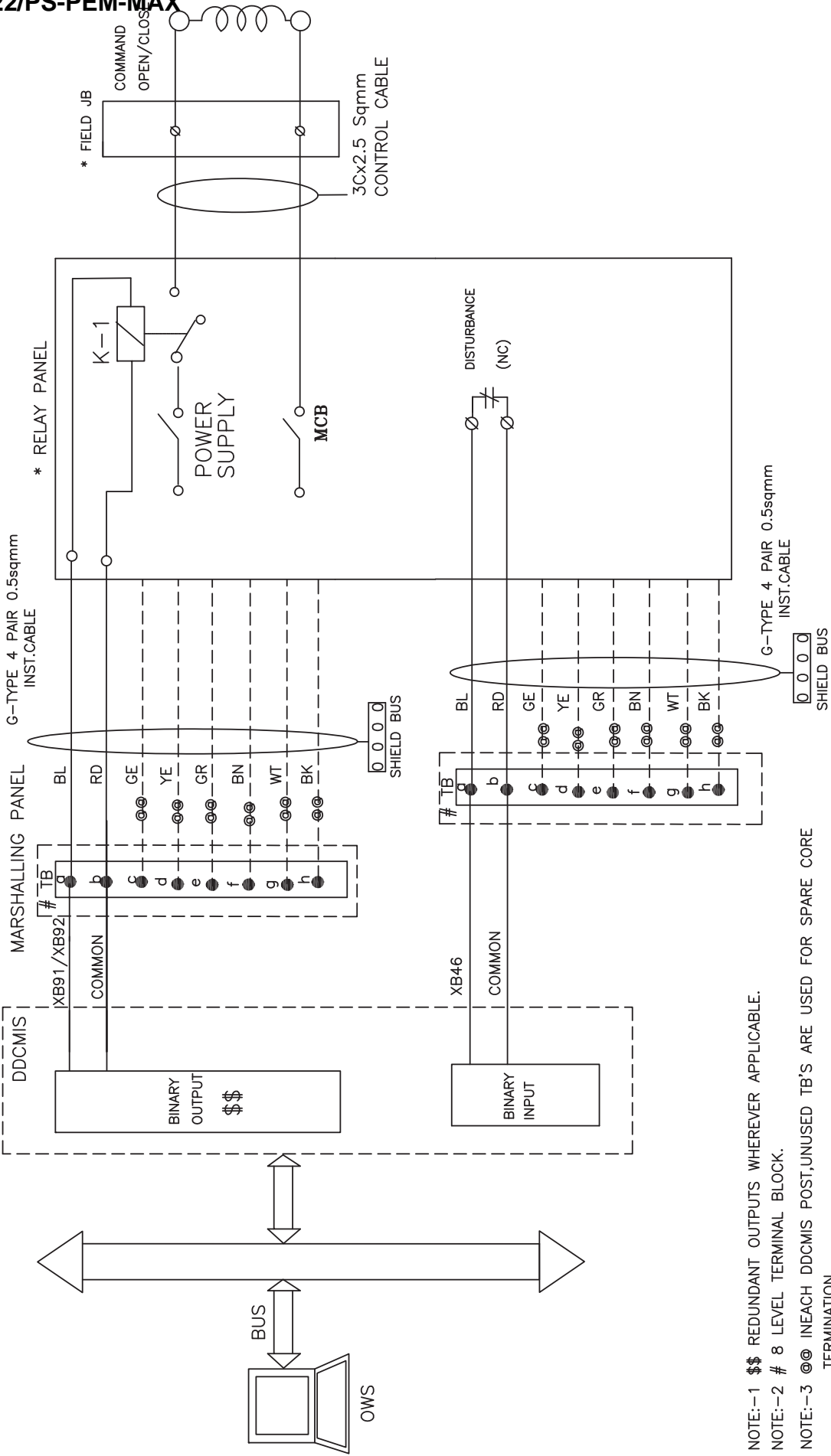
DDCMIS INTERFACE WITH DUAL COIL SOLENOID (DSOV/L)



		3XB00 MW NTPC PATRATU STPP PHASE-1		DRG.NO: 9585-001-405-PVT-B-152B
DDCMIS INTERFACE WITH DUAL COIL SOLENOID (DSOV/L)		SHT	10	OF 34

- NOTE:-1 \$\$\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE.
- NOTE:-2 # 8 LEVEL TERMINAL BLOCK.
- NOTE:-3 ●● INEACH DDCMIS POST,UNUSED TB'S ARE USED FOR SPARE CORE TERMINATION.
- NOTE:-4 * FEEDBACKS/COMMANDS OF DSOV/SOV CAN BE GROUPED IN FIELD JB/RELAY PANEL AND MARSHALLING PANEL.
- MULTICORE CABLE IS TO BE USED FOR GROUPED SIGNALS FROM FIELD JB/RELAYPANEL TO MARSHALLING PANEL.
- NOTE:-5 FOR ON/OFF TYPE,SOLENOID ACTUATED CONTROL VALVE.
- NOTE:-6 TWO INDEPENDENT OUTPUT FROM CONTROL SYSTEM SHALL BE PROVIDED TO PUSH-PULL TYPE VALVES,WITH DUAL COIL SOLENOIDS.

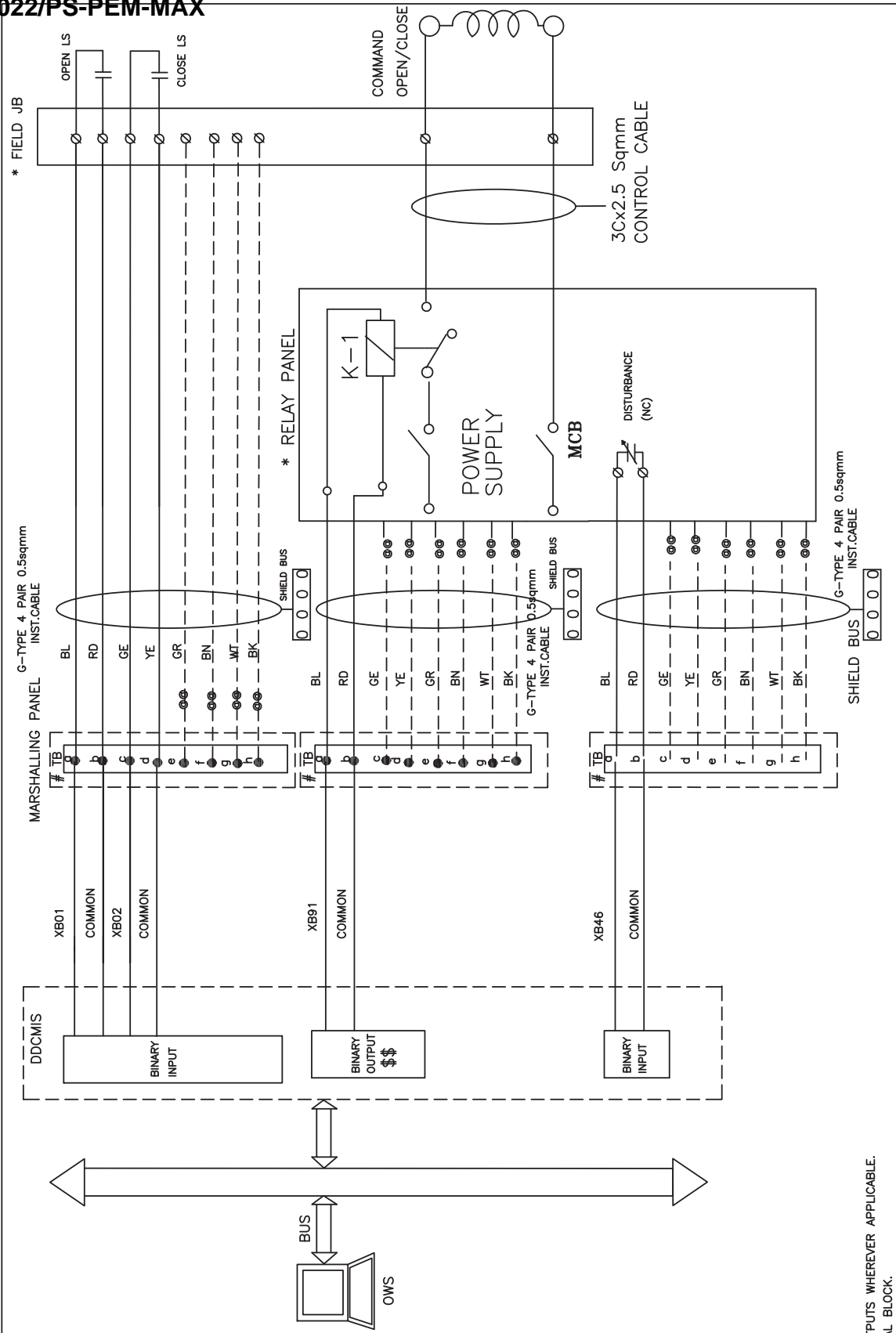
DDCMIS INTERFACE WITH SOV/O/SOV/C(WITH OUT FEEDBACKS)



- NOTE:-1 \$\$\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE.
- NOTE:-2 # 8 LEVEL TERMINAL BLOCK.
- NOTE:-3 @@ INEACH DDCMIS POST,UNUSED TB'S ARE USED FOR SPARE CORE TERMINATION.
- NOTE:-4 * FEEDBACKS/COMMANDS OF DSOV/SOV CAN BE GROUPED IN FIELD JB/RELAY PANEL AND MULTIPAIR/MULTICORE CABLE IS TO BE USED FOR GROUPED SIGNALS FROM FIELD JB/RELAYPANEL TO MARSHELING PANEL.
- NOTE:-5 FOR ON/OFF TYPE,SOLENOID ACTUATED CONTROL VALVE.

	3XB00 MW NTPC PATRATU STPP PHASE-1	DDCMIS INTERFACE WITH SOV/O/SOV/C(WITHOUT FEEDBACKS)	DRG.NO. 9585-001-405-PV-B-152B
			SHT 11 OF 34

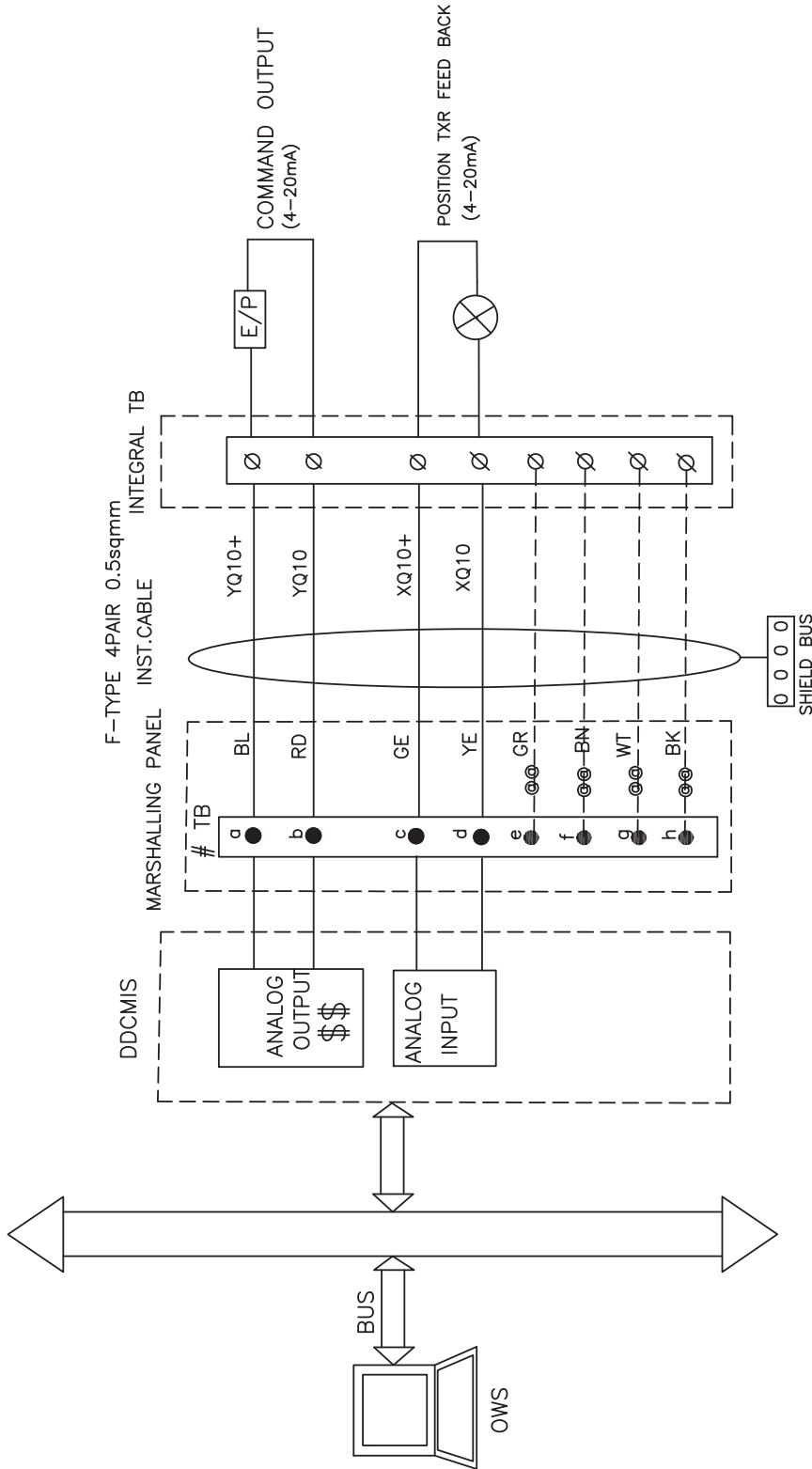
DDCMIS INTERFACE WITH SOV/O/L(WITH FEED BACKS)




3X800 MW NTPC PATRATU STPP PHASE-1		DWG. NO.	9585-001-405-PVI-B-152B
DDCMIS INTERFACE WITH SOV/O/L(WITH FEEDBACKS)		SHT	12 OF 34

NOTE:-1 \$\$\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE.
 NOTE:-2 # 8 LEVEL TERMINAL BLOCK.
 NOTE:-3 @ @ IN EACH DDCMIS POST, UNUSED TB'S ARE USED FOR SPARE CORE TERMINATION.
 NOTE:-4 * FEEDBACKS/COMMANDS OF DSOV/SOV CAN BE GROUPED IN FIELD JB/RELAY PANEL AND MULTIPAIR/MULTICORE CABLE IS TO BE USED FOR GROUPED SIGNALS FROM FIELD JB/RELAYPANEL TO MARSHALING PANEL.
 NOTE:-5 FOR ON/OFF TYPE, SOLENOID ACTUATED CONTROL VALVE.

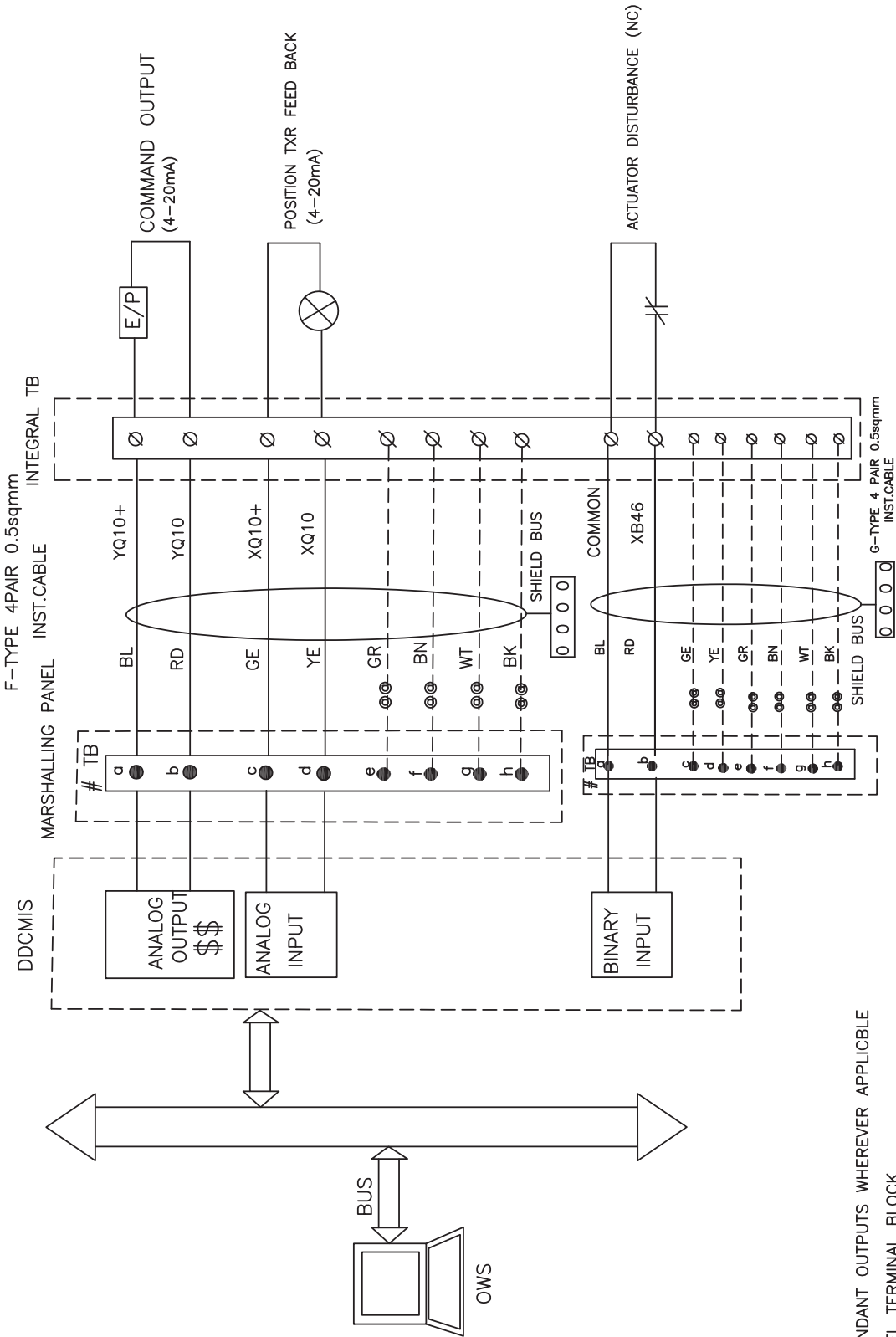
INTERFACE FOR MODULATING DRIVES - CLCS



- NOTE:--1 \$\$\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE
- NOTE:--2 # 8 LEVEL TERMINAL BLOCK
- NOTE:--3 @@ IN EACH DCCMIS POST, UNUSED TB's ARE USED FOR SPARE CORE TERMINATION.
- NOTE:--4 F-TYPE: INDIVIDUAL & OVERALL SHIELD CABLE.

	3X800 MW NTPC PATRATU STPP PHASE-I	DRG. NO. 9685-001-405-PVI-B-152B
INTERFACE FOR MODULATING DRIVES - CLCS		SHT 14 OF 34

INTERFACE FOR MODULATING DRIVES - CLCS-M

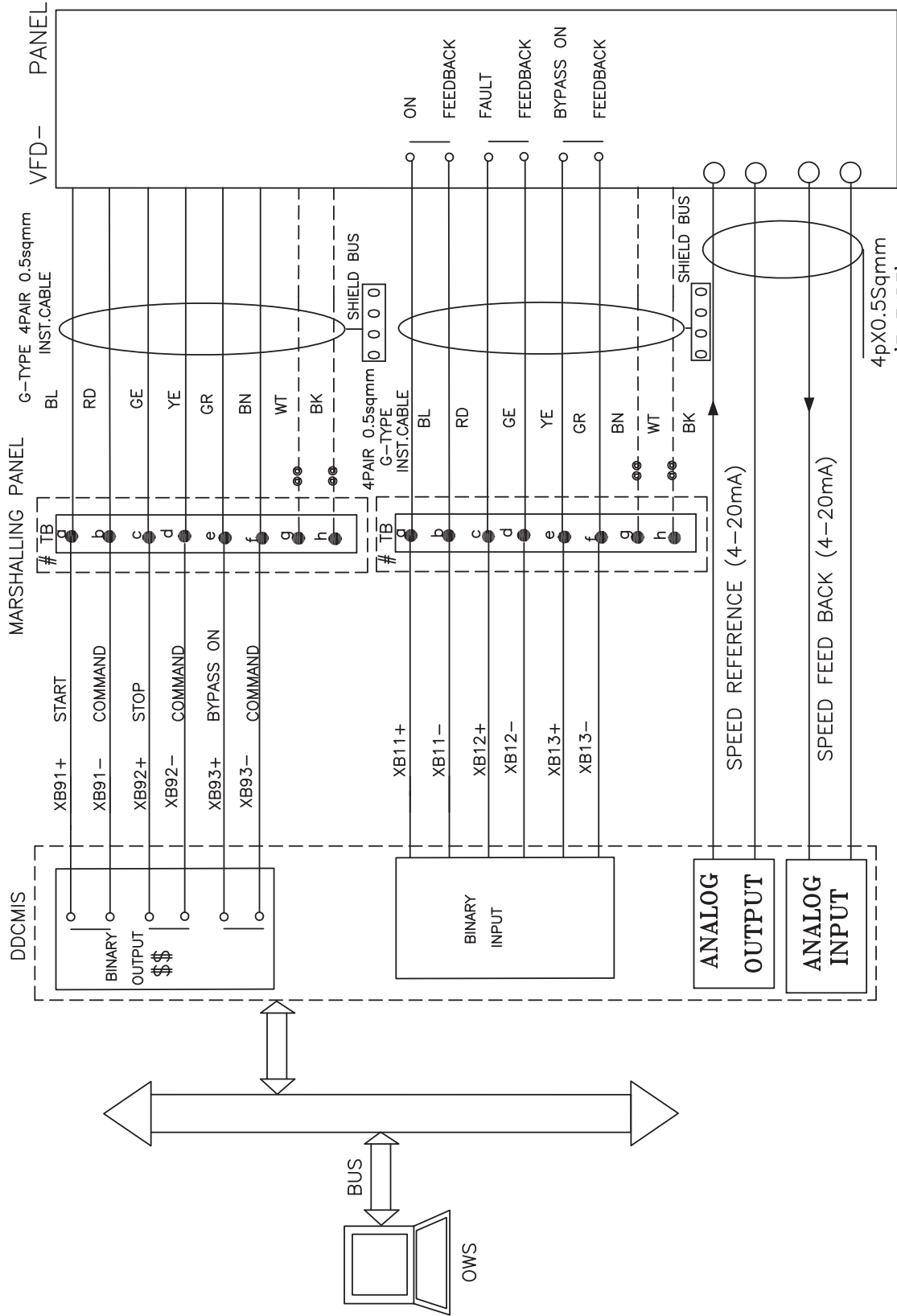


- NOTE:-1 \$\$\$ REDUNDANT OUTPUTS WHEREVER APPLICABLE
- NOTE:-2 # 8 LEVEL TERMINAL BLOCK
- NOTE:-3 @ in each DDCMIS POST, UNUSED TB's ARE USED FOR SPARE CORE TERMINATION.
- NOTE:-4 F-TYPE: INDIVIDUAL & OVERALL SHIELD CABLE.



3XB00 MW NTPC PATRATU STPP PHASE-I		DRG.NO: 9585-001-405-PVI-B-152B
INTERFACE FOR MODULATING DRIVES - CLCS-M		SHT 15 OF 34

DDCMIS INTERFACE WITH VFD



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



3X800 MW NTPC PATRATU STTPP PHASE-I

DDCMIS INTERFACE WITH VFD

DRG.NO. 9585-001-405-PVI-B-152B

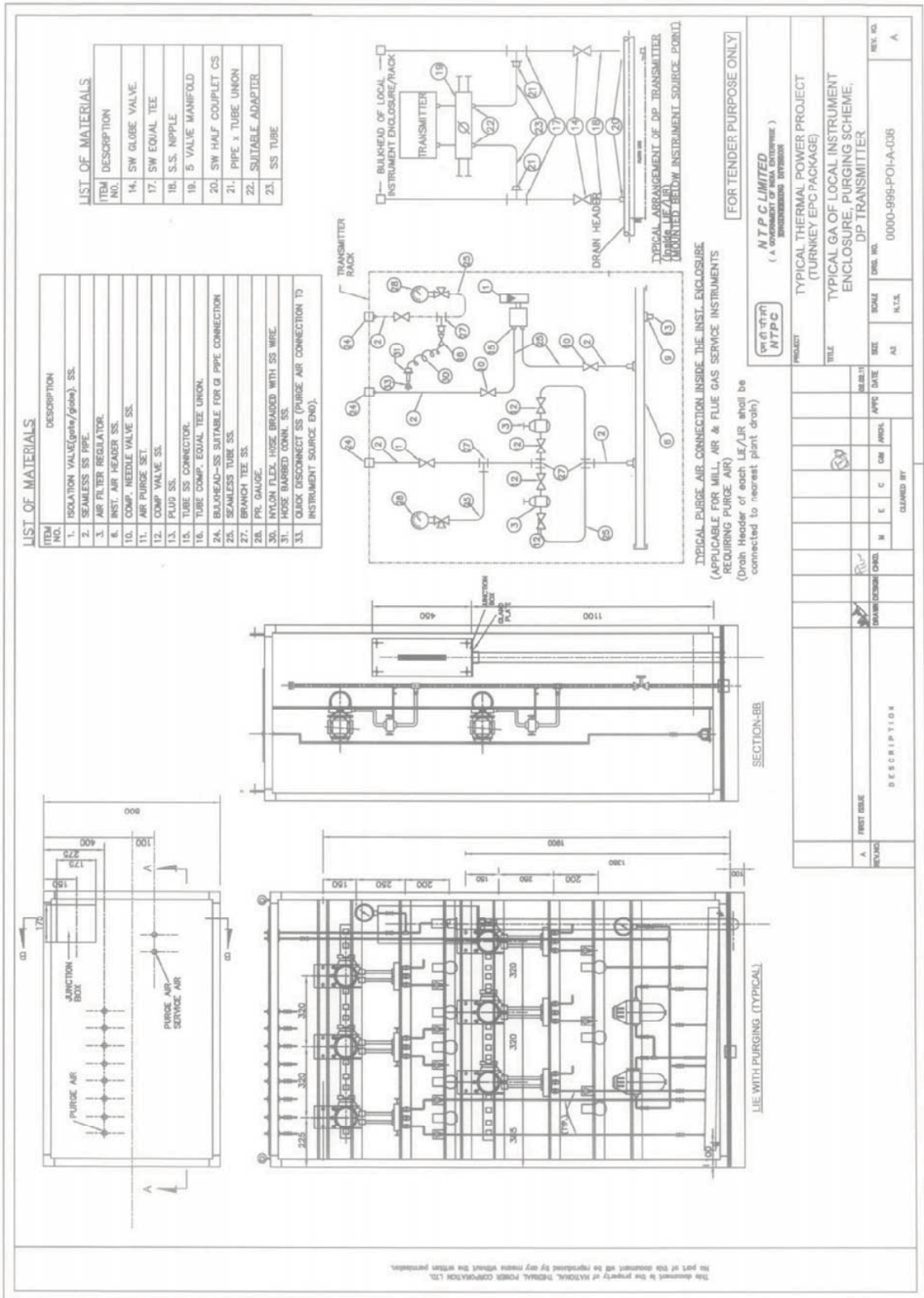
SHT 13 OF 34



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

SECTION: C4
SUB SECTION: C&I

**DRIVE & INSTRUMENT INTERFACE
DIAGRAM**

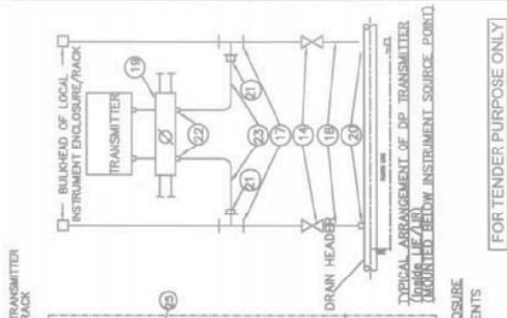


LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	ISOLATION VALVE(gate/globe), SS.
2.	SEAMLESS SS PIPE.
3.	AIR FILTER REGULATOR.
6.	INST. AIR HEADER SS.
10.	COMP. NEEDLE VALVE SS.
11.	AIR PURGE SET.
12.	COMP VALVE SS.
13.	FLUID SS.
15.	TUBE SS CONNECTOR.
16.	TUBE COMP. EQUAL TEE UNION.
24.	BULKHEAD-SS SUITABLE FOR G PIPE CONNECTION
25.	SEAMLESS TUBE SS.
27.	BRANCH TEE SS.
28.	PR. GAUGE.
30.	NYLON FLEX. HOSE BRANDED WITH SS WIRE.
31.	HOSE BARBED CONN. SS.
33.	QUICK DISCONNECT SS (PURGE AIR CONNECTION TO INSTRUMENT SOURCE END).

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
14.	SW GLOBE VALVE.
17.	SW EQUAL TEE
18.	S.S. NIPPLE
19.	5 VALVE MANIFOLD
20.	SW HALF COUPLER CS
21.	PIPE x TUBE UNION
22.	SUITABLE ADAPTER
23.	SS TUBE



TYPICAL PURGE AIR CONNECTION INSIDE THE INST. ENCLOSURE (APPLICABLE FOR MILL, NR & FLUE GAS SERVICE INSTRUMENTS REQUIRING PURGE AIR)
(Drain Header of each LIE/LJR shall be connected to nearest plant drain)

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A DIVISION OF NTPC ENTERPRISE)
ENGINEERING DIVISION

PROJECT TYPICAL THERMAL POWER PROJECT (TURNKEY EPC PACKAGE)

TITLE TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE, PURGING SCHEME, DP TRANSMITTER

SCALE AS SHOWN

DATE 08/01/2022

APP'D [Signature]

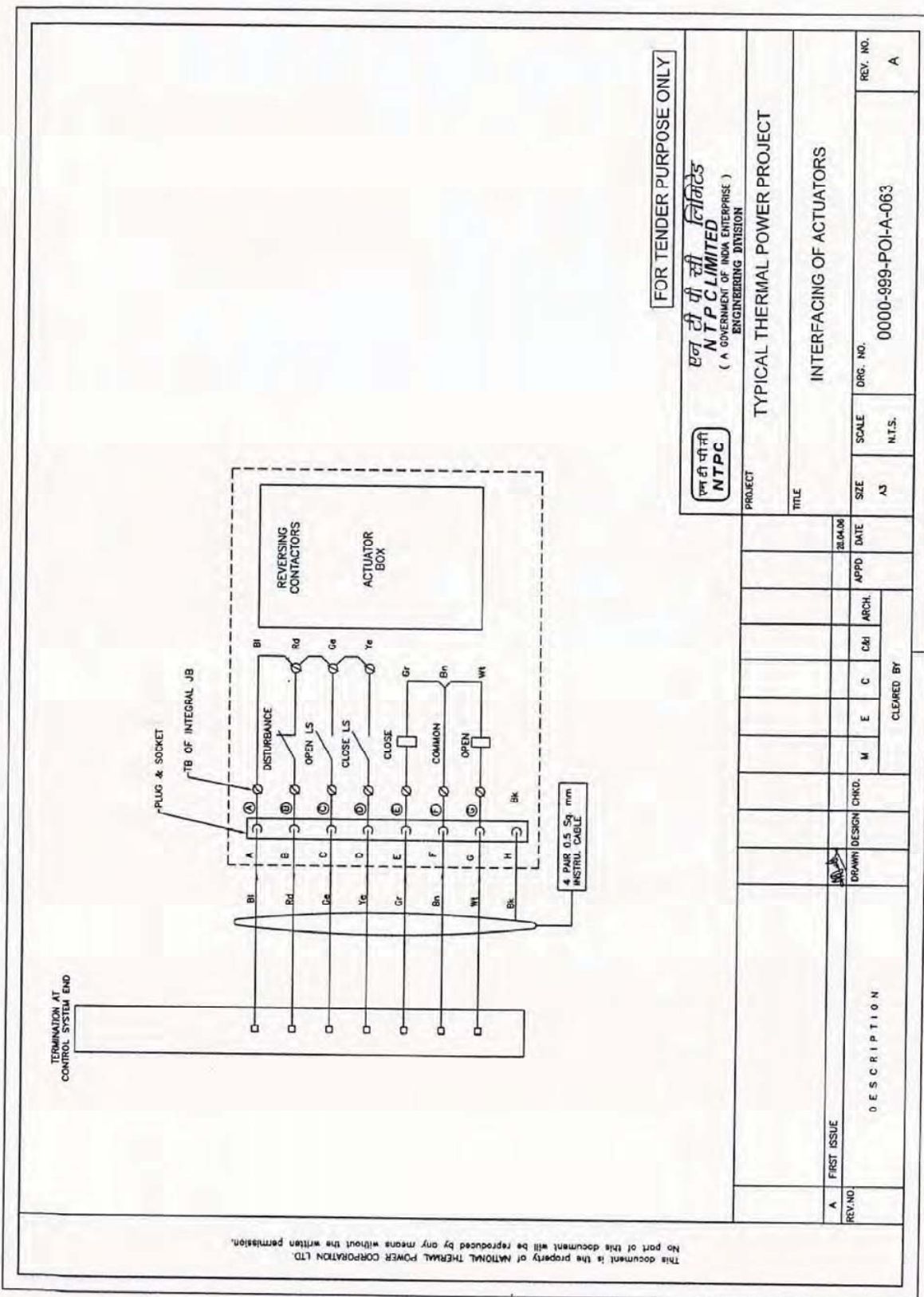
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DESIGN [Signature]

REV. NO. A

NO.	DESCRIPTION	DATE	BY	CHK'D	APP'D
1	ISSUED FOR PURGING	08/01/2022	[Signature]	[Signature]	[Signature]

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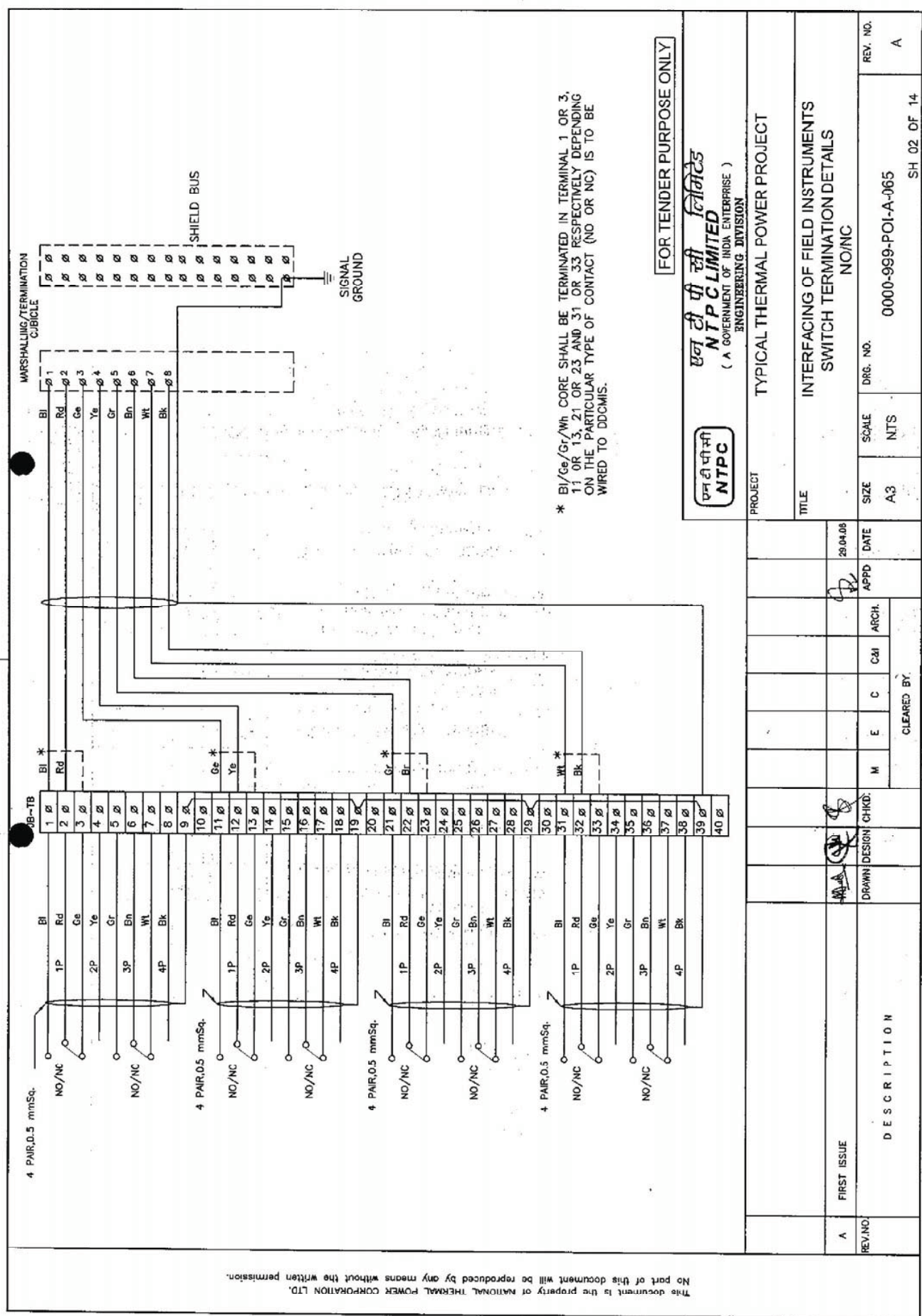
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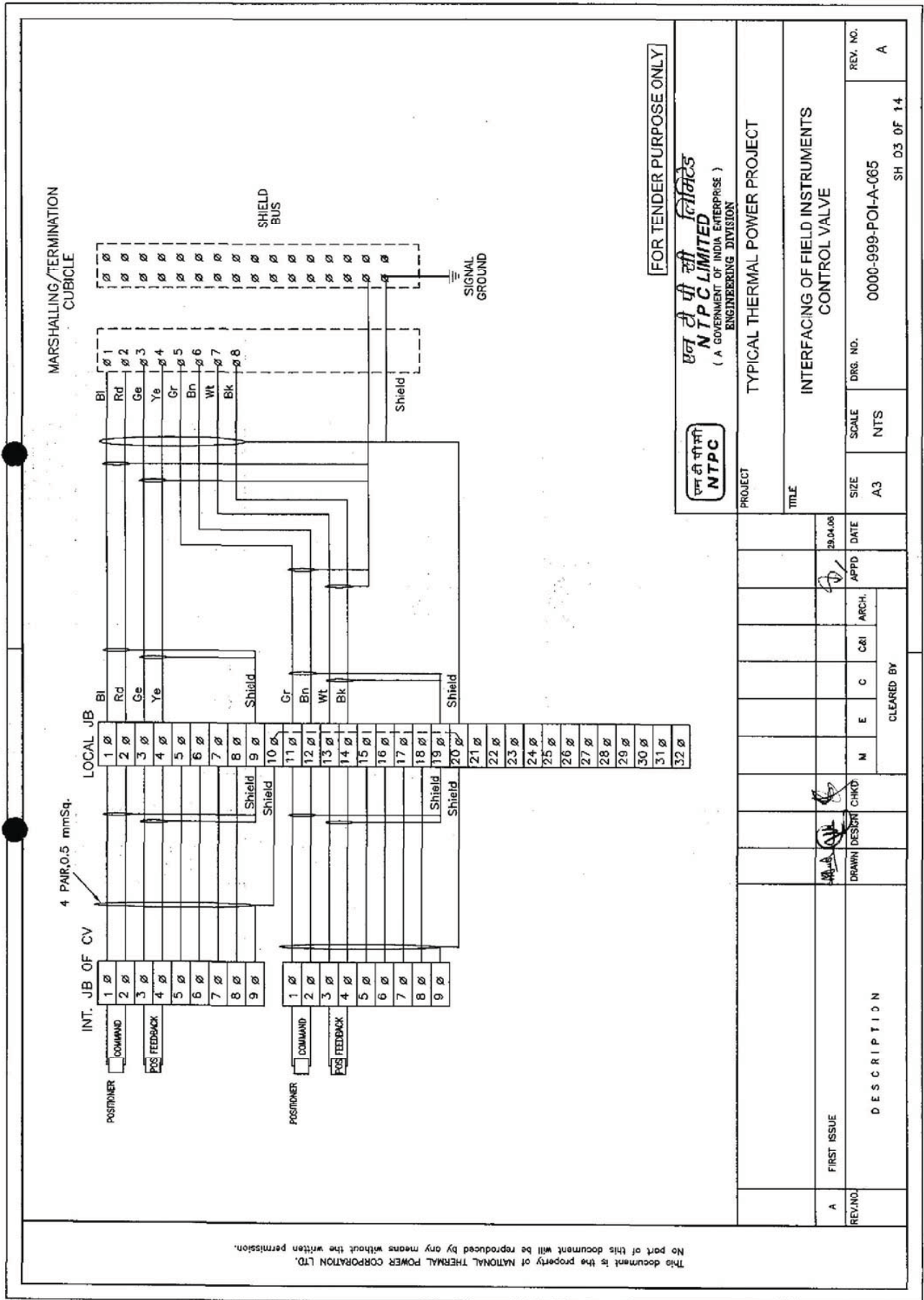
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एन टी पी सी लिमिटेड NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION	
PROJECT	
TYPICAL THERMAL POWER PROJECT	
TITLE	
INTERFACING OF ACTUATORS	
REV. NO.	A
SCALE	N.T.S.
DRG. NO.	0000-999-POI-A-063

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE	ZB/M/06


CLEARED BY





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NTPC LIMITED
 (A GOVERNMENT OF INDIA ENTERPRISE)
 ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

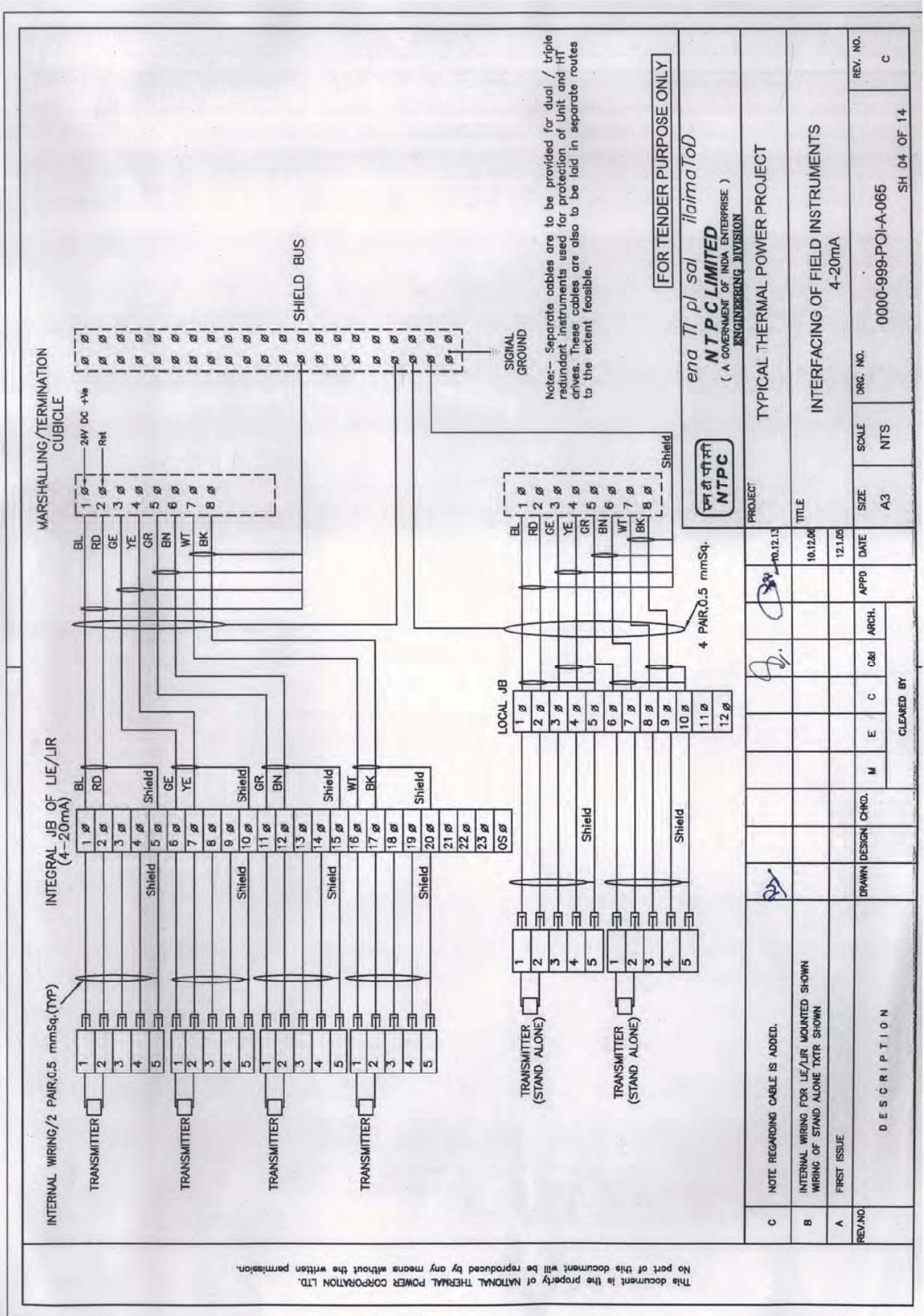
TITLE: INTERFACING OF FIELD INSTRUMENTS CONTROL VALVE

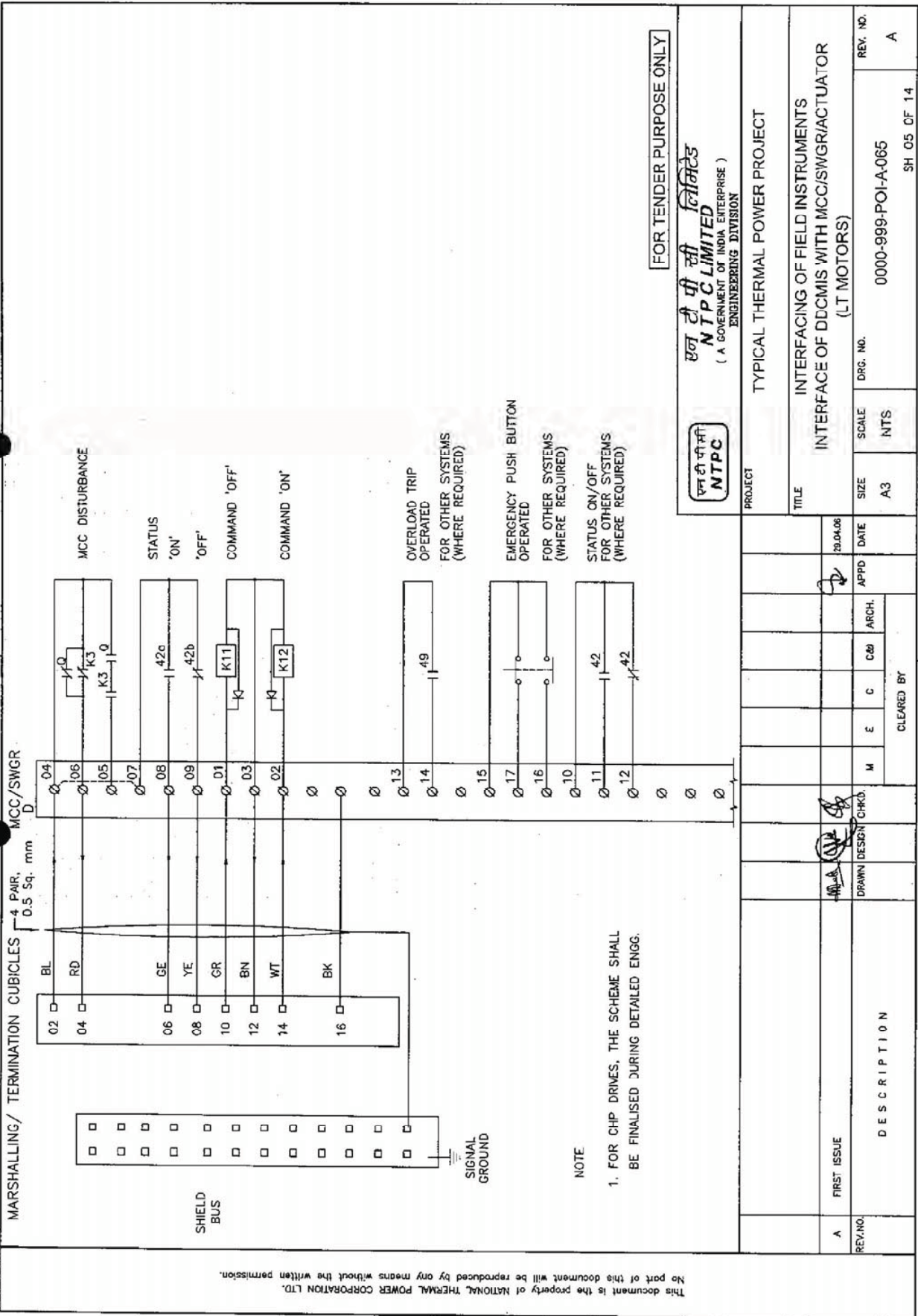
SIZE	SCALE	DRG. NO.	REV. NO.
A3	NTS	0000-999-FOI-A-065	A

SH 03 OF 14

DATE	APPD	ARCH.	CBI	C	E	N	DESCRIPTION
29.04.08							FIRST ISSUE
DRAWN DESIGN CHKD							
CLEARED BY							

REV. NO.





FOR TENDER PURPOSE ONLY

NTPC
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 (LT MOTORS)

SIZE: A3
SCALE: NTS
DRG. NO.: 0000-999-POI-A-065
REV. NO.: A

DATE: 20.04.08

APPD: [Signature]

ARCH.: [Signature]

C&B: [Signature]

C: [Signature]

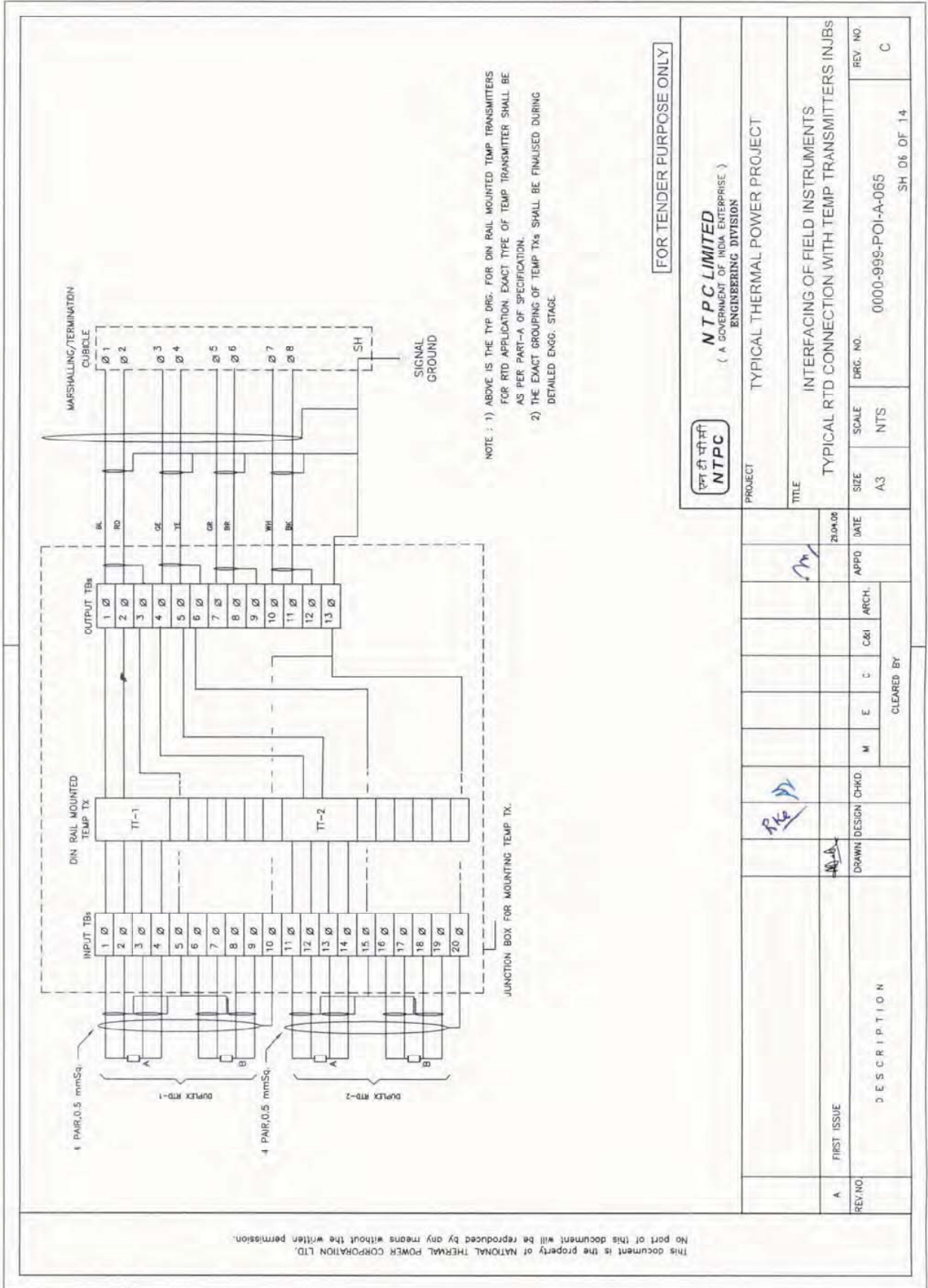
E: [Signature]

M: [Signature]

SH 05 OF 14

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

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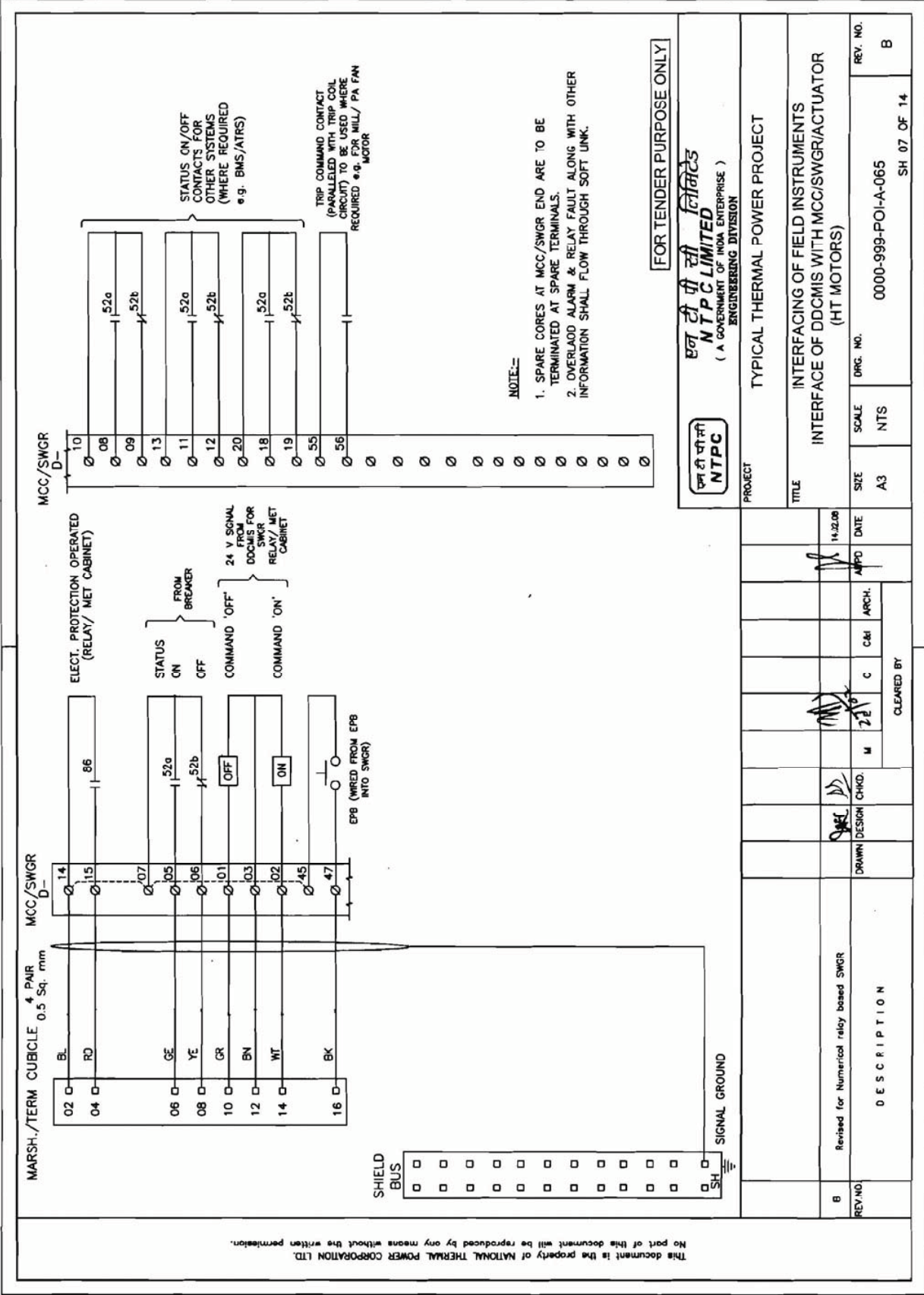
NOTE : 1) ABOVE IS THE TYP DRG. FOR DIN RAIL MOUNTED TEMP TRANSMITTERS FOR RTD APPLICATION. EXACT TYPE OF TEMP TRANSMITTER SHALL BE AS PER PART-A OF SPECIFICATION.
 2) THE EXACT GROUPING OF TEMP TXs SHALL BE FINALISED DURING DETAILED ENGG. STAGE.

FOR TENDER PURPOSE ONLY

 NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION			
PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF FIELD INSTRUMENTS	
TYPICAL RTD CONNECTION WITH TEMP TRANSMITTERS IN JB'S		SIZE	SCALE
A3	NTS	DRG. NO.	REV. NO.
		0000-9999-POI-A-065	C
		SH 06 OF 14	

DATE	25.04.20	APPRO	DATE	
ARCH.		ARCH.		
C&I		C&I		
E		E		
M		M		
CLEARED BY				
DRAWN DESIGN CHKD				
DESCRIPTION				
REV. NO.	A	FIRST ISSUE		

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NTPC LIMITED
 (A GOVERNMENT OF INDIA ENTERPRISE)
 ENGINEERING DIVISION

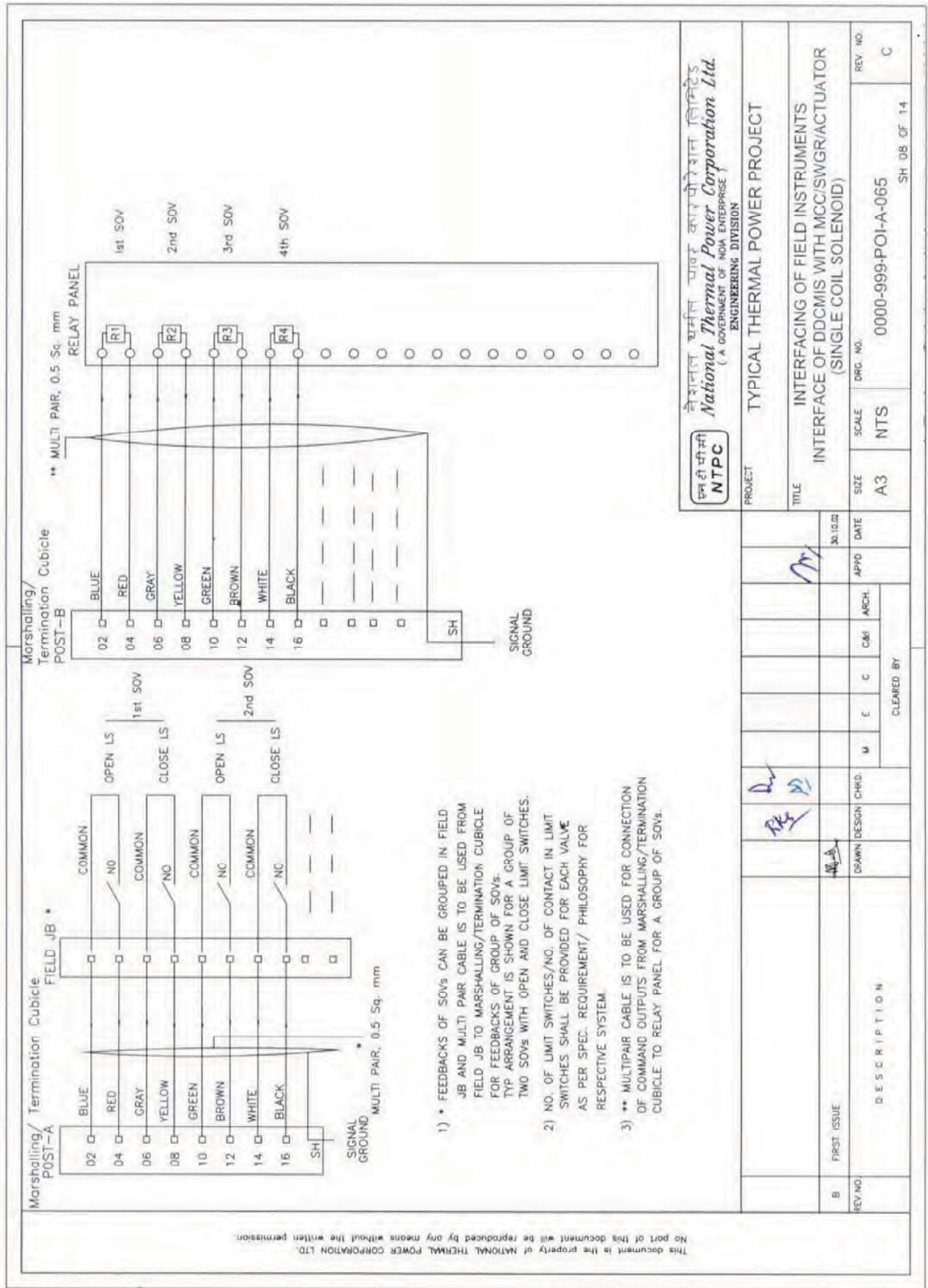
PROJECT: TYPICAL THERMAL POWER PROJECT

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

SCALE: NTS
 SIZE: A3
 DRG. NO.: 0000-999-POI-A-065
 REV. NO.: B
 SH 07 OF 14

REV. NO.	B	DATE	14.12.08
APPROVED	[Signature]	ARCH.	
CHECKED	[Signature]	C	
DESIGNED	[Signature]	M	
DRAWN	[Signature]	C	
DESIGN CHKD.	[Signature]	M	
CLEAR BY	[Signature]	C	
DESCRIPTION	Revised for Numerical relay based SWGR		

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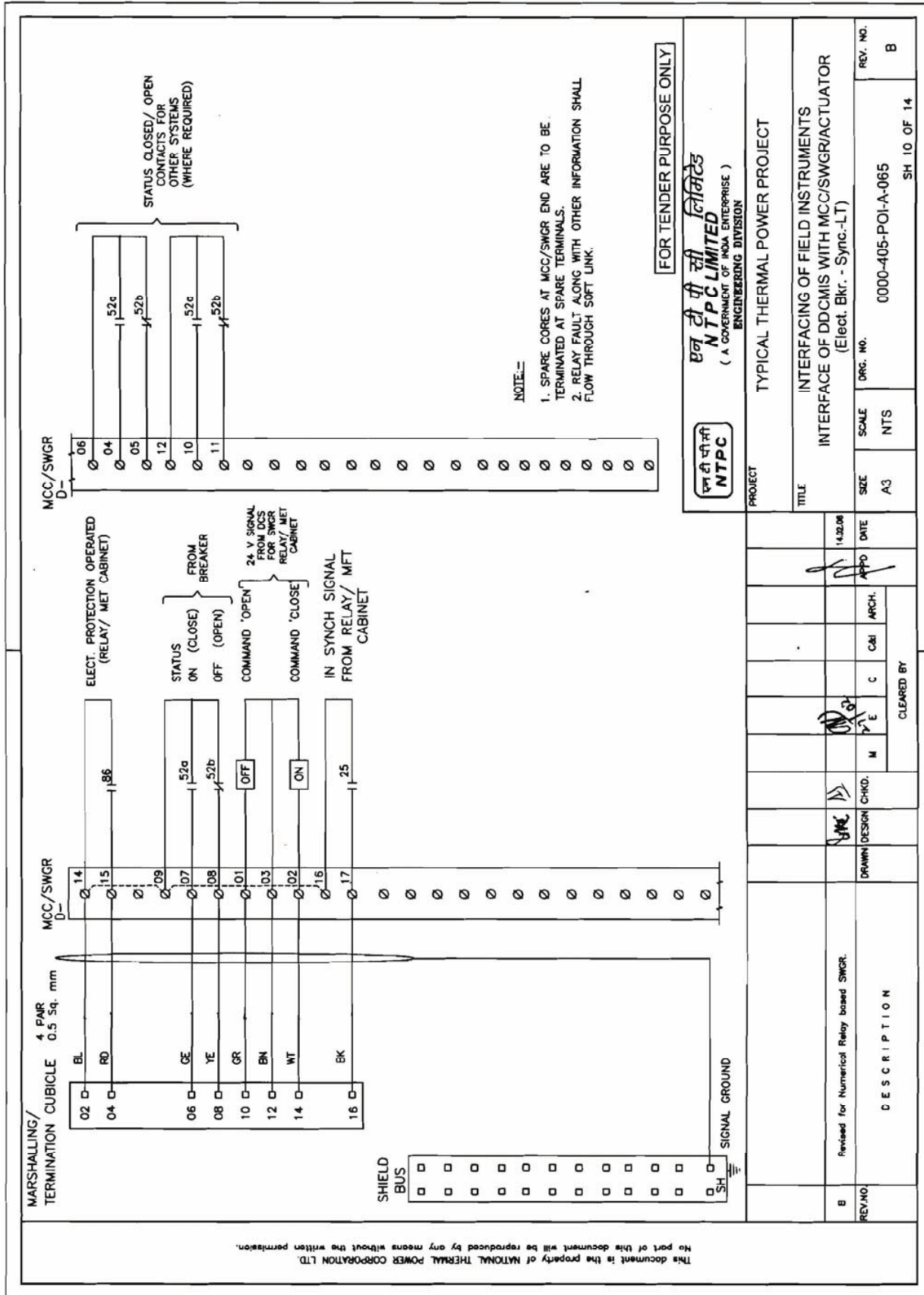
- 1) * FEEDBACKS OF SOVs CAN BE GROUPED IN FIELD JB AND MULTI PAIR CABLE IS TO BE USED FROM FIELD JB TO MARSHALLING/TERMINATION CUBICLE FOR FEEDBACKS OF GROUP OF SOVs. TYP ARRANGEMENT IS SHOWN FOR A GROUP OF TWO SOVs WITH OPEN AND CLOSE LIMIT SWITCHES.
- 2) NO. OF LIMIT SWITCHES/NO. OF CONTACT IN LIMIT SWITCHES SHALL BE PROVIDED FOR EACH VALVE AS PER SPEC. REQUIREMENT/ PHILOSOPHY FOR RESPECTIVE SYSTEM.
- 3) ** MULTIPAIR CABLE IS TO BE USED FOR CONNECTION OF COMMAND OUTPUTS FROM MARSHALLING/TERMINATION CUBICLE TO RELAY PANEL FOR A GROUP OF SOVs.



 नैशनल थर्मल पावर कॉर्पोरेशन लिमिटेड
National Thermal Power Corporation Ltd.
 (A GOVERNMENT OF INDIA ENTERPRISE)
 ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF FIELD INSTRUMENTS INTERFACE OF DDCMIS WITH MCC/SWGR/ACTUATOR (SINGLE COIL SOLENOID)	
SIZE	SCALE	DRG. NO.	REV. NO.
A3	NTS	0000-999-POI-A-065	C
			SH 08 OF 14

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FIRST ISSUE		[Signature]		[Signature]			




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


SECTION: C4
SUB SECTION: C&I


**INSTRUMENTATION CABLE
INTERCONNECTION AND TERMINATION
PHILOSOPHY**


CLAUSE NO.	TECHNICAL REQUIREMENTS																																																					
5.00.00	<p data-bbox="386 390 1386 417">INSTRUMENTATION CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY</p> <p data-bbox="386 449 1422 590">The cable interconnection philosophy to be adopted shall be such that extensive grouping of signals by large scale use of field mounted Group Junction Boxes (JBs) at strategic locations (where large concentration of signals are available, e.g. valves limit & torque switches, switchgear) is done and consequently cable with higher number of pairs are extensively used. The details of termination to be followed are mentioned in the given Table A.</p> <p data-bbox="386 621 997 648">TABLE A: CABLE TERMINATION TO BE FOLLOWED</p> <table border="1" data-bbox="404 659 1417 1829"> <thead> <tr> <th colspan="2" data-bbox="409 665 915 722">Application</th> <th colspan="2" data-bbox="919 665 1295 722">Type Of Termination</th> <th data-bbox="1299 665 1412 722">Type Of Cable</th> </tr> <tr> <th data-bbox="409 726 659 783">FROM (A)</th> <th data-bbox="662 726 915 783">TO (B)</th> <th data-bbox="919 726 1127 783">END A</th> <th data-bbox="1130 726 1295 783">END B</th> <th data-bbox="1299 726 1412 783"></th> </tr> </thead> <tbody> <tr> <td data-bbox="409 787 659 928">Valves/dampers drives (Integral Junction box)</td> <td data-bbox="662 787 915 928">Marshalling / Marshalling – cum Termination Cubicle / local group JB</td> <td data-bbox="919 787 1127 928">Plug in connector</td> <td data-bbox="1130 787 1295 928">Post mount cage clamp type.</td> <td data-bbox="1299 787 1412 928">G</td> </tr> <tr> <td data-bbox="409 932 659 1073">Transmitters, Process Actuated switches mounted in LIE/LIR</td> <td data-bbox="662 932 915 1073">Integral Junction box of LIE/LIR</td> <td data-bbox="919 932 1127 1073">Plug in connector</td> <td data-bbox="1130 932 1295 1073">Cage clamp (Rail mount) type.</td> <td data-bbox="1299 932 1412 1073">F,G</td> </tr> <tr> <td data-bbox="409 1077 659 1188">RTD heads</td> <td data-bbox="662 1077 915 1188">Local junction box</td> <td data-bbox="919 1077 1127 1188">Plug in connector</td> <td data-bbox="1130 1077 1295 1188">Cage clamp (Rail mount) type.</td> <td data-bbox="1299 1077 1412 1188">F</td> </tr> <tr> <td data-bbox="409 1192 659 1304">Thermocouple</td> <td data-bbox="662 1192 915 1304">Local junction box / CJC box (if applicable)</td> <td data-bbox="919 1192 1127 1304">Plug in connector</td> <td data-bbox="1130 1192 1295 1304">Cage clamp (Rail mount) type.</td> <td data-bbox="1299 1192 1412 1304">A, B, C*</td> </tr> <tr> <td data-bbox="409 1308 659 1419">Other Field mounted Instrument</td> <td data-bbox="662 1308 915 1419">Local JB / Group JB</td> <td data-bbox="919 1308 1127 1419">Plug in connector</td> <td data-bbox="1130 1308 1295 1419">Cage clamp (Rail mount) type.</td> <td data-bbox="1299 1308 1412 1419">F,G</td> </tr> <tr> <td data-bbox="409 1423 659 1535">RTD</td> <td data-bbox="662 1423 915 1535">Temperature transmitter</td> <td data-bbox="919 1423 1127 1535">Plug in connector</td> <td data-bbox="1130 1423 1295 1535">Screwed, Cage clamp type</td> <td data-bbox="1299 1423 1412 1535">F</td> </tr> <tr> <td data-bbox="409 1539 659 1650">Thermocouple</td> <td data-bbox="662 1539 915 1650">Temperature transmitter</td> <td data-bbox="919 1539 1127 1650">Plug in connector</td> <td data-bbox="1130 1539 1295 1650">Screwed, Cage clamp type</td> <td data-bbox="1299 1539 1412 1650">A, B, C*</td> </tr> <tr> <td data-bbox="409 1654 659 1829">Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ MCC/SWGR</td> <td data-bbox="662 1654 915 1829">Group JB</td> <td data-bbox="919 1654 1127 1829">Cage clamp (Rail mount) type.</td> <td data-bbox="1130 1654 1295 1829">Cage clamp (Rail mount) type.</td> <td data-bbox="1299 1654 1412 1829">F,G</td> </tr> </tbody> </table>				Application		Type Of Termination		Type Of Cable	FROM (A)	TO (B)	END A	END B		Valves/dampers drives (Integral Junction box)	Marshalling / Marshalling – cum Termination Cubicle / local group JB	Plug in connector	Post mount cage clamp type.	G	Transmitters, Process Actuated switches mounted in LIE/LIR	Integral Junction box of LIE/LIR	Plug in connector	Cage clamp (Rail mount) type.	F,G	RTD heads	Local junction box	Plug in connector	Cage clamp (Rail mount) type.	F	Thermocouple	Local junction box / CJC box (if applicable)	Plug in connector	Cage clamp (Rail mount) type.	A, B, C*	Other Field mounted Instrument	Local JB / Group JB	Plug in connector	Cage clamp (Rail mount) type.	F,G	RTD	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	F	Thermocouple	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	A, B, C*	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ MCC/SWGR	Group JB	Cage clamp (Rail mount) type.	Cage clamp (Rail mount) type.	F,G
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-07 INSTRUMENTATION CABLES	PAGE 7 OF 13																																																			


CLAUSE NO.	TECHNICAL REQUIREMENTS					
	Application		Type Of Termination			Type Of Cable
	FROM (A)	TO (B)	END A	END B		
	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ Group JB / MCC/SWGR	Marshalling / Marshalling – cum Termination Cubicle	Cage clamp (Rail mount) type.	Cage clamp (Post mounted) type.	F,G	
	Marshalling cubicle/ Termination Cabinet	Electronic system cabinet	Cage clamp (Post mounted) type.	Plug-in connector / other system as per Mfr.'s Standard	Internal wiring	
	Marshalling/ Termination System Cabinets	UCD mounted equipments	Cage clamp (Post mounted) type.	Plug in connector / Cage clamp type (rail mounted).	F,G (with plug-in connect or at one end)	
	DDCMIS/PLC cabinets	PC, Printers etc.	Plug in connector	Plug in connector	Mfr.'s Standard	
Notes	<p>1 Normally 10% spare cores shall be provided when the numbers of pairs of cables are more than four pairs, except for pre-fabricated cables which shall be as per manufacturer's standard.</p> <p>2 For analog signals, individual pair shielding & overall shielding & for Binary signals, only overall shielding of instrumentation cables shall be provided.</p> <p>3 * For high temperature applications only.</p> <p>4 . For connection between field/JB and DDCMIS marshalling cabinet minimum 4 pair instrumentation cable shall be used.</p> <p>5 All the spare cores of instrumentation cable have to be terminated in Marshalling cabinets/ DCS panel end.</p> <p>6 For Cable type and cable termination scheme for the instruments/ equipment that are connected to Steam Turbine and Generator (STG) control system defined at Part A, sub section IIC, clause no. 2.03.01 (a) (ii) above and hydrogen generation plant auxiliaries system, Contractor's standard and proven practice is also acceptable. However, for termination of instrumentation cable at marshalling cabinets/DCS panel end, cage-clamp termination shall be offered. For power and control cable termination, Contractor's standard and proven practice would be acceptable</p>					
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-07 INSTRUMENTATION CABLES		PAGE 8 OF 13

CLAUSE NO.	TECHNICAL REQUIREMENTS								
6.00.00	TERMINAL BLOCKS								
6.01.00	All terminal blocks shall be rail mounted/post mounted, cage clamp type with high quality non-flammable insulating material of melamine suitable for working temperature of 105 deg. C. The terminal blocks in field mounted junction boxes, temperature transmitters, instrument enclosures/racks, etc., shall be suitable for cage clamp connections. The terminal blocks in Control Equipment Room logic/termination/marshalling cubicles shall be suitable for post mounted cage clamp connection at the field input end. The exact type of terminal blocks to be provided by the Bidder and the technical details of the same including width etc. shall be subject to Employer's approval.								
6.02.00	All the terminal blocks shall be provided complete with all required accessories including assembly rail, locking pin and section, end brackets, partitions, small partitions, transparent covers, support brackets, distance sleeves, warning label, marking, etc.								
6.03.00	The marking on terminal strips shall correspond to the terminal numbering on wiring diagrams. At least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures, termination/marshalling cabinets, etc. All terminal blocks shall be numbered for identification and grouped according to the function. Engraved labels shall be provided on the terminal blocks.								
6.04.00	For terminating each process actuated switches, drive actuators, control valves, Thermocouple, RTD, etc. in Local Junction Boxes, etc, refer Drg no. 0000-999-POI-A-065.								
6.05.00	The terminal blocks shall be arranged with at least 100 mm clearance between two sets of terminal blocks and between terminal blocks and junction box walls.								
7.00.00	INTERNAL PANELS/ SYSTEM CABINETS WIRING								
7.01.00	Internal panel/cabinet wiring shall be of multi-stranded copper conductor with FRLS PVC insulation without shield and outer sheath meeting the requirements of VDE 0815.								
7.02.00	All internal wires shall be provided with tag and identification nos. etched on tightly fitted ferrules at both ends. All wires directly connected to trip devices shall be distinguished by one additional red colour ferrule.								
7.03.00	All external connection shall be made with one wire per termination point. Wires shall not be tapped or spliced between terminal points.								
7.04.00	All floor slots of desk/panels/cabinets used for cable entrance shall be provided with removable gasketed gland plates and sealing material. Split type grommets shall be used for prefabricated cables.								
7.05.00	All the special tools as may be required for solder less connections shall be provided by Bidder.								
7.06.00	<p>Wire sizes to be utilised for internal wiring.</p> <table border="0" data-bbox="391 1602 1409 1780"> <tr> <td data-bbox="391 1602 423 1633">(i)</td> <td data-bbox="467 1602 998 1690">Current (4-20 mA), low voltage signals (48V); Ammeter/Voltmeter circuit, control switches etc. for electrical system.</td> <td data-bbox="1040 1602 1170 1633">0.5 Sq.mm.</td> </tr> <tr> <td data-bbox="391 1724 423 1755">(ii)</td> <td data-bbox="467 1724 894 1755">Power supply and internal illumination.</td> <td data-bbox="1040 1724 1409 1780">2.5Sq.mm. minimum (shall be as per load requirement.)</td> </tr> </table>			(i)	Current (4-20 mA), low voltage signals (48V); Ammeter/Voltmeter circuit, control switches etc. for electrical system.	0.5 Sq.mm.	(ii)	Power supply and internal illumination.	2.5Sq.mm. minimum (shall be as per load requirement.)
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-III-C-07 INSTRUMENTATION CABLES	PAGE 9 OF 13						

CLAUSE NO.	TECHNICAL REQUIREMENTS											
8.00.00	INSTRUMENTATION CABLE INSTALLATION AND ROUTING											
8.01.00	All cables assigned to a particular duct/conduit shall be grouped and pulled in simultaneously using cable grips and suitable lubricants. Cables removed from one duct/conduit shall not be reused without approval of Employer.											
8.02.00	<p>Cables shall be segregated as per IEEE Std.-422. In vertically stacked trays, the higher voltage cable shall be in higher position and instrumentation cable shall be in bottom tier of the tray stack. The distance between instrumentation cables and those of other system shall be as follows:</p> <table border="0" data-bbox="396 531 1138 680"> <tr> <td>From 11 kV/6.6 kV/3.3 kV tray system</td> <td>-</td> <td>914 mm</td> </tr> <tr> <td>From 415V tray system</td> <td>-</td> <td>610 mm</td> </tr> <tr> <td>From control cable tray system</td> <td>-</td> <td>305 mm</td> </tr> </table>			From 11 kV/6.6 kV/3.3 kV tray system	-	914 mm	From 415V tray system	-	610 mm	From control cable tray system	-	305 mm
From 11 kV/6.6 kV/3.3 kV tray system	-	914 mm										
From 415V tray system	-	610 mm										
From control cable tray system	-	305 mm										
8.03.00	Cables shall terminate in the enclosure through cable glands. All cable glands shall be properly gasketed. Sealing (to prevent ingress of dust entry and propagation of fire) shall be provided for all floor slots used for cable entrance. Compression cable glands (double for armoured and single for other cables) shall be provided.											
8.04.00	Not in use											
8.05.00	The cables emanating from redundant equipment/devices shall be routed through different paths. The above segregation of cables & wiring for redundant equipments/devices shall be in accordance with IEEE-Std-422.											
9.00.00	CABLE LAYING AND ACCESSORIES											
9.01.00	CABLE LAYING											
1	Cables shall be laid strictly in line with cable schedule.											
2	Identification tags for cables.											
	Indelible tags to be provided at all terminations, on both sides of wall or floor crossing, on each conduit/duct/pipe entry/exit, and at every 20 m in cable trench/tray.											
3	Cable tray numbering and marking.											
	To be provided at every 10m and at each end of cable way & branch connection.											
4	No jointing is permissible for Instrumentation cables. For other cables Jointing for more than 250 Meters run of cable shall be permitted.											
5	Buried cable protection											
	With concrete slabs; Route markers at every 20 Meters along the route & at every bend.											
6	Road Crossings											
	Cables to pass through buried high density PE pipes encased in PCC. At least 300											
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIIC-07 INSTRUMENTATION CABLES	PAGE 10 OF 13									

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
9.02.00 9.03.00	<p>mm clearance shall be provided between</p> <ul style="list-style-type: none"> - HT power & LT power cables, - LT power & LT control/instrumentation cables, <p>Spacing between cables of same voltage grade shall be in accordance with the derating criteria adopted for cable sizing.</p> <p>7 Segregation (physical isolation to prevent fire jumping)</p> <ul style="list-style-type: none"> a All cable associated with the unit shall be segregated from cables of other Units. b Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire. <p>8 Cable clamping</p> <p>All cables laid on trays shall be neatly dressed up & suitably clamped/tied to the tray. For cables in trefoil formation, trefoil clamps shall be provided.</p> <p>9 Optical fiber cables (OFCs) :</p> <p>Outside Building Area - to be laid necessarily inside GI conduit with support from cable tray/Trestle structure</p> <p>Inside Building Area – to be laid on separate cable sub-trays</p> <p>While buried- in separate burried trench approx.1.0 meter depth, to be laid in 2” rodent proof HDPE conduits covered with sand, brick, laid breadth-wise and soil along the pipe line route by contractor;</p> <p>While crossing roads - to be laid in GI/ rodent proof HDPE conduits with sand filling at bottom and sand, soil filling at top with cement concrete;</p> <p>While crossing canals/river- to be laid in rodent proof HDPE conduits within hume pipe.</p> <p>10 Laying of Network Cable (UTP/STP) :</p> <p>Out side Building Area- to be laid necessarily inside GI conduits with support from cable tray / Trestle structure.</p> <p>Inside Building Area- to be laid necessarily inside GI conduits on separate cable sub-trays.</p> <p>Bidder shall supply and install all cable accessories and fittings like Light Interface Units, Surge suppressors, Opto isolators, Interface Converters, Fibre Optic Card Cage, Fibre Optic Line Driver, Repeater / Modem (for Optical Fibre Cables), cable glands, grommets, lugs, termination kits etc. on as required basis.</p> <p>Cables, which terminate in cabinets of draw out sections shall have sufficient cable coiled in the bottom of the cabinet to permit full withdrawal of draw out sections without disconnecting the cables. When prefabricated cables with factory connectors on both ends are longer than required, the excess cable shall be coiled in the bottom of one or both termination cabinets.</p>		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-07 INSTRUMENTATION CABLES	PAGE 11 OF 13

CLAUSE NO.	TECHNICAL REQUIREMENTS		
9.04.00	<p>The Bidder shall be responsible for proper grounding of all equipment under this package. Further, proper termination of cable shields shall be verified and the grounding of the same shall be coordinated so as to achieve grounding of all instrumentation cable shields at same potential. This shall be completed prior to system tests.</p>		
9.05.00	<p>The Contractor shall take full care while laying / installing cables as recommended by cable manufacturers regarding pulling tensions and cable bends. Cables damaged in any way during installation shall be replaced at the expense of the Contractor.</p>		
10.00.00	<p>FIELD MOUNTED LOCAL JUNCTION BOXES</p> <p>(i) No. of ways 12/24/36/48/64/72/96/128 with 20% spares terminals.</p> <p>(ii) Material and Thickness 4mm thick Fiberglass Reinforced Polyester (FRP).</p> <p>(iii) Type Screwed at all four corners for door. Door gasket shall be of synthetic rubber.</p> <p>(iv) Mounting clamps and accessories Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands required for erection shall be of SS, included in Bidders scope of supply.</p> <p>(v) Type of terminal blocks Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm². A M6 earthing stud shall be provided.</p> <p>(vi) Protection Class IP: 55 minimum for indoor & IP-65 minimum for outdoor applications.</p> <p>(vii) Grounding To be provided.</p> <p>(viii) Color RAL 7035</p>		
11.00.00	<p>CONDUITS</p>		
11.01.00	<p>Conduits shall be generally used for interconnecting cables from field instruments to Local JB's. All rigid conduits, couplings and elbows shall be hot dipped galvanised rigid mild steel in accordance with IS: 9537 Part-I (1980) and Part-II (1981). The conduit interior and exterior surfaces shall have continuous zinc coating with an overcoat of transparent enamel lacker or zinc chromate. Flexible conduit shall be heat resistant lead coated galvanized steel with , water leak, fire and rust proof protected <i>for the areas of Mills, Drum, Main Steam, RH steam Air Heaters and Furnace, BFPDT's</i> .</p> <p><i>And for remaining applications, water leak, fire and rust proof flexible GI conduits shall be provided.</i> The temperature rating of flexible conduit shall be suitable for actual application.</p>		
11.02.00	<p>All rigid conduit fittings shall conform to the requirements of IS: 2667, 1976. Galvanized steel fitting shall be used with steel conduit. All flexible conduit fittings shall be liquid tight, galvanized steel. The end fittings shall be compatible with the flexible conduit supplied.</p>		
11.03.00	<p>Conduit sealing, explosion proof, dust proof and other types of special fittings shall be provided as required by these specifications and shall be consistent with the area and equipment with which they are installed. Fittings installed outdoors and in damp locations shall be sealed and gasketed. Hazardous area fittings and conduits sealing shall conform</p>		
<p align="center">EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)</p>	<p align="center">TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2</p>	<p align="center">SUB-SECTION-III-C-07 INSTRUMENTATION CABLES</p>	<p align="center">PAGE 12 OF 13</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS		
	with NEC requirements for the area classification.		
11.04.00	Contractor shall provide double locknuts on all conduit terminations not provided with threaded hubs and couplings. Water tight conduit unions and rain tight conduit hubs shall be utilised for all the application which shall be exposed to weather. Moisture pockets shall be eliminated from conduits.		
11.05.00	Conduits shall be securely fastened to all boxes and cabinets.		
12.00.00	CABLE SUB-TRAY & SUPPORT		
12.01.00	The cable sub-trays and the supporting system, to be generally used between Local/Group JB's and the main cable trays and the same shall be furnished and installed by the Contractor. It is the assembly of sections and associated fittings forming a rigid structural system used to support the cable from the equipment or instrument enclosure upto the main cable trays (trunk route).		
12.02.00	The covers on the cable sub-trays shall be used for protection of cables in areas where damage may occur from falling objects, welding spark, corrosive environment, etc. & shall be electrically continuous and solidly grounded.		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-III-C-07 INSTRUMENTATION CABLES	PAGE 13 OF 13



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

SECTION: C4
SUB SECTION: C&I

QUALITY ASSURANCE-INSTRUMENTS


MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)

TESTS ITEMS	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (if applicable)(R)	Hydro Test(R)	Material Test certificate ®
1. PR Gauge (IS-3624)	Y	Y	Y	Y	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-770)	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 (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									
:									



ELECTRICAL ACTUATOR WITH INTEGRAL STARTER

Test/Attributes Characteristics	RPM ®	No Load Current ®	IR & HV Test®	Mounting Dimension®	All routine Test as per Standard & Specification®	Correct Phase Sequence®	Operation & Setting of limit Switch/Torque Switch®	Stall Torque/Current (A)	Hand Wheel operation/ Auto de clutch function (A)	Function of Aux. like Potentiometer, space heater, position indicator ®	EPT output ®	Grease leakage ®	Local/ Remote (Open-Stop-Close) Operation® Safety check (Single phasing, Phase correction, Tripping etc.) (A)
ELECTRICAL ACTUATOR WITH INTEGRAL STARTER(IS_9334)													
Motor	Y	Y	Y	Y	Y								
Final Testing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions. Requirement of test and procedure finalized during QP finalization 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the practices and procedure adopted along with relevant supporting documents.													
® - Routine Test (A) - Acceptance Test Y - Test applicable													

SUB-SECTION–E-58

VFD MODULES

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

**TECHNICAL SPECIFICATION
SECTION-VI, PART-B
BID DOC NO.:CS-9585-001-2**



VFD MODULE SQE_28

ATTRIBUTES / CHARACTERISTICS	Visual & Dimensional checks	Make / Type / Rating etc.	Final Inspection 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.



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.

QUALITY ASSURANCE													
TRANSFORMER (OIL FILLED) Attributes / Characteristics	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
Items/Components Sub Systems													
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							
CRGO Lamination & Built Core	Y	Y	Y		Y								
Bushing / Insulator (IS:2544 / 5621)	Y	Y								Y		Y	
Gasket	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, Buchholz 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.



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	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

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 IS/IEC
	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, Annunciator					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.



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

CHECK LIST FOR SOLENOID VALVES

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

Legend :

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

Note :

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



PEM :: C&I

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: PE-QP-999-145-I 006

VOLUME IIB

SECTION C

ISSUE NO. 2 REV. NO. 00 DATE: 25.05.2016

SHEET 2 OF 6

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
1.3	Spring	2. Hardness	MA	Measurement	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2	
		3. Endurance / Life cycle	MA	Cyclic test 10,000 cycles	One / Type	10,000 cycles/ Mfr. standard.	No damage	Test Certificate	3/2	---	2,1	
		1. Composition	MA	Chemical-Analysis	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
1.4	Electrical items [Limit switches, Solenoids, Position Transmitter(if provided externally)]	2. Mech. Properties	MA	Mech. Test	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
		3. Performance	MA	1. Stiffness ratio 2. Scragging 3. Cyclic test (Endurance) 4. Dimension (Measurement)	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
		1. Routine Test	MA	HV, IR, Continuity function	100%	Relevant Standards	Relevant Standards	Test Certificate	3	---	2	
		2. Degree of protection	MA	IP/NEMA Tests	One sample / type	Approved Data sheet	Approved Data sheet	Test Certificate	3	---	2,1	


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


RT- Radiographic Test
 UT - Ultrasonic Test

PT - Dye penetrant Test
 MT- Magnetic Test


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

1 - BHEL
 2 - Vendor
 3 - Sub-vendor

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

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


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

 BHEL BOMBAY HYDROELECTRIC LIMITED BHEL BOMBAY HYDROELECTRIC LIMITED	STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)														
	QUALITY PLAN NO.: PE-QP-999-145-J 006														
	VOLUME IIB					SECTION C									
	ISSUE NO. 2					REV. NO. 00					DATE: 25.05.2016				
	SHEET 5					OF 6									
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks			
									P	W	V				

5.0 AUXILIARY ITEMS (Performance test of auxiliary items shall be performed on the completely assembled valve)

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

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

 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										
		QUALITY PLAN NO.: PE-QP-999-145-I 006		VOLUME IIB		SECTION C		ISSUE NO.2 REV. NO. 00 DATE: 25.05.2016		SHEET 6 OF 6		
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
	(As Applicable)	2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	P	W	V	(C.O.C)
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
		4. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Mfr. Standard	Mfr. Standard	Test Certificate	2	---	---	(C.O.C)
6.0	PAINTING	Soundness of Painting	MA	Visual and Measurement	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-2
7.0	PACKING	Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-3

NOTES:

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


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


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

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


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

CLAUSE NO.	TECHNICAL REQUIREMENTS		
<p>2.00.00</p> <p>2.01.00</p>	<div style="text-align: right; border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">एनटीपीसी NTPC</div> <p>SPECIAL REQUIREMENT FOR SOLID STATE EQUIPMENTS/ SYSTEMS</p> <p>The minimum type test reports, over and above the requirements of above clause, which are to be submitted for each of the major C&I systems shall be as indicated below:</p> <p>i) Surge Withstand Capability (SWC) for Solid State Equipments/ Systems</p> <p>All solid state systems/ equipments shall be able to withstand the electrical noise and surges as encountered in actual service conditions and inherent in a power plant. All the solid state systems/ equipments shall be provided with all required protections that needs the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Hence, all front end cards which receive external signals like Analog input & output modules, Binary input & output modules etc. including power supply, data highway, data links shall be provided with protections that meets the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Complete details of the features incorporated in electronics systems to meet this requirement, the relevant tests carried out, the test certificates etc. shall be submitted along with the proposal. As an alternative to above, suitable class of EN 61000-4-12 which is equivalent to ANSI 37.90.1/ IEEE-472 may also be adopted for SWC test.</p> <p>ii) Dry Heat test as per IEC-68-2-2 or equivalent.</p> <p>iii) Damp Heat test as per IEC-68-2-3 or equivalent.</p> <p>iv) Vibration test as per IEC-68-2-6 or equivalent.</p> <p>v) Electrostatic discharge tests as per EN 61000-4-2 or equivalent.</p> <p>vi) Radio frequency immunity test as per EN 61000-4-6 or equivalent.</p> <p>vii) Electromagnetic Field immunity as per EN 61000-4-3 or equivalent.</p> <p>Test listed at item no. v, vi, vii, above are applicable for electronic cards only as defined under item (i) above.</p>		
<p align="center">EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)</p>	<p align="center">TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2</p>	<p align="center">SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS</p>	<p align="center">PAGE 2 OF 9</p>


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

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

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

CLAUSE NO.	TECHNICAL REQUIREMENTS																										
	<p>* 1.0 All cables to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last Ten years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.</p> <p>2.0 In case the Contractor is not able to submit report of the type test(s) conducted within last Ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract free of cost to the Owner and submit the reports for approval.</p> <p>**These tests shall be carried out as per VDE0207 Part 6 & ASTM-D-2116 for TEFLON insulated & outer sheathed cables</p> <p>***Applicable for armoured cables only</p> <p>9 DC Power Supply System (Applicable for each model and rating)</p> <p>1)The Type Test reports for offered rectifier module and the controller module irrespective of the rectifier bank shall be acceptable</p> <table border="0" data-bbox="673 989 1292 1793"> <tr> <td>Surge Withstand Capability(SWC)</td> <td>ANSI 37.90.1, No IEEE-472,EN 61000-4-12</td> <td>Yes</td> </tr> <tr> <td>Dry Heat Test</td> <td>IEC-68-2-2 or No equivalent</td> <td>Yes</td> </tr> <tr> <td>Damp Heat test</td> <td>IEC-68-2-3 or No equivalent</td> <td>Yes</td> </tr> <tr> <td>Vibration test</td> <td>IEC68-2-6 or No equivalent</td> <td>Yes</td> </tr> <tr> <td>Electrostatic discharge test</td> <td>EN 61000-4-2 No orr equivalent</td> <td>Yes</td> </tr> <tr> <td>Radio frequency immunity test</td> <td>EN-61000-4-3 No orr equivalent</td> <td>Yes</td> </tr> <tr> <td>Electromagnetic field immunity</td> <td>EN 61000-4-3 No orr equivalent</td> <td>Yes</td> </tr> <tr> <td>Degree of Protection</td> <td>IS-13947 or No equivalent</td> <td>Yes</td> </tr> </table>	Surge Withstand Capability(SWC)	ANSI 37.90.1, No IEEE-472,EN 61000-4-12	Yes	Dry Heat Test	IEC-68-2-2 or No equivalent	Yes	Damp Heat test	IEC-68-2-3 or No equivalent	Yes	Vibration test	IEC68-2-6 or No equivalent	Yes	Electrostatic discharge test	EN 61000-4-2 No orr equivalent	Yes	Radio frequency immunity test	EN-61000-4-3 No orr equivalent	Yes	Electromagnetic field immunity	EN 61000-4-3 No orr equivalent	Yes	Degree of Protection	IS-13947 or No equivalent	Yes		
Surge Withstand Capability(SWC)	ANSI 37.90.1, No IEEE-472,EN 61000-4-12	Yes																									
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Radio frequency immunity test	EN-61000-4-3 No orr equivalent	Yes																									
Electromagnetic field immunity	EN 61000-4-3 No orr equivalent	Yes																									
Degree of Protection	IS-13947 or No equivalent	Yes																									
<p align="center">EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)</p>	<p align="center">TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2</p>	<p align="center">SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS</p>	<p align="center">PAGE 6 OF 9</p>																								

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

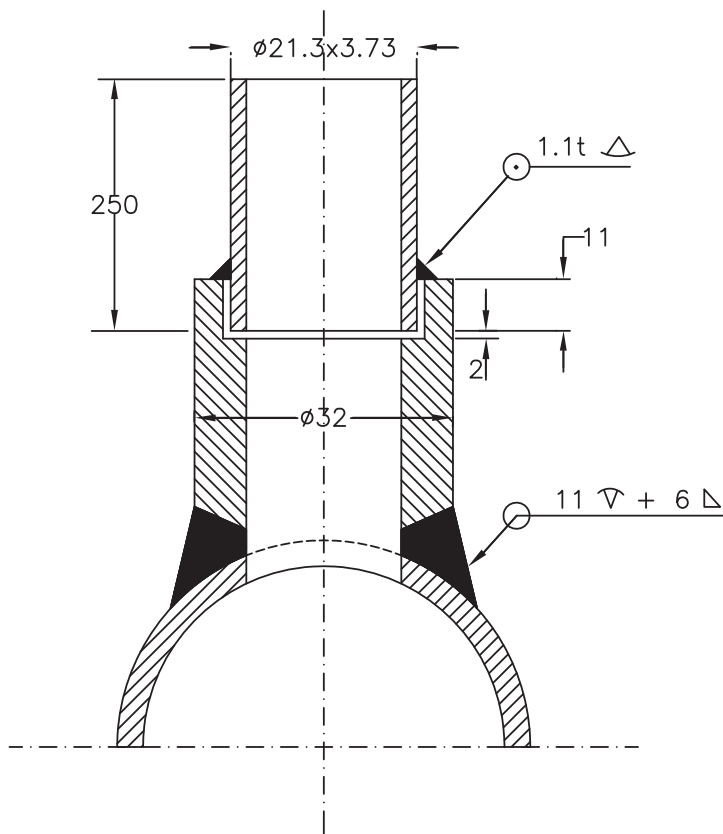
CLAUSE NO.	TECHNICAL REQUIREMENTS																																					
	<p data-bbox="472 216 1377 275">Historical Data Access Server acceptable)</p> <table border="0" data-bbox="402 304 1284 913"> <tr> <td data-bbox="402 304 435 331">21</td> <td data-bbox="472 304 673 390">Conductivity Type Level Switch</td> <td data-bbox="695 304 808 390">Degree of protection test</td> <td data-bbox="824 304 966 331">of IS-2147</td> <td data-bbox="1052 304 1084 331">No</td> <td data-bbox="1242 304 1274 331">No</td> </tr> <tr> <td data-bbox="402 409 435 436">22</td> <td data-bbox="472 409 630 436">Local Gauges</td> <td data-bbox="695 409 808 495">Degree of protection test</td> <td data-bbox="824 409 966 436">of IS-2147</td> <td data-bbox="1052 409 1084 436">No</td> <td data-bbox="1242 409 1274 436">No</td> </tr> <tr> <td data-bbox="402 525 435 552">23</td> <td data-bbox="472 525 673 590">Process actuated Switches</td> <td data-bbox="695 525 808 611">Degree of protection test</td> <td data-bbox="824 525 966 552">of IS-2147</td> <td data-bbox="1052 525 1084 552">No</td> <td data-bbox="1242 525 1274 552">No</td> </tr> <tr> <td data-bbox="402 640 435 667">24</td> <td data-bbox="472 640 641 667">Control Valves</td> <td data-bbox="695 640 781 667">CV test</td> <td data-bbox="873 640 1031 695">ISA 75.02& 75.11</td> <td data-bbox="1052 640 1084 667">No</td> <td data-bbox="1242 640 1274 667">Yes</td> </tr> <tr> <td data-bbox="402 724 435 751">25</td> <td data-bbox="472 724 537 751">PLCs</td> <td data-bbox="695 724 852 810">As per standard (Col 4)</td> <td data-bbox="873 724 982 751">IEC 1131</td> <td data-bbox="1052 724 1084 751">No</td> <td data-bbox="1242 724 1274 751">No</td> </tr> <tr> <td data-bbox="402 840 435 867">26</td> <td data-bbox="472 840 673 905">Flow Nozzle Orifice plates</td> <td data-bbox="695 840 820 867">Calibration</td> <td data-bbox="873 840 998 915">ASME PTC BS 1042</td> <td data-bbox="1052 840 1084 867">No</td> <td data-bbox="1242 840 1274 867">Yes</td> </tr> </table> <p data-bbox="386 940 1425 1087">## The contractor shall submit for Employers approval the reports of all the type test as per latest IS-10918 carried out within last ten years from the date of Bid opening and the test(s) should have been either conducted at an independent laboratory or in presence / owners representative. The complete type test reports shall be for any rating of Battery in a particular group based on plate dimensions being manufactured by supplier.</p> <p data-bbox="386 1115 456 1142">Note:</p> <p data-bbox="386 1171 1425 1226">Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.</p>	21	Conductivity Type Level Switch	Degree of protection test	of IS-2147	No	No	22	Local Gauges	Degree of protection test	of IS-2147	No	No	23	Process actuated Switches	Degree of protection test	of IS-2147	No	No	24	Control Valves	CV test	ISA 75.02& 75.11	No	Yes	25	PLCs	As per standard (Col 4)	IEC 1131	No	No	26	Flow Nozzle Orifice plates	Calibration	ASME PTC BS 1042	No	Yes	
21	Conductivity Type Level Switch	Degree of protection test	of IS-2147	No	No																																	
22	Local Gauges	Degree of protection test	of IS-2147	No	No																																	
23	Process actuated Switches	Degree of protection test	of IS-2147	No	No																																	
24	Control Valves	CV test	ISA 75.02& 75.11	No	Yes																																	
25	PLCs	As per standard (Col 4)	IEC 1131	No	No																																	
26	Flow Nozzle Orifice plates	Calibration	ASME PTC BS 1042	No	Yes																																	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	PAGE 9 OF 9																																			



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

SECTION: C4
SUB SECTION: C&I

INSTRUMENT STUB DETAILS



NOTE :

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

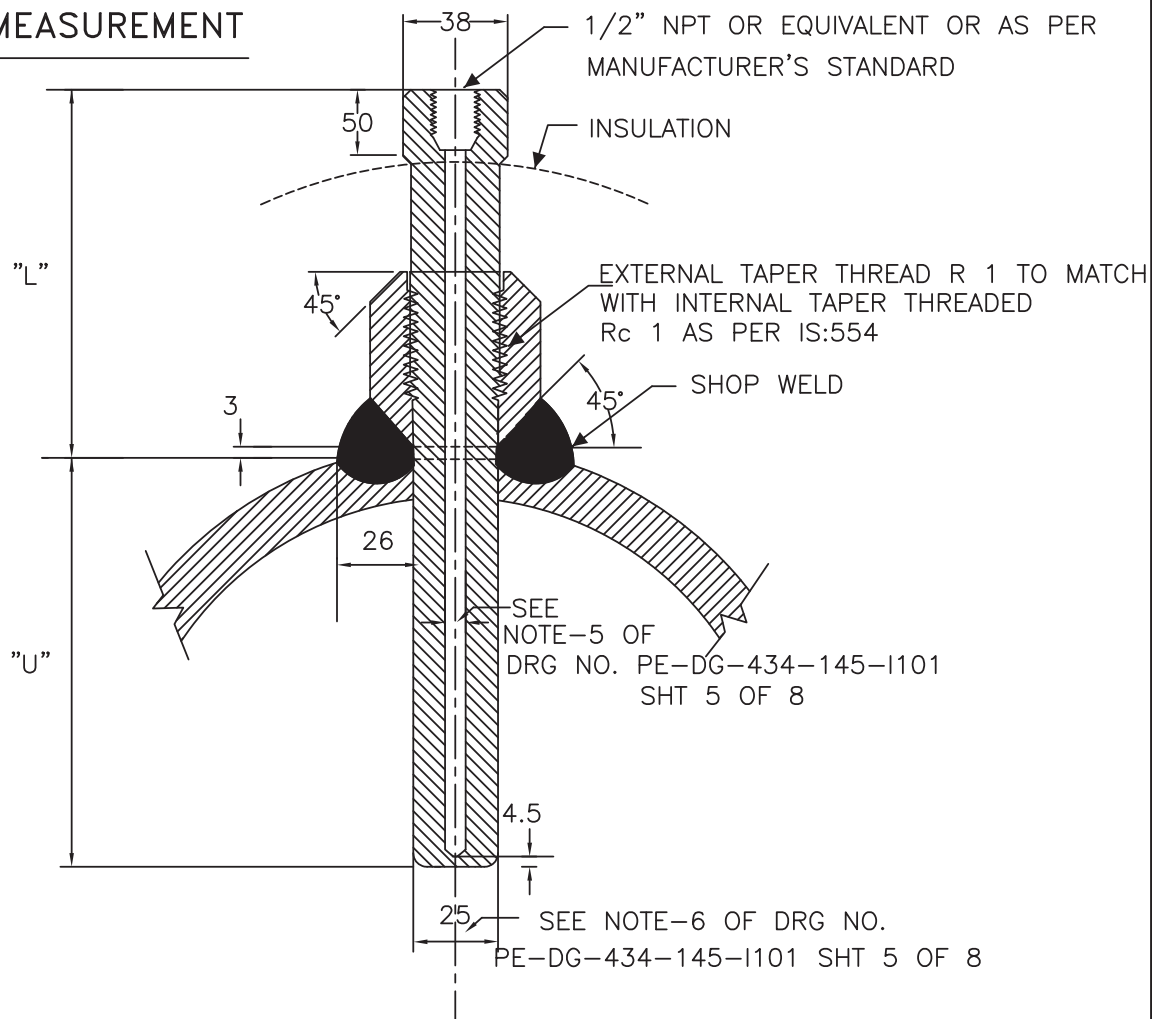


TITLE :
**INSTRUMENT STUB DETAILS
 FOR PRESSURE MEASUREMENT**

DRG. NO.
PE-DG-434-145-I101
 REV. 00

(SYSTEM PRESS UPTO 40Kg/Cm², TEMP < 400 Deg C) SH. 04 OF 08 SHS.

TEMP. MEASUREMENT



NOTES :-

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



TITLE :

INST. STUB DETAILS (TEMP)

(APPLICABLE FOR PIPE SIZE ABOVE 4")

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

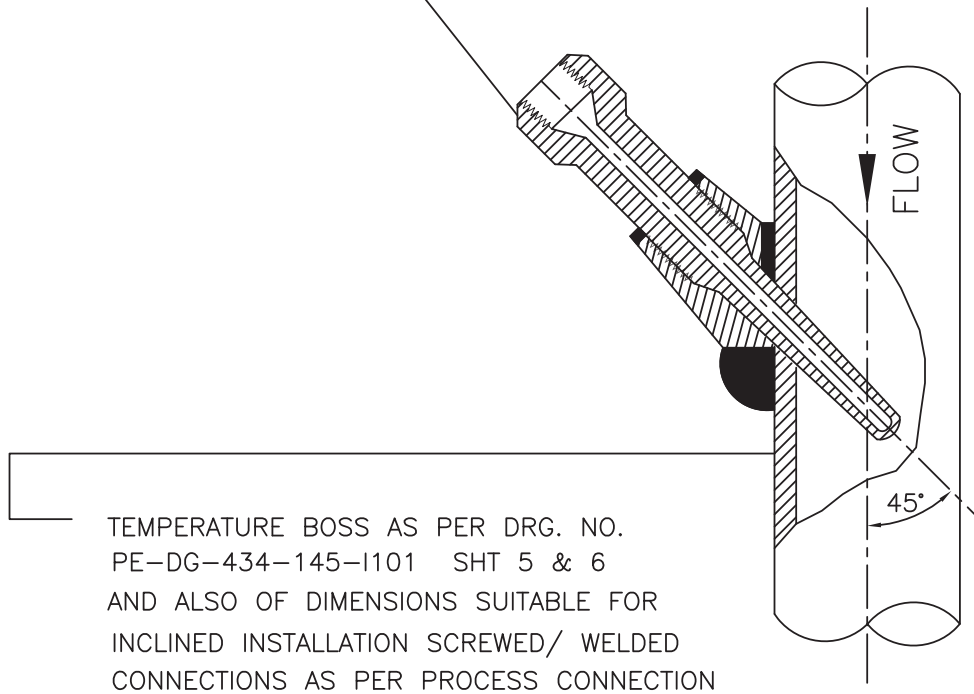
DRG. NO.

PE-DG-434-145-I101

REV. 00

SH. 06 OF 08 SHS.

THERMOWELL SUITABLE FOR THE BOSS
AS PER DRG. NO.
PE-DG-434-145-1101 SHT 5 & 6



TEMPERATURE BOSS AS PER DRG. NO.
PE-DG-434-145-1101 SHT 5 & 6
AND ALSO OF DIMENSIONS SUITABLE FOR
INCLINED INSTALLATION SCREWED/ WELDED
CONNECTIONS AS PER PROCESS CONNECTION

NOTES :-

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



TITLE :

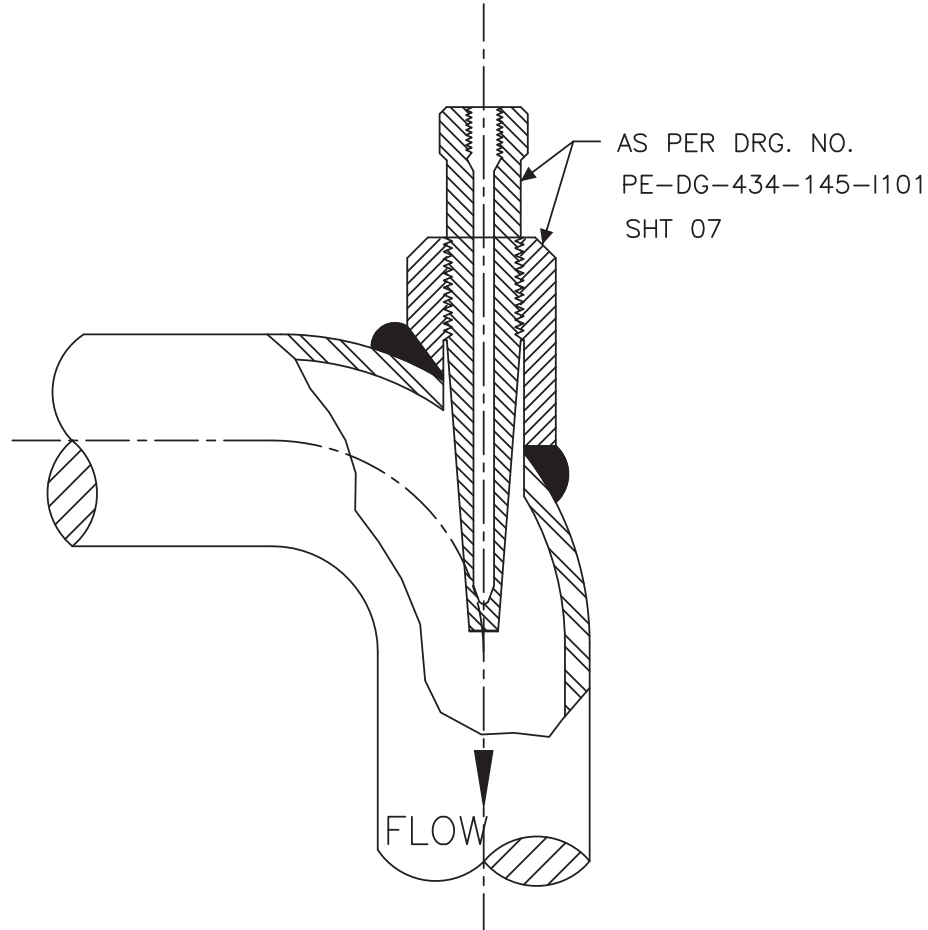
THERMOWELL INSTALLATION

DRG. NO.

PE-DG-434-145-1101

REV. 00

SH. 07 OF 08 SHS.



NOTES :-

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



TITLE :

THERMOWELL INSTALLATION
(IN BEND PIPES)

DRG. NO.

PE-DG-434-145-I101

REV. 00

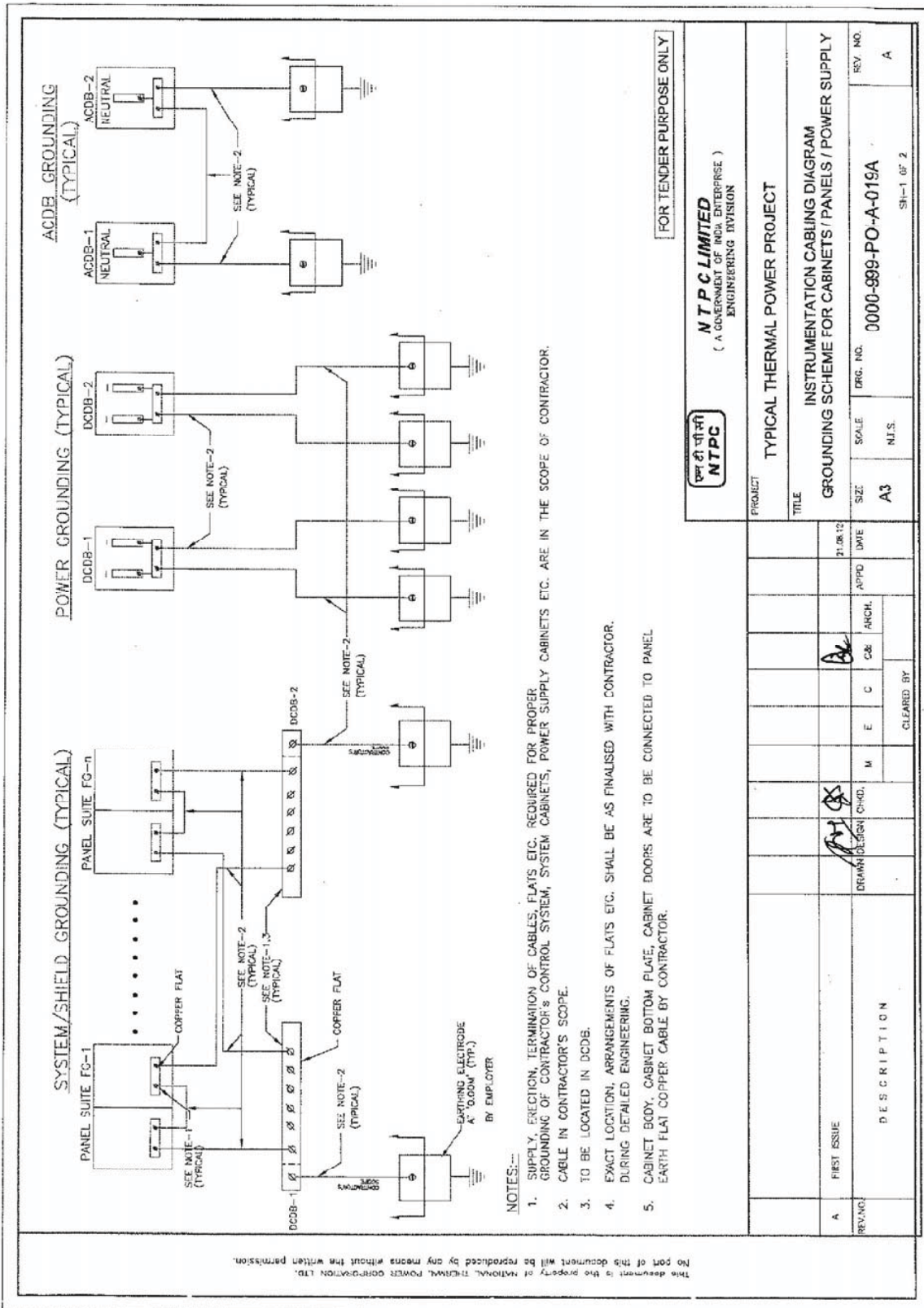
SH. 08 OF 08 SHS.



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

SECTION: C4
SUB SECTION: C&I




INSTRUMENT INSTALLATION DRAWING



NOTES:-

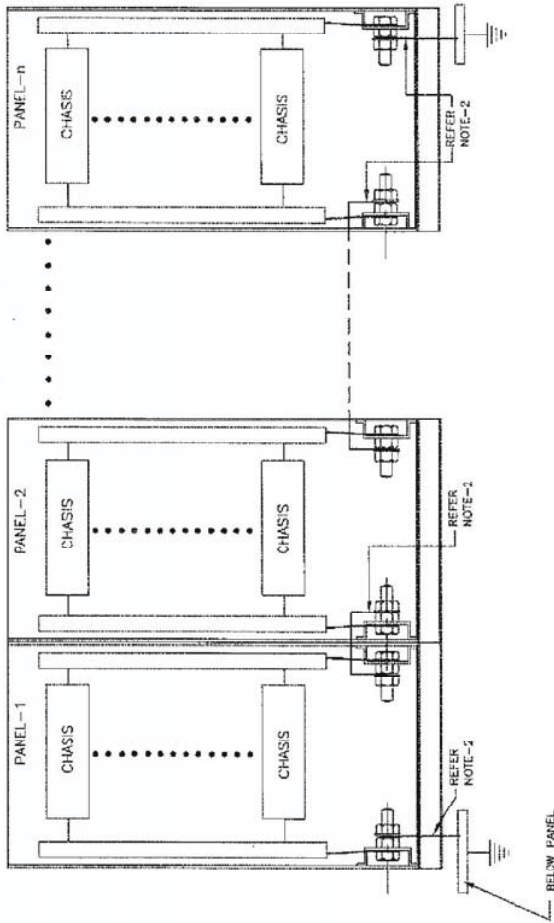
1. SUPPLY, ERECTION, TERMINATION OF CABLES, FLAYS, ETC. REQUIRED FOR PROPER GROUNDING OF CONTRACTOR'S CONTROL SYSTEM, SYSTEM CABINETS, POWER SUPPLY CABINETS ETC. ARE IN THE SCOPE OF CONTRACTOR.
2. CABLE IN CONTRACTOR'S SCOPE.
3. TO BE LOCATED IN DCDB.
4. EXACT LOCATION, ARRANGEMENTS OF FLAYS ETC. SHALL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

FOR TENDER PURPOSE ONLY

 NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION		TYPICAL THERMAL POWER PROJECT	
TITLE INSTRUMENTATION CABLING DIAGRAM GROUNDING SCHEME FOR CABINETS / PANELS / POWER SUPPLY		REV. NO. A	DRG. NO. 0000-999-PO-A-019A
SIZE A3	SCALE N.T.S.	REV. NO. A	SH-1 OF 2
DATE 21.08.22	APPD 	CHK 	CHECKED BY
REV. NO. A	DESCRIPTION	DATE 	BY

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GROUNDING FOR EACH ROW OF PANELS
(TYPICAL)



NOTES:-

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

FOR TENDER PURPOSE ONLY



NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT			
TITLE		INSTRUMENTATION CABLING DIAGRAM			
GROUNDING SCHEME FOR CABINETS / PANELS / POWER SUPPLY					
REV. NO.	SCALE	DRG. NO.	DATE	APPD	REV. NO.
A	A3	0000-999-POJ-A-019A	31.08.12		A
DESCRIPTION		SH-2 OF 2			
DRAWN/DESIGN CHKD.		M	E	C	CAI
CLEARED BY					

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LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	3/4" x 1/2" NPS SCH 40/60/160/MS/PS1 PER PROCESS (ELEMENT) NIPPLE OF MATERIAL SAME AS THAT OF MAIN PIPE.
2.	1/2" / 3/4" / 1" SW GLOBE VALVE/GATE VALVE
3.	3/4" / 1" x 1/2" SW REDUCING INSERT
4.	1/2" / 3/4" PIPE
5.	1/2" / 3/4" SW EQUAL TEE
6.	1/2" / 3/4" SW GLOBE VALVE
7.	1/2" / 3/4" NPS SW x 1/2" / 3/4" NPT(M) CARBON/ALLOY STEEL NIPPLE.
8.	1/2" / 3/4" NPT(F) CAP.
9.	1/2" / 3/4" PIPE UNION.
10.	8" SS SYPHON
11.	1/2" BLIND 3000lb RF ANSI FLANGE DRILLED AND TAPED FOR 1" NPT PIPE.
12.	SUITABLE ADAPTER.
13.	1/4" CHROME MOLY STEEL TUBE.
14.	
15.	1" / 3/4" SW EQUAL TEE.
16.	DIAPHRAGM(WATER ELEMENT)
17.	ISOLATION VALVE 316 SS, 1/4" SW

NOTES:-

- THE MATERIAL SPECIFICATION AND SCHEDULE NO. OF IMPULSE PIPE & NIPPLE AS LISTED HEREIN SHALL BE AS PER TECHNICAL SPECIFICATIONS.
- THE MATERIAL SPECIFICATION AND RATING OF FITTINGS AS LISTED SHALL BE AS PER SPECIFICATIONS. WELDED/THREADED FITTINGS SHALL CONFORM TO ANSI-B.16-11.
- INSTRUMENT'S VALVES BODY STEM MATERIAL AND PRESSURE CLASS SHALL BE AS PER TECHNICAL SPECIFICATIONS.
- THE SIZE OF THE CAPILLARY TUBES, SERVICES, SOURCE CONNECTIONS IMPULSE PIPING AND ALL FITTINGS SHALL BE OF 3/4" NB SIZE.
- GAUGES SHALL NOT BE MOUNTED ON THE PIPE. IT WILL BE MOUNTED ON A CHANNEL OR FRAME OR A RACK.
- * SLOPE APPROX. 50 MM / METRE.

FOR TENDER PURPOSE ONLY

ELEVATION INSTRUMENT MOUNTED REMOTE FROM INSTRUMENT SOURCE POINT

ELEVATION LIQUID SOURCE

PROJECT

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT

TYPICAL THERMAL POWER PROJECT

REV. NO. A

DESCRIPTION

INSTRUMENT INSTALLATION DIAGRAM (FOR PRESSURE GAUGE)

SCALE A3

DIRG. NO. 0000-999-POI-A-022

REV. NO. A

APPROVED [Signature]

DATE 21.08.12

ARCH. [Signature]

CHECKED [Signature]

DESIGNED [Signature]

DATE 21.08.12

CLEARED BY

M E C CAI ARCH.

T.G.

NO. OF SHEETS 1

TOTAL SHEETS 1

DATE 21.08.12

SCALE N.T.S.

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LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1/2" / 3/4" NPS SCH. 80/160 XXS/PS1 NIPPLE OF MATERIAL SAME AS THAT OF MAIN PIPE
2.	3/4" / 1" SW GLOBE VALVE
3.	3/4" / 1" TO 1/2" REDUCING INSERT
4.	1/2" NPS PIPE
5.	1/2" SW EQUAL TEE
6.	1/2" SW GLOBE VALVE
7.	1/2" NPS SCH. 80/160 SWK1/2" CS/AS COUPLER
8.	1/2" PIPE UNION
9.	3/8" VALVE MANIFOLD (FOR DETAIL SEE DRAWING NO.0000-102-POI-A-023)
10.	SUITABLE ADAPTER
11.	SS TUBE
12.	1/2" PIPE x 1/2" TUBE UNION
13.	1/2" NPS SCH. 80/160 SWK1/2" RPT(M) CS/AS NIPPLE

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT
TYPICAL THERMAL POWER PROJECT

TITLE
INSTRUMENT INSTALLATION DIAGRAM
(PRESSURE MEASUREMENT USING PRESS/DP TRANSMITTERS STEAM/LIQUID VACUUM)

SCALE: DRG. NO. 0000-999-POI-A-025
SIZE: A3 N.T.S.

REV. NO. A

DESCRIPTION

REV. NO.	FIRST ISSUE	DRAWN	DESIGN	CHKD.	M	E	C	CBI	ARCH.	APPD	DATE
A											21.08.12

CLEARED BY: _____

TRANS-MITTER MOUNTED BELOW INSTRUMENT SOURCE POINT
ELEVATION

TRANS-MITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT
ELEVATION

LIQUID PRESSURE MEASUREMENT
ELEVATION

VACUUM PRESSURE MEASUREMENT
ELEVATION

NOTES:-

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

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LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	3/4" x 1/2" NPS SCH.40/80/160/191 AS PER PROCESS REQUIREMENT CARBON /ALLOY STEEL PIPE.
2.	3/4" SW GLOBE VALVE.
3.	3/4" SW UNION.
4.	3/4" NPT GLOBE VALVE.
5.	3/4" NPT (M) CAP.
6.	3/4" NPT (F) UNION CONNECTION.
7.	1" SW EQUAL UNION.
8.	1" x 1/2" SW REDUCING INSERT.
9.	1" SW EQUAL TEE.
10.	1/2" SW GLOBE VALVE.
11.	1/2" NPS SW 1/2" NPT(M) CS/AS NIPPLE.
12.	1/2" NPT (F) CAP
13.	3/4" x 1/2" NPS SCH.40/80 CS/AS PIPE.
14.	1/2" NPS SCH.80/160 CS/AS NIPPLE.
15.	1" SW GLOBE VALVE.

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT
TYPICAL THERMAL POWER PROJECT

TITLE
INSTRUMENT INSTALLATION DIAGRAM
(LEVEL GAUGE & SWITCHES)

SCALE
A3 N.T.S.

DRG. NO.
0000-999-POI-A-031

REV. NO.
A

NOTES:-

- FOR LEVEL GAUGE 3/4" AND FOR LEVEL SWITCH 1" PROCESS CONNECTION SHALL BE PROVIDED.
- NOTES UNDER DRG. NO. 0000-999-POI-A-023 (WHICHEVER ARE RELEVANT).

LOCAL LEVEL INDICATION USING GAUGE GLASS

ELEVATION

LOCAL LEVEL INDICATION USING MULTIPLE GAUGES
FOR INCREASED RANGE NOT COVERED IN A SINGLE UNIT

ELEVATION

FLOAT OR DISPLACER OPERATED EXTERNAL CAGE TYPE LEVEL SWITCH INSTALLATION

ELEVATION

LOCAL LEVEL INDICATION USING MULTIPLE GAUGES
FOR INCREASED RANGE NOT COVERED IN A SINGLE UNIT

ELEVATION

DESCRIPTION

DRAWN DESIGN CHKD. M E C C&I ARCH. f.g.

APPD DATE 21.08.12

CLEARED BY


REV. NO.
A


FIRST ISSUE


DESCRIPTION

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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		
1.01.03	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		
2.00.00	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			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIIC-06 PROCESS CONNECTION AND PIPING	PAGE 1 OF 3

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
2.04.00	<p>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.</p> <p>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 1/2" 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.</p>		
2.05.00	<p>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 1/2 inch to 2 inch.</p>		
2.06.00	<p>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.</p>		
3.00.00	<p>INSTALLATION AND ROUTING</p>		
3.01.01	<p>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.</p> <p>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.</p>		
4.00.00	<p>SHOP AND SITE TESTS</p>		
4.01.01	<p>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.</p>		
4.01.02	<p>Hydrostatic and Pneumatic leakage tests shall be performed on all pipes, tubing and systems and shall conform to ANSI B31.1.</p>		
5.00.00	<p>LOCAL INSTRUMENT ENCLOSURE AND RACKS</p> <p>All transmitters, switches etc. in Boiler Turbine Generator measurements (except for all fuel oil applications) shall be suitably grouped together and mounted inside (i) local instruments enclosures in case of open areas of the plant like boiler area, etc. and (ii) In local instrument racks in case of covered areas like Turbine/Generator area. The GA of LIE with purging indicated in the Drg. No. 0000-999-POI-A-036 is to be followed by contractor. The GA of LIR shall be similar to LIE except for front/rear doors and side panels.</p>		
<p>EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)</p>	<p>TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2</p>	<p>SUB-SECTION-III C-06 PROCESS CONNECTION AND PIPING</p>	<p>PAGE 2 OF 3</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS		
5.01.00	<p>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.</p> <p>The instrument racks shall be free standing type constructed of suitable 3 mm thick channel frame of steel and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel, and extended beyond the ends of the rack.</p> <p>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.</p> <p>Contractor shall provide not more than three variants for LIE/LIR with respect to max. no. transmitters mounted in each LIE/LIR.</p> <p>ENCLOSURE / RACKS FOR DUAL I/P TEMPERATURE TRANSMITTERS</p> <p>All Dual Input temperature transmitters in Boiler Turbine Generator measurements shall be suitably grouped together and mounted inside (i) Enclosures in case of open areas of the plant like boiler area, etc. and (ii) Racks in case of covered areas like Turbine/Generator area. Integral JB shall be provided with each Enclosure and Rack.</p> <p>The internal layout shall be such that the transmitters are accessible from both front and back side of the enclosure / rack for easy maintenance.</p> <p>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.</p> <p>Enclosure and Racks shall be free standing type.</p> <p>Enclosures/Racks shall be reinforced as required to ensure true surface and to provide adequate support for instruments and equipment mounted therein.</p> <p>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.</p>		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIIC-06 PROCESS CONNECTION AND PIPING	PAGE 3 OF 3



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

SECTION: C4
SUB SECTION: C&I

SUB VENDOR LIST

NTPC		PROJECT : Patnaru STPS Phase-I (3 X800MW)				LIST OF ITEMS REQUIRING CP				REVISION NO : 09		
		PACKAGE : EPC PACKAGE				APPROVAL & ACCEPTABLE				DATE : 28.04.2017		
		CONTRACTOR : BHEL Ltd				VENDOR AS APPROVED BY						
		CONTRACT NO : CS-8585-001-2										
No.	Major Equipment	QIP Inspected Category	QIP No. 8585-001-QVI	QIP Submits 8585-001-QVI SCH	QIP Approval SCH	Proposed Sub Supplier	Country	S5 Approval Status	S5 Detail Sub SCH	S5 Approval SCH	Sub OR	Remark
		II				Forbes Avel	France	A				Approved up to 4" and 300 Class. "OR" for Higher rating and Size. M/s BHEL will forward only those proposals after details review of NTPC Technical specification requirements.
						Daume Regelbauarbeiten GmbH	Germany	DR				
						Mitsui Singapore PTE Ltd.	South Korea	DR				
						Severn Glocon	Chermal	DR				
						Spax Corporation	USA	DR				
						Rungo Valvulas SL	Spain	DR				
						Valvulas SFA	Italy	DR				
						R K Controls	Thans	DR				
						Cirror (Leske)	Coltatore	DR				
						Spax Flow Technologies	USA	DR				
						Curzor (Leske)	Coltatore	DR				
						Schenckag valve co. ZL	China	DR				
						Spax Flow Technologies	Ahamabad	DR				
						WEIR Valves and Controls	UK	DR				
						WALDENAR PRUSS	Germany	DR				
						ARMAURENFABRIK GMBH		DR				
						BOMABA Special valve solutions	Rhmedabad	DR				
						FM Ltd		DR				
						Suzhou dehan entropy science and technology co. Ltd.	China	DR				
22	Temperature Transmitter	III				EMERSON	U.S.A/Pawana / Singapore	A			Sub OR	
	(Single and Dual Input)	III				Yokogawa	Japan	A				Final testing at M/S YL Bangalore is also acceptable
		III				Mogre	USA	A				
		III				M System	JAPAN	A				
		III				ABB	GERMANY/ Bangalore	A				
		III				ENDRESS & HOUSER	Aurangabad	A				
						Khrona		DR				
						Tokyo Keiko	Japan	DR				
						Honeywell	Pune	DR				
						HOOR	Sweden	DR				
						P & F	Bangalore	DR				
						Siemens		DR				
						Yamatika	JAPAN	DR				
						Yemari	JAPAN	DR				
						Fosforo		DR				
23	Conductivity/level/GI					Reflex Electrical Ltd	USA/Pawana	A			Sub OR	
24	Electronic transmitters (pressure, DP, Flow)	III				EMERSON (Rajshambur)		A				
		III				FUJI ELECTRIC YOKOGAWA	France JAPAN	A				
		III						A				



5-07-28

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Testing and Calibration of M/s YL, Bangalore is also acceptable.

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





NTPC		PROJECT : PAVRIU STPS Phase-I (3 X60MW)				LIST OF ITEMS REQUIRING OP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY				REVISION NO : 00 DATE : 18.04.2017	
PACKAGE : EPC PACKAGE		CONTRACTOR : IHEL Ltd				Country				SS Approval Status	
CONTRACT NO : CS-9885-001-3		Proposed Sub Supplier				SS Approval Status				SS Approval Sub.SCH	
No.	Major Equipment	QP No. / Inspect on	QP No. / Submit	QP No. / Appro val	QP No. / SCH	Country	SS Approval Status	SS Approval Sub.SCH	SS Approval Sub OR	Remark	
25	Thermocouples, RTD & Thermowells	III	III	III	III	Bangalore	A			EJA-E series 110,430,630	
		III	III	III	III	Bangalore	A			Model - 2600 T	
		III	III	III	III	GERMANY / Italy	A			Model - 2600 T	
		III	III	III	III	France / Korea	A				
		III	III	III	III	Pune	A			SMART MARK	
		III	III	III	III	Dieman	A			SMART MARK	
		III	III	III	III	Bahadur	A				
		III	III	III	III	Mumbai	A				
		III	III	III	III	Aurangabad	DR				
		III	III	III	III	Germany	DR				
		III	III	III	III	Chennai	DR				
		III	III	III	III	GERMANY	A		Sub OR		
		III	III	III	III	Korea	A				
		III	III	III	III	Uttarpradesh	A				
		III	III	III	III	Uttarpradesh	A				
		III	III	III	III	Uttarpradesh	A				
		III	III	III	III	Uttarpradesh	A				
		III	III	III	III	Mumbai	A				
		III	III	III	III	USA	A				
		III	III	III	III	JAPAN	A				
		III	III	III	III	JAPAN	A				
		III	III	III	III	Singapore	A				
		III	III	III	III	Germany	A				
		III	III	III	III	Germany	A				
		III	III	III	III	France	A			Imported from Emerson, Germany (make)	
		III	III	III	III	Savarivadi	A				
		III	III	III	III	Ahmadabad	A				
		III	III	III	III	GOA	A				
		III	III	III	III	GOA	DR			For Thermowell only	
		III	III	III	III	Goa	DR			Ms IHEL will forward only two proposals after obtains review of NTPC Technical specification requirements.	
		III	III	III	III	Pune	DR				
		III	III	III	III	Ajmer	DR				
		III	III	III	III	Aurangabad	DR				
		III	III	III	III	Vapi	DR				
		III	III	III	III	Kolkata	DR				
		III	III	III	III	Thane	DR				
		III	III	III	III	Vapi	DR				
		III	III	III	III	Noida	DR				
		III	III	III	III	Gurgaon	DR				
		III	III	III	III	Roorkee	A				
		III	III	III	III	Aurangabad	A			For Generator Turbine & Motor	
		III	III	III	III	Germany	A		Sub OR		
		III	III	III	III	France	A				
		III	III	III	III	CANADA	A				
		III	III	III	III	Hungary	A				
		III	III	III	III	Germany	DR				
26	Ultrasonic Type Level Transmitter	III	III	III	III	EMERSON	A				
		III	III	III	III	BEVERLYS MILTRONICS	A				
		III	III	III	III	Invivo	A				
		III	III	III	III	Vega	DR				

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NTPC		PROJECT : Patratu STPS Phase-I (3 X800MW) PACKAGE : EPC PACKAGE CONTRACTOR : BHEL Ltd			LIST OF ITEMS REQUIRING OP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY			REVISION NO : 00 DATE : 28.04.2017			
No.	Major Equipment	QP No. on Category	OP No. Submittal (001-QVI) SCH	QP Approval SCH	Prepared Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
27	Critical plate assembly	III	III	III	Zhenhua	France / USA / Pune	DR				Mis BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		III	III	III	Yokogawa	Bangalore	DR				
		III	III	III	PAF	Germany	DR				
		III	III	III	Magistral	Belgium	DR				
		III	III	III	ABB	Germany / India	DR				
		III	III	III	Polaris Marshel	Pune	DR				
		III	III	III	Instrumentation Limited	Paigah	A				
		III	III	III	Microprecision	Paigah	A				
		III	III	III	Shimadzu	Pune	A				
		III	III	III	Flow Star	Fardabad	A				
		III	III	III	SFERCO	Australia	A				
		III	III	III	MINCO India Pvt. Ltd.	GOA	A				Up to 32"
		III	III	III	MINCO India Flow Elements Pvt. Ltd.	GOA	A				Up to 28"
		III	III	III	WISE Control	Korea	A				
		III	III	III	T M Technomic	Italy	A				
		III	III	III	BEPL	Hyderabad	DR				
		III	III	III	Engg. Specialities	Kolkata	DR				
		III	III	III	BAI IGA	CHENNAI	DR				
		III	III	III	Pyrotech	Mumbai	DR				
		III	III	III	Hydrometronics	Marissa	DR				
		III	III	III	Tensa Equipment Pvt. Ltd.	Thane	DR				
		III	III	III	Dynasim Field Vales Pvt. Ltd.	Bilgaon	DR				
		III	III	III	BUCHHEBERG	UK	A				
		III	III	III	ASHCROFT	USA/Germany/ India	A				
		III	III	III	Wika	GERMANY	A				
		III	III	III	WISE Control	Korea	A				
		III	III	III	Nagano NEMO	Japan	A				
		III	III	III	H.Geno South India	Bangalore	A				Not for MS & FW application
		III	III	III	A.K. Instruments	Kolkata	A				Not for MS & FW application
		III	III	III	Gauge Bharat	Panvel	A				
		III	III	III	Gota Thermotatic	GOA	A				Not for MS & FW application
		III	III	III	Wika	Pune	A				
		III	III	III	Baumert	Vgl	A				
		III	III	III	Precision mass products Pvt. Ltd.	Gandhinagar	A				
		III	III	III	H.Geno	Rishra/Auzatapur	A				
		III	III	III	US Gauge	USA	A				
		III	III	III	Winters	USA	DR				
		III	III	III	Fuchs Marechal	Hyderabad	A				
		III	III	III	Manometer	Mumbai	DR				
		III	III	III	Wahcondiagar Industries Ltd.	Chennai	A				
		III	III	III	Wassch	Vgl	A				
		III	III	III	Gauges Bourdon	UK	DR				
		III	III	III	Pisher Metax	Germany	DR				OP Gauge for Mis Westech, Japan



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