ANNEXURE- VIII

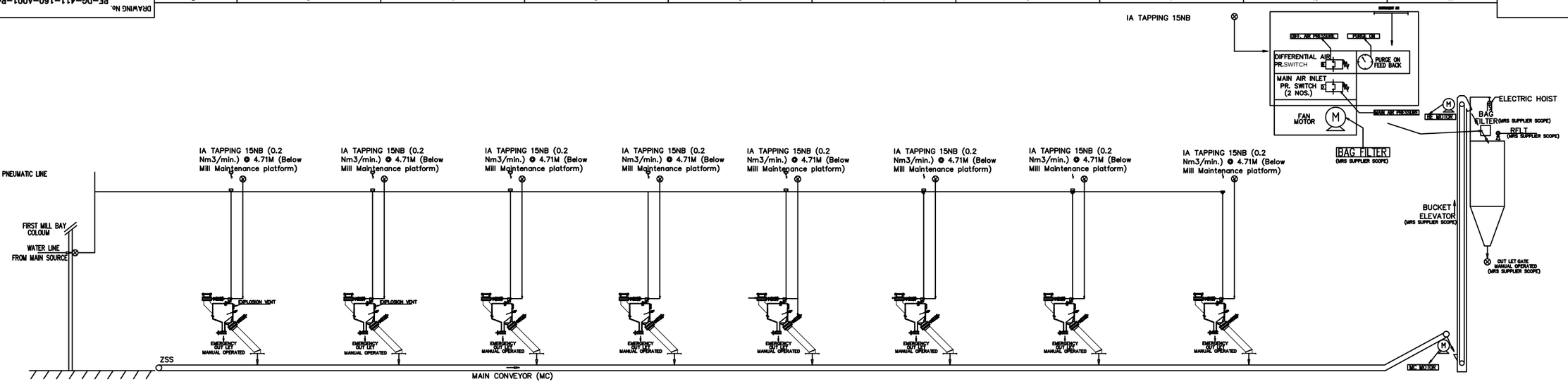
INPUT DRAWINGS

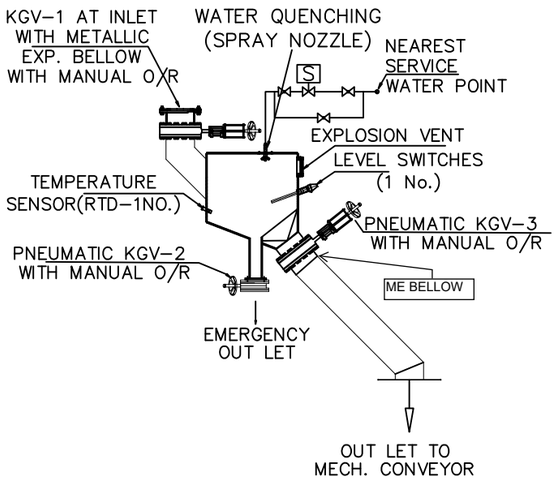
DRAWING No. PE-DG-411-160-A001-Rev.0

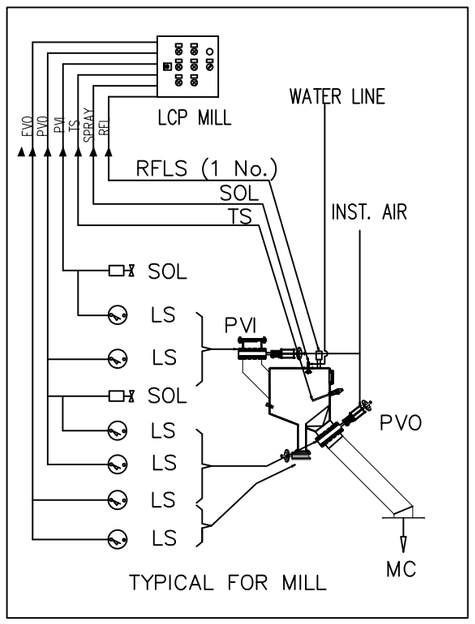
CUSTOMER'S DRAWING No.

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM







ALL SOLENOIDS SHALL BE DOUBLE COILED

NOTE :–

1. FOLLOWING PREFIXES TO BE USED FOR KKS TAG No. IN DETAIL DRAWINGS

UNIT NO.	PREFIX
UNIT–1	1
UNIT–2	2
UNIT–COMMON	9

2. THE SCHEME IS TYP. FOR ONE UNIT AND SHALL BE SIMILAR FOR ALL UNITS
3. INSTRUMENTS SHOWN HERE ARE TENATTIVE. ACTUAL REQUIREMENT OF INSTRUMENTS INCLUDING REDUNDANCY SHALL BE GOVERNED BY C&I SPECIFICATION.
4. THE INSTRUMENTATION FURNISHED IN THE PID IS A MINIMUM REQUIREMENT HOWEVER ANY INSTRUMENT REQUIRED FOR COMPLETENESS OF THE SYSTEM SHALL BE PROVIDED BY BIDDER WITHOUT ANY COST IMPLICATION IMPLICATION. FOR REDUNDANCY CRITERIA, VENDOR TO FOLLOW THE CLAUSE PERTAINING TO REDUNDANCY CRITERIA MENTIONED SPECIFIC TECHNICAL REQUIREMENT

COMMON LEGEND:

MC – MECHANICAL CONVEYOR
LS – LIMIT SWITCH
SOL–SOLENOID VALVE
RFLT–RADIO FREQUENCY LEVEL TRANSMITTER
RFLS–RADIO FREQUENCY LEVEL SWITCH
TS–TEMPERATURE SENSOR (RTD)
ZSS– ZERO SPEED SWITCH
PS– PRESSURE SWITCH
PG– PRESSURE GAUGE
PVI– PYRITE HOPPER INLET VALVE
PVO– PYRITE HOPPER OUTLET VALVE

REV	DATE	ALTD	CHD	APPD
01	3.6.15	PKK	RN	VK/GB

REV	DATE	ALTD	CHD	APPD

CUSTOMER: NTPC LIMITED.
CUSTOMER'S CONSULTANT:
JOB No. 512
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

NTPC SINGRAULI STPP STAGE–III (2X800 MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
A	DRN			
	DESN			
	CHD			
	APPD			

TITLE: FLOW DIAGRAM FOR MILL REJECTS HANDLING SYSTEM

DEPT.	SCALE	DRAWING No.
SIGN		PE–DG–512–160–A001
DATE		REV 0

SIZE–A3

COMPUTER FILE NAME:

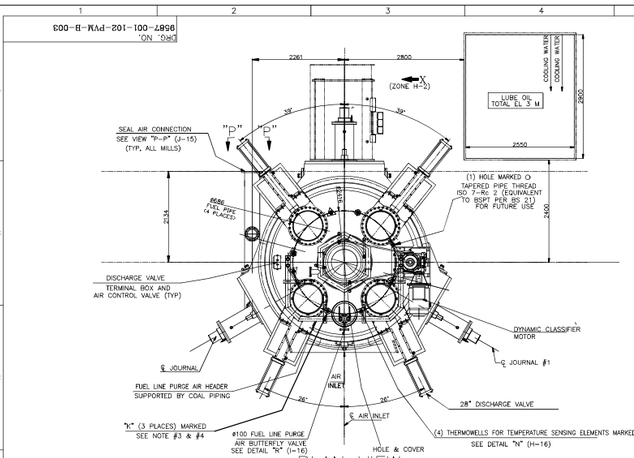

PASSAGE WAY
CONV. TRESTLE
MRS BELT CONVEYOR
MRS SILO U#8
67
57
FWBPH (12.5Mx6M)
539.35E
1311.1N
1337.0N
1333.5N
TR-1
15000
15986
SPACE FOR MILL HANDLING AT GRADE
MILL-'A'
MILL-'B'
MILL-'C'
MILL-'D'
MILL-'F'
MILL-'G'
MILL-'H'
LOS (TYP.)
PASSENGER ELEVATOR
SPACE FOR UNIT DRAIN OIL SYSTEM (7000X4000X3000 HIGH)
SPACE FOR CONDESATE RETU PUMPS (7MX17M)
EL.8590 COLD PA BUS DUCT
1250.0N
529.2E
℄ BOILER-8
BOILER
SPACE FOR DMCW PUMPS (AT GRADE LEVEL 3500 HIGH)
SPACE FOR PHE AT GRADE LEVEL (12500X6250X3500HT)
GOODS CUM PASSENGER ELEVATOR
TENTATIVE SPACE ERECTION ELEVAT (4MX4M)
29A
111
110
109
108
107
106
105.5
105
104
103
102
101
102.8
102.5
11000
10800
11800
11800
3500
5000


PSS-6
1103.0N
529.2E
BOILER-9
BOILER
PASSENGER ELEVATOR
ENTRY
SPACE FOR UNIT DRAIN OIL SYSTEM (7000X4000X3000 HIGH)
SPACE FOR DMCW PUMPS (AT GRADE LEVEL 3500 HIGH)
SPACE FOR PHE AT GRADE LEVEL (12500X6250X3500HT)
GOODS CUM PASSENGER ELEVATOR
4000
1500
5000
D.5
102.8
102.5
111
110
109
108
107
106
105.5
105
104
103
102
101
LOS
CONV-29B
CONV-29A
=6600=
1000
10500
5250
7000
2000
11500
10500
11000
10000
12000
12500
9500
13000
14200
8000
11800
12374
DA
DB
D
E
C
67
1
LM09
RES
1031.0N
500.5E
MRS BELT CONVEYOR
MRS SILO U#9
PASSAGE WAY
C.L. OF 7.5M WIDE ROAD

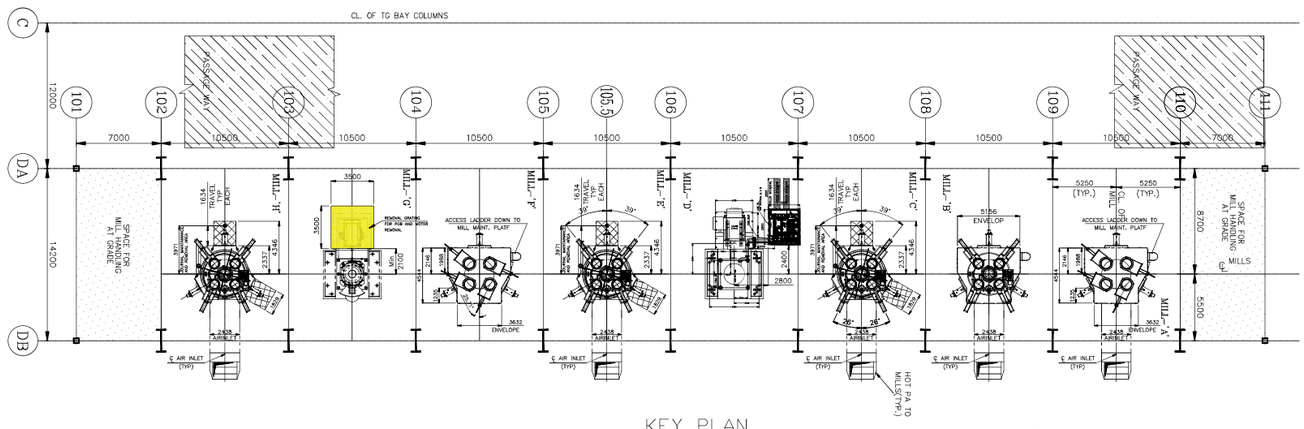
pg 257 of 351

FIRST ANGLE PROJECTION

DRG. NO. 9867-001-102-PVM-B-003

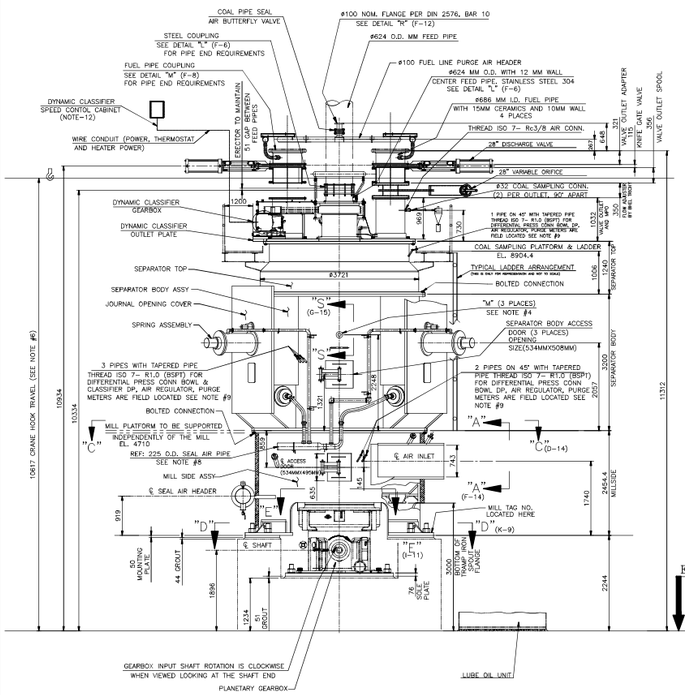


PLAN VIEW
(SEE NOTE #3)

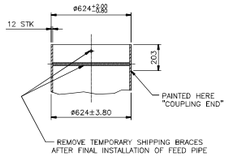


KEY PLAN

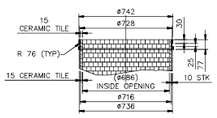
NORTH



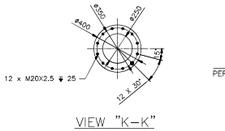
ELEVATION VIEW
(SEE NOTE #3)



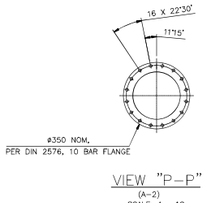
DETAIL "L"
CENTER FEED PIPE END DETAIL
(D-2)
SCALE: 1 : 12



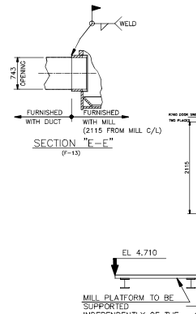
DETAIL "M"
VALVE ADAPTOR END DETAIL
(D-2)
SCALE: 1 : 12



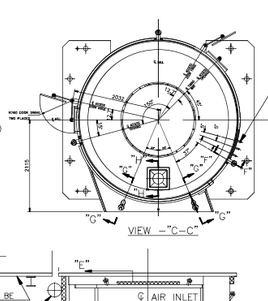
VIEW "K-K"
TRAMP IRON SPOUT FLANGE
(MATING FLANGE ø250 NOM. PER DIN 2576)
(FLANGE THK. 26)
SCALE 1 : 12
(I-9)



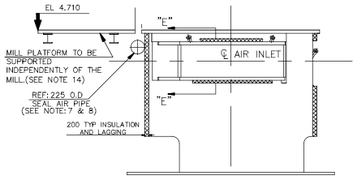
VIEW "P-P"
(A-2)
SCALE: 1 : 12



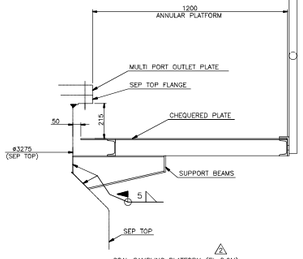
SECTION "E-E"
(F-15)

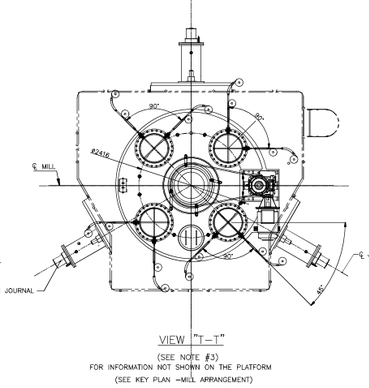


VIEW -"C-C"

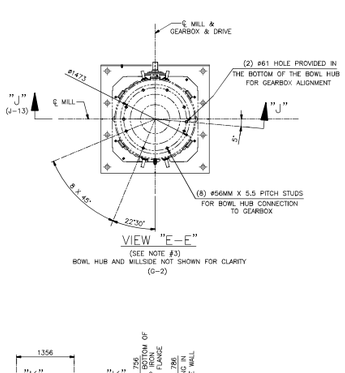


VIEW "A"-"A"
(SEE NOTE #3)

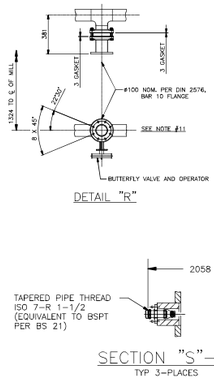




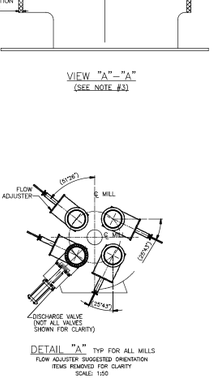
VIEW "T-T"
(SEE NOTE #3)
FOR INFORMATION NOT SHOWN ON THE PLATFORM
(SEE KEY PLAN -MILL ARRANGEMENT)



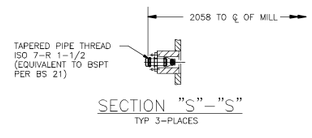
VIEW "E-E"
(SEE NOTE #3)
BOWL HUB AND MILLSIDE NOT SHOWN FOR CLARITY
(G-2)



DETAIL "R"

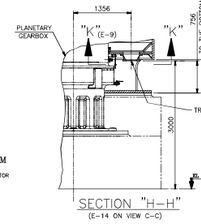


DETAIL "N"
THERMOWELL DETAIL
(C-4)
SCALE: 1 : 4

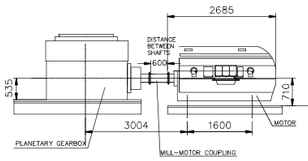


SECTION "S"-"S"
TYP 3-PLACES

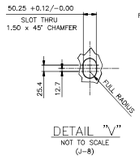
DETAIL "A" TYP FOR ALL MILLS
FLOW ADJUSTER SUGGESTED ORIENTATION ITEMS REMOVED FOR CLARITY
SCALE: 1:20



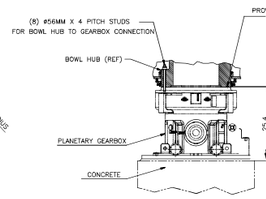
SECTION "H-H"
(E-14 ON VIEW C-C)



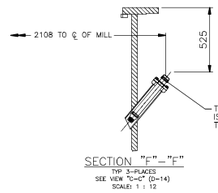
VIEW-X



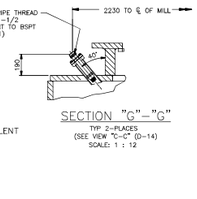
DETAIL "V"
NOT TO SCALE
(J-8)



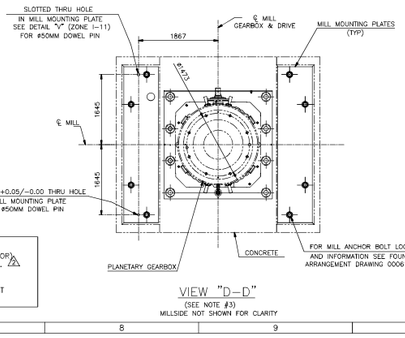
SECTION "J-J"



SECTION "F"-"F"
TYP 3-PLACES
SEE VIEW "C-C" (D-14)
SCALE: 1 : 12



SECTION "G"-"G"
TYP 2-PLACES
(SEE VIEW "C-C" (D-14)
SCALE: 1 : 12



VIEW "D-D"
(SEE NOTE #3)
MILLSIDE NOT SHOWN FOR CLARITY

MAJOR COMPONENTS	WEIGHT (ESTIMATED) (MT)	MAJOR DIMENSIONS
PLANETARY GEAR BOX (W/O OIL)	16.00	2900 x 2600 x 2100
MILLSIDE ASSEMBLY	19.83	4450 x 4420 x 4460
BOWL AND BOWL HUB ASSEMBLY	18.35	3600 x 3600 x 2200
SEPARATOR BODY ASSY. WITH TRUNNION SHAFTS	21.98	5200 x 5200 x 3500
SEPARATOR TOP	4.74	4500 x 4500 x 1300
DYNAMIC CLASSIFIER COMPLETE	11.80	3600 x 3600 x 2200
DYNAMIC CLASSIFIER OUTLET PLATE AND DRIVE ASSEMBLY	9.00	LOOSE ITEMS
JOURNAL SHAFT ASSEMBLY WITH GRINDING ROLL (1)	5.76	1500 x 1500 x 1300
JOURNAL HEAD ASSEMBLY (1)	3.44	2200 x 990 x 1000
JOURNAL OPENING COVER ASSEMBLY WITH SPRING ASSEMBLY (1)	3.91	1500 x 1500 x 1300
JOURNAL MAINTENANCE: – JOURNAL TILT OUT – JOURNAL BEARING & END PLAY CHECKING	6.03 6.45	

NOTES:

1. ALL DIMENSIONS ARE IN MM. ELEVATIONS SHOWN IN METRES.
2. PAINT SHOP COAT IN ACCORDANCE WITH CONTRACT SPECIFICATION.
3. FOR RELATIVE LOCATIONS AND TRUE ORIENTATION OF MILL, MILL PARTS AND EXTERNAL EQUIPMENT SEE KEY PLAN.
4. FIRE EXTINGUISHING SYSTEM: (PIPING & CONNECTORS IN PIPING CENTRE SCOPE) THE FOLLOWING NOZZLES WILL BE SUPPLIED PER MILL. SIZE NOTED BELOW, LOCATION OF CONNECTIONS SHOWN IN ELEVATION AND PLAN VIEWS
   (3) NOZZLES "K" PIPE THREAD ISO 7-Rc 1-1/2 -SEPARATOR TOP (ZONE A-4)
   (5) NOZZLES "L" PIPE THREAD ISO 7-R 1-1/2 -MILLSIDE (ZONE D-12 & D-14)
   (3) NOZZLES "M" PIPE THREAD ISO 7-R 1-1/2 -SEPARATOR BODY (ZONE G-4)
   30.66 LPM PER NOZZLE AT 2.812 Kg/cm², MAXIMUM PRESSURE 7.030 Kg/cm²
   PURGE AIR 7.08m³/Min PER MILL REQUIRED FOR NOZZLE @ PRESSUE 254 mm GREATER THAN UNDER BOWL PRESSURE.
5. ALL CONNECTIONS TO BE PER ISO, NOMINAL SIZES IN MM.
6. CRANE HOOK TRAVEL FROM GROUND FLOOR TO EL 10617 MM SEE ELEVATION VIEW. THE CRANE HOOK MUST TRAVEL 2337 FROM THE ℄ OF THE MILL ALONG THE ℄ OF THE JOURNAL TO 3971 FROM THE ℄ OF THE MILL ALONG THE ℄ OF THE JOURNAL. SEE KEY PLAN.
7. SEAL AIR CONSUMPTION PER MILL IS 5881 KG/HR WITH A MILL SEAL AIR HEADER PRESSURE 250 mm WATER COLUMN HIGHER THAN MILL INLET AIR PRESSURE. HIGHER SEAL AIR HEADER PRESSURE WILL RESULT IN GREATER SEAL AIR CONSUMPTION. ⚠
8. CLEARANCE FOR SEAL AIR PIPE MUST BE MAINTAINED IN PLATFORM DESIGN.
9. INSTRUMENT PURGE AIR: .045 Kg/HR @ 4.5–7.030 Kg/cm².
10. SERVICE AIR FOR COAL SAMPLING 0.57m³/Min @ 5.624 Kg/cm², 49°C INTERMITTENT.
11. COAL PIPE SEAL AIR FLOW AND PRESSURE DETERMINED BY FUEL FIRING GROUP / BHEL TRICHY.
12. VFD CABINET (1 PER MILL) TO BE LOCATED IN BOILER MCC ROOM. THE DIMENSION OF THE PANEL IS 900(L) X 700 (W) X 2100(H) WITH 500MM CLEARANCE ALL AROUND. ⚠
13. ALL ELEVATIONS ARE WITH RESPECT TO EL 0.0 M, FINISHED GROUND FLOOR LEVEL OF POWER BUILDING WHICH CORRESPONDS TO RL(+) 276.5M. ⚠
14. MILL REJECT HANDLING SYSTEM IS BY PEM, MILL MOTOR BY BHEL BHOPAL & MILL MAINTENECE PLATFORM SCOPE IS IN BHEL TRY SCOPE.
15. PORTABLE STOOL SHALL BE SUPPLIED WITH HEIGHT 500 MM ALONG WITH COAL SAMPLING PLATFORM AS LOOSE ITEM. ⚠

DYNAMIC CLASSIFIER REQUIREMENTS:
–MOTOR:
CLASS F INVERTER DUTY INSULATION, NEMA DESIGN B
–DRIVE:
VARIABLE FREQUENCY DRIVE 415 V, 3 PHASE, 50 HZ, IP-54 45 KW INVERTER DUTY CONSTANT TORQUE, TEFC 415 V, 50 HZ, 3 PHASE ENCLOSURE WITH AIR CONDITIONERS.

MILL DISCHARGE VALVE REQUIREMENTS:
DISCHARGE VALVE TERMINAL BOX – IP-65
CONDUIT CONNECTION ISO 7-R 1-1/2 (BSPT)

AIR CONTROL VALVE:
ELECTRICAL REQUIREMENTS: 240 VAC, RATED FOR CONTINUOUS DUTY, IP 65 RATED, CLASS H COILS, DOUBLE SOLENOID, 4 WAY, 5 PORTS THREE POSITION VALVE, ø13MM NPT CONNECTION, 10.546 Kg/cm² MAX PRESSURE, 0.20m/Min
AIR REQUIREMENTS: AIR SHALL BE OF INSTRUMENT AIR QUALITY, @ 4.5–7.030 Kg/cm² OPERATING PRESSURE.
LIMIT SWITCHES:
ELECTRICAL REQUIREMENTS: RATED 10 AMP AT 240 VAC, 5 AMP @ 125 VDC, IP 65 (8 SWITCHES PER MILL)

⚠ MATERIAL OF MILL WEAR PARTS:
1. ROTOR ASSEMBLY(CLASSIFIER BLADES +ROTOR) MATERIAL: ABRASION RESISTANT ALLOY STEEL. ⚠
2. GRINDING ROLL MATERIAL: SINTERED CAST HARDNESS IS 550 BHN(min).
3. BULLRING SEGMENT MATERIAL: SINTERED CAST HARDNESS IS 550 BHN(min)

REV.	DATE	ALTERED	CHECKED	APPROVED
02	27.02.25	UDAY	AMAN	AMAN
	MODIFIED IN-LINE WITH CUSTOMER VIDE COMMENTS.			
01	18.11.24	UDAY	AMAN	AMAN
	MODIFIED IN-LINE WITH CUSTOMER VIDE COMMENTS.			

REFERENCE DRAWINGS:
1. GENERAL ARRANGEMENT OF BOILER-SIDE ELEVATION DRAWING No. : 0-00-022-77885 (1150-001-102-PVM-B-012).
&
BOILER PLAN SECTION DRAWING NO.: 0-00-022-77880 (1150-001-102-PVM-B-007).
2. MILL FOUNDATION PLAN DRG. NO. :0-00-610-87101 (1150-001-102-PVM-V-001).

CUSTOMER: NTPC LIMITED (A Government of India Enterprise)

PROJECT: **NTPC SINGRAULI STPP STG -III (2X800 MW)**

BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	UDAY		29.05.24	
CHD.	MTT		29.05.24	
APPD.	AMAN		29.05.24	

DEPT.	UNTOL DIMS. GR.	SCALE	WEIGHT (KG)	BHEL DRAWING NUMBER	ITEM NO.	NO.OF ITEMS
PVPV ENGG. CODE 446	C/M/F	NTS		0-00-620-87133		

TITLE: GENERAL ARRANGEMENT DRAWING OF HP–1103 MILL (WITH PLANETARY GEAR BOX)

CARD CODE | NTPC DRAWING NO. 1150-001-102-PVM-B-003 | REV. 02

SHEET NO. 01 | NO OF SHEETS 01

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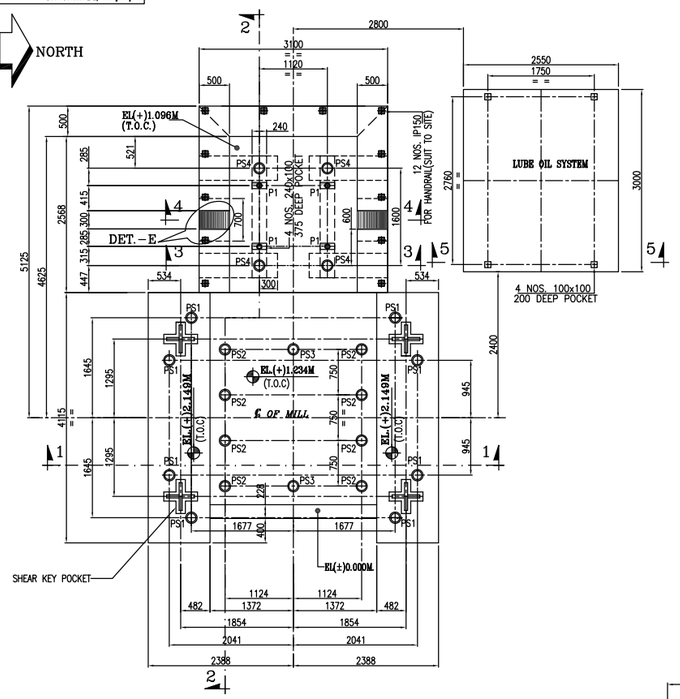
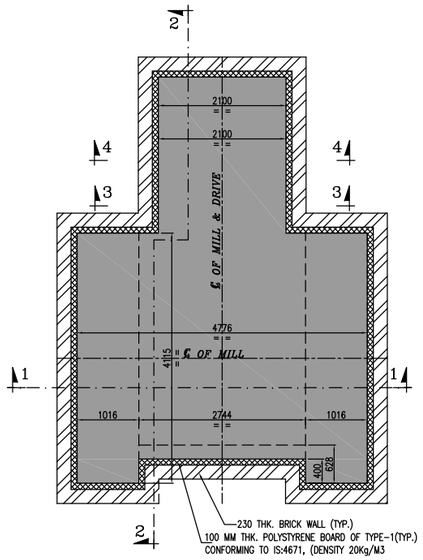
COMP. FILE NAME: 00087083

REF. DRG. NO.

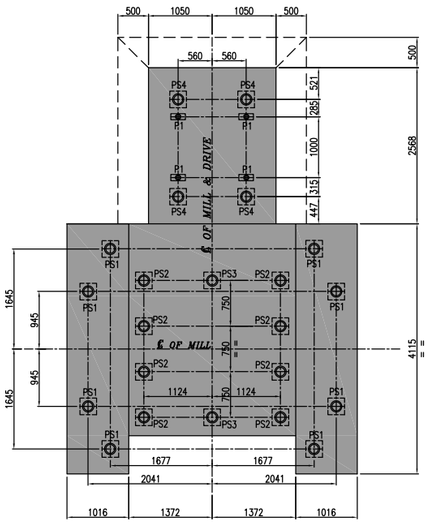
INVENTORY NO



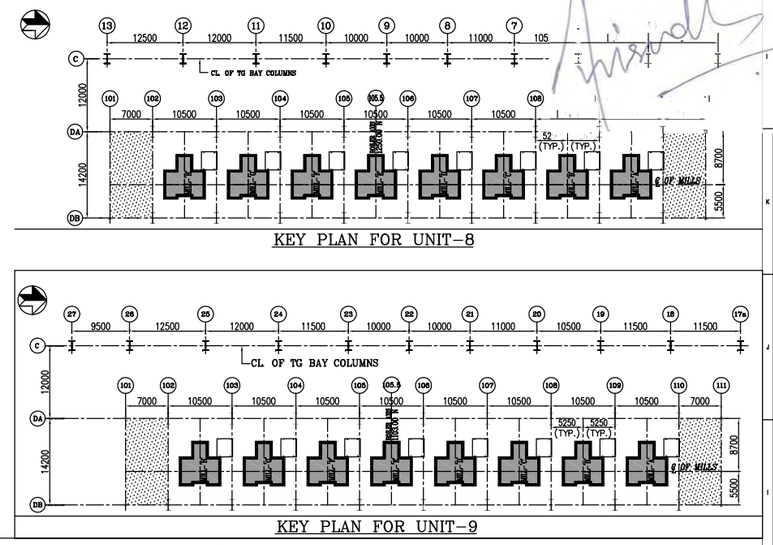
PLAN AT EL(+)2.149M



SECTION X-X

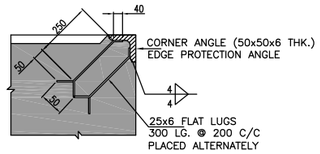


SECTIONAL PLAN Y-Y

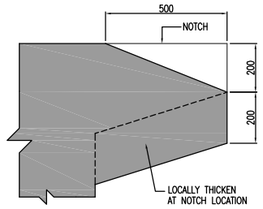


KEY PLAN FOR UNIT-8

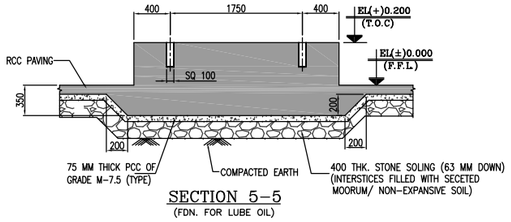
KEY PLAN FOR UNIT-9



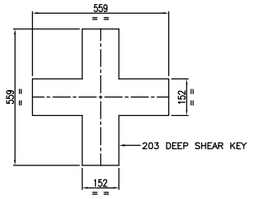
TYPICAL LUG DETAILS OF CORNER ANGLE



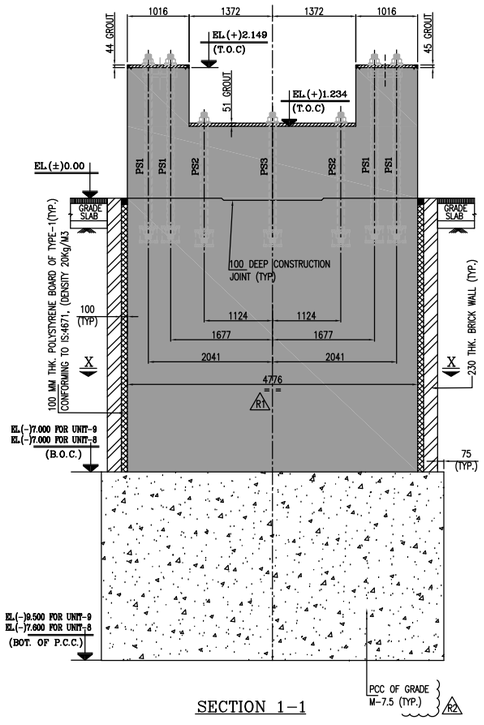
DETAIL-E
(DETAIL FOR CABLE ENTRY)



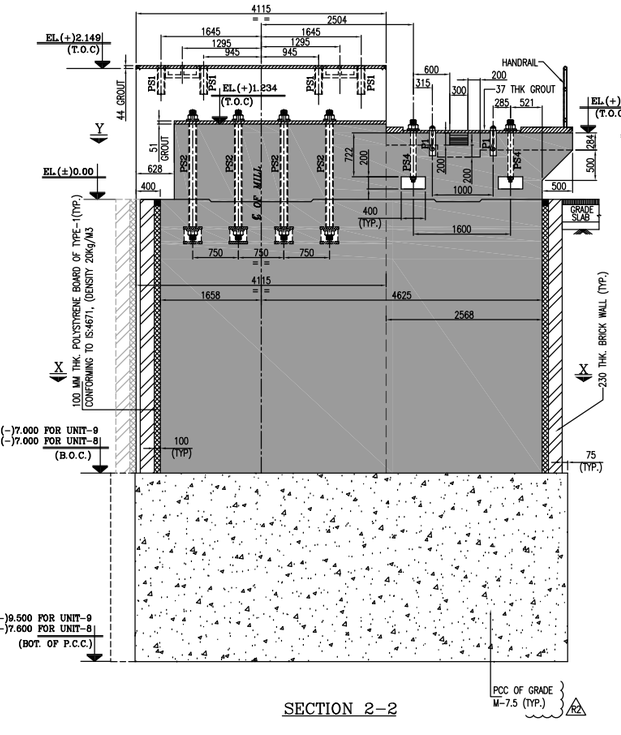
SECTION 5-5
(FDN. FOR LUBE OIL)



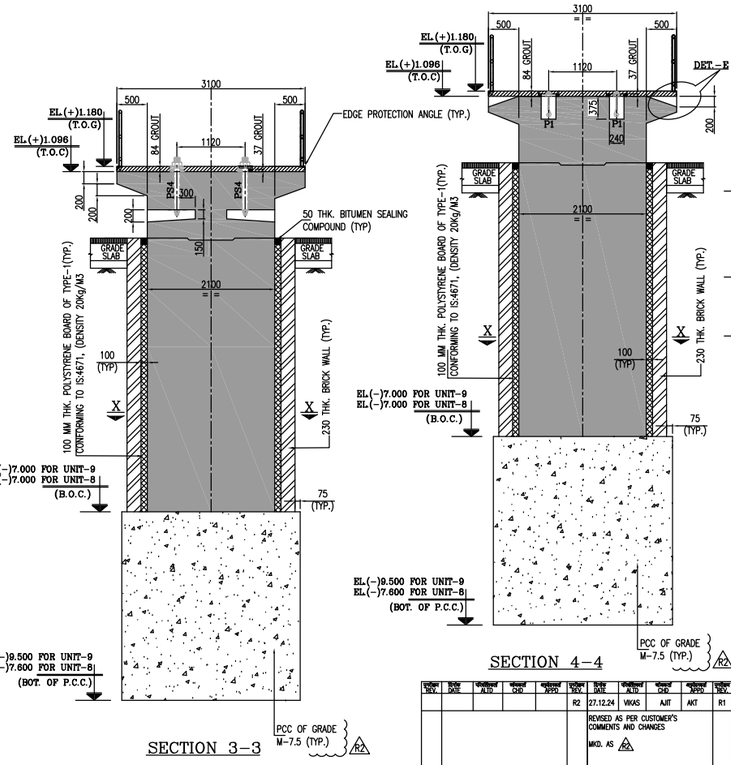
PLAN OF SHEAR KEY



SECTION 1-1



SECTION 2-2



SECTION 3-3

SECTION 4-4

NOTES:-

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, TECHNICAL SPECIFICATIONS AND SCHEDULE OF ITEMS.
2. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
3. ALL ELEVATIONS ARE WITH RESPECT TO EL. (±)0.00m, FINISHED GROUND FLOOR LEVEL OF POWER HOUSE BUILDING WHICH CORRESPONDS TO RL(+)276.50M.
4. FOR OTHER NOTES AND STD. DETAILS REF. DRG. PE-DG-512-600-C001 (NTPC DRG NO. NTPC NO. 1150-001-315-PVC-C-0451B)
5. BAR MARKED Y DENOTES TMT BARS OF GRADE Fe-550D CONFORMING TO IS:1786 HAVING MIN. ELONGATION 14.5%.
6. GRADE OF CONCRETE IS M30 UNLESS NOTED OTHERWISE.
7. CLEAR COVER TO OUTERMOST REINFORCEMENT (INCLUDING TIES) SHALL BE AS FOLLOWS:-

ITEM	TOP	BOTTOM	SIDE
a) MILL FOUNDATION & PEDESTALS	50	75	50

8. ALL HOOKS, BENDS, LAPS AND SPLICES SHALL BE AS PER IS 2502, SP 34 AND IS:13920 UNLESS OTHERWISE INDICATED.
9. LAP LENGTH FOR M30 GRADE CONC. SHALL BE 46d WHERE 'd' IS DIA OF THE SMALLER BAR.
10. LAPPING OF BARS SHALL BE SUITABLY STAGGERED AND IN NO CASE MORE THAN 50% BARS SHALL BE LAPPED AT ANY SECTION.
11. NET SAFE BEARING CAPACITY IS 40T/m2 AT EL.(-)7.600M FOR UNIT-8 & EL.(-)9.500M. FOR UNIT-9.
12. MILL FOUNDATION SHALL BE CAST IN SINGLE POUR UPTO CONSTRUCTION JOINT. CONSTRUCTION JOINT TO BE PROVIDED AS SHOWN IN THE DRAWING.
13. ANCHOR BOLT ASSEMBLY TO BE SUPPLIED AT SITE BY BHEL (HYD.) AND EMBEDDED BY CIVIL CONTRACTOR AFTER PROPER CLEANING. CIVIL CONTRACTOR SHALL USE TEMPLATES (BHEL SUPPLY) FOR MAINTAINING LOCATION EXACT AND VERTICAL ALIGNMENT OF BOLTS.
14. BHEL/ERECTOR SHALL REFER FOR ORIENTATION, ALIGNMENT AND SIZES OF ANCHOR BOLT ASSEMBLY AND SHEAR KEY WITH BHEL HYD. DRG. 0-00-610-87101 BEFORE CONCRETING OF PEDESTAL.
15. GROUTING SHOULD BE DONE ONLY AFTER FINAL ALIGNMENT OF MILL.
16. FOUNDATION POCKETS SHOULD BE PERPENDICULAR TO THE FLAT SURFACE OF FOUNDATION.
17. BACK FILLING SHALL HAVE TO BE DONE ENSURING PROPER COMPACTION AS PER SPECIFICATION & IS-2720 (PART-VII) USING APPROVED SOIL. BACK FILLING SHALL BE CARRIED OUT IN LAYERS NOT EXCEEDING 300 MM. AND EACH LAYER TO BE COMPACTED SO AS TO ACHIEVE 90% COMPACTION AS PER STANDARD PROCTOR DENSITY TEST FOR COHESIVE SOIL.
18. AT THE POINT OF CONSTRUCTION JOINT, FIRST STAGE CONCRETE SURFACE SHOULD BE ROUGHENED AND A LAYER OF CEMENT SLURRY SHALL BE APPLIED OVER THE ROUGHENED SURFACE BEFORE APPLICATION OF SECOND STAGE CONCRETING. R2
19. THE TEMPERATURE OF FRESH CONCRETE SHALL NOT EXCEED 25 Deg. C WHEN PLACED. FOR MAINTAINING THE TEMPERATURE OF 25 Deg. C, CRUSHED ICE SHALL BE USED IN MIXING WATER. R2
20. THE SLUMP SHALL GENERALLY BE IN THE RANGE FOR BLOCK FOUNDATIONS-100 MM TO 150 MM

ENGINEERING REFERENCE DRAWINGS :-

1. 1150-001-301-POC-F-001 (PE-DG-512-100-M001) ------ PLOT PLAN
2. 1150-001-102-PVM-B-007 ---------- GENERAL LAYOUT PLAN.
3. 0-00-610-87101---FOUNDATION PLAN OF HP 1103 MILL-DYNAMIC CLASSIFIER (WITH PLANETARY GEAR BOX) (NTPC DRG NO. NTPC NO. 1150-001-102-PVM-V-001)

CONST. REFERENCE DRAWINGS :-

1. PE-DG-512-616-C001 (1150-001-315-PVC-C-0240)----MILL & BUNKER BAY - G.A. OF COLUMN FOUNDATIONS
2. PE-DG-512-615-C002 (1150-001-102-PVC-V-004)----BOWL MILLS - FOUNDATION RC DETAILS

LEGEND:

1. NGL = NATURAL GROUND LEVEL
2. FGL = FINISH GROUND LEVEL
3. (TYP.) = TYPICAL
4. R/F = REINFORCEMENT
5. TOG = TOP OF GROUT
6. FFL = FINISHED FLOOR LEVEL

- RCC HATCH
- P.C.C.
- BRICK

SPECIAL NOTE:

'BHEL HEREBY CONFIRMS THAT THIS DRAWING/DOCUMENT MEETS ALL THE CONTRACT REQUIREMENTS INCLUDING SAFETY AND STATUARY REQUIREMENTS AND FACILITATE EASE OF OPERATION AND MAINTENANCE. IN CASE ANY DEVIATION IS FOUND, THE CONTRACTOR SHALL CARRY OUT ALL REQUIRED CHANGES/ MODIFICATIONS WITHOUT ANY COST IMPLICATIONS TO NTPC. IN ADDITION, PENALTY ON ACCOUNT OF NONCOMPLIANCE OF CONTRACT SPECIFICATION AS DEEMED FIT BY THE EMPLOYER SHALL BE RECOVERED.'

BHEL-PROJECT ENGINEERING MANAGEMENT(CIVIL)
THIS DRAWING MARKED(✓) IS RELEASED FOR
☑ COMMENTS/APPROVAL ☐ FABRICATION
☐ PLANNING ☐ INFORMATION
☐ CONSTRUCTION ☐ AS BUILT DRAWING
STAMP ALL PREVIOUS REVISION AS SUPERSEDED

ISSUED BY	
NAME	AMIT KUMAR THAKUR
SIGNATURE	-Sd-
DATE	27.12.2024

ग्राहक ड्राईंग संख्या CUSTOMER DRAWING NO.	1150-001-102-PVC-V-003
ग्राहक/CUSTOMER	एन टी पी सी लिमिटेड N T P C LIMITED
कार्य संख्या-JOB NO.	512
स्थिति STATUS	CONTRACT
परियोजना PROJECT	2x800 मेगावाट सिंगरौली सुपर थर्मल पावर परियोजना चरण-III 2x800MW SINGRAULI SUPER THERMAL POWER PROJECT STAGE-III
मुद्रण स्केल नॉट टू स्केल PRINT SCALE IN METRIC	0 2 4 6 8 10 20 30 40 50 60
	भारत हेवी इलेक्ट्रिकल्स लिमिटेड BHARAT HEAVY ELECTRICALS LTD पावर सेक्टर/POWER SECTOR परियोजना अभियांत्रिकी प्रबंधन PROJECT ENGINEERING MANAGEMENT नोएडा (उ॰प्र॰)/NOIDA (U.P.)

DEPT CODE		नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
C	डिजायनर/DSN	SACHIN	-sd-	16/09/2024
	डिजाइनकर्ता/DESN	AJIT	-sd-	16/09/2024
	चॉकिकर्ता/CHD	RKP	-sd-	16/09/2024
	अनुमोदनकर्ता/APPD	DKM	-sd-	16/09/2024

संशोधन REV.	दिनांक DATE	जांचकर्ता/CHD	अनुमोदनकर्ता/APPD	संशोधन REV.	दिनांक DATE	जांचकर्ता/CHD	अनुमोदनकर्ता/APPD	संशोधन REV.	दिनांक DATE	जांचकर्ता/CHD	अनुमोदनकर्ता/APPD
				R2	27.12.24	AJIT	AKT	R1	30.10.24	AJIT	AKT
				REVISED AS PER CUSTOMER'S COMMENTS AND CHANGES				REVISED AS PER CUSTOMER'S COMMENTS AND CHANGES			
				MKD. AS R2				MKD. AS R1			

शीर्षक/TITLE
BOWL MILL
BOWL MILL FOUNDATION-GA & CONCRETE OUTLINE DETAILS

अनुरेखक MPL	तिथि CIVIL	इलेक्ट्रिकल ELEC	सीएण्डआई C&I	जानकारी MSE	मैकेनिकल MAX	डिजाइन DEPT.	स्केल – SCALE–
						हस्ताक्षर SIGN	
						दिनांक DATE	

ड्राईंग संख्या / DRAWING NO.
PE-DG-512-615-C001

शीट SHEET 1 OF 1 | पुनरीक्षण REV. R2

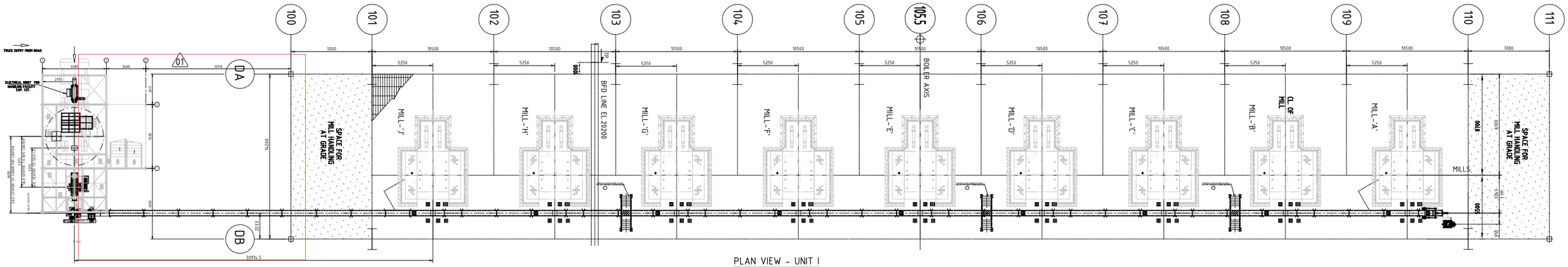
ELECTRONIC FILE NAME : 9587-001-102-PVM-A-111 - Copy.dwg

फर्स्ट एंगल प्रोजेक्शन/FIRST ANGLE PROJECTION

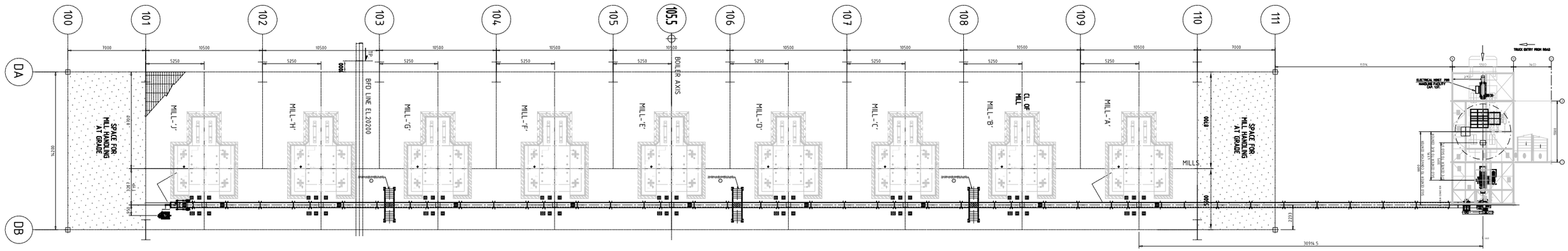
सभी माप मि॰ मी॰ मे है /ALL DIMENSIONS ARE IN MM

ड्राइंग संख्या/DRAWING NO.

APPROVED LETTER	REVISION	SIGN.	DATE



PLAN VIEW - UNIT I



PLAN VIEW - UNIT II

REF DRG:
1. BOWL MILL FOUNDATION-GA AND CONCRETE OUTLINE DETAILS: 9587-001-315-PVC-C-0230
2. PLOT PLAN (GENERAL LAYOUT OF PLANT) - 9587-001-301-POC-F-001
3. MRHS LAYOUT DRAWING - 9587-001-102-PVM-F-016

SUPPORT REACTIONS

NODE NO	DEAD LOAD			LIVE LOAD			EQUIPMENT LOAD			MATERIAL LOAD			WIND IN X DIR			WIND IN -X DIR			WIND IN Z DIR			WIND IN -Z DIR			SEISMIC IN X DIR			SEISMIC IN -X DIR			SEISMIC IN Y DIR			SEISMIC IN -Y DIR			SEISMIC IN Z DIR			SEISMIC IN -Z DIR			TEMP LOAD (+)			TEMP LOAD (-)		
	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ
1	2.3	-33.6	0.8	1.6	-35.6	2.1	0.0	0.2	0.0	6.7	-5.6	0.0	31.9	-104.0	-2.3	-35.7	97.1	2.4	-1.5	74.4	21.4	2.1	-66.7	-17.6	-66.3	-182.3	-6.5	66.3	182.3	6.5	-4.9	13.3	-1.6	4.9	-13.3	1.6	-4.7	67.3	-12.0	4.7	-67.3	12.0	40.4	-4.5	-2.9	-40.4	4.5	2.9
2	-0.4	-143.7	-12.9	-0.4	-89.6	-11.7	0.0	-1.0	-0.2	-1.6	-467.9	-34.3	8.2	170.0	25.2	2.6	-158.8	-24.2	0.8	241.1	51.4	-0.6	-229.5	-47.4	-2.0	227.5	-28.4	2.0	-227.5	28.4	-0.2	19.4	-4.2	0.2	-19.4	4.2	-0.8	351.0	-75.8	0.8	-351.0	75.8	-4.5	-5.7	-44.6	4.5	5.7	44.6
3	-3.2	-162.6	-22.9	-3.8	-130.7	-25.9	-0.1	-4.2	-0.8	-3.9	-456.2	-58.1	25.4	-66.0	-20.3	-28.3	61.8	19.7	9.9	268.4	50.8	-8.1	-244.5	-44.4	-56.4	-86.1	-22.8	56.4	86.1	22.8	-4.4	19.2	-4.2	4.4	-19.2	4.2	-8.1	324.8	-51.4	8.1	-324.8	51.4	-4.5	-5.7	-44.6	4.5	5.7	44.6
4	5.1	-54.6	1.3	6.9	-75.7	2.0	0.1	-0.4	0.0	5.4	-3.2	0.0	55.3	-131.9	-2.3	-58.8	122.2	2.4	1.2	-73.9	19.0	-1.8	66.3	-20.1	-78.1	-189.4	-6.5	78.1	189.4	6.5	-4.8	13.6	-1.6	4.8	-13.6	1.6	-7.5	-75.0	-12.0	7.5	75.0	12.0	40.9	-4.9	2.7	-40.9	4.9	-2.7
5	-0.5	-213.2	12.9	-0.6	-212.5	11.7	0.0	-3.5	0.2	-1.7	-468.5	35.5	9.5	128.6	2.2	1.3	-115.7	-3.0	-0.6	-240.8	47.8	0.5	229.2	-49.1	-2.3	206.7	-15.9	2.3	-206.7	15.9	-0.2	23.5	-4.4	0.2	-23.5	4.4	-0.6	-345.4	-74.6	0.6	345.4	74.6	-4.6	-0.2	44.1	4.6	0.2	-44.1
6	-3.3	-218.9	20.8	-3.8	-231.9	21.8	0.0	-7.6	0.7	-5.0	-457.2	56.8	48.9	3.3	-2.5	-51.7	-6.6	2.8	-9.7	-269.2	73.3	8.0	245.2	-73.1	-68.7	26.5	-9.1	68.7	-26.5	9.1	-4.2	19.1	-7.3	4.2	-19.1	7.3	-5.5	-329.2	-93.8	5.5	329.2	93.8	-35.9	5.1	54.3	-35.9	5.1	54.3

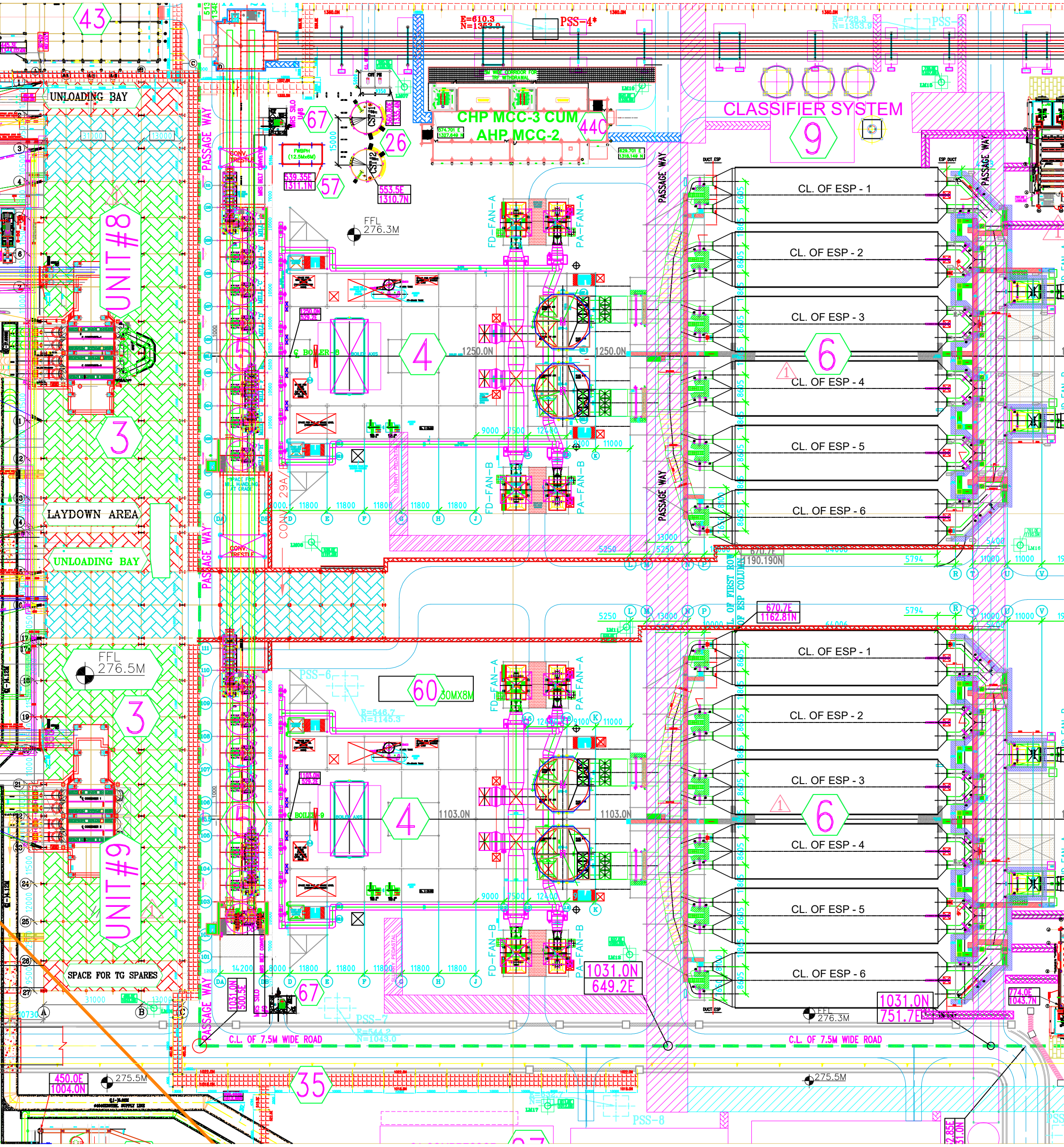
MONORAIL LOAD HAS BEEN ADDED IN DEAD LOAD CASE.
ALL LOAD ARE IN KN

DRAWING TO BE REFERRED FOR LAODING PURPOSE ONLY

शीर्षक/TITLE	GAD for Silo with DS and civil load data & foundation location details for MILL REJECT SYSTEM (CONVEYOR TYPE)									
एम्पीपल MPL	सिविल CIVIL	इलेक्ट्रिकल ELEC	स्ट्रक्चरल&पाइपिंग STRCE	आई&सी I&C	मैक्स MAX	विभाग DEPT.	स्केल – SCALE: 1 : 120	BHEL DWG.No	PE-DG-512-160-A122	
						डिजाइन DSGN				
						दिनांक DATE		शीट SHEET	4 OF 4	पुनरीक्षण REV.-01

फॉर्मेट साइज़ A0
FORMAT SIZE A0

PLOT PLAN


UNLOADING BAY
PASSAGE WAY
CHP MCC-3 CUM
AHP MCC-2
CLASSIFIER SYSTEM
CL. OF ESP - 1
CL. OF ESP - 2
CL. OF ESP - 3
CL. OF ESP - 4
CL. OF ESP - 5
CL. OF ESP - 6
UNIT #8
UNIT #9
LAYDOWN AREA
UNLOADING BAY
SPACE FOR TG SPARES
C.L. OF 7.5M WIDE ROAD
FFL 276.3M
FFL 276.5M
PSS-4*
PSS-6
PSS-7
PSS-8
FD-FAN-A
PA-FAN-A
FD-FAN-B
PA-FAN-B
BOILER-8
BOILER-9
CONV. TRESTLE
SLURRY PEDASTAL
E=610.3
N=1353.0
E=546.7
N=1145.3
E=544.2
N=1043.0
1250.0N
1103.0N
1031.0N
649.2E
1031.0N
500.5E
1031.0N
751.7E
670.7E
1162.81N
670.7E
190.190N
450.0E
1004.0N
774.0E
1043.7N
539.35E
1311.1N
553.5E
1310.7N
574.701 E
1327.849 N
629.701 E
1318.149 N
275.5M
276.3M

ANNEXURE- IX-

PACKING REQUIREMENT

ANNEXURE-IX	
PACKING REQUIREMENT	
	COMMON GUIDELINES FOR PACKING
1	**GENERAL:**
1.1	The Components/Assemblies need to be packed suitably to avoid physical damage & corrosion during transit & storage. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage of materials.
1.2	All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. The Contractor shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.
1.3	The identification marking indicating the name and address of the consignee shall be clearly marked in indelible ink on two opposite sides and top of each of the packages. In addition the Contractor shall include in the marking gross and net weight, outer dimension and cubic measurement.
1.4	Each package shall be accompanied by a packing note quoting specifically the name of the Contractor, the number and date of contract and names of the office placing the contract, nomenclature of contents and Bill of Material.

2.	**TYPES OF PACKING:**
	The following 5 types of packing have been standardized for packing of General Components/ Assemblies.
a	**OP'** - Open Type.
b	**PP'** - Partially Packed.
c	**CP'** – Crate/Box Packing - Components/Equipment requiring physical protection.
d	'**CQ'** - Case Packing – Machined components-Small & Medium Components/ Assemblies/ Equipment which require corrosion & physical protection.
e	**'CR'** - Case Packing – Electrical/Electronic Components/ Assemblies, which require special packing viz. Water Proof, Shock Proof etc…

3.	**DESCRIPTION OF TYPES OF PACKING:**
	The various types of packing, as standardized above, are described below.
3.1	**'OP' - Open Type**
	In case, of components which are not affected by water & dust and do not require special protection, are generally not machined, shall be sent as open packages. However, these components may be sent in crates, wherever necessary.
3.2	**PP' - Partially Packed**
3.2.1	Components which need special protection at selected portions only shall be despatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces should be protected with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene
3.2.2	Film. All sharp corners and edges shall be protected by rubber mats to prevent damage to the polyethylene film.

3.3	**'CP' - Crate Packing**
	Assemblies/Components which need only physical protection from the point of view of handling shall be despatched duly packed in crates.
3.4	**'CQ' - Case Packing -** Machined Components/Assemblies/Equipment
3.4.1	Small and medium sized components/assemblies/equipment due to size/weight and to avoid handling and pilferage problems shall be packed in Case/Containers. Wherever required adequate quantity of silica gel or VCI Powder/Tablets, packed in thin muslin cloth cotton bags shall be suitably placed. Small machines/components of less weight shall be provided with suitable cushioning by Rubberised coir. The components inside the case shall be entirely covered with100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film, wherever required. This may be prescribed for electronic parts/critical machined components/surfaces.
3.4.2	For mechanical product like valves where motors are separately securely wrapped in polyethylene, the requirement of individual component wrapping shall be exempted.
3.5	**CR' - Case Packing** - Electrical & Electronic Components/Assemblies
	Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons. Adequate quantity of Silica gel packed in cotton bags of 100grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film before being packed in the cases. VCI Powder/Tablets can be used as an alternative to Silica Gel.
4	**PREPARATION OF PACKING CASES**
4.1	**DIMENSIONS:**
a)	Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25/20mm +2/-3 mm as per applicable drawings of the respective units/manufacturers.
b)	Width of all planks including the tongue shall be more than 125mm and after plaining it shall be minimum 100mm.
c)	Minimum number of planks shall be used for a shook.
d)	Horizontal, vertical, diagonal planks shall be given for binding (number of such planks depend on the dimension of panel.
e)	Width of binding planks shall be minimum 100mm.
f)	Distance between any 2 binding planks shall be less than 750mm.
g)	diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm
h)	Distance of the outer edges of these planks from the edge of case shall be less than 250mm.
i)	Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.
4.2	**HOOP IRON STRIPS**
	These are used for strapping the boxes. The width of the strips shall be 19+1mm and thickness 0.6+0.01mm. The material shall be free from rust. If sufficient nailing is done for bigger boxes, strapping need not be done.

4.3	**BRACKETS**
	These brackets are used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of thickness min 2mm and width 25+1mm. The brackets shall be of “L" shape, the length of each side being 100+2mm. Two holes shall be provided towards the end of each side for screwing /nailing.
4.4	**MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM**
	100GSM (Colourless) Multi Layered Cross Laminated Polythelene Film are used to make covers to the jobs individually. The cross lamination gives qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays.

4.5	**RUBBERISED COIR:**
	The rubberized coir is used as cushioning material. For the packing of loose items, items are to be arrested by using rubberized coir. For the packing of cubicles rubberized coir of thickness 25mm and width 75mm shall be used.
5	**MULTI LAYER CROSS LAMINATED POLY FILM WHILE PACKING OF CUBICLES/CASING**
5.1	The inner surface of 4 sides of shook's shall be nailed with Multi-layer cross laminated poly film (as per 4.4) using blue nails wherever 2 pieces of Cross laminated poly film are used, the joint shall have an overlap of minimum 20mm.
5.2	The inner surface of top cover shall be nailed with Multi-layer cross laminated poly film. This sheet shall project outside on 4 sides by at least 100mm and shall be nailed properly on sides. Joining of sheets should have overlap of minimum 20mm.
5.3	The cubicles shall be covered with Multi-layer cross laminated poly film.
6	**PACKING OF LOOSE ITEMS/SPARES**
6.1	Inner surfaces of all 6 sides shall be lined with Multi Layered Cross Laminated Polythelene Film (as per clause 5.4) using blue nails.
6.2	Rubberized coir of minimum 25mm thickness and 100 mm width shall be nailed to inner surfaces of bottom and 4 sides of box.
6.3	Internal packing: Items that go into the box shall be packed using 100GSM, (Colourless) Multi Layered Cross Laminated Polyethylene Film. Any space left between the job and the sides and the top of the box shall be filled with rubberized coir to get proper cushioning effect.
6.4	Certain items like transformers, reactors, breakers, etc., shall be bolted to the bottom of the box using bolts, nuts and washers.
6.5	Silica gel held in cotton bags shall be kept at proper places in the box.
6.6	Packing slip kept in polyethylene bag shall be placed in the box.
6.7	Two numbers of hoop iron strips shall be strapped tightly on the case using clips.
6.8	Stencil marking of various details and marking of various symbols shall be done as per BHEL instructions using indelible/non-washable marking ink.
6.9	Loose items to be kept inside the cubicle/casing
	- Other items which are given loose in addition to cubicle shall be packed in separate boxes.

7 TYPICAL PATTERN OF WOODEN BOX

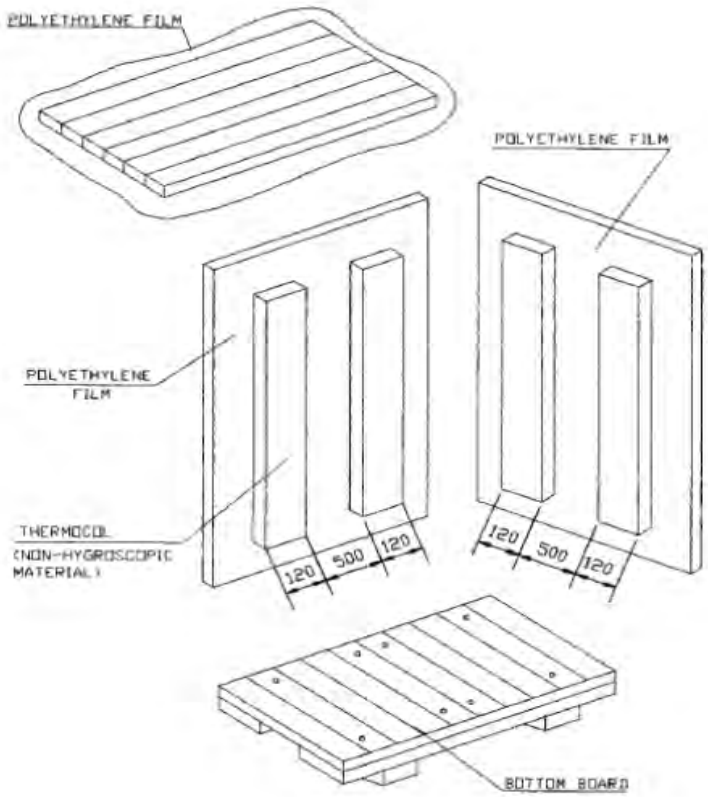


Figure 1

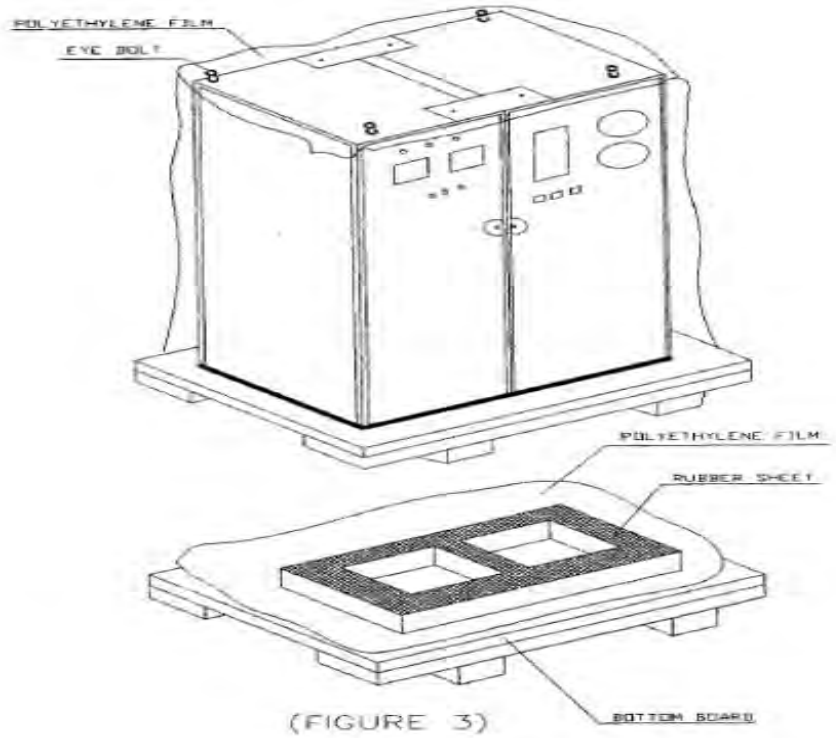
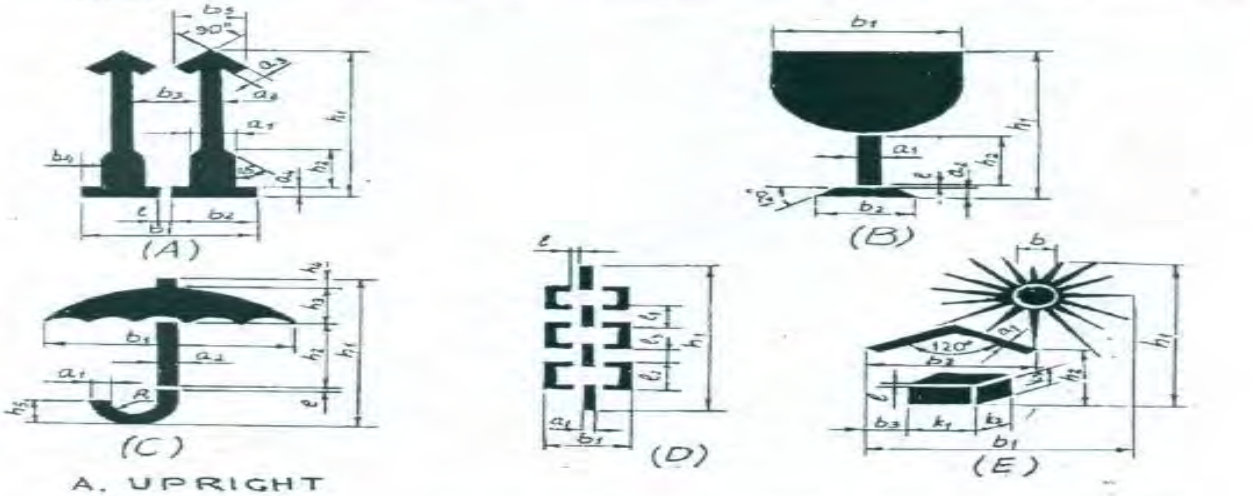


Figure 2

8	**SEALED PACKING:**
	Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture. The components sub-assemblies and assemblies are completely covered with 2 layers of polyethylene sheet. All sharp corners and edges are to be protected by rubber mats to prevent the polyethylene sheet from damage. Top surface of the case shall be free from dents to prevent rain water pockets.
9	**MARKINGS/STENCILINGS**
9.1	**"HANDLE WITH CARE", "FRAGILE DO NOT TURN OVER".**
9.2	Besides the caution signs the product information's shall be stencilled of letters with 13mm to 50mm height.
9.3	In case of consignment consists of more than one package, each package shall carry its package no as given in shipping list. All caution signs shall be stencilled in high quality full glossy out door finishing paint red in colour (AA56126). All other markings shall be carried out in black enamel.
9.4	Caution signs & other markings shall be stencilled on both the end shooks & the side shooks.
9.5	Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.
9.6	In case the size of package is small for using the stencils, then hand written letters/figures shall be allowed.

MARKINGS ON PACKING CASES

1. THIS PLANT STANDARD PRESCRIBES THE VARIOUS CAUTION SIGNS AND OTHER MARKINGS ON PACKING CASES.
2. DIMENSIONS IN THE TABLE 1 SHALL BE USED FOR MAKING STENCILS ONLY.



A. UPRIGHT
B. FRAGILE
C. PROTECTION FROM FALLING OR CONDENSING MOISTURE
D. SLINGING POSITION
E. PROTECTION FROM DIRECT RADIATIONS.

Figure 3

	BHEL – <unit> - <location> - <pin>			
CONSIGNEE				
MATERIAL				
CUSTOMER REF.		MO. NO.		
DESPATCH ADVICE NOTE NO		CASE NO		
DIMENSIONS(MM) L x B x H			NET WT -KGS	GROSS WT -KGS
SPECIAL INSTRUCTIONS	HANDLE WITH CARE - KEEP DRY DO NOT DROP - DO NOT TILT			

Figure 4 – TYPICAL MARKING PLATE (225 X 170)

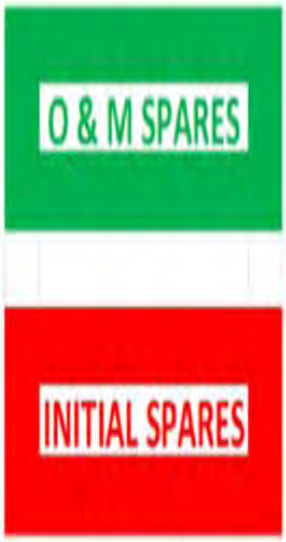


Figure 5

Easy spares [Initial and O&M] Traceability and Identification at units and as well as at sites:

Note:
Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.

PACKING REQUIREMENT OF INSTRUMENTS

Sl.no	DESCRIPTION
1	**Type of Packing:**
1.1	Item shall be fully covered with multi layered cross laminated colourless polyethylene sheet of at least 100 GSM and shall be packed inside wooden box or crate or fixed on wooden pallet depending upon the size.
1.2	Item shall be firmly fixed to the bottom of the packing box/crate/pallet with the help of supports/blocks to arrest the movement from all sides. The branch pipe ends and all opening shall be protected with polyethylene blind end caps.
1.3	Loose items/accessories like nipples, expander/reducer, root valves etc. shall be separately packed with polyethylene sheet of at least 100 GSM inside the packing box/crate.
2	**Quality of wood:**
2.1	**Quality of wood:** Wood used for packing box shall be Pinewood, Rubber wood, Mango wood, Fir wood, Silver Oak wood or other as per availability with moisture content not exceeding 30%.
3	**Cushioning material and moisture absorber:**
3.1	Suitable cushioning shall be provided by rubberized coir/ thermocol / expanded soft polyethylene foam.
3.2	Adequate quantity of packed desiccant shall be suitably placed inside the packing box.
4	**Packing slip & holder:**
4.1	Packing slip kept in polyethylene bag shall be placed inside the wooden box at appropriate place.
4.2	One copy of packing slip wrapped in polyethylene bag covered in galvanized iron tin sheet/ aluminium packing slip holder shall be fixed on the external surface the packing box.

ANNEXURE- X

Check List for Operation & Maintenance Manual

Project name :
Project number :
Package Name :
PO reference :
Document number :
Revision number :

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	Cover page				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	Index				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	Description of Plant/System				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				
4.0	Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				

4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	Operation Guidelines for plant personal/user/operator				
5. 1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5. 2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5. 3	Do's & Don't of the equipments.				
5. 4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5. 5	Parameters to be monitored with normal values and limiting values				
5. 6	Trouble shooting with causes and remedial measures				
5. 7	Routine operational checks, recommended logs & records				
5. 8	Changeover schedule if more than one auxiliary for the same purpose is given				
5. 9	Painting requirement and schedule				
5. 10	Inspection, repair , Testing and calibration procedures				
6.0	Maintenance guidelines for plant personal				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				
6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul.				

	Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	**Statutory and other specific requirements considerations.**				
8.0	**List of reference documents**				
9.0	**Binding as per requirement**				

Checked by
Dealing Engineer

Key Resource Person

Section Head

SECTION- IB
ELECTRICAL SPECIFCATION

SPECIFIC TECHNICAL REQUIREMENTS: ELECTRICAL

1.0 Scope for supply, and erection & commissioning of various equipment forming part of electrical system for this package shall be as per Annexure–I [Scope of Work (Electrical)].

2.0 Make of all electrical equipment/ items supplied shall be reputed make. Same shall be subject to approval of BHEL/customer after award of contract without any commercial implications. Tentative make list of various Electrical items (Motors/ lugs/glands) is attached.

3.0 All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.

4.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

4.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated.

4.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

5.0 LIST OF ENCLOSURES

5.1 Electrical scope between BHEL & vendor (Annexure-I).
5.2 Technical specification - Motors (Annexure-II).
5.3 Datasheets –Motor (Annexure-III)
5.4 Quality Plan for motors. (Annexure-IV)
5.5 Load data format (Annexure-V).
5.6 Explanatory note for Cable routing & Cable schedule format (Annexure-VI)
5.7 Tentative make list for electrical items (motor, lugs, glands) (Annexure-VII)
~~5.8 Tentative list of cable sizes (Annexure-VIII)~~

REV-0, DATE: 14.10.2024

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGES: MILL REJECT SYSTEM

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: SINGRAULI SUPER THERMAL POWER PROJECT STAGE-III (2X800 MW)

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL		Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	 BHEL BHEL BHEL		1. For 3.b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Termination at BHEL equipment terminals by BHEL. 3. Termination at Vendor equipment terminals by BHEL
4	Junction box for control & instrumentation cable	Vendor		Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, optical fibre etc.	Vendor		Refer C&I portion of specification for scope of fibre Optical cables if used between PLC/ microprocessor & DCS.
6	Cable trays, accessories & cable trays supporting system 100/ 50 mm cable trays/ Conduits/ Galvanised steel cable troughs for local cabling	BHEL BHEL		Local cabling from nearby main route cable tray (BHEL scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs, as per approved layout drawing during contract stage.
7	Cable glands, lugs and bimetallic strip for equipment supplied by Vendor	Vendor		Bimetallic washers shall be used for bimetallic connections.
8	Conduit and conduit accessories for cabling between equipment supplied by vendor	BHEL		Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Lighting	BHEL		
10	Equipment grounding (including electronic earthing) & lightning protection	BHEL		Vendor shall indicate location of Electronic Earth pit in their Civil assignment drawing.

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGES: MILL REJECT SYSTEM

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: SINGRAULI SUPER THERMAL POWER PROJECT STAGE-III (2X800 MW)

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
11	Below grade grounding	BHEL	BHEL	
12	LT Motors with base plate and foundation hardware	Vendor		
13	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor		Additionally, in case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.
16	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor		Cable listing for Control and Instrumentation Cable and electronic earthing cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Electrical Equipment & cable tray layout drawings	Vendor		For ensuring cabling requirements are met, vendor shall furnish Electrical equipment layout & cable tray layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Cabling arrangement of the same (wherever overhead cable trays, trenches, cable ducts, conduits etc.) shall be decided during contract stage. Electrical equipment layout & cable tray layout drawing shall be subjected to BHEL/ customer approval without any commercial implications to BHEL.
18	Electrical Equipment GA drawing	Vendor		For necessary interface review.

NOTES:

ANNEXURE-II

SUB-SECTION-B – 02

MOTORS

MOTORS

1.00.00 GENERAL REQUIREMENTS

1.01.00 This chapter has to be read in conjunction with sub-section B-0 "General electrical specification" of Technical specification Section- VI, Part-B and Sub-Section-IIB Electrical system/Equipment of Technical Specifications Section-VI, Part-A"

Degree of Protection

Degree of protection for various enclosures as per IEC60034-05 shall be as follows :-

i)	Indoor motors	-	IP 55
ii)	Outdoor motors	-	IP 55 (Additional Canopy to be provided)
iii)	Cable box-indoor area	-	IP 55
iv)	Cable box-Outdoor area	-	IP 55

2.00.00 CODES AND STANDARDS

1)	Three phase induction motors	:	IS15999/IEC:60034
2)	Single phase AC motors	:	IS 996/ IEC:60034
3)	Crane duty motors	:	IS:3177, IS/IEC:60034
4)	DC motors/generators	:	IS:4722, IS/IEC:60034
5)	Energy Efficient motors	:	IS 12615, IEC:60034-30

3.00.00 TYPE

3.01.00 **AC Motors:**

a) Squirrel cage induction motor suitable for direct-on-line starting.

b) Continuous duty LT motors upto 50 KW Output rating (at 50 deg.C ambient temperature), shall be **super Premium Efficiency class-IE4, 50-200 KW shall be of Premium Efficiency class – IE3**, conforming to IS 12615, or IEC:60034-30. HT motors shall have minimum design efficiency of 95 %. However, tolerance on this efficiency value shall be applicable as per IEC 60034

c) Motor operating through variable frequency drives shall be suitable for inverter duty with VPI insulation. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable.

3.02.00 DC Motors Shunt wound.

4.00.00 RATING

(a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor.

(b) Whenever the basis for motor or driven equipment ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.

5.00.00 TEMPERATURE RISE

Air cooled motors (AC &DC)

70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation.

Water cooled

80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.

6.00.00 OPERATIONAL REQUIREMENTS

6.01.00	**Starting Time**
6.01.01	For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.
6.01.02	For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.
6.01.03	For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.
6.01.04	Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.
6.02.00	**Torque Requirements**
6.02.01	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor rated torque.
6.02.02	Pull out torque at rated voltage shall not be less than 205% of rated torque. It shall be 275% for crane duty motors.
6.03.00	NOT USED
7.00.00	**DESIGN AND CONSTRUCTIONAL FEATURES**
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors, space heater terminals inside the main terminal box may be acceptable.
7.02.00	All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). The method of movement of primary and secondary coolant shall be self-circulated by fan or pump directly mounted on the rotor of the main motor as per IEC 60034-6. However VFD driven motors can be offered with forced cooling type with machine mounted fan or pump driven by separate electric motor. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below (a) Fuel oil area : Group – IIB (b) Hydrogen generation : Group - IIC or (Group-I, Div-II as per plant area NEC) or (Class-1, Group-B, Div-II as per NEMA /IEC60034)
7.03.00	Winding and Insulation (a) Type : Electrolytic grade Copper conductor, Non-hygroscopic, oil resistant, flame resistant Insulation. (b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature. However , conveyor motors shall be suitable for 3 consecutive hot starts (c) 11kV, 6.6 KV & 3.3 kV AC motors : Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Presure Impregnated i.e resin poor method. The lightning Impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15. (d) 240VAC, 415V AC & 220V DC motors : Thermal Class (F) or better
7.04.00	Motors rated above 1000KW shall have insulated bearings/housing to prevent flow of shaft currents.
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.
7.06.00	Noise level for all the motors shall be limited to 85 dB(A) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits prescribed in IS:12075 / IEC 60034-

	14 . Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with 3 numbers duplex RTDs connected to three numbers dual input transmitters with display. However for air compressor, being high speed drive, each motor bearing shall be provided with minimum two numbers of duplex RTDs connected to two numbers dual input transmitters with display unit.
7.08.00	Motor body shall have two earthing points on diagonally opposite sides.
7.09.00	11 KV motors shall be offered with Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.
7.10.00	3.3/6.6 KV motors shall be offered with dust tight phase segregated double walled (metallic as well as insulated barrier) Terminal box. Alternately Elastimold type Terminal box should also be accepted as per OEM standard proven practice. Contractor shall provide termination kit for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided.
7.11.00	The spacing between gland plate & centre of bottom terminal stud shall be as per Table-I.
7.12.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.
7.13.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 6.6 KV, 3.3 kV /415V systems without any injurious effect on its life.
7.14.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.
7.15.00	NOT USED.
8.00.00	NOT USED.
10.00.00	**TYPE TEST**
10.01.00	**HT MOTORS**
	LIST OF TYPE TESTS TO BE CONDUCTED
	The following type tests shall be conducted on each type and rating of HT motor
	(a) No load saturation and loss curves upto approximately 115% of rated voltage
	(b) Measurement of noise at no load.
	(c) Momentary excess torque test (subject to test bed constraint).
	(d) Full load test(subject to test bed constraint)
	(e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp.,coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.
	LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED
	The following type test reports shall be submitted for each type and rating of HT motor
	(a) Degree of protection test for the enclosure followed by IR, HV and no load run test.
	(b) Terminal box-fault level withstand test for each type of terminal box of HT motors only.
	(c) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15
	(d) Surge-withstand test on inter-turn insulation shall be as per clause no. 4.2 of IEC 60034, part-15

10.02.00 **LT Motors**

LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED

The following type test reports shall be submitted for each type and rating of LT motor of above 100 KW only

1. Measurement of resistance of windings of stator and wound rotor.
2. No load test at rated voltage to determine input current power and speed
3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors)
4. Full load test to determine efficiency power factor and slip
5. Temperature rise test
6. Momentary excess torque test.
7. High voltage test
8. Test for vibration severity of motor.
9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section)
10. Test for degree of protection and
11. Overspeed test.
12. Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1

10.03.00 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

10.04.00 The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.

TABLE - I

DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS

Motor MCR in KW	**Minimum distance between centre of bottom terminal stud and gland plate in mm**
UP to 3 KW	**As per manufacturer's practice.**
Above 3 KW - upto 7 KW	85
Above 7 KW - upto 13 KW	115
Above 13 KW - upto 24 KW	167
Above 24 KW - upto 37 KW	196
Above 37 KW - upto 55 KW	249
Above 55 KW - upto 90 KW	277
Above 90 KW - upto 125 KW	331
Above 125 KW-upto 200 KW	385/203 (For Single core cables only)

For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.

PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:

NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:

Motor MCR in KW	**Clearance**
UP to 110 KW	10mm
Above 110 KW and upto 150 KW	12.5mm
Above 150 KW	19mm

SUB-SECTION– E-42
MOTORS

MOTOR

TESTS/CHECKS / TEMS/COMPONENTS	Visual	Dimensional	Make/Type/Rating /General Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-4722 /IS- 9283/IS 2148/IEC60034\IEC 60079-I/ IS-12615	Vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion
Plates for stator frame, end shield, spider etc.	Y	Y	Y	Y	Y				Y										
Shaft	Y	Y	Y	Y	Y	Y			Y										
Magnetic Material	Y	Y	Y	Y			Y			Y		Y							
Rotor Copper/Aluminium	Y	Y	Y	Y			Y		Y										
Stator copper	Y	Y	Y	Y			Y		Y			Y							
SC Ring	Y	Y	Y	Y	Y		Y	Y	Y										
Insulating Material	Y		Y	Y			Y					Y							
Tubes, for Cooler	Y	Y	Y	Y	Y				Y		Y								
Sleeve Bearing	Y	Y	Y	Y	Y				Y		Y								
Stator/Rotor, Exciter Coils	Y	Y	Y				Y	Y											
Castings, stator frame, terminal box and bearing housing etc.	Y	Y	Y	Y	Y			Y											
Fabrication & machining of stator, rotor, terminal box	Y	Y			Y			Y	Y										
Wound stator	Y	Y					Y	Y											
Wound Exciter	Y	Y					Y	Y											
Rotor complete	Y	Y					Y						Y	Y					
Exciter, Stator, Rotor, Terminal Box assembly	Y	Y					Y												

Accessories, RTD, BTD, CT, Space heater, antifriction bearing, gaskets etc.	Y	Y	Y																
Complete Motor	Y	Y	Y												Y	Y	Y	Y1	Y

Note:

1. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, following methodology to be followed for Inspection Categorization:

Note for LT Motor:

i) Motor rating up to 50 KW: Inspection CAT- III : Acceptance of Motor up to 50 KW is based on COC of the Manufacturer and Main Contractor confirming as follows:
"It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequency variation, hot s
KVA/KW, temperature rise, distance between center of stud gland plate and tested in accordance with approved drawing /data sheets."

ii) Motor rating above 50 KW & less than 75 KW: Inspection CAT- II as per NTPC approved MQP: Acceptance of Motor rating above 50 KW & less than 75 KW is based on NTPC rev
report as per IS:12615 - 2018 (including latest revision) duly witnessed by main contractor along with COC of the Manufacturer and Main Contractor confirming as follows:
"It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequency variation, hot s
KVA/KW, temperature rise, distance between center of stud gland plate, space heater and tested in accordance with approved drawing /data sheets."

iii) Motor rating 75 KW & above: Inspection CAT-I: As per NTPC approved MQP.

2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard
3. Makes of major bought out items for HT motors will be subject to NTPC approval.
4. Y1 = for HT Motor / Machines only.
5. For LT Motors, stator core stack length & grade, no load loss and winding resistance w.r.t. type tested motor for IE2/IE3 shall be checked/verified in addition to Compliance of relevant standard IS:12615/IEC requirement. In case actual results are not within the tolerance limit as declared by manufacturer during QP submission, the motor shall be subjected to efficiency test.

	TECHNICAL SPECIFICATION MILL REJECT SYSTEM SINGRAULI SUPER THERMAL POWER PROJECT STAGE-III (2X800MW)	PE-TS-XXX-YYY-HZZZ Issue No: 01 Rev. No. 00 Date :

TECHNICAL DATA - PART - A			
SL.NO	**DESCRIPTION**	**UOM**	**DETAIL**
1.0	**DESIGN CODES & STANDARDS**		
1.1	Three phase induction motors :		IS15999, IEC:60034, IS: 12615, IS: 325
1.2	Energy Efficient motors		IS 12615, IEC:60034-30
1.3	Mechanical Vibration of Rotating Electrical Machines with Shaft Heights 56 mm and Higher - Measurement, Evaluation and Limits of Vibration Severity		IS 12075/IEC 60034-14
1.4	Designation of Methods of Cooling of Rotating Electrical Machines		IS 6362
1.5	Designation for types of construction and mounting arrangement of rotating electrical machines		IS 2253
2.0	**DESIGN /SYSTEM PARAMETERS**		
2.1	Rated voltage	V	415
2.2	Frequency	Hz	50
2.3	Permissible variations for		
a)	Voltage	%	+/-10
b)	Frequency	%	(+)3 to (-)5
c)	Combined	%	10 (absolute sum)
2.4	System fault level at rated voltage for 1 sec	kA	50
2.5	Short time rating for terminal boxes for 0.25 sec	kA	50
2.6	Type of motors		Squirrel cage induction motor
a)	Non-VFD		Suitable for direct on line starting
b)	VFD (if applicable)		Suitable for inverter duty
2.7	Efficiency class		
a)	Output rating (at 50 deg.C ambient temperature)		Efficiency class
i)	upto 50 KW		IE4
ii)	50- 200 KW		IE3
2.8	Rating		
a)	Motor duty		Continuously rated-S1
b)	Design margin over continous max. demand of the driven equipment (min)		10%
3.0	**CONSTRUCTION FEATURES**		
3.1	Winding		Electrolytic grade copper conductor
3.2	Enclosure Details		
a)	Degree of protection		
	i) Indoor application		IP 55
	ii) Outdoor application		IP 55 (Additional Canopy to be provided)
b)	Method of ventilation		Totally enclosed fan cooled (TEFC) type
3.3	Insulation		
a)	Class		'F' with temperature rise limited to class 'B'
b)	General Characteristics		Non-hygroscopic, oil resistant, flame resistant

c)	Special Characteristics		VPI insulation for VFD motors
3.4	Bearings		
a)	Horizontal motors		Grease lubricated ball or roller bearings
b)	Vertical motors		Grease lubricated ball or roller bearings or combined thrust and guide beaing
3.5	Main terminal box		
a)	Type		Detachable type
b)	Location		In accordance with Indian Standards clearing the motor base-plate/ foundation
c)	Terminals		Stud or lead wire type, substantially constructed and thoroughly insulated from the frame
d)	Markings		Phase markings on terminals and direction of rotation marked on the non-driving end
e)	DOP		Same as motor
f)	Position when veiwed from the non driving end		Left hand side
g)	Rotation		90 Deg.
h)	Space heater (for ratings 30 kW and above)		Suitable for 240V, 50Hz 1 ph AC. Separate terminal box provided for space heaters.
f)	Cable glands/lugs/gland plates		
i)	Size		As per cable size used
ii)	Lugs		Solderless crimpting type heavy duty (Aluminium lugs for Aluminium cables and copper lugs for copper cables)
iii)	Glands		Double compression Ni-Cr plated brass glands
iv)	Gland plate thickness		3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables)
3.6	Earthing points		
a)	No. of points on motor body		Two earthing points on opposite sides with two separate and distinct grounding pads complete with tapped holes, GI bolts and washers.
b)	No. of points on motor terminal box		One earthing point complete with tapped holes, GI bolts and washers.
c)	Earthing Flat size		
i)	LT Motors above 125 KW		50 x 6mm GS flat
ii)	25 KW to 125 KW		25 x 6mm GS flat
iii)	1KW to 25 KW		25 x 3mm GS flat
iv)	Fractional kW		8 SWG GS Wire
3.7	Painting		Corrosion proof epoxy based paint with suitable additives to be used.
a)	Paint shade		RAL 5012 (Blue)
b)	Thickness of paint		The thickness of finish coat shall be minimum 50 microns (minimum total DFT 100 microns).
3.8	Minimum spacing between gland plate & centre of bottom terminal stud		
a)	UP to 3 KW		As per manufacturer's practice.
b)	Above 3 KW - upto 7 KW		85 mm
c)	Above 7 KW - upto 13 KW		115 mm
d)	Above 13 KW - upto 24 KW		167 mm

e)	Above 24 KW - upto 37 KW		196 mm
f)	Above 37 KW - upto 55 KW		249 mm
g)	Above 55 KW - upto 90 KW		277 mm
h)	Above 90 KW - upto 125 KW		331 mm
i)	Above 125 KW-upto 200 KW		385/203 (For Single core cables only) mm
3.9	Minimum inter-phase and phase-earth air clearances with lugs installed		
a)	UP to 110 KW		10mm
b)	Above 110 KW and upto 150 KW		12.5mm
c)	Above 150 KW		19mm
4.0	**PERFORMANCE PARAMETERS**		
4.1	Starting requirement		
a)	Minimum permissible voltage as a percentage of rated voltage, at start to bring the driven equipment upto rated speed		a) Up to 85% of rated voltage for ratings below 110 KW b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW
b)	Maximum locked rotor current		As per IS 12615
c)	Starting duty		Two hot starts in succession, with motor initially at normal running temperature.
d)	The locked rotor withstand time		Speed switches mounted on the motor shaft shall be provided in cases where below requirements are not met.
	Starting time of motors at minimum permissible voltage during starting		The locked rotor withstand time under hot condition at highest voltage limit
i)	upto 20 secs.		atleast 2.5 secs. more than starting time
ii)	more than 20 secs. and upto 45 secs		atleast 5 secs. more than starting time
iii)	more than 45 secs.		more than starting time by at least 10% of the starting time
e)	Ratio of locked rotor KVA at rated voltage to rated KW (max.)		
i)	Below110KW		10
ii)	From 110 KW & upto 200 KW		9
4.2	Torque		
a)	Accelerating torque at any speed with the lowest permissible starting voltage		at least 10% motor full load torque
b)	Pull out torque at rated voltage		at least 205% of full load torque
4.3	Noise level (max.)		85 dB(A)
4.4	Vibration limits		As per IS 12075
5.0	**INSPECTION/TESTING**		

5.1	LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED. The following type test reports shall be submitted for each type and rating of LT motor of above 100 KW only. 1. Measurement of resistance of windings of stator and wound rotor. 2. No load test at rated voltage to determine input current power and speed 3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors) 4. Full load test to determine efficiency power factor and slip 5. Temperature rise test 6. Momentary excess torque test. 7. High voltage test 8. Test for vibration severity of motor. 9. Test for noise levels of motor(Shall be limited as mentioned above.) 10. Test for degree of protection and 11. Overspeed test.		
5.2	The type test listed above should have been conducted within 10 yrs prior to supply under this contract. In absence of type tests reports or in case reports are not found to be meeting the specification/standards requirements, vendor shall conduct all such type tests without any commercial/delivery implication to BHEL according to the relevant standards and reports shall be submitted to the owner for approval.		
5.3	The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and “No design Change”. Minor changes if any shall be highlighted on the endorsement sheet.		
5.4	All acceptance and routine tests as per the specification and relevant standards shall be carried out.Charges for these shall be deemed to be included in the equipment price.		
5.5	For motor rating upto 50 KW, BHEL QP No. PE-QP-999-Q-006 Rev 02 is to be followed. For motor ratings above 50 kW NTPC Quality assurance plan will be followed.		

TECHNICAL SPECIFICATION OF CABLE GLANDS AND LUGS

Cable glands shall conform to BS:6121. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and Hardware shall also be made of brass with nickel chrome plating. Rubber components shall be of neoprene or better synthetic material and of tested quality.

Cable lugs/ferrules shall be solderless crimping type suitable for power and control cables as per the DIN 46239. Aluminium solderless crimping lugs/ ferrules shall be used for Aluminium cables and Copper lugs/ferrules shall be used for Copper cables. Bimetallic washers or bimetallic type lugs shall be used for bimetallic connections

	TECHNICAL SPECIFICATION MRS **SINGRAULI SUPER THERMAL POWER PROJECT** **STAGE-III (2X800MW)**	PE-TS-XXX-YYY-HZZZ Issue No: 01 Rev. No. 00 Date :

TECHNICAL DATA - PART - B (SUPPLIER DATA TO BE FURNISHED AFTER AWARD OF CONTRACT)

SL.NO		UOM	DETAIL
1.0	**GENERAL**		
i)	Manufacturer & Country of origin.		
ii)	Equipment driven by motor)		
iii)	Motor type		
iv)	Country of origin		
v)	Quantity	nos.	
2.0	**DESIGN AND PERFORMANCE DATA**		
i)	Frame size		
ii)	Type of duty		
iii)	Type of enclosure and method of cooling		
vi)	Type of mounting		
vii)	Direction of rotation as viewed from DE END		
viii)	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard	(KW)	
ix)	(A) Derated rating for specified normal condition i.e. 50 deg. C ambient temperature	(KW)	
	(B) Rating as specified in load list	(KW)	
xi)	Rated speed at rated voltage and frequency	rpm	
xii)	At rated Voltage and frequency		
	a) Full load current	A	
	b) No load current	A	
xiii)	Power Factor at		
	a) 100% load		
	b) At duty point		
	c) 75% load		
	d) 50% load		
	e) NO load		
	f) Starting.		
xiv)	Efficiency at rated voltage and frequrecy		
	a) 100% load		
	b) At duty point		
	c) 75% load		
	d) 50% load		
xv)	Starting current*(inclusive of IS tolerance)* at		
	a. 100 % voltage	A	
	b. Minimum starting voltage	A	
xvi)	Starting time with minimum permissible voltage		
	a. Without driven equipment coupled	sec	
	b. With driven equipment coupled	sec	
xvii)	Safe stall time with 110% of rated voltage		
	a. From hot condition	sec	

	b. From cold condition	sec	
xviii)	**Torques :**		
	a. Starting torque at min. permissible voltage	(kg-mtr.)	
	b. Pull up torque at rated voltage.	(kg-mtr.)	
	c. Pull out torque	(kg-mtr.)	
	d. Min accelerating torque available	(kg-mtr.)	
	e. Rated torque	(kg-mtr.)	
xix)	Stator winding resistance per phase (at 20 Deg.C.)	Ohm	
xx)	GD^2 value of motors		
xxi)	Locked rotor KVA input (at rated voltage)		
xxii)	Locked rotor KVA/KW.		
xxiii)	**Bearings**		
	a. Type		
	b. Manufacturer		
	c. Self Lubricated or forced Lubricated		
	d. Recommended Lubricants		
	e. Guaranteed Life in Hours		
	f. Whether Dial Type thermometer provided		
	g. Oil pressure Gauge/switch		
	i. Range		
	ii. Contact Nos. & ratings		
	iii. Accuracy		
xxiv)	**Vibration**		
	a) Velocity	mm/s	
	b) Displacement	microns	
xxv)	Noise level	db	
3	**CONSTRUCTIONAL FEATURES**		
i	Stator winding insulation		
	a. Class & Type		
	b. Tropicalised (Yes/No)		
	c. Temperature rise over specified max.		
	i. Cold water temperature of 38 DEG. C.		
	ii. Ambient Air 50 DEG. C.		
	d. Method of temperature measurement		
	e. Stator winding connection		
	f. Number of terminals brought out		
ii	Type of terminal box for		
	a. stator leads		
	b. space heater		
	c. Temperature detectors		
	d. Instrument switch etc.		
iii)	For main terminal box		
	a. Location		
	b. Entry of cables		
	c. Recommended cable size		
	d. Fault level	MVA	
iv)	Temperature detector for stator winding		
	a Type		
	b. Nos. provided		
	c . Location		
	d. Make		
	e. Resistance value at 0 deg. C	ohms	

vi)	Paint shade		
vii).	Weight of(approx)		
	a. Motor stator (KG)		
	b. Motor Rotor (KG)		
	c. Total weight (KG)		
4	Relevant motor curves		

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
	PROJECT:		PO NO.:	DATE:
	ITEM: AC ELECT. MOTORS UPTO 50 KW (415V)	SYSTEM:	SECTION: II	SHEET 1 of 2

S. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY **			REMARKS
1	2	3	4	5	6		7	8	9	D	M	C	N	
					M	C/ N								
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	-	MFG. SPEC.	MFG. SPEC.	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	VISUAL	100%	-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	LOG BOOK		P	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	-	MFG.SPEC./	MFG.SPEC.	LOG BOOK		P	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	-	MFG. SPEC/ APPROVED DATASHEET	MFG. SPEC/ APPROVED DATASHEET	LOG BOOK	✓	P	V	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST	MA	VISUAL	100%	-	IS-325 / IS-12615/ APPROVED DATA SHEET	IS-325 / IS-12615/ APPROVED DATA SHEET	TEST/ INSPN. REPORT	✓	P	V *	-	* NOTE -1
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	-	APPROVED DRG/ DATA SHEET	APPROVED DRG/ DATA SHEET	TEST/ INSPN. REPORT	✓	P	V *	-	* NOTE -1 & NOTE-2

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	HEMA KUSHWAHA	HEMA KUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
	PROJECT:		PO NO.:	DATE:
	ITEM: AC ELECT. MOTORS UPTO 50 KW (415V)	SYSTEM:	SECTION: II	SHEET 2 of 2

		3.NAMEPLATE DETAILS	MA	VISUAL	100%	-	IS-325 / IS-12615 / APPROVED DATA SHEET	SAME AS COL. 7	TEST/ INSPN. REPORT	✓	P	V	-	
4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL	100%	100%	AS PER MFG. STANDARD / (#)	AS PER MFG. STANDARD / (#).	INSPC. REPORT	✓	P	W	-	(#) REFER NOTE-8

NOTES:
1. Routine tests on 100% motors shall be done by the vendor. However, BHEL/ Customer shall witness routine tests on random samples. The sampling plan shall be mutually agreed upon.
2. For exhaust/ventilation fan motors of rating up to 1.5 KW, only routine test certificates shall be furnished for scrutiny.
3. In case test certificates for these tests on similar type, size and design of motor from independent laboratory are available, the same is valid for 5 years.
4. BHEL reserves the right to perform repeat test, if required.
5. After packing and prior to issue MDCC, photographs of items to be despatched shall be sent to BHEL for review.
6. In case of any changes in QP commented by customer at contract stage, same shall be carried out by bidder without any implication to BHEL/ Customer.
7. Project specific QP to be developed based on customer requirement.
8. For export job, BHEL technical specification for seaworthy packing to be followed.
9. Packing shall be suitable for storage at site in tropical climate conditions.
10. Latest revision/ year of issue of all the standards (IS/ ASME/ IEC etc.) indicated in QP shall be referred.

LEGENDS:

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

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	HEMA KUSHWAHA	HEMA KUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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

ANNEXURE-V

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)

2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (dc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V

: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

LOAD DATA (ELECTRICAL)	JOB NO.	512	ORIGINATING AGENCY		PEM (ELECTRICAL)
	PROJECT TITLE	2X800MW SINGRAULI STPP	NAME		DATA FILLED UP ON
	SYSTEM / S	STP	SIGN.		DATA ENTERED ON
	DEPTT. / SECTION		SHEET 1 OF 1	REV. 00	DE'S SIGN. & DATE

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

1. For the purpose of clarity, it may please be noted that the information given in regard to the cables to be routed through WinPath as per the system elaborated below is called "Cable List", while the term "Cable Schedule" applies to the cable list with routing information added after routing has been carried out.

2. The cable list shall be entered as an MS Excel file in the format as per enclosed template EXT_CAB_SCH_FORMAT.XLS. No blank lines, special characters, header, footer, lines, etc. shall be introduced in the file. No changes shall be made in the title line (first line) of the template.

3. The field properties shall be as under:
    a. UNITCABLENO: A/N, up to sixteen (16) characters; each cable shall have its own unique, unduplicated cable number. In case this rule is violated, the cable cannot be taken up for routing.
    b. FROM: A/N, up to sixty (60) characters; the "From" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    c. TO: A/N, up to sixty (60) characters; the "To" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    d. PURPOSE: A/N, up to sixty (60) characters; the purpose (i.e. power cable/ indication/ measurement, etc.) to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    e. REMARKS: A/N, up to forty (40) characters; Any information pertinent to routing to be specified here (e.g., cable number of the cable redundant to the cable number being entered). Information in excess of 40 characters will be truncated after 40 characters.
    f. CABLESIZE: A/N, 7 characters exactly as per the codes indicated below shall be specified here. The program cannot route cables described in any other way/ format.
    g. PATHCABLENO: Field reserved for utilization by the program. User shall not enter any information here.

4. One list shall be prepared for each system/ equipment (i.e., separate and unique cable lists shall be prepared for each system).

5. The cables shall be described as per the scheme listed below:

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

A	NN	A	NNN
Cable Voltage Code (see B below)	No. of cores (e.g. 01,03,3H, 07)	Cable code (See C below)	Cable size (e.g. 035,185,2.5, 0.5)

please refer below examples:

i) 3C x 120 sq. mm. (1.1kV) PVC FRLS, Unarmoured Aluminium cable, the voltage code shall be D03G120
ii) 3C x 2.5 sq. mm. (1.1kV) PVC FRLS, Unarmoured Copper cable, the voltage code shall be D03C2.5
iii) 3.5C x 120 sq. mm. (1.1kV) PVC non-FRLS, Armoured Aluminium cable, the voltage code shall be D3HF120

(A) SYSTEM VOLTAGE CODES:

(ac) A = 11KV, B = 6.6KV, C = 3.3KV, D = 415V, E = 240V, F = 110V
(dc) G = 220V, H = 110V, J = 48V, K = +24V, L = -24V

(B) CABLE VOLTAGE CODES:

A = 11KV (Power cables)
B = 6.6KV (Power cables)
C = 3.3KV (Power cables)
D = 1.1KV (LV & DC system power & control cables)
E = 0.6KV (0.5 sq. mm. Control cables)

(C) CABLE CODES

PVC Copper

A = Armoured FRLS	B = Armoured Non-FRLS
C = unarmoured FRLS	D = Unarmoured Non-FRLS

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

PVC Aluminium

E = Armoured FRLS	F = Armoured Non-FRLS
G = unarmoured FRLS	H = Unarmoured Non-FRLS

XLPE Copper

J = Armoured FRLS	K = Armoured Non-FRLS
L = unarmoured FRLS	M = Unarmoured Non-FRLS

XLPE Aluminium

N = Armoured FRLS	P = Armoured Non-FRLS
Q = unarmoured FRLS	R = Unarmoured Non-FRLS

S = FIRE SURVIVAL CABLES
T = TOUGH RUBBER SHEATH
U = OVERALL SCREENED
V = PAIRED OVERALL SCREENED
W = PAIRED INDIVIDUAL SCREENED
Y = COMPENSATING CABLES
I = PRE-FABRICATED CABLES
Z = JELLY FILLED CABLES

6. Once a cable list has been given to PEM for routing, any subsequent changes required in the cable list (which may be in the form of addition of cables, deletion of cables, change of type or size of cable, etc.) must be informed as specific changes (as a separate file MS Excel of the same format as the original file) to the cable list given earlier if the cable list has been routed and cable schedule generated. The routing status of the cable list shall be got confirmed from PEM by the agency that has prepared the cable list before the changes are intimated. In case PEM confirms that the cable list in question has not been taken up for routing, and the revised cable list is acceptable,

the same may be sent. Since cable routing through the program involves adding each cable list to the project cable schedule database, the original cable schedule shall not be furnished to PEM with revisions incorporated within.

7. For any assistance or clarifications, please contact mailto:praveendutta@bhelpem.co.in

ANNEXURE-VII

CABLE SCHEDULE FORMAT

UNITCABLENO	FROM	TO	PURPOSE	CABLE SCOPE (BHEL PEM/ VENDOR)	REMARKS	CABLESIZE	PATHCABLENO	TENTATIVE CABLE LENGTH

SECTION- IC
C&I SPECIFCATION

	GENERAL TECHNICAL REQUIREMENT
C&I TECHNICAL REQUIREMENT	
1	Control of Mill Handling Reject System shall be through DCS located in Control Room.
2	Complete Field Intrumentation for monitoring and operation of Mill Handling Reject System shall be provided by Vendor.
3	The quantity of instruments for the system shall be as per tender P &ID wherever provided of the respective system as a minimum, for bidding purpose.
4	Bidder to provide one number local control panel for each pyrite hoppers. This local panel will act as interface between the DCS and the field devices for commands & feedbacks.
5	Every panel-mounted instrument, requiring power supply, shall be provided with a pair of easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.
6	Temperature transmitter shall be provided for all temperature measurement applications (as applicable). All temperature transmitters shall be suitably grouped together and mounted inside (i) Enclosures in case of open areas of the plant and (ii) Racks in case of covered areas on as required basis. In case grouping is not possible and temperature transmitter is to be installed individually,TTJB, canopy with suitable mounting arrangement shall be provided.
7	The PROFIBUS protocol design shall be further validated by BHEL and approved by NTPC during detailed engineering and any variation/ changes required based on DDCMIS system requirements and actual field installation, operational philosophy etc. shall be considered by bidder without any implications.
8	Redundancy of sensors shall be provided by bidder (i) Triple redundancy for all analog and binary inputs required for protection of system/drives. (ii) For all other control functions dual redundancy of the sensors shall be provided by the bidder.
9	415V AC / 230V AC UPS Power supply shall be provided by BHEL at a single point, All necessary hardware for deriving other power supply from given feeder shall be in Vendor's scope.
10	Root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifold, junction boxes and all other accessories required for erection of local / remote instruments shall be provided by Vendor. Double root valve to be provided where the design pressure is or more than 40kg/cm2.
11	The contacts of equipment mounted instruments, sensors, switches etc. for external connection including spare contacts shall be wired out in flexible/rigid conduits, independently to suitably located common junction boxes.
12	All instruments other than profibus type shall be terminated on JB/LCP in field. Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 12-15 mtrs) and trunk cable.
13	All the outdoor field instruments such as transmitters/meters etc. shall be provided with suitable Free standing cabinet(s)/panel/rack so that the equipment are protected against rain/ sunlight etc.
14	All Junction Boxes, Solenoid valves and Local control panels which are not installed inside building, suitable canopy shall be provided and design of canopy shall be approved by Employer during detailed engineering.
15	For all profibus devices GSD/DD and DTM files are to be provided for configuration/ testing in the DCS for proper interfacing and diagnostics.
16	The design of the control systems and related equipment shall adhere to the principle of 'Fail Safe' Operation wherever safety of personnel / plant equipment is involved. 'Fail Safe' operation signifies that the loss of signal, loss of excitation or failure of any component shall not cause a hazardous condition. However, it shall also be ensured that occurrence of false trips are avoided / minimized.

17	All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. While packing all the materials, the limitation from the point of view of the sizes of railway wagons available in India should be taken account of. The Bidder shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. BHEL/NTPC shall have right to insist for completion of works in shops before despatch of materials for transportation.
18	Number of pairs to be selected for Screen/ Control cable a. F-Type: 2P/4P/8P/12P(Size : 0.5 mm2) b. G-Type: 2P/4P/8P/12P(Size : 0.5 mm2) c. Core Cable: 3CX2.5sqmm2/ 5CX2.5sqmm2
19	Filed interrogation voltage for DI/DO:- 24 VDC power supply for contact interrogation for all potential free contacts.
20	**TYPE TEST GENERAL REQUIREMENT**
20.1	Submission of type test results and certificate shall be acceptable provided:
20.2	The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment.
20.3	There has been no change in the components from the offered equipment & tested equipment.
20.4	The test has been carried out as per the latest standards alongwith amendments as on the date of Bid opening.
20.5	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.
20.6	The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.
20.7	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.
21	**ANNUAL MAINTAINENCE SERVICE (AMS) FOR PROFIBUS INSTRUMENTS**
21.1	The requirements specified below are applicable for warranty (defect liability period) and 3 years AMS period.
21.2	The Contractor’s scope shall also include providing Post Warranty Maintenance for 3 years after completion of warranty period of the offered wireless systems and all associated components as per specification. The AMS shall include tools and tackle as required; travel, boarding & lodging of service engineer. In the event of any malfunction of the system hardware/system software, experienced service engineer shall be made available at site within 48 hours on the receipt of such information from Employer.
21.3	Employer personnel will work on system day-to-day basis and wherever possible, Employer shall inform the type of failure of hardware/ software to Contractor based on diagnostic available with the system. However Contractor shall be fully responsible to attend and rectify the root cause and the failure within 48 hrs. Contractor may utilize the spares available with Employer, if necessary and available with Employer at site, which are part of mandatory spares supplied with system as per this specification. However, the consumed spares shall be replenished to Employer within 2 months’ time.
21.4	**The services under Post Warranty Maintenance Agreement, shall broadly comprise of the following:**
21.4.1	Periodic Maintenance Site visits, minimum four (4) times in a year (total days expected 16 in a year), schedule of visits to be discussed and finalized jointly between Contractor and client after placement of order/ delivery. It shall include inspection of general healthiness of the system, study and advice on daily maintenance, inspection of Hardware & Software, if any problem is reported, running of test programs, on-line servicing and solving reported problems. System shall be checked online.
21.4.2	Software Maintenance/ Support Contractor shall maintain the existing operating & application software for any debugging requirements to have consistent performance of the system.

21.4.3	Emergency Service In the event of any malfunction of the wireless system hardware/system software during this period, Service Engineer must report at site within 48 hrs. of report of failure. The system must be brought back within 48 hours after reporting at site.
21.4.4	Contractor shall note that while carrying out the Annual Maintenance Contract activities, Employer's engineers shall associate with the Contractor. On-job training of these associated engineers shall be covered under this scope. This shall include all items being supplied by Contractor, including any bought out items but not limited to the following: Labour, at no additional cost, to repair any system devices , to provide tests, and adjustment to system devices.

TECHNICAL DATA - PART - A

SL.NO	DESCRIPTION	UOM	DETAIL
1.0	**DESIGN CODES & STANDARDS**		
1.1	Impulse pipes, tubes (material, rating)		ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70
1.2	Valves (material, pr. Class, size)		ASTM A182/ASTM A105 as per ASME 16.34
1.3	Fittings (size, rating, material)		ANSI B31.1, ANSI B31.1a, ASME B16.11
1.4	Installation schemes		BS 6739-2009, ANSI/ISA 77.70
1.5	Actuator		EN15714-2
1.6	Fieldbus concepts		IEC 61158
1.7	Instruments and apparatus for pressure measurement		ASME PTC19.2
1.8	Electonic transmitters		BS-6447, IEC-60770
1.9	Bourdon tube pressure and vacuum gauges		IS-3624
1.10	Colors for ready mixed paints and enamels.		IS-5
1.11	Annunciator Sequences and Specification		ISA-18.1
1.12	Instrument and apparatus for temperature measurement		ASME PTC 19.3(1974)
1.13	Temperature measurement by electrical Resistance thermometers		IS:2806
1.15	Type of Enclosures		NEMA ICS Part - 6 - 1978 (with Rev. 1 4/80) through 110.22 (Type 4 to 13)
1.16	Racks, panels and associated equipment		EIA : RS - 310 C- 1983 (ANSI C83.9 - 1972)
1.17	Protection class for enclosures, cabinets, control panels & desks		IS:2147 -1962

2.0	**DESIGN /SYSTEM PARAMETERS**		
2.1	**DATASHEET - PRESSURE TRANSMITTER, DIFFERENTIAL PRESSURE TRANSMITTER, DP BASED FLOW AND LEVEL TRANSMITTER**		
	Output		Profibus PA complying to IEC 61158, digital output
	Turndown ratio		50:1
	Accuracy	%	0.06%
	Stability (% of calibrated range)	%	+/-0.25% for 10 year
	Diaphragm seal material		Suitable for process fluid
	Diagram fill fluid		Inert liquid
	Wetted parts		All wetted parts upto diaphragm seal shall be suitable for process application.
	Housing		Metallic housing with durable corrosion resistant coating
	Protection		Weather proof IP-67
	Display		Integral digital display
	Diagonstic feature		Required
	Electrical connection		1/2" NPT (f)
	Manifold		2/3 valve non integral manifold for PT and 5 valve non integral manifold for DPT
2.2	**DATASHEET - PRESSURE GAUGE, DIFFERENTIAL PRESSURE GAUGE**		
	Sensing element		Bourdon for high pressure, diaphragm/bellow for low pressure
	Sensing element material		SS316
	Movement material		SS316
	Body material		SS316
	Dial size	mm	150mm
	End connection	inch	1/2 inch NPT (m)
	Accuracy		±1% of span
	Scale		Linear, 270° arc graduated in metric units
	Range selection	%	Cover 125% of max. of scale
	Over range test		Test pr. for the assembly shall be 1.5 to the max. Design pr. At 38°C.
	Diaphragm seal material		Suitable for process fluid
	Diaphragm fill fluid		Inert liquid
	Wetted parts		All wetted parts upto diaphragm seal shall be suitable for process application
	Housing		IP-55
	Zero/span adjustment		External
	Accessories		Blow out disc, siphon, snubber, pulsation, dampener, chemical seal, gauge isolation valve
2.3	**DATASHEET - TEMPERATURE TRANSMITTER**		
	Transmitter Type		Profibus PA complying to IEC 61158 with EMC compatibility as per EN 61326, Dual input (Trip/Protection), Single Input (other application)
	Compatibility		fully compatible with RTDs
	Protection Class		IP-67
	Display		Integral digital display
	Diagonstic feature		self-indicating diagnostics
	Operating ambient temperature (with display)		70 deg C
	Electrical Connection		1/2” NPT(F)
	Composite Accuracy		RTD =<0.25% of 0-250 deg C span
	Changeover facility		Bump less changeover to second sensor in case first sensor fails with alarm facility.

	Composite accuracy Calculation		Accuracies of temperature transmitter for converting sensor input to output + temperature effect on these accuracies at ambient temperature of 50 deg C (based on the figure/ formula given in the standard product catalogue for span as specified for RTD).
	Emergency/failure Measures		In case of failure (open or burn-out) of RTD, transmitter shall provide low temperature output.
2.4	**DATASHEET - RESISTANCE TEMPERATURE DETECTOR (RTD)**		
	Type		Four wire, Pt-100 (100 Ohms resistance at zero degree Centigrade).
	No. of element		Duplex
	Housing		Diecast Aluminium
	Protection Class		IP-65
	Head		Head of TE to be provided with sufficient space and arrangement to mount head mounted temperature transmitter. Plug in connectors are to be provided for external signal cable connection. TE terminal head shall be spring loaded for positive contacts with the thermo well.
	Insulation and sheathing		Mineral (magnesium oxide) insulation and SS316 sheath
	Calibration and accuracy		As per IEC-751/ DIN-43760 Class-A for RTD
	Accessories		Thermo well and associated fittings
2.5	**DATASHEET - THERMOWELL**		
	Design		One piece solid bored type of step-less tapered design
	Material		SS316
2.6	**DATASHEET - PRESSURE/ DRAFT SWITCHES/ DP SWITCHES**		
	Repeatability		+/-0.5% of full range
	No. of contacts		2 No.+2NC. SPDT snap action dry contact
	Rating of contacts		60 V DC, 6 VA (or more if required by DDCMIS)
	Elect. Connection		Plug in socket.
	Set point adjustment		Provided over full range.
	Dead band adjustment		Adjustable/ fixed as per requirement of application.
	Enclosure		Weather and dust proof as per IP-55, metallic housing.
	Power Supply (where applicable)		As per Contractor's Standard practice.
	Sensing Element		Piston actuated for high pressure and diaphragm or bellows for low pr./ vacuum as per suitability to the application.
	Material		316 SS
	End connection		½ inch NPT (F)
	Over range/ proof pressure		150% of maximum operating pr.

	Accessories		Siphon, snubber, chemical seal, pulsation dampeners as required by process
	Mounting		Suitable for enclosure/ rack mounting or direct mounting
2.7	**DATASHEET - GW RADAR TYPE LEVEL TRANSMITTER**		
	Type		Microprocessor based 2 wire type (loop powered), HART protocol compatible Guided wave radar transmitter.
	Principle		TDR (Time domain reflectometry)
	Probe Type & Material		(i) Coaxial probe of SS316/316L. If required, probe shall be suitable for overfill prevention.
			(ii) Rod probe, cable probe of SS316/SS316L can be used for applications wherever coaxial probe is not suitable.
	Output signal		4-20 mA DC along with superimposed digital signal (based on HART protocol), suitable for over fill prevention.
	Accuracy		+/-0.5% of calibrated span or minimum 5mm.
	Power supply		24 VDC +/-10%.
	Housing		Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.
	Adjustment/ calibration		Using hand held HART calibrator/ centralized PC based system (as applicable).
	Zero & span adjustment		Continuous, temper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument without any level in the tank/sump etc.
	Display		Integral digital display.
	Load Impedance		500 ohms (minimum).
	Electromagnetic compatibility		Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2
	Mounting		(i) External cage shall be provided where ever side mounting is required. External cage and other mounting accessories to be provided by the contractor.
			(ii) Where ever top mounting is required, all mounting accessories, stilling well (as required) etc., shall be provided by the contractor.
			(iii) All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations.
2.8	**DATASHEET - LEVEL GAUGE**		
	Sensing element and material		Tempered toughened borosilicate gauge glass steel armoured reflex or transparent type
	Body material		304 SS
	End connection		Process connection as per ASME ptc , 3/4" and drain/vent 15 NB
	Accuracy	%	± 2%
	Scale		Liner vertical
	Housing		304 SS leak proof
	Over range test		Test pr. for the assembly shall be 1.5 to the max. Design pr. At 38°C.
	Wetted parts		All wetted parts upto diaphragm seal shall be suitable for process application
	Accessories		Gasket for all KEL-F shield for transparent type vent and drain valves of steel/SS as per CS /Alloy process requirement.
	Length of Gauge glass		Length of gauge glass shall not be more than 1400 mm. If the vessel is higher, multiple gauge glasses with 50 mm overlapping shall be provided.
2.9	**DATASHEET - RF LEVEL SWITCH**		
	Sensing Element		Radio Frequency type
	Material		316 SS
	End connection		Manufacturer standard
	Over range/ proof pressure		150% of maximum operating pr.
	Repeatability		+/-0.5% of full range

	No. of contacts		2 No.+2NC. SPDT snap action dry contact
	Rating of contacts		60 V DC, 6 VA (or more if required by DDCMIS)
	Elect. Connection		Plug in socket.
	Set point adjustment		Provided over full range.
	Dead band adjustment		Adjustable/ fixed as per requirement of application.
	Enclosure		Weather and dust proof as per IP-55, metallic housing.
	Accessories		All mounting accessories
2.10	**DATASHEET - SOLENOID VALVE**		
	Type		2/3/4 way SS 316/Forged Brass (depending on the application subject to Employer's approval during detailed Engg.)
	Power supply		24 V DC + 10%.
	Electrical connection		Plug and socket
	Insulation		Class 'H'
	IP Class		IP65
	Limit switches (for open/close feedback)		Required
2.11	**DATASHEET - LIMIT SWITCH**		
	Type		Inductive proximity type
	Mounting arrangement		Inside the enclosure
	Operating voltage Range	V	10-40 V DC
	Sensing system		Inductive Proximity type , 2 Wire
	Sensor Contact Type		NO
	Reverse polarity and short circuit protection		Yes
	IP Class-Sensor		IP67
	IP Class-Enclosure(Switch box)		IP67
	Cable entry-Enclosure(Switch box)		2 no-1/2" NPT
	Casing material-Sensor		Brass /SS
	Enclosure(Switch box) Housing material		FRP or SS
	Operating Ambient temp(sensors)	DegC	-5 to 70 deg C
	Max allowed Voltage Drop across sensor	V	5 V
	Standard applicable		EN 60947-5-2 or equivalent.
	Applicable for		Manual valves and solenoid operated on-off valves
	Corrosion resistance		Silver plated with high conductivity and non corrosive
	Protection class		IP 55

	Contact rating		shall be sufficient to meet the requirement of DCS subject to a minimum of 60 V, 6 VA rating
2.12	**DATASHEET - JUNCTION BOX**		
	No. of ways		12/24/36/48/64/72/96/128
	Material and Thickness		4mm thick Fiberglass Reinforced Polyester(FRP)
	Type of terminal blocks		Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm2. A M6 earthing stud shall be provided.
	Protection Class		IP- 55 min. for indoor & IP-65 min for outdoor applications.
	Grounding		To be provided
	Color		RAL 7035
	Spare Terminals		At least 20% unused terminals
2.13	**DATASHEET - LOCAL CONTROL PANEL**		
2.13.1	**Construction**		
	Type		Skid mounted
	Construction		Folded
	Devices & equipments		Panel enclosure, secondary instruments, annuniciation system, selector switch, push buttons, indicating lamps/ led cluster, relays, MCBs, clamp on terminals, plug socket, panel light, space heater, nameplate, earth bus
	Enclosure sheet material		Cold rolled sheet steel
	Enclosure sheet thickness		Minimum 3.0 mm for load bearing sections (mounted with instruments)
			2.0 mm for doors
			Minimum 2.0 mm for other sections
	Height		Minimum 1100 mm
	Frame thickness		Minimum 3.0 mm
	Internal plate thickness		2.5 mm
	Gland plate thickness		3.0 mm
	Cable gland		Double compression
	Base channel		ISMC 100 with anti-vibration mounting & foundation bolts
	Class of protection		IP-55
2.13.2	**Doors**		
	Rear doors		Required with integral lockable handle
	Door locking		Door when locked shall be held at minimum three places.
	Type		Removable type with concealed hinges to facilitate maintenance work
	Suitable pocket inside the door		Required for keeping the drawings / documents
	Double door		Required with suitable glass windows as per the requirement.
2.13.3	**Power & control supply**		
	Input power supply		415V 3 phase AC
	No. Of feeders		Two
	Control supply		230V AC
	Additonal requirement for control supply		MCBs
			Supervisory relay along with a pilot lamp to indicate control supply 'on'
			Auto changeover unit mounted on panel
2.13.4	**Internal wiring**		
	Voltage	V	1100 V

	Material & size		PVC insulated copper multi strand wire /flexible of 1.5mm2, power cable 2.5sqmm
	Routing and runs		Through PVC troughs, AC & DC wires shall be kept separately
	Colour		Separate colours for AC & DC wires
	Ferruling		Cross ferruling
2.13.5	**Painting details***		
	Painting shade & thickness - exterior / interior (these details shall be finalised during detailed engineering)		RAL 5012 & minimum 85 microns / glossy white & minimum 70 microns
2.13.6	**Gasket**		
	At door & removable cover		Neoprene
2.13.7	**Ventilation system along with louvers**		
	Cooling fan		2 x 100%, covered with removable wire mesh
2.13.8	**Terminal block**		
	Type		Clip on, separate for AC & DC circuits
	Voltage		1100 V
	Tb points		Cage clamp
	Mounting height from finished floor	mm	>=250 mm
	Spare	%	20%
	Identification strip		To be provided
2.13.9	**Illumination**		
	Light		Led tubelight
	Shrouded cover	W	15W minimum
	Operating power supply		240V 50 Hz AC
	Operable through		Panel door switch
	Power receptacle		15 Amp, 3-pin
2.13.10	**Earthing studs**		
	Termination to main station earth		Internally with 10 mm bolts at extreme ends for connection
2.13.11	**Alarm annunciator system**		
	No. Of windows	Nos.	Minimum 20
	Facia		Solid state discrete
	Hooter		10W
	Annunciator spare (with electronics)		10% spare window or minimum 2nos. Whichever is more
	Lamp test provision		Required
2.13.12	**Mounting devices on panel**		
	On front side		All operable and indicating devices
	Inside panel		Aux. Relays, terminal, PVC trough, MCBs etc.
	Easy access for operation / maintenance.		Required

2.14	**DATASHEET - VARIABLE FREQUENCY DRIVE (VFD)**		
2.14.1	**OPERATING CONDITIONS**		
	Ambient Temperature		50 Deg
	Relative Humidity		95% at 40DegC
	Rated frequency		50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.
	Voltage level for the VFD output to be fed to		415V/690V, Low Voltage, Three Phase AC (LV VFD)
2.14.2	**SYSTEM DESCRIPTION**		
	Type of drive		3-Phase Diode / Thyristor / Multi Stage IGBT / IGCT / SGCT/ IEGT
	Type of Cooling of VFD		Naturally air cooled/forced air cooled
	Converter Type		Full wave diode rectifier/active front end type
	Inverter Type		Thyristor/IGBT/IGCT/SGCT/IEGT
2.14.3	**GENERAL REQUIREMENTS**		
	Design		Modern proven design in power plant/industry
	415 V/690 V LV VFD		Current Source Inverter (CSI) or Voltage Source Inverter (VSI) type with minimum Twelve (12) pulse design / 6 pulse with active front end harmonic filter.
			For drives less than 100 KW Six (6) pulse
	Impact of VFD operation on Motors/ cables & supply system		no inherent detrimental impact
	Multiple VFDs for particular application		shall be of same design so as to ensure 100 % interchangeability of components
2.14.4	**TECHNICAL AND OPERATIONAL REQUIREMENTS**		
	System Design		Shall be designed to deliver the motor input current and torque for the complete speed torque characteristics of the driven equipment, with worst input supply voltage and frequency variation.
			Shall be suitable for the load characteristics and the operational duty of the driven equipment
	Overload capacity of the controller :		
	- for constant torque applications		150% of the rated current for one minute
	- for variable torque applications at rated		110% of rated current for one minute
	- If the motor load exceeds the limit		Automatically reduction of the frequency and voltage to the motor to guard against overload.
	Operating modes		Variable torque changing as a function of speed / Constant torque over a specific speed range / Constant power over a specific speed range / Any other
	Total harmonic voltage and current distortion		Shall comply to IEEE 519 & IEC 61000
	Withstanding power		Capable of thermal, dynamic stresses and transient mechanical torque, resulting from short circuit
	Damage control		Any damage resulting from short circuit or internal fault shall be limited to the component concerned.
	Easy access to hardware		To be provided
	Provision for replacement of card (in case of		To be provided
	Allowable speed variation		Within range 10-110% or as per the requirement of driven equipment with speed set accuracy of +1% of rated maximum speed and steady state regulation of +0.5% of rated speed as per system requirement
	Power Factor for LV VFD		0.95 (minimum)
	Maximum allowable audible noise		85 dB (A) at a distance of one meter under rated loaded with all cooling fan operating conditions.
	Circuit components protection		Suitably protected against over voltages, surges, lightning etc.
	Programmed warning and fault protection function		Display a message in complete English words or Standard English abbreviations
	Drive's fault history		At least 30 time tagged fault messages to be stored
	AC environment for VFDs (>=100KW)		Required
	AC environment for VFDs (<100KW)		Not required
	Fiber optic cable connection		To be provided preferably to ensure high network reliability

2.14.5	**VFD COMPATIBILITY WITH THE MOTOR**		
	Inherent output harmonic resonance		Shall not be present in operating speed range
	Limitations of the motor cable length		VFD shall provide stable operation of motor from high-voltage dv/dt stress, regardless of cable length to motor, in case of any limitation , the vendor shall clearly state the limitations in the motor cable distance in his proposal
	If cable length becomes critical due to system requirements & constraints		filters/ chokes etc. shall be provided by the VFD manufacturers as an integral part of the VFD to mitigate the reflected wave effect of harmonics.
2.14.6	**BYPASS ARRANGEMENT (Optional)**		
	Bypass mode		Operation of Motor with VFD bypassed
	Bypass mode operation		During starting (under rated conditions) the motor will be switched on in VFD Mode to limit the starting current and after gaining speed, the load would be switched over to bypass mode.
	Comprehensive motor protection scheme for		Shall be decided during detailed engineering
2.14.7	**STANDBY VFD ARRANGEMENT (Optional)**		
	Common standby arrangement with		Required
	Changeover module		Complete protection, interlocks & control required
2.14.8	**EFFICIENCY**		
	Efficiency		Minimum 98%
	Efficiency evaluation parameters		Input transformer, harmonic filters and power factor correction (if applicable), VFD converters, cooling fans and output filter, as applicable in the system. Auxiliary controls : VFD control boards, cooling fans/pumps
	Valid test report		Required
2.14.9	**COOLING SYSTEM**		
	Type		Air cooled Design
	Air-flow pressure switches		Required for monitoring purpose
	Temperature detectors		Required for monitoring purpose
	Cooling fans		Integral to the VFD/ enclosure, If the fan fails, the system must generate the alarm/trip for the fan failure
2.14.10	**MOTOR**		
	Type		Three (3) phase squirrel cage inverter duty Induction motor with VPI insulation (Resin poor) suitable for VFD application
	Bearings		Insulated bearing on at least one side for motor frame size above 250 frame
	Power Supply Requirement		Solid state power supply consisting of an adjustable frequency inverter for speed control
			Motor shall be suitable for the current waveforms produced by the power supply including the harmonics generated by the drive.
	Motor Insulation design		To accept the applied voltage waveform, within the Vpeak and dv/dt limits as per IEC-61800
2.14.11	**OUTPUT FILTER (AS APPLICABLE):**		
	Output/ dv/dt filter		Required for protection of motor from high voltage dv/dt stress.
			Shall be included within the VFD enclosure
2.14.12	**DC LINK CAPACITOR (AS APPLICABLE):**		
	Type		Self-healing film or electrolytic type having high life time
	Discharge resistors		Required, shall be capable of reducing the residual charges to zero just after the capacitor is disconnected from the supply source.
	Suitable for high ripple currents		Yes
2.14.13	**AC/DC Reactor (As applicable)**		
	Type		Dry type, air cored, self cooled, indoor type. Suitable for withstanding earth fault continuously
	Insulation		Thermal Class 155(F), temperature rise is limited to thermal class 130 (B)
	Noise level		Shall not exceed value specified in NEMA TR-1
2.14.14	**VFD PANEL REQUIREMENTS**		
	Enclosure frames		Required
	Load bearing members		Required

	Cable entry		Bottom of the panel with a removable bolted un-drilled gland plate.
	Protection (as per IS/IEC 60947)		IP: 4X or better for LV VFD
	Enclosure Design Criteria		Shall avoid harmonic and inductive heating effects and to shield any outside equipment from interference, to eliminate any radio frequency interference
	Protection against electromagnetic emissions		To be provided
	Illuminating lamp		Required
	Space heater with switch fuse		Required
	Variable setting thermostat.		Required
	Ventilation using air filters and fans/pumps		Required, to ensure that maximum temperature inside the cubicle is within permissible limits for reliable and continuous operation of the system.
	Terminal block		Separate Terminal block for power and control cable
2.14.15	**LT & HT CABLES**		Required, suitable for VFD system
2.14.16	**CONTROL AND PERFORMANCE REQUIREMENTS**		
	Automatic current limiting feature		Required, to control motor currents during startup and provide a “soft start” torque profile for the motor load combination
	Current and torque limit adjustments		Required
	Drive Speed control		Local or Remote mode
	Local / Remote selection provision		from VFD panel
	Parameter Monitoring		- Input and output voltage of Drive - Input and output current of Drive - Motor speed - Input and output power frequency of Drive -Torque - Output kWhr of Drive - Ambient temperature - Run/stop and local/remote status displayed
	Operator console panel features		Front mounted
			Backlit alphanumeric display
			A keypad with keys for parameterization and adjusting parameter
			Facility / port to connect external hardware
			Upload and download of all parameter settings from one drive to another drive for start up and operation
			User-friendly licensed software for operation and fault diagnostic
	Protection features		i) Converter transformer: short circuit, over current, earth fault & winding temperature high protection.
			ii) Incoming and outgoing line surge protection.
			iii) Under / over voltage protection
			iv) Phase loss, phase reversal, overload, negative phase sequence, locked rotor protection.
			v) Instantaneous Over current & Earth fault protection
			vi) Converter/Inverter module failure indication.
			vii) Over frequency/speed protection.
			viii) Ventilation failure indication & alarm.
			ix) Over temperature of VFD
			x) Bearing temperature protection.
			xi) System earth fault protection.
			xii) Speed reference loss protection.
	Operator Control PaneL (on the front panel door)		Start / stop (in local/remote mode)
			Speed control (Raise / lower)
			Acknowledge/Accept/ Test Push Button for annunciation
			Auto / Manual / Test Mode select
			Emergency stop
			Trip-Remote Breaker
			Microprocessor/PLC based digital diagnostic system which monitors its own control functions and displays faults and operating conditions.
			Information regarding failure of any of the system including shut down of the system shall be available.

2.14.17	**DIAGNOSTIC FEATURES**		It shall be possible to retrieve the record of events prior to tripping of the system or de-energization.
			Auxiliary supply to the system components or to the electronics (firmware) for the diagnostics / display shall be taken care of by the manufacturer for this purpose.
2.14.18	**SERVICEABILITY / MAINTAINABILITY**		
	Power Component Accessibility		All power components in the converter sections shall be designed for rack-out accessibility for ease of maintenance and to minimize repair downtime.
	Marking / Labelling		Sleeve type wire marker tags or other acceptable means of permanent identification shall be applied to power and control wiring. Individual labels shall be provided for all major components of the VFD system.
2.15	**DATASHEET - MOTORISED VALVE ACTUATOR**		
2.15.1	**General**		
	Duty		☐ On / Off ☐ Inching
	Valve type		☐ Globe ☐ Gate ☐ Reg. Globe ☐ Butterfly
	Ambient condition		Shall be suitable for continuous operation under an ambient temp. Of 0-60 deg c and relative humidity of 0-95%
2.15.2	**Construction and sizing**		
	Construction		Totally enclosed weather proof, minimum IP:68
	Mechanical position indicator		To be provided for 0-100% travel
	Bearings		Double shielded, grease lubricated anti-friction.
	Gear train for limit switch/torque switch operation		Metal (not fibre gears). Self-locking to prevent drift under torque switch spring pressure when motor is de-energized.
	Sizing		Open/close at rated speed against designed differential pressure at 90% of rated voltage. For isolating service three successive open-close operations or 15 mins. Whichever is higher. **For inching service - 150 starts/hr or required cycles whichever is higher.**
2.15.3	**Handwheel**		
	Required		■ Yes ☐ No
	Orientation		☐ Top Mounted ☐ Side Mounted
	Additional requirement		To disengage automatically during motor operation.
2.15.4	**Electric actuator**		
	Motor type		Squirrel cage induction motor suitable for Direct On-Line (DOL) Starting
	Power supply to motor / starter		415V +/- 10%, 3 Ph, 3W & 50Hz +/- 5%
	Control voltage requirement		To be derived from the Power Supply to the Starter ☐ 230 V ■ 110 V AC / 24 V DC
	Enclosure class of motor		IP 68
	Insulation class		Class F. Temperature Rise 70 Deg C. Over 50 Deg C Ambient
	Winding temp protection		Thermostat (3 Nos.,1 In Each Phase)
	Single phasing protection & wrong phase sequence protection		Required, suitable means shall be provided to diagnose the type of fault locally.
2.15.5	**Integral starter**		
	Integral starter		Required with built in SPP (Single Phasing Preventer)
	Type of switching device		■ Contactors ☐ Thyristors
	Type		Non-Intrusive Profibus Actuator
	Feature		All actuator settings including torque, limit shall be possible without opening the actuator cover.
	If smart		
	A) Serial link protocol		☐ Foundation Field-Bus ■ Profibus DP
	B) Redunadant profibus DP port		Required
	C) Hand held programmer		Not Required

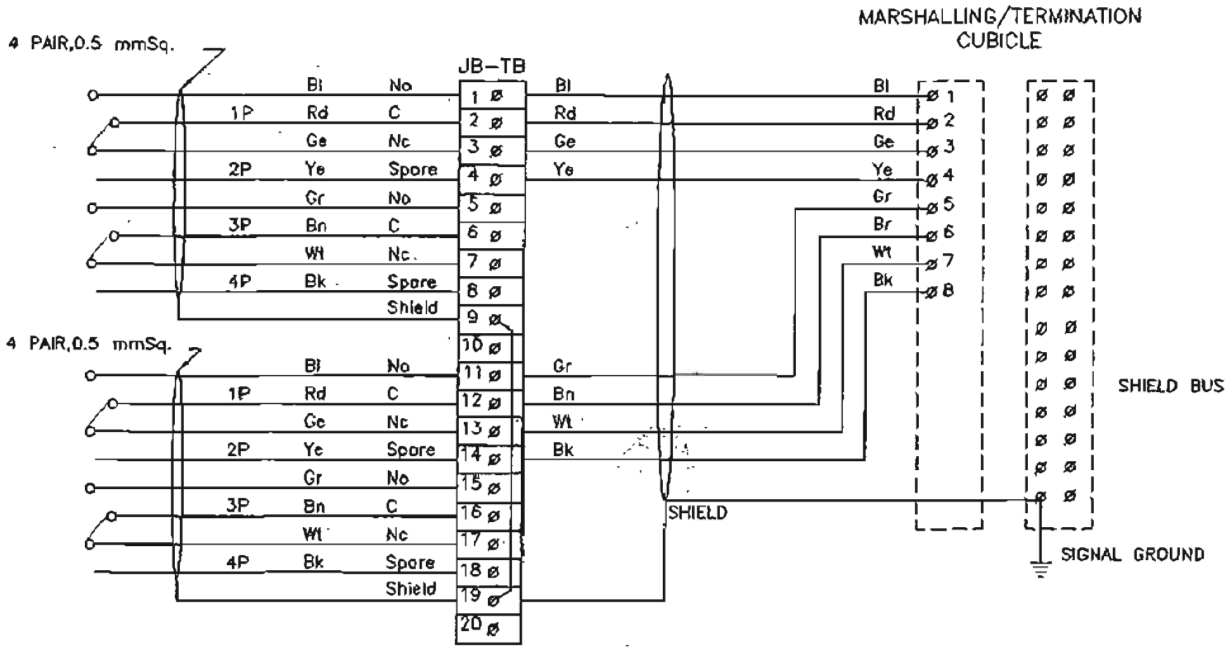
	D) Profibus DP cable connection		Suitable connector integral to the actuator, or external devices/ accessories (mounted inside minimum IP65 protection class enclosure) shall be provided so that the actuator can be isolated online from the profibus network without disturbing the profibus communication of other actuators of the segment.
	E) Open/Close command termination logic		Shall be suitably built inside actuator
	F) GSD and DTM files		To be provided which shall be configured/ tested with DCS for proper interfacing and diagnostics
	G) Available signals to DCS (through profibus network)		Open/ close commands, open/ close feedback status, disturbance signal etc. along with diagnostics. The detailed diagnostics including the actuator operating data shall be available to the DCS
	Step down cont. Transformer		Required
	Open / close PB		Required
	Stop PB		Required
	Indicating lamps		Required
	Local remote s/s		Required (Lockable)
	Status contacts for monitoring		Required
2.15.6	**Position/ torque transmitter**		
	Position/torque transmitter		i. Position/limit measurement shall be done using absolute encoders which will give information of position/limit in both the directions.
			ii. Electronic measurement of torque shall be provided.
	Supply		24V DC
	Accuracy		+ 1% FS
2.15.7	**Space heater**		
	Space heater		Required
	Power supply (non integral)		230V AC,1 Ph.,50 Hz
	Power supply (integral)		Power supply derived from main power supply available at actuator end
2.15.8	**Terminal block**		
	Actuator/motor terminal block		Required. For power cables, the grade of TBs shall be minimum 650V
	Terminals / connectors		Suitable terminals/ connectors, integral to actuator, for terminating fieldbus cables and power cables shall be provided
	Earthing terminal		Required (2nos.)
2.15.9	**Cable glands**		
	Type		Double Compression
	Material		Brass Material
	Armored fieldbus cable glands		Required
	Power cable glands		Required
2.15.10	**Wiring**		Suitable voltage grade copper wire
2.15.11	**LCD Display**		
	LCD Indication		Integral to actuator body
	Local display information		Regarding actuator alarms, status and valve position indications as a minimum.
2.15.12	**Motor considerations**		
	Power Supply		shall operate satisfactorily under the +/- 10% supply voltage variation at rated frequency, -6% to +4% variation in frequency at rated supply voltage, simultaneous variation in voltage & frequency the sum of absolute percentage not exceeding 10%.
2.15.13	**SIL certification**		SIL2
2.15.14	**Accessories**		
	Accessories for calibration / settings / configuration of various parameters of actuator		Required
2.16	**DATASHEET - ULTRASONIC LEVEL TRANSMITTER**		
	Transmitter type		Non contact microprocessor based 2 wire type loop powered, HART protocol compatible

	Output signal	mA	4-20 mA DC (analog signal) alongwith superimposed digital signal based on HART protocol
	Accuracy	%	±0.5% of calibrated span or minimum 5mm
	Power supply	V	24V DC +/- 10%
	Temperature compensation		To be provided within transducer
	Housing material		Metallic housing with durable corrosion resistance coating
	Protection		Weather proof as per IP-65
	Sensor material		Corrosion resistant material to suit individual application requirement
	False signal tolerance		Transmitter shall be capable of ignoring false echoes from internal tank/sumped obstructions such as pipes, heating coils or agitator blades. Also transmitter shall have adjustable damping circuitry.
	Display		Integral digital display
	Diagnostics		Loss of echo alarm etc.
	Electrical connection		Plug and socket

2.17	**Impulse piping for water area/equipment**		
	Painting color scheme		Grey RAL 9002
	Identification Tag/band color scheme		Sea green, ISC no. 217
2.18	**Impulse piping for oils**		
	Painting color scheme		Grey RAL 9002
	Identification Tag/band color scheme		Light Brown, ISC no. 410
2.19	**Impulse piping for air**		
	Painting color scheme		Grey RAL 9002
	Identification Tag/band color scheme		Sky Blue, ISC no. 101
3.0	**INSPECTION/TESTING**		
3.1	Type Test requirement		Yes
	Item-1		Electronic Transmitters
	Test & Standard -1		As per Standard, BS-6447 / IEC-60770
	Test to be specifically conducted		No
	NTPC's approval required. on Test certificate		Yes

TECHNICAL DATA - PART - B (SUPPLIER DATA TO BE FURNISHED AFTER AWARD OF CONTRACT)			
SL.NO	**DESCRIPTION**	**UOM**	**DETAIL**
	FOLLOWING DATA SHALL BE FILLED UP BY VENDOR FOR EACH INSTRUMENT		
1.0	MAKE		
1.1	MODEL		
1.2	TAG NO. / KKS NO.		
1.3	SERVICE		
1.4	QUANTITY		
1.5	OPERATING PRESSURE		
1.6	OPERATING TEMPERATURE		
1.7	DESIGN PRESSURE		
1.8	DESIGN TEMPERATURE		
1.9	RANGE		

Please refer attached drawings for this portion



FOR TENDER PURPOSE ONLY

एन टी पी सी लिमिटेड
NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INTERFACING OF FIELD INSTRUMENTS/ SWGR SWITCH (COC) TERMINATION DETAILS

REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE										29.04.08

CLEARED BY

SIZE	SCALE	DRG. NO.	REV. NO.
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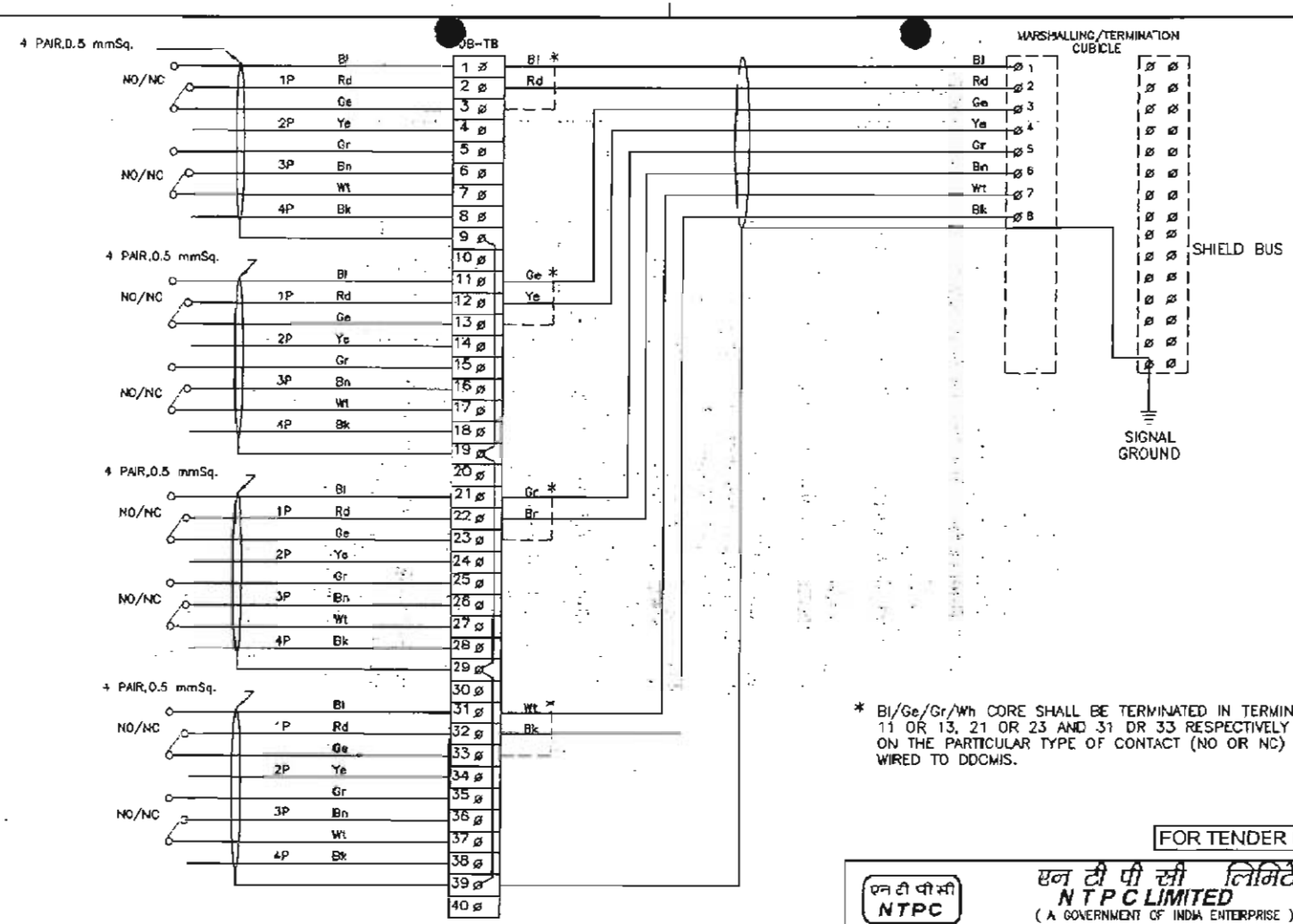

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NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INTERFACING OF FIELD INSTRUMENTS
SWITCH TERMINATION DETAILS
NO/NC

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE										29.04.06

CLEARED BY

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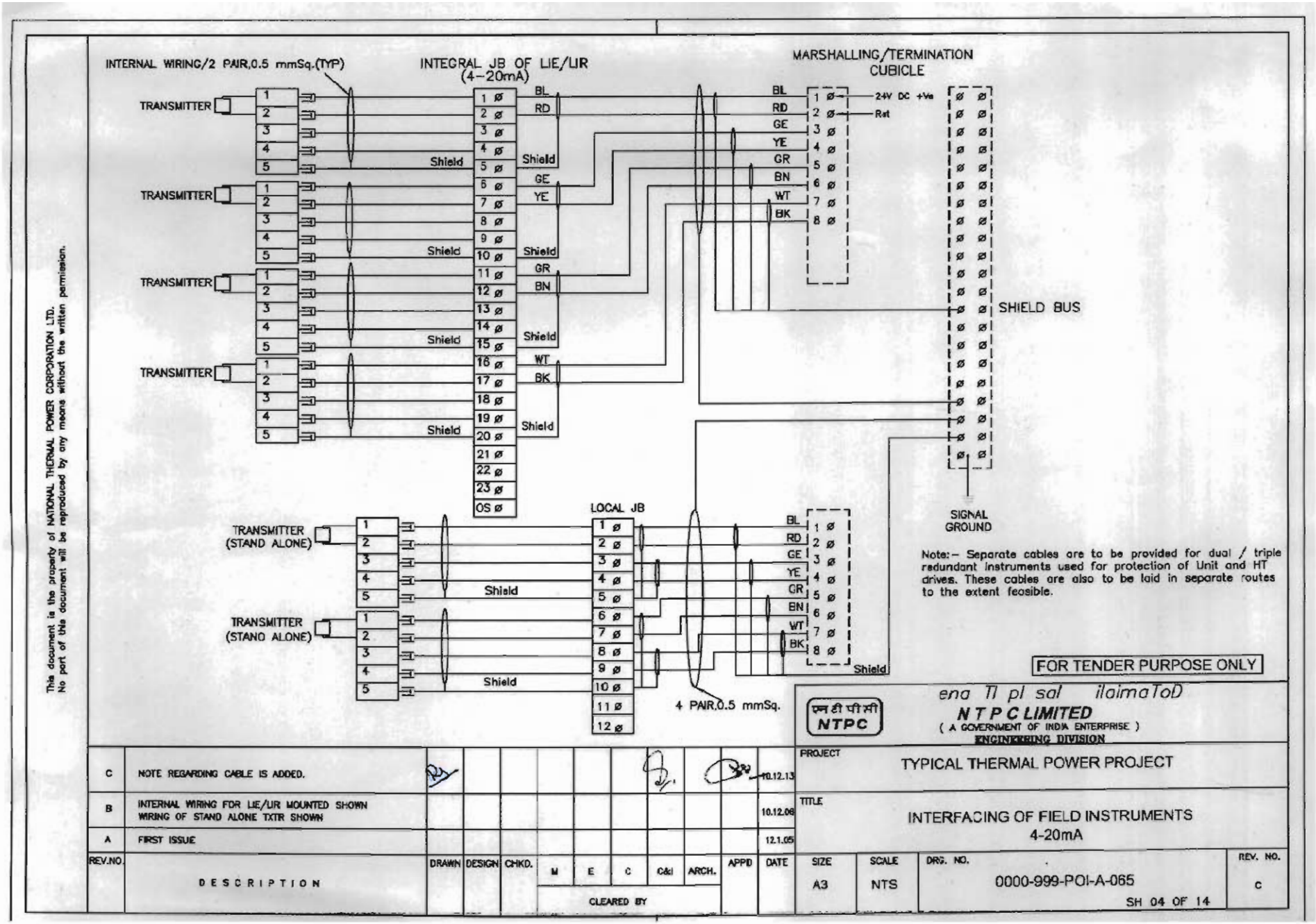

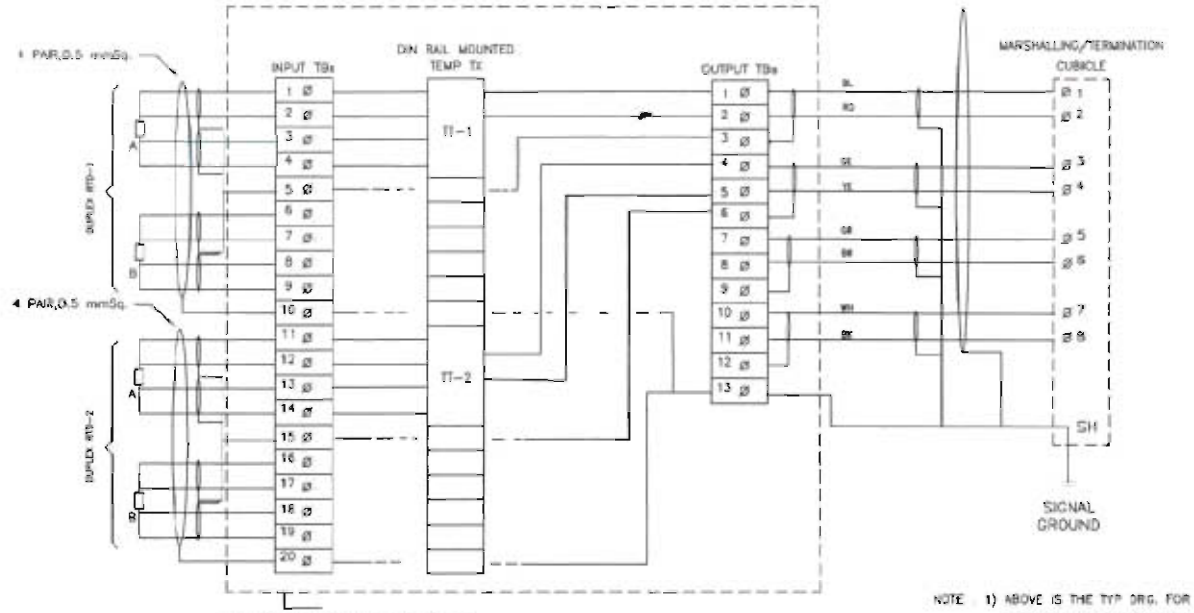

NOTE : 1) ABOVE IS THE TYP DRG. FOR DIN RAIL MOUNTED TEMP TRANSMITTERS FOR RTD APPLICATION. EXACT TYPE OF TEMP TRANSMITTER SHALL BE AS PER PART-A OF SPECIFICATION.

2) THE EXACT GROUPING OF TEMP Txs SHALL BE FINALISED DURING DETAILED ENGG. STAGE.

FOR TENDER PURPOSE ONLY

एन टी पी सी NTPC

N T P C LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INTERFACING OF FIELD INSTRUMENTS
TYPICAL RTD CONNECTION WITH TEMP TRANSMITTERS INJBs

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE										29.04.01

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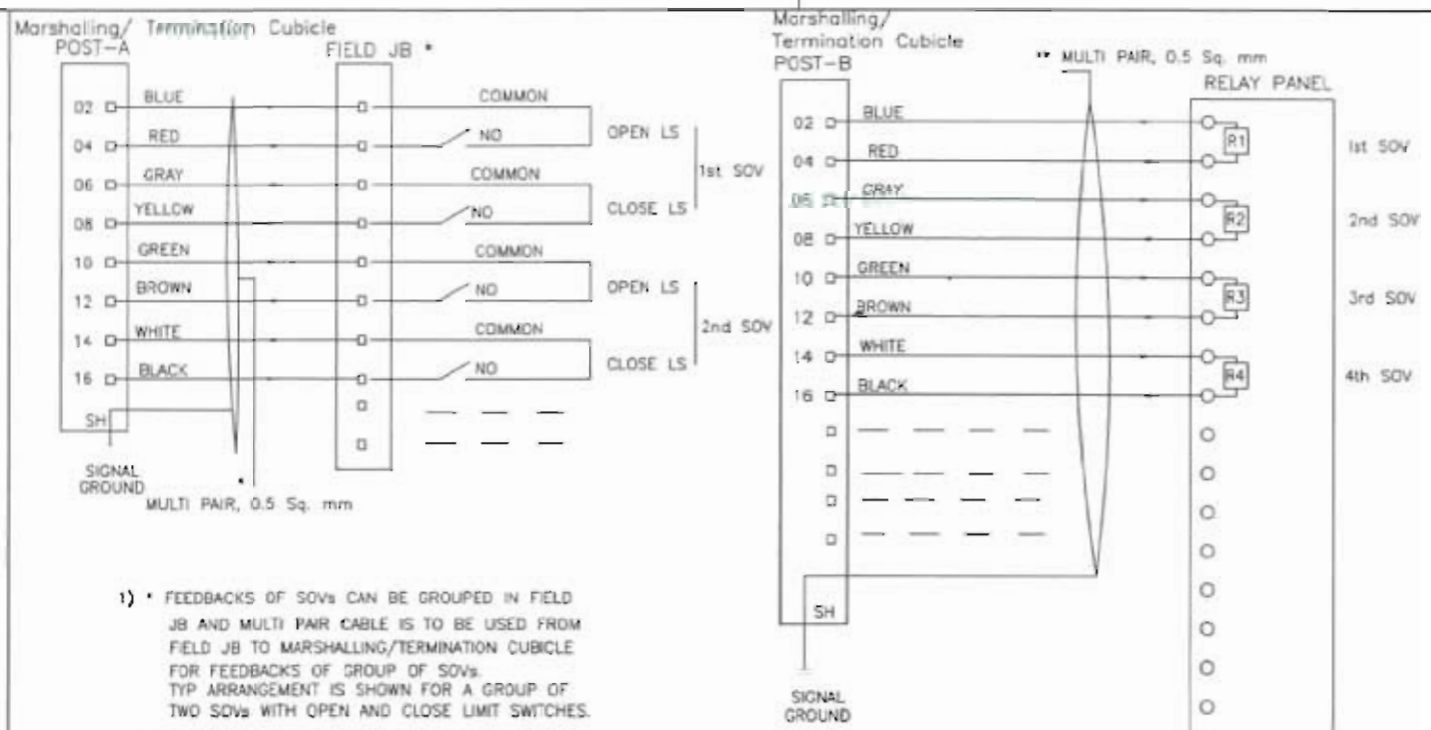

1) * FEEDBACKS OF SOVs CAN BE GROUPED IN FIELD JB AND MULTI PAIR CABLE IS TO BE USED FROM FIELD JB TO MARSHALLING/TERMINATION CUBICLE FOR FEEDBACKS OF GROUP OF SOVs. TYP ARRANGEMENT IS SHOWN FOR A GROUP OF TWO SOVs WITH OPEN AND CLOSE LIMIT SWITCHES.

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.

एन टी पी सी NTPC
नेशनल थर्मल पावर कार्पोरेशन 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)

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
B	FIRST ISSUE										30.10.02

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SIZE	SCALE	DRG. NO.	REV. NO.
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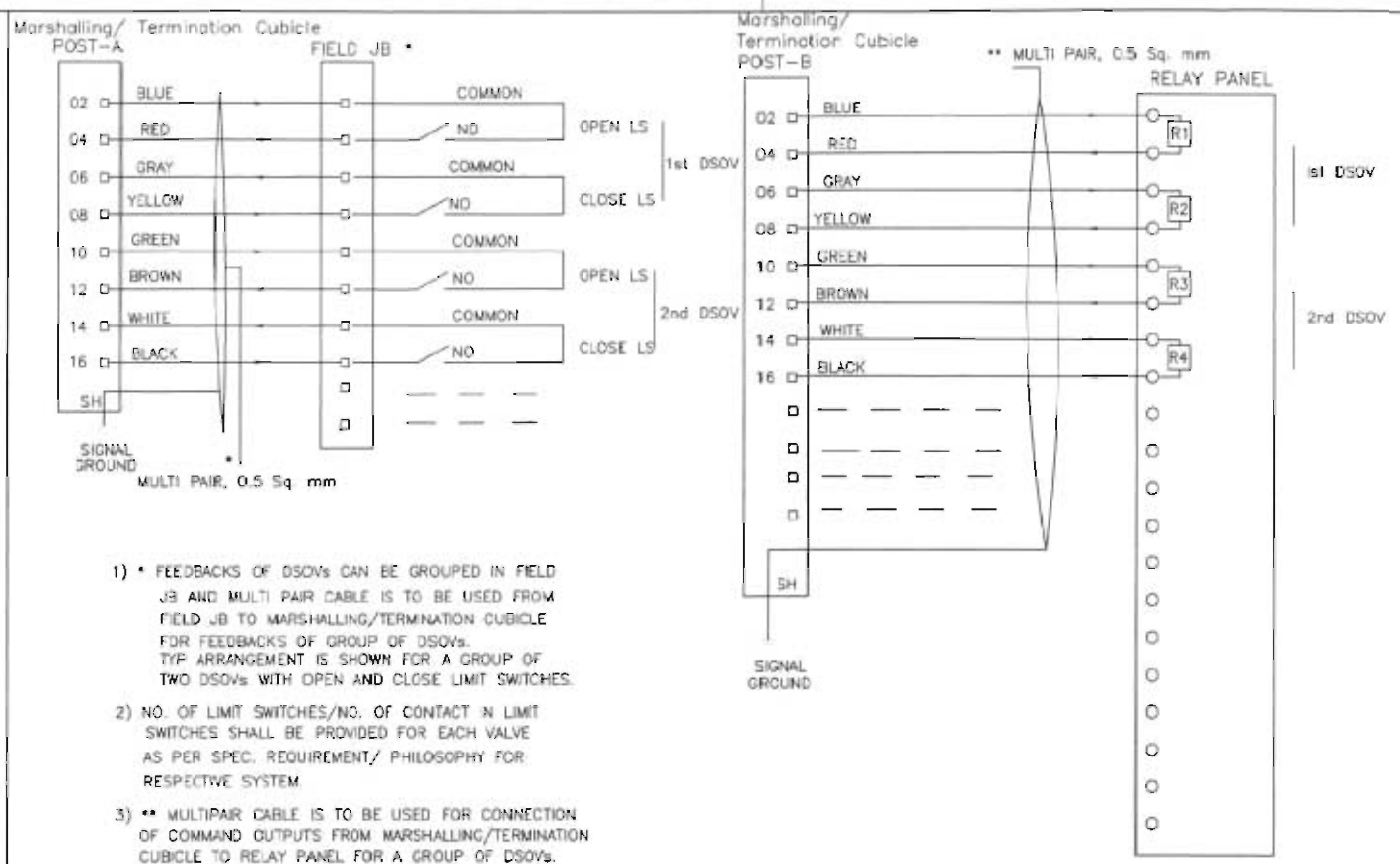

1) * FEEDBACKS OF DSOVs CAN BE GROUPED IN FIELD JB AND MULTI PAIR CABLE IS TO BE USED FROM FIELD JB TO MARSHALLING/TERMINATION CUBICLE FOR FEEDBACKS OF GROUP OF DSOVs. TYP ARRANGEMENT IS SHOWN FOR A GROUP OF TWO DSOVs WITH OPEN AND CLOSE LIMIT SWITCHES.

2) NO. OF LIMIT SWITCHES/NO. OF CONTACT N 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 DSOVs.

एन टी पी सी NTPC
नैशनल थर्मल पावर कार्पोरेशन 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
(DOUBLE COIL SOLENOID)

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
B	FIRST ISSUE										30.10.02

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SIZE	SCALE	DRG. NO.	REV. NO.
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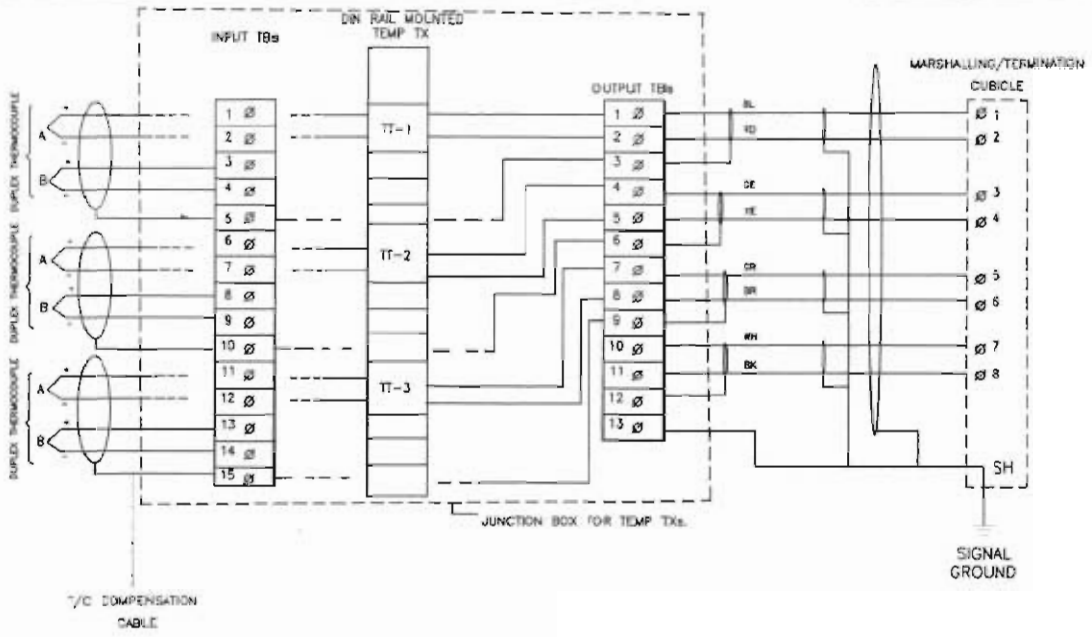

NOTE: 1) ABOVE IS THE TYP DRG. FOR DIN RAIL MOUNTED TEMP TRANSMITTER FOR T/C APPLICATION. EXACT TYPE OF TEMP TRANSMITTERS SHALL BE AS PER PART-A OF SPECIFICATION.

2) THE EXACT GROUPING OF TEMP TXs SHALL BE FINALISED DURING DETAILED ENGG. STAGE.

3) AFTER GLANDING OF T/C CABLES ON JB, THE CABLE PAIR OF FIRST ELEMENT WILL BE DIRECTLY CONNECTED TO TT AND FOR CABLE PAIR OF SECOND ELEMENT LOOP SHALL BE KEPT, BEFORE TERMINATION AT INPUT TBs FOR FUTURE USE.

FOR TENDER PURPOSE ONLY

एन टी पी सी NTPC

N T P C LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INTERFACING OF FIELD INSTRUMENTS
TYPICAL T/C CONNECTION WITH TEMP TXs IN JBs

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD.	DATE
A	FIRST ISSUE										28.04.06

CLEARED BY

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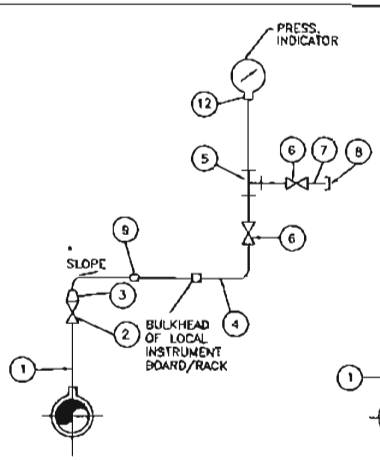
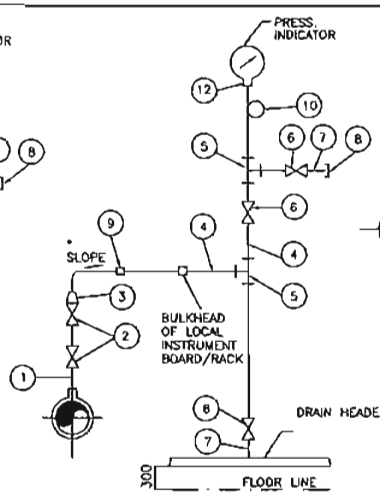
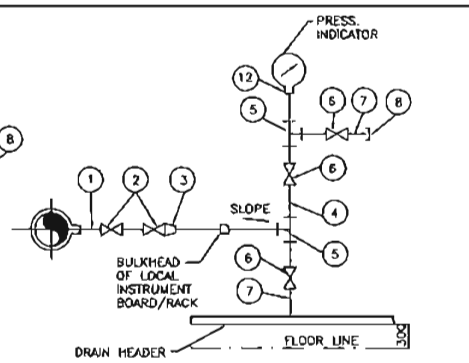


ELEVATION
INST./ SERVICE AIR



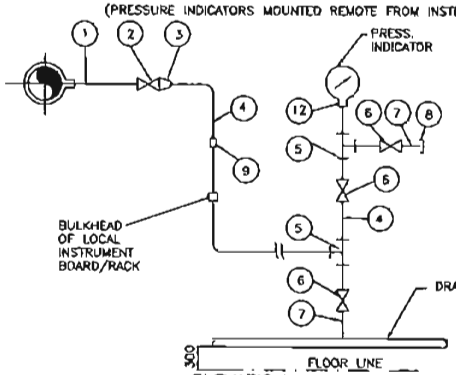
ELEVATION
STEAM SERVICE

(PRESSURE INDICATORS MOUNTED REMOTE FROM INSTRUMENT SOURCE POINT)



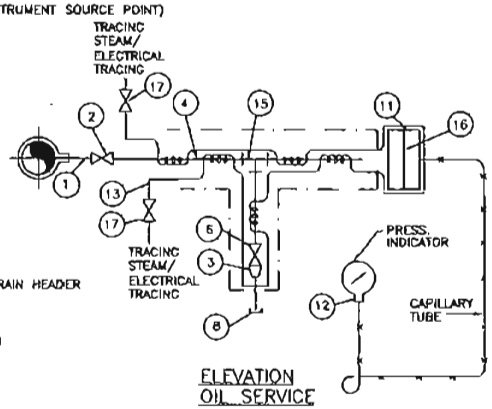
ELEVATION
LIQUID SOURCE

(GAUGE MOUNTED ABOVE INSTRUMENT SOURCE POINT)



ELEVATION
LIQUID SOURCE

(GAUGE MOUNTED BELOW INSTRUMENT SOURCE POINT)



ELEVATION
OIL SERVICE

(GAUGE MOUNTED BELOW INSTRUMENT SOURCE POINT)

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1/2", 3/4", 1" NPS SCH 40/80/160/XXS/P91 (AS PER PROCESS REQUIREMENT) 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.	6" SS SYPHON
11.	1/2" BLIND 300lbs 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(WAFER ELEMENT)
17.	ISOLATION VALVE 316 SS,1/4"SW

NOTES:-

1. THE MATERIAL SPECIFICATION AND SCHEDULE NO. OF IMPULSE PIPE & NIPPLE AS LISTED HEREIN SHALL BE AS PER TECHNICAL SPECIFICATIONS.
2. THE MATERIAL SPECIFICATION AND RATING OF FITTINGS AS LISTED SHALL BE AS PER SPECIFICATIONS. WELDED/THREADED FITTINGS SHALL CONFIRM TO ANSI-B.16-11.
3. INSTRUMENTS VALVES BODY STEM MATERIAL AND PRESSURE CLASS SHALL BE AS PER TECHNICAL SPECIFICATIONS.
4. FOR BOILER AIR/FLUE GAS SERVICES SOURCE CONNECTIONS IMPULSE PIPING AND ALL FITTINGS SHALL BE OF 3/4" NB SIZE.
5. GAUGES SHALL NOT BE MOUNTED ON THE PIPE. IT WILL BE MOUNTED ON A CHANNEL OR FRAME OR A RACK.
6. * SLOPE APPROX. 50 MM / METRE.

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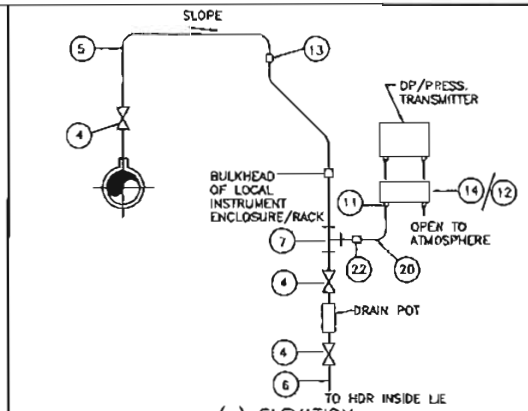
REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.G.			21.08.12

CLEARED BY

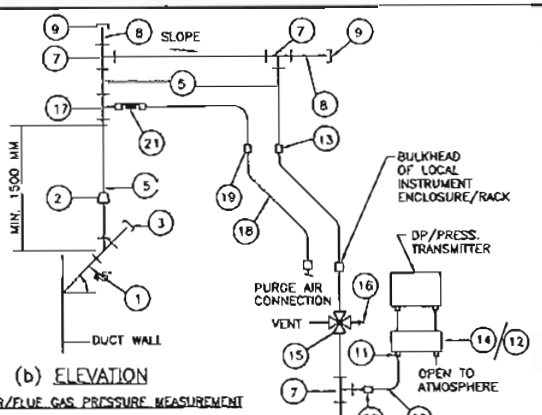
PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT INSTALLATION DIAGRAM (FOR PRESSURE GAUGE)

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-022	A

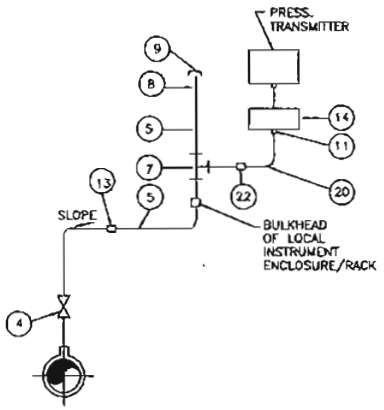


(a) ELEVATION
INST/SERVICE AIR PRESSURE MEASUREMENT

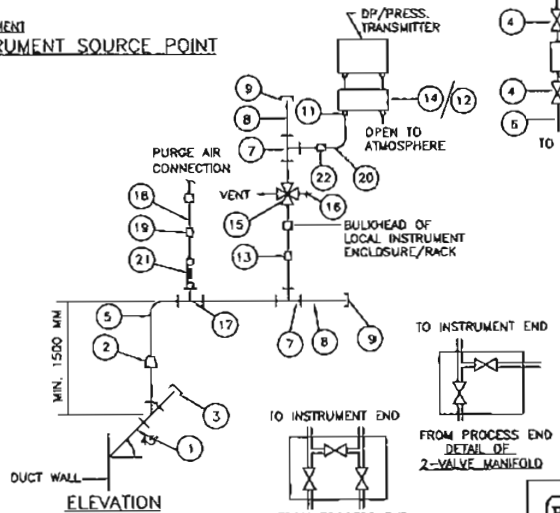


(b) ELEVATION
DIRTY AIR/FLUE GAS PRESSURE MEASUREMENT

TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT



ELEVATION
INST/SERVICE AIR PRESSURE MEASUREMENT



ELEVATION
DIRTY AIR/FLUE GAS PRESSURE MEASUREMENT

TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	42 x 405 MM M.S. BLACK PIPE
2.	M42x2 TO 3/4" REDUCING INSERT
3	M42x2(F) M.S.CAP
4.	3/4" SW GLOBE VALVE/GATE VALVE
5.	3/4" NPS PIPE
6.	3/4" NPS SW 3/4" NPT(M) CS/AS NIPPLE
7.	3/4" SW EQUAL TEE
8.	3/4" NPS SCH 80 CARBON/ALLOY STEEL NIPPLE
9.	3/4" NPT(F) CS/AS CAP
10.	3/4" SW CS/AS EQUAL CROSS
11.	1/2" TUBE ADOPTER
12.	3 VALVE MANIFOLD
13.	3/4" PIPE UNION
14.	2 VALVE MANIFOLD
15.	3/4" SW 4 WAY VALVE
16.	QUICK DISCONECT FITTING
17.	3/4"SWx1/2"SW BRANCH TEE
18.	1/2" NB SEAMLESS GI PIPE
19.	1/2" NPT (F) GI FITTING
20.	SS TUBE
21.	FLEXIBLE HOSE WITH ONE END SOCKET WELDED (PIPE SIDE) & OTHER END WITH SUITABLE FITTINGS.
22.	3/4" x 1/2" S.S. TUBE UNION

NOTES:-

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

FOR TENDER PURPOSE ONLY

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NTPC LIMITED
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ENGINEERING DIVISION

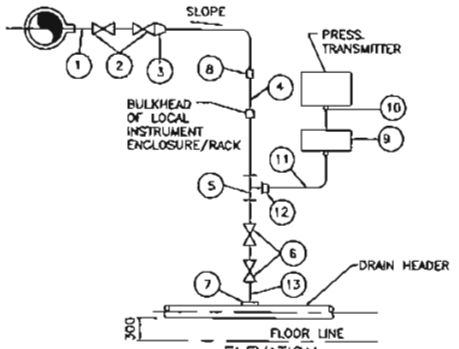
PROJECT: TYPICAL THERMAL POWER PROJECT

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

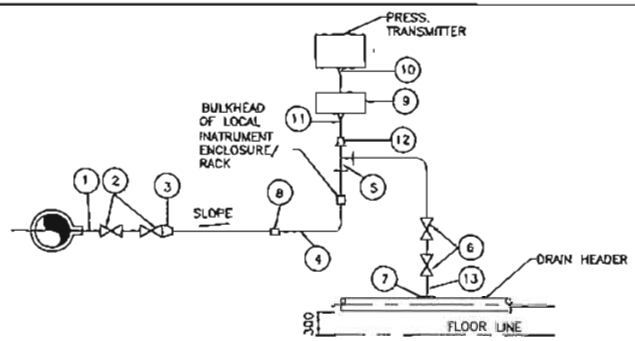
REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.G.			21.08.12

CLEARED BY

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-023	A



ELEVATION
TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT

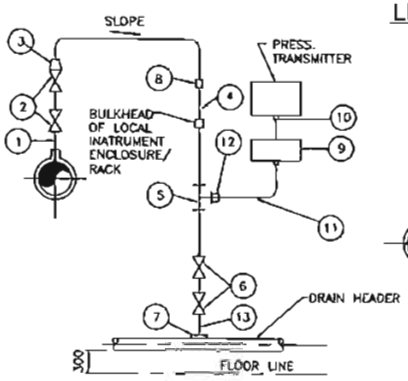


ELEVATION
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

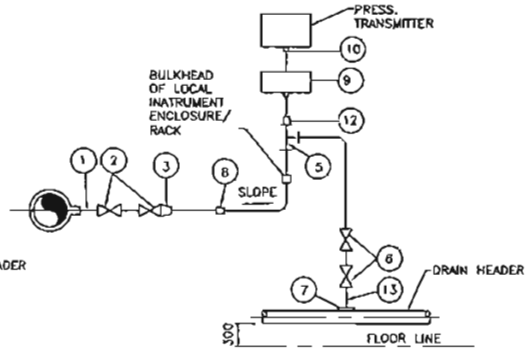
LIQUID PRESSURE MEASUREMENT

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1/2" / 3/4"/1" NPS SCH. 80/160/XXS/PSI 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 SWx1/2"CS/AS COUPLER
8.	1/2" PIPE UNION
9.	2/3 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 SWx1/2" NPT(M) CS/AS NIPPLE

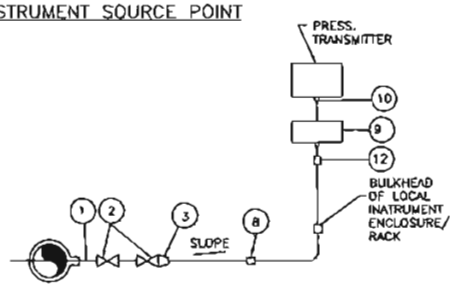


ELEVATION
TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT



ELEVATION
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

STEAM PRESSURE MEASUREMENT



ELEVATION
VACCUM PRESSURE MEASUREMENT

NOTES:-

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

FOR TENDER PURPOSE ONLY

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ENGINEERING DIVISION

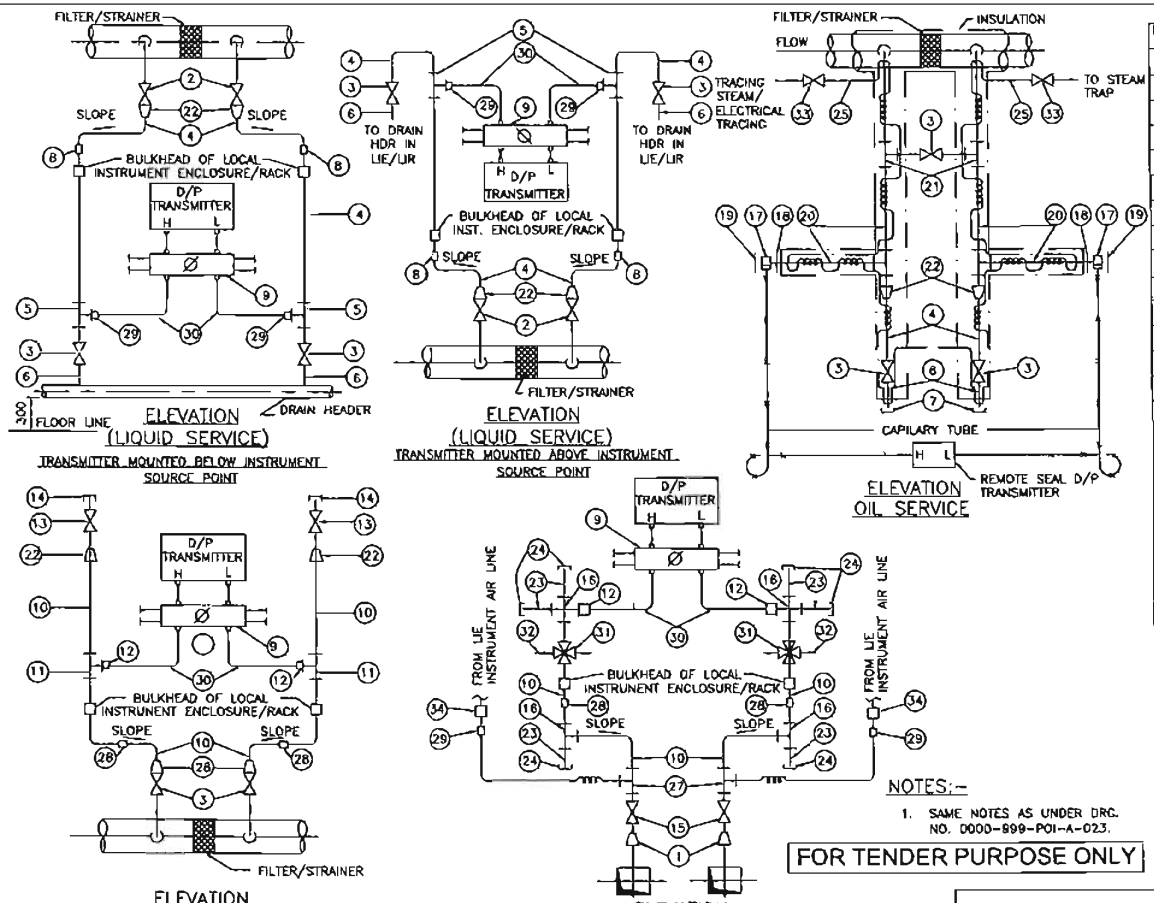
PROJECT: TYPICAL THERMAL POWER PROJECT

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

REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.G.			21.08.12
					CLEARED BY						

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

SECTION-IC, C&I SPECIFICATION- SINGRAULI MRHS



NOTES:-

1. SAME NOTES AS UNDER DRG. NO. 0000-999-POI-A-023.

FOR TENDER PURPOSE ONLY

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	42x2 TO 3/4" SW REDUCING INSERT.
2.	3/4" SW GLOBE VALVE.
3.	1/2" SW GLOBE VALVE FOR LIQUID APPLICATION & 3/4"/1" IN GAS/AIR APPLICATION
4.	1/2" NPS 40/80/160 (AS PER PROCESS REQUIREMENT) CARBON/ALLOY STEEL PIPE.
5.	1/2" SW EQUAL TEE.
6.	1/2" NPS SW x 1/2" NPT (M) NIPPLE.
7.	1/2" NPT (F) CAP.
8.	1/2" PIPE x 1/2" PIPE UNION.
9.	5 VALVE MANIFOLD (FOR DETAL REFER DRAWING NO.0000-999-POI-A-026.
10.	3/4" SCH 80 CARBON/ALLOY STEEL PIPE.
11.	3/4"/1/2" SW EQUAL TEE.
12.	3/4"x1/2" TUBE UNION.
13.	1/2" SCREWED GLOBE VALVE.
14.	1/2" NPT (M) PLUG.
15.	3/4" SW GATE VALVE.
16.	3/4" SW EQUAL CROSS.
17.	WAFER ELEMENT FOR USE WITH 3"ANSI R.F. VALVE.
18.	3"BLIND 300lbs R.F. WELD NECK FLANGE DRILLED FOR 1" SCH. 40/80 PIPE
19.	3" BLIND FLANGE.
20.	1"NPS SCH. 40/80 (AS PER PROCESS REQUIREMENT) CS PIPE.
21.	1" SW EQUAL TEE.
22.	3/4" x 1/2"SW REDUCING INSERT.
23.	3/4" SW x 3/4" NPT (M) CS/AS NIPPLE
24.	3/4" NPT (F) CS/AS CAP.
25.	1/4" NPS ALLOY STEEL PIPE.
26.	1" x 3/4" SW REDUCING INSERT.
27.	3/4" SW x 1/2" PSW BRANCH TEE.
28.	3/4" PIPE UNION
29.	1/2" CLAMP UNION (THREADED) SUITABLE FOR FLEXIBLE CONNECTION OF NYLON REINFORCED PVC TUBE.
30.	SS TUBE
31.	3/4" SW 4 WAY VALVE.
32.	QUICK DISCONNECT FITTINGS.
33.	1/4" SW ISOLATION VALVE 316SS
34.	1/2" x 1/2" SS PIPE UNION.

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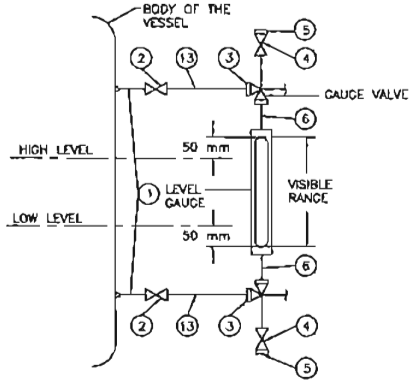
PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT INSTALLATION DIAGRAM
DIFF. PRESS.MEASUREMENT (LIQUID, OIL, AIR/GAS SERVICE)

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.C.			21.06.12

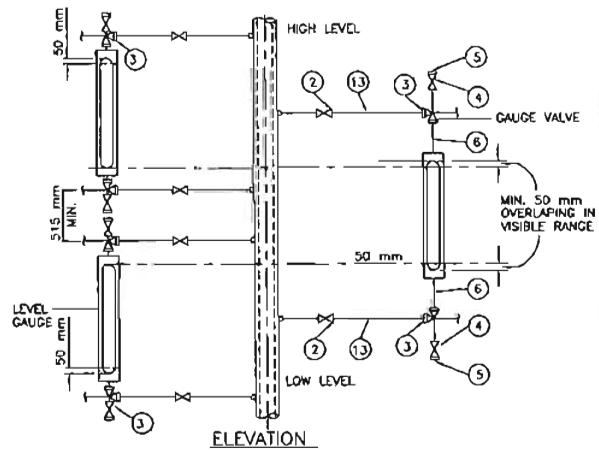
CLEARED BY

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-030	A



ELEVATION

LOCAL LEVEL INDICATION USING GAUGE GLASS

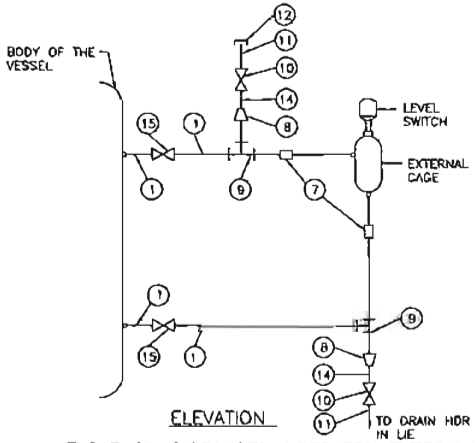


ELEVATION

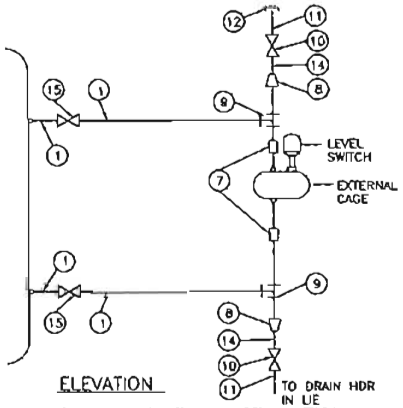
LOCAL LEVEL INDICATION USING MULTIPLE GAUGES FOR INCREASED RANGE NOT COVERED IN A SINGLE UNIT

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	3/4"/1" NPS SCH.40/80/160/P91 (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 SWx1/2" NPT(M) CS/AS NIPPLE.
12.	1/2" NPT (F) CAP
13.	3/4"x1/2" NPS SCH.40/80 CS/AS PIPE.
14.	1/2" NPS SCH.80/160 CS/AS NIPPLE.
15.	1" SW GLOBE VALVE



ELEVATION



ELEVATION

FLOAT OR DISPLACER OPERATED EXTERNAL CAGE TYPE LEVEL SWITCH INSTALLATION

NOTES:-

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

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REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							C.G.			21.08.12

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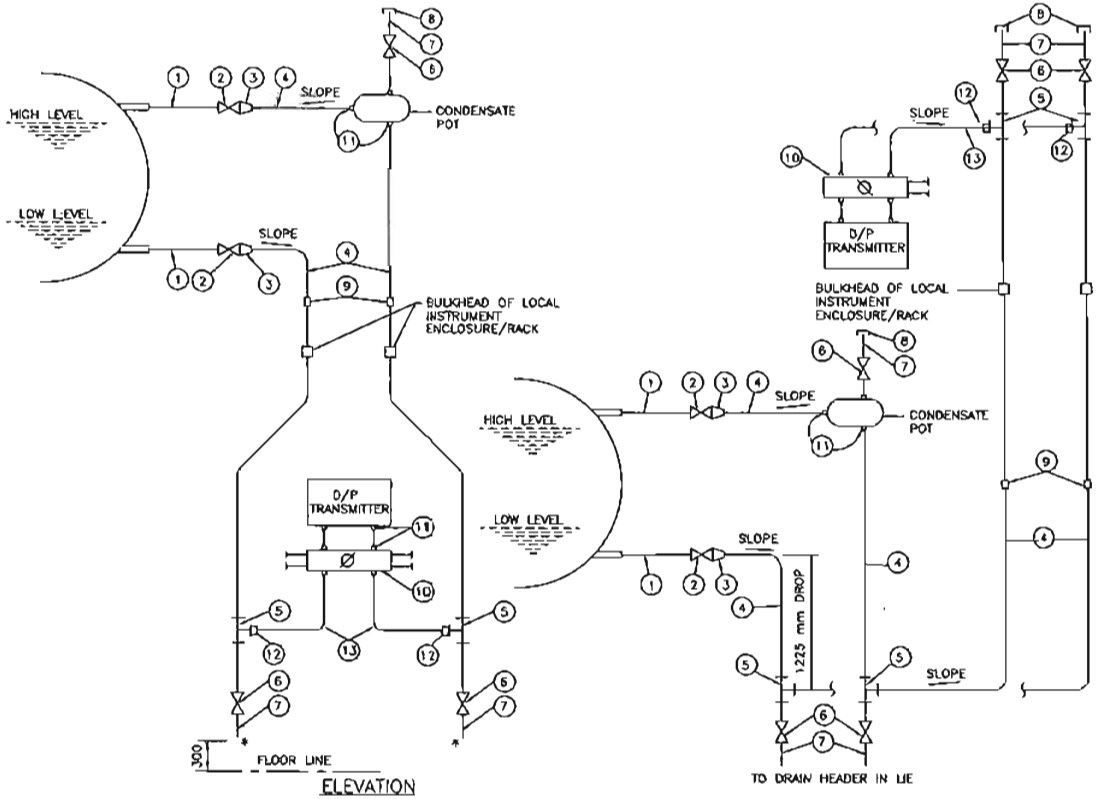
PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT INSTALLATION DIAGRAM (LEVEL GAUGE & SWITCHES)

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-031	A



ELEVATION
TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT

ELEVATION
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1" NPS SCH.40/80/160/XXS/P91 (AS PER PROCESS REQUIREMENT) CARBON /ALLOY STEEL PIPE.
2.	1" SW GLOBE VALVE.
3.	3/4"/1" TO 1/2" REDUCING INSERT.
4.	1/2" NPS SCH.80/160/XXS(AS PER PROCESS REQ.)CS/AS PIPE.
5.	1/2" SW EQUAL TEE.
6.	1/2" SW GLOBE VALVE.
7.	1/2" NPS SWx1/2" NPT(M) CS/AS NIPPLE.
8.	1/2 NPT (F) CAP.
9.	1/2" PIPE UNION.
10.	5-VALVE MANIFOLD (FOR DETAILS REF. DRG. NO.0000-999-POI-A-026.
11.	SUITABLE ADAPTER.
12.	1/2" PIPE x 1/2" TUBE UNION.
13.	S.S. TUBE.

NOTES:-

1. SAME NOTES AS UNDER DRG. NO.0000-999-POI-A-023 (WHICHEVER ARE RELEVENT).

* TO DRAIN HEADER IN LIE/LIR.

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LEVEL MEASUREMENT OF CLEAR NON-VISCOUS OR NON-CORROSIVE LIQUID IN CLOSED VESSEL WITH CONDENSABLE ATMOSPHERE USING D/P TRANSMITTER

NTPC

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

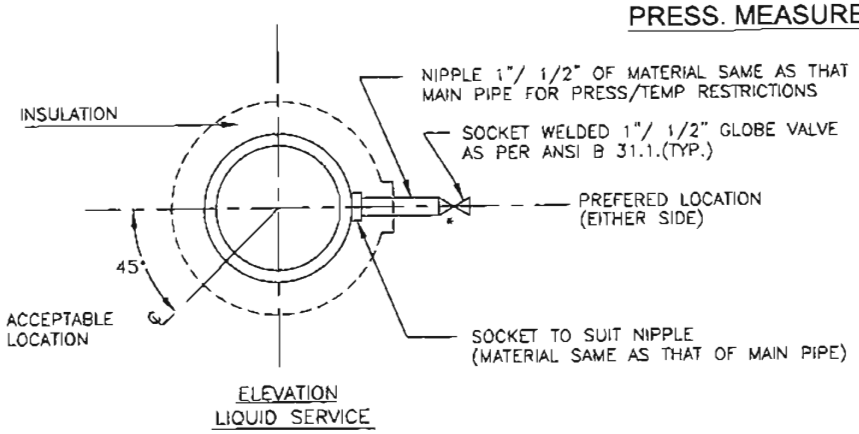
TITLE: INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT USING D/P TRANSMITTERS)

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	CLEARED BY: M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.G.			21.08.12

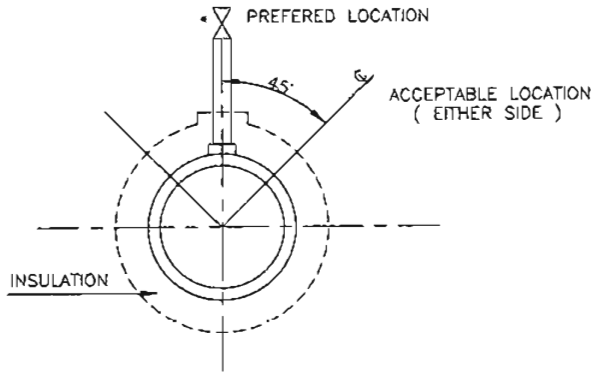
SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-032 SH 1 OF 2	A

SECTION-IC, C&I SPECIFICATION- SINGRAULI MRHS

PRESS. MEASUREMENT

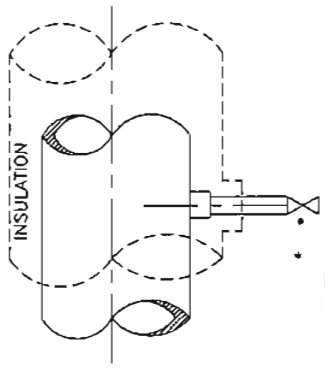


ELEVATION
LIQUID SERVICE



ELEVATION
STEAM SERVICE

PRESSURE CONNECTION ON HORIZONTAL PIPE



* USE DOUBLE ISOLATION VALVES FOR PRESSURE EQUAL TO OR EXCEEDING 40 Kg/Cm2.

ELEVATION
LIQUID OR STEAM SERVICE

PRESSURE CONNECTIONS ON VERTICAL PIPES

FOR TENDER PURPOSE ONLY

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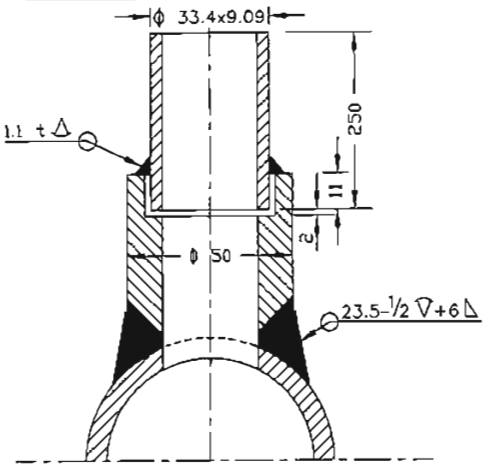
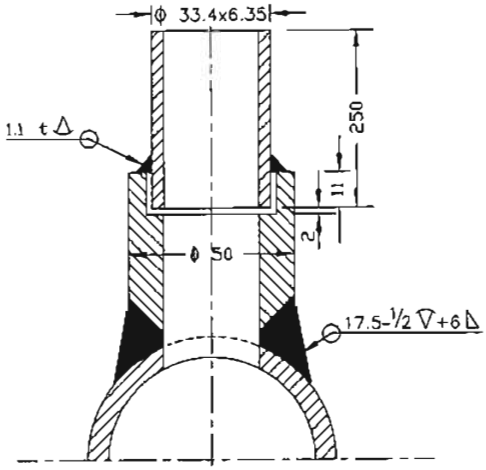
														PROJECT	TYPICALTHERMAL POWER PROJECT		
														TITLE	INSTRUMENT SOURCE CONNECTION DETAILS		
A	FIRST ISSUE							T.O.						SIZE	SCALE	DRG NO	REV. NO.
REV NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CLI	APPD.	APPD	DATE	CLEARED BY		A4	N.T.S.	0000-999-POI-A-035 Sh-1 Of 14	A

PRESSURE MEASUREMENT

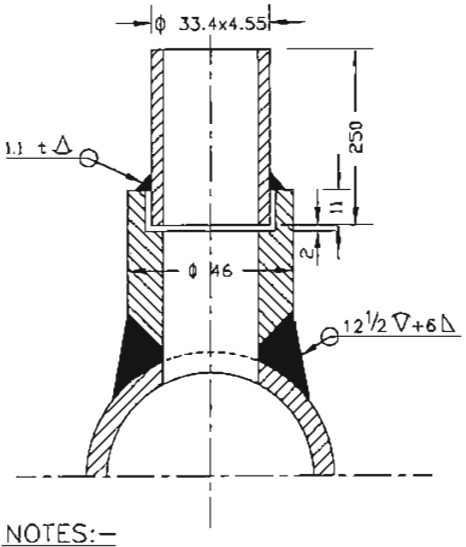
(SYSTEM PR.>40Kg/Sq Cm CL 9000)



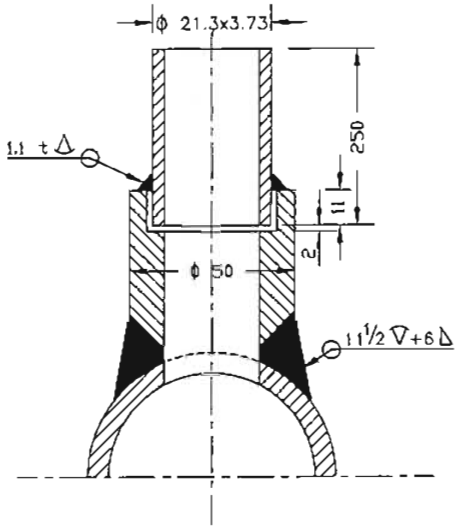
(SYSTEM PR.>40Kg/Sq Cm CL 6000)



(SYSTEM PR. <40Kg/Sq cm Nb 25 CL 3000)



(SYSTEM PR. <40Kg/Sq cm Nb 15 CL 3000)



NOTES:–

1. MATERIAL OF THE BOSS AND NIPPLE SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED AND CONFIRM TO ANSI B 16.11.
2. THE LENGTH OF THE NIPPLE SHOULD BE 250mm.
3. THE OTHER END OF THE NIPPLE SHALL BE SOCKET WELDED WITH 1" GLOBE VALVE OF MATERIAL AS PER ANSI B 16.1.
4. TWO ISOLATED VALVES ARE TO BE USED FOR PRESSURE = >40 Kg/Cm2.
5. EDGE HOLE MUST BE CLEAN AND SQUARE OR ROUNDED SLIGHTLY (1/64" RADIUS) FREE FROM BURRS, WIRE EDGES OR OTHER IRREGULARITIES.
6. ORIENTATION OF TAP WILL BE VARY WITH TYPE OF PROCESS FLUID AND NATURE OF RUN OF THE PIPE.
7. ACTIVITIES TO BE COMPLETED AT THE SHOP, WELD THE COUPLING (OR BOSS) ON THE PIPE AND DRILL PRESSURE CONNECTION HOLE (SAME AS I D OF NIPPLE) IN THE PIPE IN ALLIGNMENT WITH HOLE IN THE COUPLING.
8. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.

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REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	T.C. DLI	ARCH.	APPD.	DATE
A	FIRST ISSUE										

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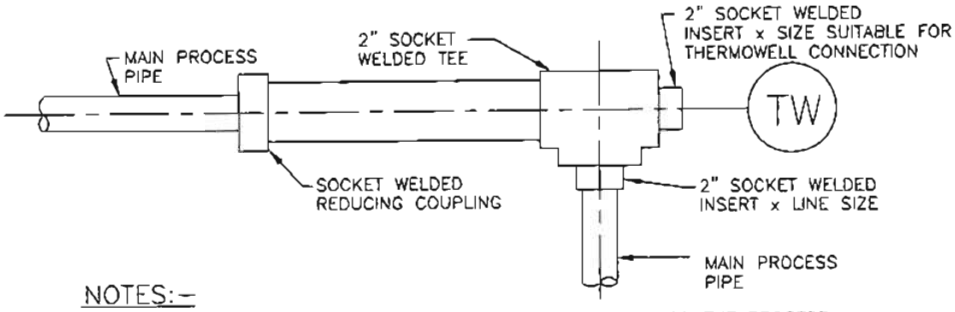
NTPC — NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

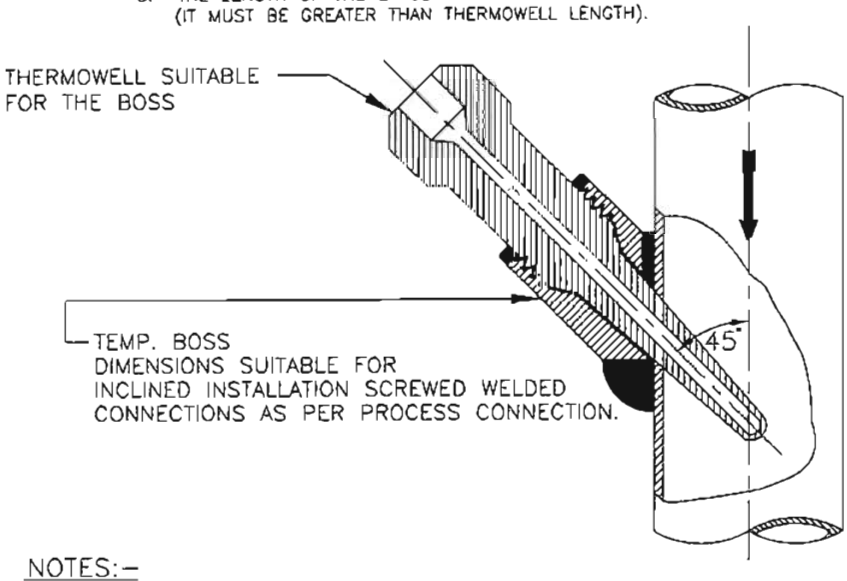
SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 SH-2 OF 14	A

TEMP. MEASUREMENT



NOTES:-

1. THIS TYPE OF THERMOWELL INSTALLATION IS SUITABLE FOR THE PROCESS PIPE OF 2" NPS AND SMALLER.
2. FOR STEAM SERVICE THIS TYPE OF THERMOWELL INSTALLATION 90° BEND MAY BE USED ONLY IN VERTICAL PLANE.
3. THE LENGTH OF THE LARGER PIPE SECTION SHALL BE MINIMUM 150mm (IT MUST BE GREATER THAN THERMOWELL LENGTH).



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 MIN. 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 THE INSTALLED THERMOWELL).

FOR TENDER PURPOSE ONLY

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CLEARED BY	ARCH.	APPD.	DATE
A	FIRST ISSUE						T.G.				

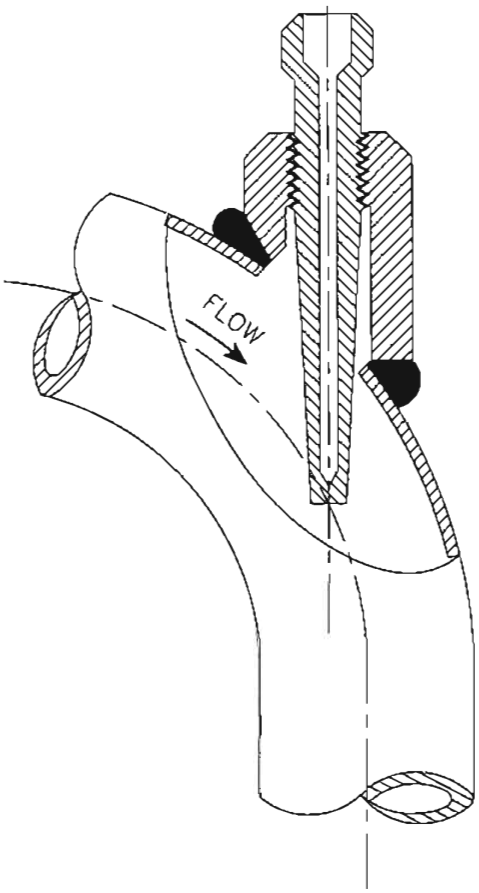
NTPC — NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: TYPICALTHERMAL POWER PROJECT (SG PACKAGE)

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO	REV NO.
A4	N.T.S.	0000-999/102-POI-A-035 Sh-1 Of 14	A

TEMP. MEASUREMENT



NOTES:-

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

FOR TENDER PURPOSE ONLY

REV NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	T.G. DLI	ARCH.	APPD.	DATE
A	FIRST ISSUE										

CLEARED BY

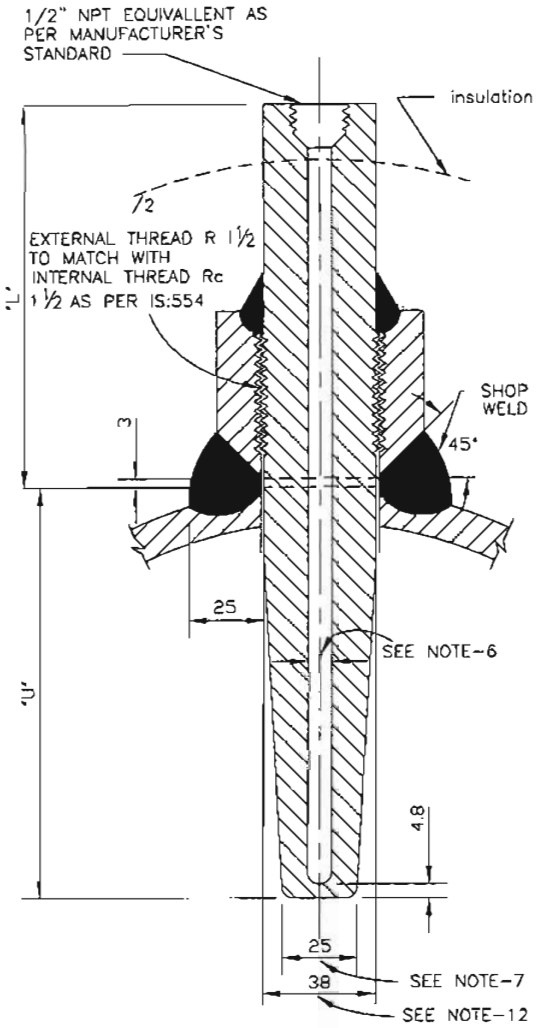
NTPC — NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO.	REV NO.
A4	N.T.S.	0000-999-POI-A-035 Sh-5 OF 14	A

TEMP. MEASUREMENT



NOTES:-

1. THIS TYPE OF TEMPERATURE BOSS SHALL BE USED FOR THE PROCESS PRESS EQUAL/ABOVE 40 Kg/Cm2(g).
2. THE MATERIAL OF THE BOSS SHOULD BE SIMILAR TO THAT OF PIPING MATERIAL OF SPECIFICATION.
3. ALL WELD TO BE TESTED IN ACCORDANCE WITH APPLICABLE CODES BY MANUFACTURER.
4. MATERIAL OF THE THERMOWELL SHALL BE OF 316SS.
5. THERMOWELL SHALL BE DRILLED BARSTOCK TYPE.
6. INTERNAL BORE OF THE THERMOWELL SHOULD BE SELECTED BASED ON THE NORMAL SIZE OF THE SENSING ELEMENT AS PER ASME.PTC-19.3.
7. THE BOTTOM DIAMETER OF THE THERMOWELL TYPICALLY SHOWN HERE SHALL BE SUBJECT TO VARIATION BASED ON THE INTERNAL BORE OF THERMOWELL AND THICKNESS OF THERMOWELL MATERIAL TO WITHSTAND THE PROCESS PRESS.AND TEMP.,AS PER ASME,PTC-19.3.
8. THE TYPE OF TAPERED THERMOWELL SHALL BE USED FOR LIQUID VELOCITIES UP TO 92M.P.S.(300F.T.P.S.).
9. THERMOWELL WITH THE INSULATION LAG EXTENSIONS SHALL BE USED WHEREVER APPLICABLE.
10. ACTIVITIES TO BE COMPLETED AT THE SHOP. WELD THE BOSS ON THE PIPE AND DRILL THE HOLE IN THE PIPE IN ALLIGNMENT WITH HOLE IN THE BOSS. PROVIDE INTERNAL THREAD AS PER IS:554 TO MATCH WITH THE THERMOWELL EXTERNAL THREAD.
11. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.
12. WIILL BE SUITABLE TO MATCH THE STUB DIMENSIONS AS PER RC 1½
13. THE "U" & "L" DIMENSIONS SHALL BE BE SELECTED BASED ON PARTICULAR APPLICATION AND THE SAME SHALL BE SUBJECT TO OWNER'S APPROVAL DURING DETAILED ENGINEERING.
14. ALL DIMENSIONS ARE INDICATIVE ONLY.

FOR TENDER PURPOSE ONLY

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	T.C. ARCH.	APPD.	DATE
A	FIRST ISSUE										

CLEARED BY

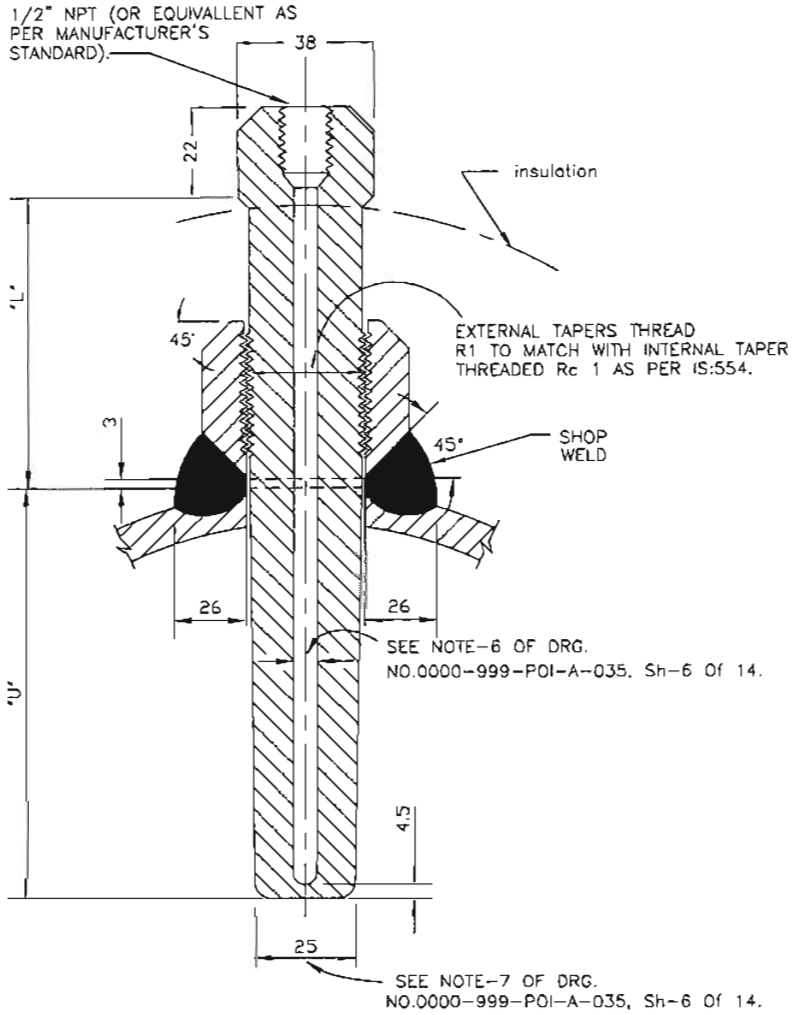
NTPC — N T P C LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO	REV NO
A4	N.T.S.	0000-999-POI-A-035 Sh-6 OF 14	A

TEMP. MEASUREMENT



NOTES:-

1. THIS TYPE OF TEMPERATURE BOSS IS APPLICABLE FOR THE PROCESS PRESSURE/TEMPERATURE BELOW 40 Kg/Cm2(g)/400°C
2. FOR PRESSURE TIGHT JOINTS THE BOSS SHOULD HAVE INTERNAL TAPERED PIPE THREAD Rc 1 AS PER IS:554. THE LENGTH OF THREAD ENGAGEMENT SHOULD BE AS PER ABOVE STANDARD.
3. PIPES HAVING PROBABILITY OF PROLONGED VIBRATION SEAL WELDING MAY BE DONE ALL AROUND AFTER TIGHTENING THERMOWELL WITHIN THE BOSS.
4. SEE NOTES-2 TO 14 OF DRG. NO. 0000-999-POI-A-035, Sh-6 Of 14.

FOR TENDER PURPOSE ONLY

REV NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD.	DATE
A	FIRST ISSUE							T.C.			

CLEARED BY

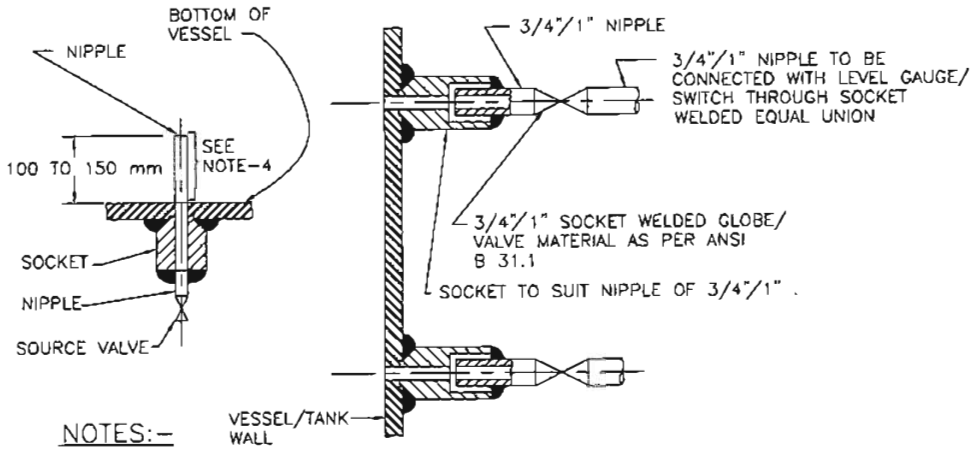
NTPC — NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

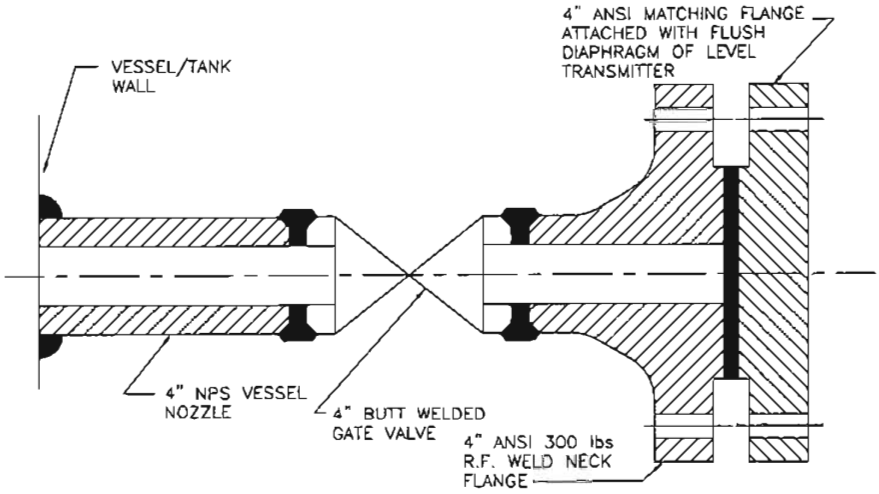
SIZE	SCALE	DRG NO.	REV NO.
A4	N.T.S.	0000-999-POI-A-035 Sh-7 Of 14	A

LEVEL MEASUREMENT



NOTES:-

1. THIS TYPE OF PROCESS CONNECTION SHALL BE USED FOR LEVEL GAUGE AND EXTERNAL CAGE TYPE FLOAT OR DISPLACER OPERATED LEVEL SWITCH.
2. FOR GAUGES 3/4" NIPPLE ALONG WITH 3/4" SW SOURCE VALVE AND FOR SWITCHES 1" NIPPLE ALONG WITH 1" SW SOURCE VALVE SHALL BE PROVIDED AS PROCESS CONNECTION.
3. SOURCE CONNECTION ON VESSEL SHOULD NOT BE LOCATED AT PLACES SUBJECTED TO INTERFACE AND TURBULENCE FROM INLETS AND OUTLETS.
4. IF LOWER CONNECTION IS TAKEN FROM BOTTOM OF THE VESSEL THEN THE NIPPLE MUST BE 100 mm TO 150 mm ABOVE THE BOTTOM OF THE VESSEL.



NOTES:-

1. THIS TYPE OF PROCESS CONNECTION SHALL BE PROVIDED FOR TANK LEVEL MEASUREMENT OF VISCOUS OR CORROSIVE LIQUID USING FLUSH DIAPHRAGM/WAFER TYPE LEVEL TRANSMITTER.
2. WELDING OF MATCHING FLANGE TO GATE VALVE SHALL BE DONE BY BIDDER.

FOR TENDER PURPOSE ONLY

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	T.G. CLEARED BY	CALI	ARCHI.	APPVL.	DATE
A	FIRST ISSUE											

NTPC — NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 Sh-13 Of 14	A

QUALITY PLAN

Note: This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.

MEASURING INSTRUMENTS

Item Components / Sub System Assembly	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (As applicable)(R)	Hydro Test(R)	Material Test certificate (R)
Pressure Gauge (IS-3624)	Y	Y	Y	Y	Y				
Temp. Gauge (BS-5235)	Y	Y	Y	Y	Y				
Pr./D.P.Switch(BS-6134)	Y	Y	Y	Y	Y	Y			
Electronic Transmitter(IEC-60770)		Y	Y	Y	Y	Y	Y		
Temp. Switch	Y	Y	Y	Y	Y	Y			
Electrical Metering Instrument (IS-1248)	Y	Y	Y	Y	Y	Y			
Transducer (IS-14570)	Y	Y	Y	Y	Y	Y			
RTD(IS-2848)	Y	Y	Y	Y	Y	Y			
Thermowell	Y	Y	Y	Y	Y				

R-Routine Test A- Acceptance Test Y – Test applicable

PROCESS CONNECTION AND PIPING

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

LOCAL CONTROL PANEL

Tests / Items	Pre Power on Check (#) (R)	Post Power on Check (%) (R)	Internal cabling / Wiring checking(R)	Door Alignment, waviness, and Locking (R)	Louvers, Fans, wire mesh, Lifting arrangement (R)	HV / IR on wired panels (R)	Paint Shade, Thickness and Illumination (R)	Hardware/Make as per BOM (R)	Dimensions, GA, layout (R)
Local Control Panel	Y	Y	Y	Y	Y	Y	Y	Y	Y
R-Routine Test A- Acceptance Test Y – Test applicable									

Note:

2) Pre power on check: - Wire dressing, looseness, Availability of Fuses and MCB, Modules are inserted properly, Earthing connection, Input Voltage checking.

3) Manufacturer also needs to include their practices and procedure in MQP along with relevant supporting documents.

VARIABLE FREQUENCY DRIVE

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							
Contactor/ MCB(IS-13947)					Y	Y	Y							
O/L Protection relays(IS-3231)					Y		Y							
C.T /V.T/ Indicating Meter(IS-2705/3156/1248)					Y	Y	Y							
Fuse/ Fuse carrier(IS-13703)					Y	Y	Y							
Terminals/lugs/pvc wires(IS-13947//IS-694)	Y			Y	Y	Y	Y							
Timers(IS-3231)					Y	Y	Y							
Push Button/ Lamp/ (IS-6875)					Y	Y	Y							
Control Transformer (IS-12021)					Y	Y	Y							
Mimic, Annunciater					Y		Y							
GASKET(IS-11149)		Y	Y	Y	Y		Y							
Fabrication								Y						
Pretreatment & Painting									Y	Y				
VFD panel										Y	Y	Y	Y	Y

DOCUMENTATION REQUIREMENT

DRAWINGS & DOCUMENTS TO BE SUBMITTED BY SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT ALONG WITH SUBMISSION SCHEDULE

Sl. No.	DOCUMENT TITLE	SUBMISSION SCHEDULE (Schedule week no. after date of LOI)
1	TECHNICAL DATASHEETS OF TRANSMITTERS,LOCAL INSTRUMENTS, MOV ETC.	12
2	IO LIST	10
3	INSTRUMENT SCHEDULE	6
4	CONTROL & OPERATIONAL WRITE-UP FOR THE SYSTEM WITH SET POINTS	6
5	CONTROL SCHEME FOR MRHS	6
6	CABLE SCHEDULE (IN EXCEL FORMAT)	10
7	CABLE INTERCONNECTION	10
8	WIRING DIAGRAM	10
9	HMI PICTURES/PLANT SCHEMATICS	10
10	ANNUNCIATION & SOE LIST	10
11	INSTRUMENTS INSTALLATION DIAGRAM	12
12	QUALITY PLAN DULY SIGNED & STAMPED FOR APPLICABLE ITEMS	12
13	CALIBRATION CERTIFICATES	12

DRAWINGS & DOCUMENTS TO BE SUBMITTED AS FINAL/AS-BUILT DOCUMENT

Sl. No.	DOCUMENT TITLE
1	APPROVED DOCUMENTS
2	CALIBRATION CERTIFICATES
3	O&M MANUAL
4	ALL TEST CERTIFICATES

SECTION – III

Sl no.	Description
1	DOCUMENTS TO BE SUBMITTED ALONG WITH THE BID
2	COMPLIANCE CUM CONFIRMATION CERTIFICATE
3	PRE-BID CLARIFICATION SCHEDULE
4	UTILITY REQUIREMENT
5	GUARANTEED POWER CONSUMPTION FORMAT

DRAWINGS/ DOCUMENTS TO BE SUBMITTED WITH THE BID

Bidder shall submit the following drawings/documents along with their bid:

a) Pre-qualification requirement (PQR) documents

b) Signed and stamped copy of Compliance cum Confirmation Certificate

c) Un-priced copy of price format indicating quoted/ not quoted against each row / column.

d) Guaranteed Power Consumption Format (shall be submitted in open along with techno commercial offer only)

OFFER WILL BE CONSIDERED AS INCOMPLETE IN ABSENCE OF ANY OF ABOVE DOCUMENTS.

DOCUMENT OTHER THAN ABOVE, IF ANY, SUBMITTED WITH THE OFFER WILL NOT FORM PART OF CONTRACT AND ACCORDINGLY WILLNOT BE CONSIDERED FOR BID EVALUATION.

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificates (every sheet) and furnishes same with the offer.

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions, other than those resolved as per 'Schedule of Deviations', with regard to same.

b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection / testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates / Inspection records etc. This is within the contracted price with extra implications to BHEL after award of the contract.

d) All drawings / data-sheets / calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.

e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre-bid discussions, otherwise BHEL/ Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself. Prices for special tools & tackles, if any, shall also be included in the base price.

g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.

h) Guarantee for plant /equipment shall be as per relevant clause of GCC /SCC /Other Commercial Terms & Conditions.

i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities. This clause will apply in case during site commissioning additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account.

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

k) As built drawings shall be submitted as and when required during the project execution.

l) That the bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

PRE-BID CLARIFICATION SCHEDULE

S. No.	Section/Clause /Page No.	Statement of the referred clause	Clarification Required

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL

UTILITY REQUIREMENT

S. No.	Utility	Requirement	Tapping point location
1.	Instrument air	For unit#8, 1. One no. 15 NB IA line (Flow – 0.2 m3 /min per unit, at Pressure - 5-7 bar)at an elevation EL +4.71m (below mill maintenance platform) for each mill. (total 8 nos. mills) 2. One no. 15 NB IA line (Flow – 0.2 m3 /min per unit, at Pressure - 5-7 bar)at an elevation EL +15m (at mill-A column) for MRS silo For unit#9, 1. One no. 15 NB IA line (Flow – 0.2 m3 /min per unit, at Pressure - 5-7 bar) at an elevation EL +4.71m (below mill maintenance platform) for each mill. (total 8 nos. mills) 2. One no. 15 NB IA line (Flow – 0.2 m3 /min per unit, at Pressure - 5-7 bar) at an elevation EL +15m (at mill column nearer to MRS silo)	
2.	Service water	Pressure - 2.5-3 bar Flow - 6-8 m^3/ hour per unit	3-6 m at first column of mill bay

The bidder has to submit signed and stamped copy of this sheet along with bid.

	ANNEXURE-IV: **Guaranteed Power Consumption** **for Mill Reject Handling System (Mechancial conveyor type)**			**Doc No:**	**PE-PF-512-160-A101**	
				Rev. No:	**0**	
				Date of issue	24-11-2025	
NAME OF PROJECT:		**2 X 800 MW SINGRAULI STAGE-III, STPP**				
NAME OF PACKAGE:		**Mill Reject Handling System (Mechancial conveyor type)**				
TECHNICAL SPECIFICATION:		**PE-PF-512-160-A101**				
S.No.	**Description of Equipments**	**Working**	**Standby**	**Power Consumption (kW) (at Motor Input Terminal)**	**Duty Factor (5)**	**Total Power consumption (KW)**
1	**2**	**3**	**4**	**5**	**6**	**7= 3 x 5 x 6**
1	Total power consumption per unit	1	0	To be filled by bidder	**1**	To be filled by bidder
					TOTAL kW=	
Note :						
1	Power consumption (KW) of motors shall be measured at motor input terminals when the system operating at the rated capacity. Power consumed by horizontal conveyor and bucket elevator motors along with vent fan motor and vibrating feeder (if applicable) shall be taken into consideration for the purpose.					
2	The base auxilliary power is **35 kW per unit.** Quoted power by bidder at column no. (7) shall be evaluated with respect to base auxilliary power. *Declared Guaranteed Power Consumption in this Format duly signed and stamped shall be submitted along with technical bid.*					
3	The price quoted by the bidder shall be loaded @ US $ 4350 (US Dollar Four Thousand Three Hundred Fifty only) for every additional kW increase in consumption from base figure indicated in Note no. 2.					
4	In case the successful bidder fails to establish /prove the guaranteed values of power consumptions (base figure of auxiliary power consumption or the GPC quoted by bidder, whichever is higher) on the actual performance testing at the manufacturing works/site, penalty **@US $ 4350** (US Dollar Four Thousand Three Hundred Fifty only) for every additional kW increase in consumption figure shall be levied.					
5	Conversion rate of USD to INR shall be Bill selling exchange rate of State Bank of India prevailing on 05.03.2024					
Particulars of bidder / authorised representative						
Name	**Designation**	**Signature**	**Date**	**Date**	**Company Seal**	