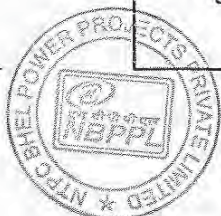


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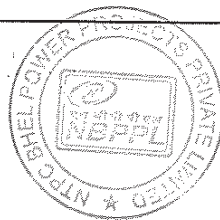
CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC
11.05.00	Alarm boxes shall be provided in each display to alert the operator about an alarm when he is viewing some other picture. No of alarm boxes shall be finalised during detailed engineering for each process area & each priority therein.	
11.06.00	The annunciator sequence shall conform to ISA sequence ISA-2A..	
12.00.00	SOFTWARE DOCUMENTATION AND SOFTWARE LISTINGS	
12.01.00	All technical manuals, reference manuals, user's guide etc., in English required for modification/editing/addition/deletion of features in the software of the PLC System shall be furnished. The Contractor shall furnish a comprehensive list of all system/application software documentation after system finalisation for Employer's review and approval.	
12.02.00	All The software listings including Source code for application software, All special - to-project data files etc. shall be submitted by the Contractor.	
13.00.00	SOFTWARE LICENCES The Contractor shall provide software license for all software being used in Contractor's System. The software licenses shall be provided for the project (e.g. organisation or site license) and shall not be hardware/machine-specific. That is, if any hardware/machine is upgraded or changed, the same license shall hold good and it shall not be necessary for Employer to seek a new license/renew license due to upgradation/change of hardware/machine in Contractor's System at site. All licenses shall be valid for the continuous service life of the plant. As a customer support, the Contractor shall periodically inform the designated officer of the Employer about the software upgrades/new releases that would be taking place after the system is commissioned so that if required, same can be procured & implemented at site.	
14.00.00	For the Specification of OWS, GIU, printer and other Human Machine interface items please refer Part-B, Sub-Section-C02, DDCMIS of Technical Specification.	
15.00.00	Following C&I drawings referred in this sub-section is enclosed herewith. Drawing No.0000-151-POI-A-013 Rev-A., Configuration diagram for PLC based Offsite Control systems.	
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B
SUB-SECTION-C-12(A) PLC BASED CONTROL SYSTEM		PAGE 16 OF 16



CLAUSE NO.	TECHNICAL REQUIREMENTS																							
1.01.09	14. Contractor shall include for each LVS, supply of lamps for three (3) years after the completion of the warranty period, based on the average life of the lamps, as per the Contractor's published literature. It during the warranty period, it is found that lamps are consumed at faster rate than the published average life of the lamps, the Contractor shall augment the quantity of the three years supply of lamps accordingly. (As a minimum for each LVS Contractor shall supply 150% lamps with respect to the no. of lamps used in each LVS).																							
	Graphical Interface Unit Minimum specifications of Graphical Interface unit shall be as follows:- <table><tr><th>Sl no.</th><th>Features</th><th>Description</th></tr><tr><td>1.</td><td>Power supply</td><td>230 V AC</td></tr><tr><td>2.</td><td>Display Size & Type</td><td>10-11 inch & Color, TFT screens</td></tr><tr><td>3.</td><td>Humidity</td><td>5-95%</td></tr><tr><td>4.</td><td>Protection class</td><td>IP-65 for extremely dust prone area, otherwise IP-55. Enclosure shall be provided to prevent ingress of dust.</td></tr><tr><td>5.</td><td>Keys</td><td>Function keys and numeric keys</td></tr><tr><td>6.</td><td>Interfacing requirements</td><td>Interface with respective control systems</td></tr><tr><td>7.</td><td>Functional requirements</td><td>Ability to operate drives locally using function keys. Ability to do programming. Graphics display including alarms and operator guidance messages.</td></tr></table>	Sl no.	Features	Description	1.	Power supply	230 V AC	2.	Display Size & Type	10-11 inch & Color, TFT screens	3.	Humidity	5-95%	4.	Protection class	IP-65 for extremely dust prone area, otherwise IP-55. Enclosure shall be provided to prevent ingress of dust.	5.	Keys	Function keys and numeric keys	6.	Interfacing requirements	Interface with respective control systems	7.	Functional requirements
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1.01.10	Printers <table><tr><th>Sr. No</th><th>Features</th><th>Colour Laser Printer</th><th>Colour Laser Printer</th><th>Line Impact Dot Matrix Printer</th></tr><tr><td>1</td><td>Paper Size</td><td>A3</td><td>A4</td><td>132 column continuous fan fold type</td></tr><tr><td>2</td><td>Printing Speed</td><td>6 ppm (Color)</td><td>4 ppm (color)</td><td>1000 LPM</td></tr></table>	Sr. No	Features	Colour Laser Printer	Colour Laser Printer	Line Impact Dot Matrix Printer	1	Paper Size	A3	A4	132 column continuous fan fold type	2	Printing Speed	6 ppm (Color)	4 ppm (color)	1000 LPM								
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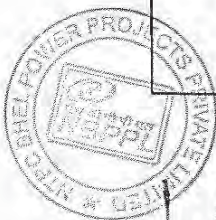
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.01.11	(min.)- in normal mode for A4 size paper	24 ppm (B&W)	16 ppm (B&W)	
	3 Type	Heavy duty, at least 50000 pages/month	Heavy duty, at least 30000 pages/month	Heavy duty, at least 50000 pages/month
	4 Resolution (black) (min.)	600 dpi	600 dpi	-
	5 First page out time (with full graphic display)	=<1 min for color, <45 sec for BW	=<1 min for color, <45 sec for BW	
	6 Paper input capacity (min.)	500 sheets	500 sheets	Continuous paper feed
	7 Additional features	Automatic Duplex Printing		With printer Stand & sound proof enclosure (<60 dB)
	8 Paper sheets (1 ream = 500 sheets) with each printer	20 reams (A3) 20 reams (A4)	20 reams (A4)	20 reams (132 column fan-fold)
	9 Additional Cartridge/toner/ ribbon of each type as used in printer with each printer	1	1	100
	Specification of PC The minimum requirement for PC shall be as below: CPU Latest generation CPU			
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	ANNEXURE - C-02G HMI HARDWARE	PAGE 7 OF 12



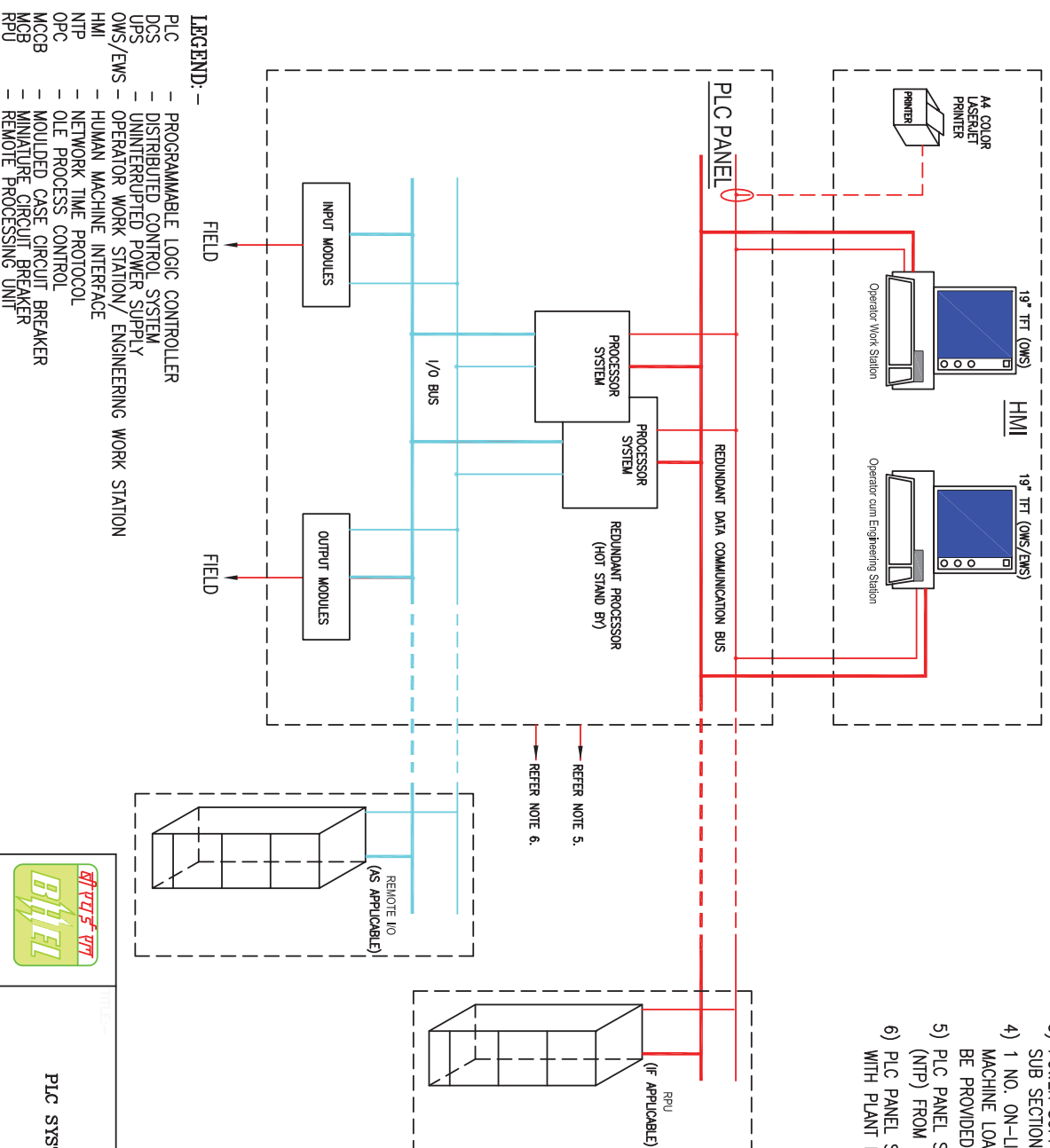
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CLAUSE NO.	TECHNICAL REQUIREMENTS
1.01.12	Main memory 1GB expandable to 4 GB Drives DVD read/write drive Hard disk 80 GB Monitor 19" Full Flat TFT, refresh rate min 75 Hz Graphic Memory 16 MB Communication port 2 serial plus, one parallel, 1 USB port, Dual 100 Mbps Ethernet Expansion slots 3 Other Features 101 Keys Keyboard and Optical Mouse UPS 1 no. on-line Intelligent UPS with 30 mins. Battery backup on machine load (for PC & its printer) and remote monitoring are to be provided for each PC. Accessories Industrial grade furniture (computer table & chair) for PC & its printer, as approved during detailed engineering. Software - a General MS Windows latest, MS-Office, Microsoft Visual Studio, Adobe Acrobat, anti-virus McAfee or equivalent, etc. - b Application software - to suit project specific requirement
	The list of PC stations, their location in plant and purpose shall be as per Appendix-I to Part-A (Annexure-I to Contract quantities for DDCMIS). All the PC stations shall be connected to Unit LAN/Station LAN.
	It shall be possible to access any information of HMIPIS data base along with operator functionality (with General purpose rights as defined in table titled SECURITY LEVELS IN HMIPIS) like mimics, logs, trends etc. from the PC station given below. To achieve this, recreation of graphics, logs & other application need not be required. Also any modification etc done in any mimic etc. need not be separately done for these stations. Therefore suitable provisions (including adequate no of OWS license), if required shall be provided. However, normally the access will be for the purpose listed in Appendix-II to Part-A.
	Specification for Lap-Top (Note-Book) PC
	Core 2 duo latest version or better network-ready lap-top PC with 15.4 inch wide
	SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE
	TECHNICAL SPECIFICATION SECTION-VI PART-B
	ANNEXURE - C-02G HMI HARDWARE
	PAGE 8 OF 12



NOTES:

- 1) TABLE TOP OWS/EWS SHALL BE 19" OR AVAILABLE INDUSTRY STANDARD.
- 2) PLC SYSTEM SHALL HAVE REDUNDANCY IN PROCESSOR AND COMMUNICATION SYSTEM.
- 3) POWER SUPPLY FOR PLC PANEL SHALL BE 24V DC AS PER CI. 9.0.00, SUB SECTION-C-12(A), SECTION-VI, PART-B OF CONTRACT SPECIFICATION.
- 4) 1 NO. ON-LINE INTELLIGENT UPS WITH 30 MINS. BATTERY BACKUP ON MACHINE LOAD(FOR PC & ITS PRINTER) AND REMOTE MONITORING ARE TO BE PROVIDED FOR EACH OWS/EWS.
- 5) PLC PANEL SHALL HAVE PROVISION TO ACCEPT TIME SYNC. SIGNAL (NTP) FROM MASTER CLOCK SYSTEM (PLANT AREA).
- 6) PLC PANEL SHALL HAVE PROVISION FOR DATA EXCHANGE (OPC/MODBUS) WITH PLANT DCS.

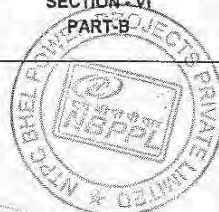
**PLC SYSTEM CONFIGURATION**

DRG. NO.	PE-DM-401-145-1900		
REV. No.	02	DATE	14.07.14
SHEET	05	OF	05

CHAPTER

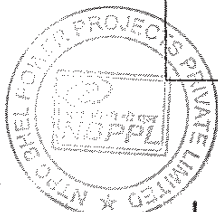
MEASURING INSTRUMENTS

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC						
1.00.00	MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)							
1.01.00	Measuring instruments/equipment and subsystems offered by the Bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Refer Sub-section Basic Design Criteria. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards and shall be subject to Employer's approval.							
1.02.00	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.							
1.03.00	All transmitters, sensors, and switches for parameters like pressure, temperature, level, flow etc. as required for the safe and efficient operation and maintenance as well as for operator and management information (including all computation) of equipment in the system under the scope of specification shall be provided as indicated in the APPENDIX I TO PART A OF TECHNICAL SPECIFICATIONS tender drawings. Estimated system parameters & instrument ranges etc. are indicated in the I & C device list. The exact value shall be provided by Employer during detailed engineering. The Contractor shall furnish all Instrumentation / Control equipment & accessories under this specification as per technical specification, ranges, makes & model as approved by the Employer during detailed engineering.							
1.04.00	The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. 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. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg./sq.cm.							
1.05.00	The quantity of secondary instruments etc. to be provided by Contractor is listed in Appendix I to Part A of Technical Specifications.							
2.00.00	SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, D.P., FLOW AND LEVEL ELECTRONIC TRANSMITTERS <table border="1"> <thead> <tr> <th>Sl.No.</th><th>Features</th><th>Essential/Minimum Requirements</th></tr> </thead> <tbody> <tr> <td>1.</td><td>Type of Transmitter</td><td>Microprocessor based 2 wire type, Hart protocol compatible.</td></tr> </tbody> </table>	Sl.No.	Features	Essential/Minimum Requirements	1.	Type of Transmitter	Microprocessor based 2 wire type, Hart protocol compatible.	
Sl.No.	Features	Essential/Minimum Requirements						
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SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 1 OF 45						



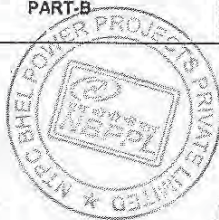
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CLAUSE NO.	TECHNICAL REQUIREMENTS एनटीपीसी NTPC		
	2. Accuracy 3. Output signal range 4. Turn down ratio 5. Stability 6. Zero and span drift 7. Load impedance 8. Housing 9. Over Pressure 10. Connection (Electrical) 11. Process connection 12. Span and Zero 13. Accessories	$\pm 0.1\%$ of calibrated span (minimum) (upto turn down ratio of 10:1) 4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol) 10:1 for vacuum/very low pressure applications. 5:1 for very high pressure application. 30:1 for other applications. $\pm 0.1\%$ of calibrated span for six months for Ranges up to and including 70 Kg/cm ² . $\pm 0.25\%$ of calibrated span for six months for Ranges more than 70 Kg/cm ² (g). $\pm 0.015\%$ per deg.C at max span. $\pm 0.11\%$ per deg.C at min. Span. 500 ohm (min.) Weather proof as per IP-55 with durable corrosion resistant coating. 150% of max. Operating pressure Plug and socket type 1/2 inch NPT (F) Continuous, tamper proof, Remote as well as adjustability manual from instrument with zero suppression and elevation facility. -Diaphragm seal, pulsation dampeners, syphon etc. as required by service and operating condition. -2 valve manifold for absolute & Gauge pressure transmitters, 3-valve manifold for vacuum pressure transmitters & where DP transmitters are being used for pressure measurement and 5 valve manifold for DP/Level/Flow applicable. -For hazardous area, explosions proof enclosure as described in NEC article 500.	
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 2 OF 45



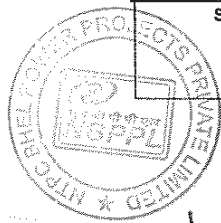
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CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC				
2.01.00	14.	Diagnostics	Self Indicating feature				
	15.	Power supply	24V DC $\pm$ 10%.				
	16.	Adjustment/calibration/maintenance	From hand held calibrator/centralized PC based system (as applicable).				
	Notes						
	For air/flue gas applications, DP type transmitters shall be provided for pressure measurement.						
	LVDT type is not acceptable.						
	Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.						
	GUIDED WAVE RADAR TYPE LEVEL TRANSMITTER						
	Guided wave radar type level transmitters shall be provided for level measurements of the vessel under vacuum or low pressure applications.						
	Type	Guided wave Radar					
Principle	TDR (Time domain reflectometry)						
Probe Type& Material	Coaxial, SS316/316L. If required, probe shall be suitable for overflow prevention.						
Signal o/p	4-20mA with HART signal suitable for overflow prevention.						
Display	Integral						
Power supply	24 VDC						
Accuracy	5mm						
Electromagnetic compatibility	Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2						
Mounting	External cage mounting						
The transmitters shall be provided with IP-55 protection class with durable corrosion resistant coating.							
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B		SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY)		PAGE 3 OF 45	



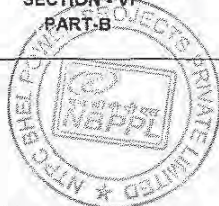
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CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC																																																													
	The transmitters shall be able to provide digital signals super imposed on 4-20 mA signal as per HART protocol. Ultrasonic Type level Transmitter <table><tr><th>Sl.No.</th><th>Features</th><th>Essential/Minimum requirement</th></tr><tr><td>1.</td><td>Type of Transmitter</td><td>Non contact Microprocessor based 2 wire type, HART protocol compatible Ultrasonic transmitter</td></tr><tr><td>2.</td><td>Output signal</td><td>Galvanically isolated 4-20mA DC (Analog) along with superimposed digital signal (based on HART protocol)</td></tr><tr><td>3.</td><td>Sensor Accuracy</td><td>+/- 0.5% of calibrated span.</td></tr><tr><td>4.</td><td>Sensor Repeatability</td><td>3mm or better</td></tr><tr><td>5.</td><td>Power supply</td><td>24 V DC +/-10%</td></tr><tr><td>6.</td><td>Temperature compensation</td><td>To be provided within transducer</td></tr><tr><td>7.</td><td>Configuration</td><td>Sensor unit and Electronic units are to be separate. It shall be possible to mount the Electronic unit at a remote accessible location from the transducer. All cables and weather proof fittings to interconnect transducer to electronic unit shall be provided by Bidder.</td></tr><tr><td>8.</td><td>Housing</td><td>Weather proof as per IP-55 with durable corrosion resistant coating.</td></tr><tr><td>9.</td><td>Calibration</td><td>Through HART Communicator.</td></tr><tr><td>10.</td><td>Zero and Span adjustment</td><td>Continuous, tamper proof, remote as well as manual adjustability from instrument. It shall be possible to calibrate the instrument without any level in the tank/sump etc.</td></tr><tr><td>11.</td><td>Sensor Material</td><td>Corrosion resistant material to suit individual application requirement.</td></tr><tr><td>12.</td><td>False signal tolerance</td><td>Transmitter shall be capable of ignoring false echoes from internal tank/sumps obstructions such as pipes, heating coils or agitator blades. Also transmitter shall have adjustable damping circuitry</td></tr><tr><td>13.</td><td>Range</td><td>Range of transmitter shall be capable of covering the complete level span of tank taking care of blocking distance, frequency attenuation due to surface, obstructions, vapors etc.</td></tr><tr><td>14.</td><td>Display</td><td>Minimum 4 character LCD display with integral keypad, access protected by user code</td></tr><tr><td>15.</td><td>Diagnostics</td><td>Loss of echo alarm etc.</td></tr><tr><td>16.</td><td>Load Impedance</td><td>500 ohms minimum</td></tr><tr><td>17.</td><td>Electrical Connection</td><td>Plug and socket</td></tr><tr><td>18.</td><td>Accessories</td><td>All weather canopy for protection from direct sunlight and direct rain. All mounting hardware and accessories required for erection and commissioning mounting fittings material shall be Ss 316. For hazardous areas, explosion proof enclosure as described in NEC article 500</td></tr><tr><td>Note:</td><td colspan="2">Contractor can also provide Radar type transmitter in place of ultrasonic transmitters subject to approval by Employer during detailed Engineer.</td></tr></table>				Sl.No.	Features	Essential/Minimum requirement	1.	Type of Transmitter	Non contact Microprocessor based 2 wire type, HART protocol compatible Ultrasonic transmitter	2.	Output signal	Galvanically isolated 4-20mA DC (Analog) along with superimposed digital signal (based on HART protocol)	3.	Sensor Accuracy	+/- 0.5% of calibrated span.	4.	Sensor Repeatability	3mm or better	5.	Power supply	24 V DC +/-10%	6.	Temperature compensation	To be provided within transducer	7.	Configuration	Sensor unit and Electronic units are to be separate. It shall be possible to mount the Electronic unit at a remote accessible location from the transducer. 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SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 4 OF 45																																																												



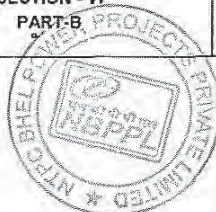
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TECHNICAL REQUIREMENTS		एनटीपीसी NTPC	
HART Hand Held calibrator			
Hand held calibrator shall be provided for adjustment/calibration/maintenance of the HART compatible transmitters. The hand held calibrator shall be suitable for all types of transmitters supplied in the package. If one type of hand held type calibrator is not suitable for communicating with all types of transmitters then separate hand held calibrator will be provided.			
TEMPERATURE ELEMENTS AND ACCESSORIES			
Thermocouple			
Sr. No.	Features	Essential/Minimum Requirements	
1	Type of Thermocouple.	: 16 AWG wire of Chromel-Alumel (Type K) or 24 AWG wire Pt-Rhodium Pt (Type R) depending on operating temperature Range (ungrounded type).	
2	No. of element	: Duplex	
3	Housing/Head	: IP-65/Diecast Aluminium. Head of TE to be provided with sufficient space and arrangement to mount head mounted temperature transmitter (as applicable). Plug in connectors are to be provided for external signal cable connection.	
4	Sheathing of Thermocouple	: Swaged type magnesium oxide insulation.	
5	Calibration and accuracy	: As per IEC-751/ANSI-C-96.1(special class)for T/C.	
6	Characteristic	: Linear with respect to temp, within $\pm 1/2$ percent of top range value.	
7	Accessories	: Thermo well (as specified below) and shall be spring loaded for positive contacts with the well.	
8	Standard	: ANSI C 96.1 for Thermocouple and ASME PTC-19.3 for Thermo-well.	
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	
		SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	
		PAGE 5 OF 45	

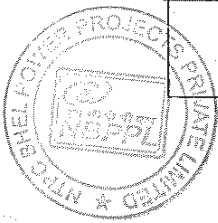
CLAUSE NO.	TECHNICAL REQUIREMENTS			
3.02.00	Resistance Temperature Detector (RTD)			
	Sr. No.	Features	Essential/Minimum Requirements	
	1	Type of RTD.	: Four wire, Pt-100 (100 Ohms resistance at zero degree Centigrade).	
	2	No. of element	: Duplex	
	3	Housing/Head	: IP-55/Diecast Aluminium. Head of TE to be provided with sufficient magnesium to mount head mounted temperature transmitter (as applicable). Plug in connectors are to be provided for external signal cable connection.	
	4	Sheathing of RTD	: Metal sheathed, ceramic packed	
	5	Calibration and accuracy	: As per DIN-43760 Class-A for RTD	
	6	Characteristic	: Linear with respect to temp, within $\pm 1/2$ percent of top range value.	
	7	Accessories	: Thermo well (as specified below) and shall be spring loaded for positive contacts with the well.	
	8	Standard	: DIN-43760 for RTD and ASME PTC-19.3 for Thermo-well.	
3.03.00	Metal Temperature Thermocouples			
	Measuring Medium	Metal Temperature		
	Material of Thermocouple.	Chromel Alumel Type K		
	Type of Thermocouple	Duplex with separate hot junctions, ungrounded		
	Insulation	Mineral Insulation Magnesium Oxide.		
	Thermocouple wire gauge	16 AWG		
	Protective sheath	SS 321		
	Protective sheath dia	8 mm O.D		
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 6 OF 45

CLAUSET NO.	TECHNICAL REQUIREMENTS		00475	एन टी पी सी NTPC
3.04.00	Characteristics of Thermocouple	Special limits of error as in ANSI thermocouple MC 96.01.1975		
	Mounting accessories	1/2" BSP SS sliding end connector, weld pad, clamps of heat resistant steel SS310.		
	Cold end sealing	SS pot weal with colour coded PTFE headed sleeve Insulated flexible tails. Sealing compound- Epoxy resin.		
	Minimum bending radius	30 mm		
	Length of T/C	30 Mtr. (minimum)		
TEMPERATURE TRANSMITTER				
Following types of 2-wire temperature transmitter (directly powered from 4-20mA input cards of DDCMIS) shall be provided. The temperature transmitter shall be fully compatible with thermocouples and RTDs being provided by the contractor as well as Employer. Temperature compensation of the thermocouples shall be performed in the temperature transmitter itself.				
a. Single Input Head mounted Temperature Transmitter				
These shall be suitable for mounting in the head of temperature element itself. The protection class of head of thermo well along with its plug-in connector shall be min. IP65.				
b. Single Input DIN-rail mounted Temperature Transmitter				
These shall be suitable for mounting on DIN-rails in JB's. The specifications of the JB's shall be same as indicated in Subsection INST CABLE with additional DIN-rails and IP 65 Protection class . This temperature transmitter shall be the ones which are especially designed for DIN-rail mounting with IP 20 protection class. These shall have terminals for input/output provided on front side when mounted on DIN-rail. Head mounted temperature transmitter with clamps to make it suitable for DIN-rail mounting shall not be acceptable under this category.				
c. Dual-input Temperature Transmitter With Indicator:				
These shall be suitable for mounting on pipes/ support. Indicator shall be provided with these transmitters. These transmitters shall have bump less change over facility to second sensor in case first sensor fails .This change-over is to be alarmed. Protection class shall be IP65 minimum.				
<i>The exact applications for which this type of transmitter is to be provided shall be finalized during detailed engineering. However, the quantity shall be as per Appendix-I to Part-A.</i>				
SINGRAULI STPP STAGE-III (1X600 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B		SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
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CLAUSE NO.	TECHNICAL REQUIREMENTS एनटीपीसी NTPC
	d. Common requirements for each of the above type of temperature transmitters. Output : 2-wire (power supply from input card of Control System) with 4-20mA output with superimposed HART protocol signal. Input : Same transmitter shall be capable to handle Pt-100 RTD , Thermocouples –K&R types (input type to be selectable at site through HART terminal) Isolation : min. 500 V AC EMC compatibility : as per EN 61326 Operating ambient temperature : 0 to 85 deg C (without indicator) 0 to 70 deg C (with indicator) Power supply : compatible with input module of Control System Accessories : Mounting arrangements including clamps etc. Composite Accuracy (a) For head mounted and DIN-rail mounted types: (Refer note 2) RTD = <0.4% of 0-250 deg C span T/C-K type = <0.4% of 0-600 deg C span T/C-R type = <0.4% of 0-1000 deg C span CJC accuracy (for thermocouples) shall be =< 1 deg C (b) For dual-input type: RTD = <0.25% of 0-250 deg C span T/C-K type = <0.2% of 0-600 deg C span CJC accuracy (for thermocouples) shall be =< 1 deg C e. Field bus compatible temperature transmitters <i>Temperature transmitters of this category shall be field mounting type & shall be capable of withstanding operating ambient temperature upto 85 deg C. These modules shall be connected to DDCMIS through field bus such as Profibus, Foundation Field bus etc directly from the transmitter. Maximum Number of inputs per such temperature transmitter shall be eight. These shall be mounted in cabinets in non-AC areas.</i>
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 8 OF 45



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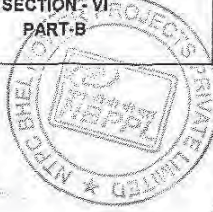
CLAUSE NO.	TECHNICAL REQUIREMENTS
	As an alternate, these signals from temperature transmitters can be connected to DDCMIS through standard remote I/O modules of the DCS, in which case, the temperature transmitter signals will be acquired through 4-20mA input modules in the remote I/O cabinet for connecting to DDCMIS through remote I/O bus. The no. of such modular systems/ JB's shall be provided as per Appendix-1 to Part-A. Notes (Common for a) to e) above):- 1. In case of failure (open or burn-out) of RTD/thermocouple, temp. Transmitter shall provide low temperature output. 2. Composite Accuracy is to be calculated as summation of all applicable accuracies of temp transmitter, for converting sensor input to output in 4-20 mA (e.g., basic accuracy, digital accuracy, D/A accuracy, etc.) and 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 above for various types of Temperature Elements specified. All such accuracy/ temp effect figures in catalogue shall be first converted to deg C, and then percentage of this converted accuracy in specified span shall be calculated to compare with the specified composite accuracy figures. 3.05.00 Thermo well (for all process temp. elements) (a) Shall be one piece solid bored type of 316 SS of step-less tapered design. (As per ASME PTC 19.3 1974) (b) For Mill classifier outlet long life solid sintered tungsten carbide material of high abrasion resistance shall be provided. (c) For Air & Flue gas 316 SS protecting tube with welded cap. (However contractor shall provide better material for Flue gas service if required based on the specified boiler design parameters). (d) For furnace zone, impervious ceramic protecting tube of suitable material along with Incoloy supporting tubes and adjustable flanges. 3.06.00 Cold Junction Compensation (CJC) Boxes a) Ref. temp. $60^{\circ}\text{C} \pm 1.3^{\circ}\text{C}$ for type K Thermocouple $60^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for type R Thermocouple b) Effect of ambient temp. variation $\pm 0.1\%$ per 10°C c) Material 4 mm thick fiberglass reinforced polyester with Polyetherene paint & glazed finish.
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 9 OF 45





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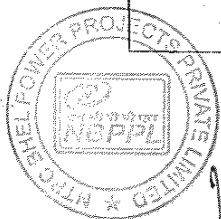
CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	2. Size 48 mm (w) x 24 mm (h)/50 mm x 25 mm 3. Display Accuracy 2.5% of final value Temp. coefficient 0.15% /°C of measured value 4. Mounting Flush panel 5. Type 3½ digit seven segment LED display. Float decimal.			
4.04.00	Synchronising Relays Synchronising check relay with necessary ancillary equipment shall be provided which shall permit breakers to close after checking the requirements of synchronising of incoming and running supply. The phase angle setting shall not exceed 100 and this angle shall be adjustable and shall take the account the circuit breaker closing period. This relay shall have a response time of less than 200 milliseconds when the two system conditions are met within preset limits and with the timer disconnected. The relay shall have a frequency difference setting not exceeding 0.45% at rated value and at the minimum time setting. The relay shall have a continuously adjustable time setting range of 0.5-3 secs. Additionally, a guard relay shall be provided to prevent the closing attempt by means of synchronising check relay when control switch is kept in closed position long before the two systems are in synchronism. The Control Voltage shall be 220V DC and PT input Voltage shall be 110 V AC.			
4.05.00	Auxiliary PTs for Measurement & Synchronisation Applicable Standard IS : 3156 Rated Voltage 110V Insulation Level 660V grade Frequency 50 Hz Mounting Panel Mounting Test Voltage (Power frequency) 2.5 KV for 1 min. Operating temperature (-) 40⁰C to(+) 85⁰C Primary Voltage 63.5 V to 115V Secondary Voltage 63.5 V to 115V Class of accuracy 1			
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 11 OF 45	



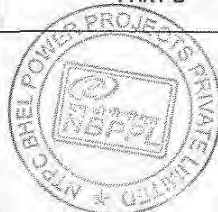
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CLAUSE NO.	TECHNICAL REQUIREMENTS
4.06.00	Burden 25 kA Class of Insulation E or better Transducers for Electrical Meters Inputs (i) 110V (PT Secondary) 50 Hz (for AC) / 220V DC (for DC) for Voltage transducers. (ii) 110V (PT Secondary) 50 Hz for Frequency Output 2 Nos. isolated 4-20 mA Accuracy $\pm 0.5\%$ of full scale or better.
5.00.00	IMPACT HEAD TYPE FLOW ELEMENT Impact head type flow elements shall be used for measurement of CW flow. The impact head type element shall be tubular insert type with four impact ports facing upstream direction, located precisely for determination of average flow velocity and shall be of 316 SS. Accuracy shall be 1.0% of actual value or better. Repeatability shall be + 0.1% of actual value or better. The elements shall be supplied complete with mounting hardware; end support plugs and CS valve manifold (1/2" NPT connection) for instrument connections. All pertinent data including Employer's instrument tag no. for the flow element shall be punched on a stainless steel plate and affixed to the element. Flushing arrangement shall be provided. For quantity and line size etc., refer Appendix-I to Part-A.
6.00.00	FLUE GAS ANALYSER INSTRUMENTS : Common Requirements 1 Output signals Analog 4-20 mA DC galvanically isolated. If analyser provides superimposed HART signal on 4-20 mA DC output, It shall also be connected to PC based station. Binary 2 NO + 2 NC for high alarm 2 Zero & span To be provided with range selection facility. Adjustment
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 12 OF 45

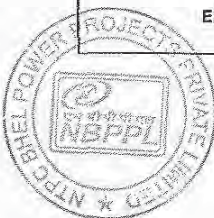


CLAUSE NO.	MEASURING INSTRUMENTS (C-03)	एनटीपीसी NTPC
	power supply shall not affect any monitoring function in the system. Also any power supply failure /earth fault in any of the monitors will be isolated without affecting other monitors/ common power supply. However, if any power supply modules internal to the monitors are envisaged, the failure of one such module should not affect more than one monitor. The functional requirement for vibration monitoring system shall include but not be limited to the following: - Vibration monitor front face status indications shall be available for indications of healthy conditions of pick up circuit, monitor circuit and power supply. On sensor fault/wire break in the sensor circuit, the system shall have the feature of identifying the same through suitable means like the big not forced to a value less than 4 mA. In case, such a feature is not available then suitable contact shall be provided from the monitor for sensor fault. - The facility shall be available from front of mounting rack for functional checking of monitors. - All vibration monitoring equipment shall be functionally tested for circuit continuity and output response. All the components & interconnection cables shall be tested to ensure compliance with the specification requirements & all other applicable codes & standards. In case it is the proven standard practice of a Contractor to provide vibration monitoring PC with TFT LCD monitor, instead of dedicated monitors with the signal conditioning equipment in control equipment room, the same shall also be acceptable. However, all relevant functional requirements detailed above shall be met and the system shall be subject to Employer's approval.	
8.00.00	E-P CONVERTER E-P converters and associated accessories shall be furnished in accordance with the specifications given below : Air supply: 1.5 kg/cm sq., Input signal: 4-20mA dc (as required by the design of control system), Output signal: 0.2 to 1.0 kg/cm sq., Linearity: 0.5% of span or better, Hysteresis: 0.5% of span or better, Ambient Temperature Effect: less than 0.02% of span per deg C between -20 to +60 deg C. Mounting: Close to actuator (but not on the actuator), output capacity-to suit the actuator, protection class IP 55. On loss of control signal, the last set point pressure shall be maintained so that the associated control valve remains in stay put condition without any additional solenoid valve. The allowable drift rate will be $\pm 2\%$ of set point/ hour maximum.	
9.00.00	COAL BUNKER LEVEL MONITORING SYSTEM Complete Coal Bunker Level Monitoring System consisting of strain gauge sensors, electronic units, interconnecting cables etc. shall be provided. The number & location of the strain gauge sensors shall be selected by the Contractor to ensure	
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
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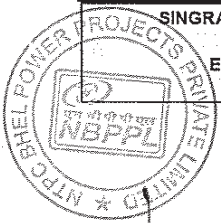


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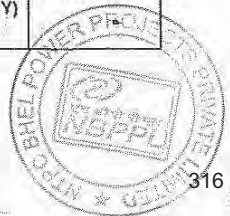
CLAUSE NO.	MEASURING INSTRUMENTS (C-03)			एनटीपीसी NTPC	
15.00.00	The transmitter shall provide suitable 4-20mA dc output signal for control and indication/recording. Converters if necessary shall be provided to generate the 4-20mA signal. A local indicator of fuel oil flow shall also be provided. The instrument shall be calibrated in Tons/hr. Suitable strainer shall be provided before the transmitter for the protection of oval wheel meters against foreign matter contained in the fuel oil. The exact model no. and type of material being used, etc., shall be subject to Employer's approval during detailed engineering without any price repercussion to Employer.				
	PROCESS ACTUATED SWITCHES				
	FEATURES		ESSENTIAL / MINIMUM REQUIREMENTS		
		Pressure/ Draft Switches/ DP Switches	Temperature switches	Level switches	
	Sensing Element	Piston actuated for high pressure and sensing, liquid diaphragm or filled bellow type with SS pr./ vacuum	Vapor pressure sensing, liquid filled bellow type with SS bulb and capillary (10 m minimum)	Capacitance types for oil and dirty medium, water, condensate application. Float type switches for applications as decided by Employer during detailed engineering. Capacitance/ Conductivity/ Ultrasonic type for acid and alkali application. Radio-frequency/ Ultrasonic type for ash hopper, ash slurry application.	
	Material	316 SS	Bulb 316 SS/ capillary 304 SS	316 SS	
	End connection	½ inch NPT (F)	½ inch NPT (F)	Manufacturer standard	
	Over range proof pressure	150% of max. design pr.	-	150% of max. design pressure	
	SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B		SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
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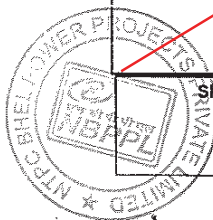
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CLAUSE NO.	MEASURING INSTRUMENTS (C-03) 
	Repeatability $\pm 0.5\%$ of full range No. of 2 No.+2NC. SPDT snap action dry contact contacts Rating of 60 V DC, 6 VA (or more if required by DDCMIS) contacts Elect. Plug in socket. Connection Set point/dead band adjustment Provided over full range. Enclosure Weather and dust proof as per IP-55 Accessories Siphon, Thermo well of All mounting accessories snubber, 316 SS and chemical packing glands seal, pulsation dampeners as required by process Mounting Suitable for enclosure/ rack mounting or direct mounting Power Supply 24 V DC, to be arranged by Contractor except for Ash Level Switches, where the same shall be as per Contractor's Standard practice. (wherever required) Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.
	
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 34 OF 45

CLAUSE NO.	MEASURING INSTRUMENTS (C-03)				एनटीपीसी NTPC
16.00.00	SPECIFICATIONS FOR PR. GAUGE, D.P. GAUGE, TEMP. GAUGE AND LEVEL GAUGE.				
	Sl. No	FEATURES	ESSENTIAL/MINIMUM REQUIREMENTS		
			Pr. Gauge/ DP Gauge/ Draught gauges	Temperature Gauge	Level Gauge
	1	Sensing Element and material	Bourdon for high pressure, Diaphragm/Bellow for low pr. Of 316 SS	Mercury in steel for below 450°C and inert gas actuated for above 450°C of SS bulb and capillary.	Tempered * toughened Borosilicate gauge glass steel armoured reflex or transparent type.
	2	Body material	Die-cast aluminium	Die-cast aluminium	Forged carbon steel/304 SS
	3	Dial size	150mm	150 mm	Tubular covering entire range
	4	End connection	1/2 inch NPT (M)	3/4" NPT (M)	Process connection as per ASME PTC and drain/vent 15 NB
	5	Accuracy	±1% of span	± 1% of span	± 2%
	6	Scale	Linear, 270° arc graduated in metric units	Linear, 270° arc graduated in °C	Linear vertical
	7	Range selection	Cover 125% of max. of scale	Cover 125% of max. of scale	Cover 125% of max. of scale
	8	Over range test	Test pr. for the assembly shall be 1.5 to the max. Design pr. at 38°C.		
	9	Housing	Weather and dust proof as per IP-55	Weather and dust proof as per IP-55	CS/304 SS leak proof
	10	Zero/span adjustment	Provided	Provided	--
	11	Identification	Engraved with service legend or laminated phenolic name plate		
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B		SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 35 OF 45



CLAUSE NO.	MEASURING INSTRUMENTS (C-03)	एनटीपीसी NTPC
	12 Accessories Blow out disc, SS Thermowell siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve 13 Material of 316 SS / 304 SS Bourdon/ movement Notes:- *Bicolour type level gauges will be provided for applications involving steam and water except for condensate and feed water services. 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. Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.	Gasket for all KEL-F shield *for transparent type vent and drain valves of Steel/SS as per CS/Alloy process Requirement.
17.00.00	0 Related Special Measuring Instrument	
17.01.00	ANALYSER INSTRUMENTS: Common Requirements 1 Output signals Analog 4-20 mA DC Binary 2 NO + 2 NC for high alarm 2. Zero & span Adjustment Available 3. Ambient temp. 50°C 4. Indication Digital 5. Enclosure Type/Material Weather & Dust proof (IP 55) Die cast Aluminium/SS 6. Type of Electronics Microprocessor based	
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
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TECHNICAL SPECIFICATION FOR RF TYPE LEVEL SWITCH

PROJECT TITLE

1 X 500 MW UNCHAHAR TPP

RF TYPE LEVEL SWITCH:

A. ELECTRONIC CONTROLLER

INPUT SUPPLY VOLTAGE: 24 VDC

RELAY OUT PUT: 2 NOS. RELAY CHANGE OVER POTENTIAL FREE CONTACT

CONTACT RATING: 5 AMPS at 240VAC & 0.25A, 220V DC

ENCLOSURE PROTECTION: IP-66

ENCLOSURE HOUSING: CAST ALUMINIUM

AMBIENT TEMPERATURE: 60 °C

B. SENSING PROBE

MATERIAL: STAINLESS STEEL - 316

MOUNTING: 40 NB BSP THREADED

APPLICATION TEMPERATURE: 350 °C (MAX.)

ENCLOSURE PROTECTION: IP-66

ENCLOSURE HOUSING: CAST ALUMINIUM

INSULATION: CERAMIC/PTFE

NO. OF CONTACTS: 2 NO. + 2NC, SPDT SNAP DRY CONTACT

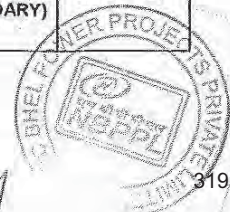
ELECT. CONNECTION: PLUG IN SOCKET

REPEATABILITY: $\pm 0.5\%$ OF FULL RANGE

ACCESSORIES: 40NB MOUNTING SOCKET

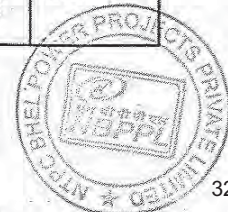
OVER RANGE PROOF PRESSURE: 150% OF MAX. DESIGN PRESSURE

CLAUSE NO.	MEASURING INSTRUMENTS (C-03)	एनटीपीसी NTPC																											
	4-20 mA DC Output signal is to be connected to control system in Contractor's Scope (Interconnection cables are to be provided by the Contractor). In case the system is not suitable for Direct online mounting, then all the required sampling system is to be provided by the contractor. All required accessories including cables, sensor holder, desiccant chambers, mounting fixtures etc. are to be supplied by the Contractor within his quoted lumpsum price.																												
19.00.00	SOLENOID VALVES Solenoid valves shall fulfil the following requirements : - 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 $\pm$ 10%. - Plug and socket electrical connection. - Insulation : Class 'H'																												
20.00.00	SG Related Special Instruments																												
21.00.00	WATER SYSTEM RELATED SPECIAL INSTRUMENTS(DM PLANT, CPU PLANT, PT PLANT, AWRS ETC)																												
21.01.00	ANALYSER INSTRUMENTS: Common Requirements <table border="0"> <tr> <td>1</td><td>Output signals Analog</td><td>4-20 mA DC</td></tr> <tr> <td>2</td><td>Zero & span Adjustment</td><td>To be provided</td></tr> <tr> <td>3</td><td>Ambient temp.</td><td>50°C</td></tr> <tr> <td>4</td><td>Indication</td><td>LCD</td></tr> <tr> <td>5</td><td>Enclosure Type/Material</td><td>Weather & Dust proof (IP 55) Die cast Aluminium/SS</td></tr> <tr> <td>6</td><td>Type of Electronics</td><td>Microprocessor based</td></tr> <tr> <td>7</td><td>Calibration</td><td>Auto & Manual (hand held HART calibrator)</td></tr> <tr> <td>8</td><td>Error Diagnostic</td><td>To be provided.</td></tr> <tr> <td>9</td><td>Power supply</td><td>240V AC 50, Hz single phase/ 24 V DC. Power supply is to be arranged by Contractor. In case the Analysers require UPS, then the same shall also be in the scope of Contractor.</td></tr> </table>	1	Output signals Analog	4-20 mA DC	2	Zero & span Adjustment	To be provided	3	Ambient temp.	50°C	4	Indication	LCD	5	Enclosure Type/Material	Weather & Dust proof (IP 55) Die cast Aluminium/SS	6	Type of Electronics	Microprocessor based	7	Calibration	Auto & Manual (hand held HART calibrator)	8	Error Diagnostic	To be provided.	9	Power supply	240V AC 50, Hz single phase/ 24 V DC. Power supply is to be arranged by Contractor. In case the Analysers require UPS, then the same shall also be in the scope of Contractor.	
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SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-03(A) MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 39 OF 45																											



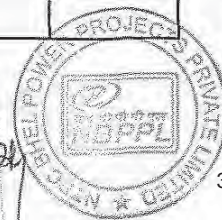
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CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
9.07.00	instrumentation cable shields at same potential. This shall be completed prior to system tests. All the cables etc. required for grounding of all equipments supplied under this package are to be supplied by the Bidder. The Contractor shall take full care while laying / installing cables as recommended by cable manufacturers regarding pulling tensions and cable bends. Cables damaged in any way during installation shall be replaced at the expense of the Contractor.		
10.00.00	FIELD MOUNTED LOCAL JUNCTION BOXES (i) No. of ways 12/24/36/48/64/72/96/128 with 20% spares terminals. (ii) Material and Thickness 4mm thick Fiberglass Reinforced Polyester (FRP). (iii) Type Screwed at all four corners for door. Door gasket shall be of synthetic rubber. (iv) Mounting clamps and accessories Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands required for erection shall be of SS, included in Bidders scope of supply. (v) Type of terminal blocks Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm². A M6 earthing stud shall be provided. (vi) Protection Class IP: 55 minimum for indoor & IP-65 minimum for outdoor applications. (vii) Grounding To be provided. (viii) Color To be decided during detailed engineering & subject to Employer's approval.		
11.00.00	CONDUITS		
11.01.00	Conduits shall be generally used for interconnecting cables from field instruments to Local JB's. All rigid conduits, couplings and elbows shall be hot dipped galvanised rigid mild steel in accordance with IS: 9537 Part-I (1980) and Part-II (1981). The conduit interior and exterior surfaces shall have continuous zinc coating with an overcoat of transparent enamel lacker or zinc chromate. Flexible conduit shall be heat resistant lead coated steel, water leak, fire and rust proof for the following areas:- (i) Mills, (ii) Drum, (iii) Main Steam, RH steam		
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-06 INSTRUMENTATION POWER SUPPLY CABLE
			PAGE 15 OF 17



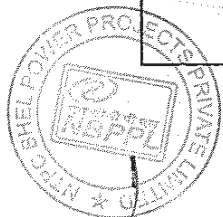
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CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
PROCESS CONNECTION AND PIPING			
1.00.00	PROCESS CONNECTION PIPING		
1.01.00	The Contractor shall provide, install and test all required material for completeness of Impulse Piping System and Air Piping System as per the requirements of this Sub-section, enclosed installation drawings and source connection drawings on as required basis for the connection of instruments and control equipment (provided by the Contractor) to the process / Employer's main equipment / systems. The installation & source connection of various items shall generally as per installation drawings (drawing no. 0000- 405 -POI-A-022 to 033, 0000- 405 -POI-A-034) and instrument source connection drawings (drawing nos. 0000-405 -POI-A -035), however, the Contractor shall furnish during detailed engineering. Installation drawings, GA and fabrication drawings of LIES / LIRs, other relevant drawings, material and tech data sheets of various items service wise for Employer's approval / information.		
1.01.01	All materials, furnished under this sub-section and the installation thereof shall conform to the latest editions of American National Standard Code for Pressure Piping, Power Piping, ANSI B 31.1, ANSI B16.11, ASME Boiler and Pressure Vessel Codes, IBR and other applicable ASME, ANSI and state standards.		
1.01.02	All materials supplied under this Sub-section shall be suitable for intended service, process; operating conditions and type of instruments used and shall fully conform to the requirements of this specification. The bidder is responsible for the performance of equipment furnished under this specification on system basis. The Bidder may offer suggestions for improvement based on his experience, during detailed engineering, which shall be subjected to the Employer's approval.		
1.01.03	Contractor to note that any reducers, nipple etc. for proper connection of the impulse piping system to Employer's root valves / isolation valves / stubs etc. shall be in Contractor's scope only, unless otherwise clearly excluded.		
1.02.00	IMPULSE PIPING, TUBING, FITTINGS, VALVES AND VALVE MANIFOLDS		
1.02.01	All impulse pipe shall be of seamless type conforming to ANSI B36.10 for schedule numbers, sizes and dimensions etc. The material of the impulse pipe shall be same as that of main process pipe. For various applications specification of impulse pipe materials and associated fittings and valves shall be as given in Table PCP. For protection against sea environment, all impulse pipes, fittings etc shall be provided with durable epoxy coating with poly urethane finish.		
1.02.02	Stainless steel tube shall be provided inside enclosures & racks from tee connection to valve manifold and then to instrument. For high pressure/temperature applications (piping class A,B,C & D of the table no. PCP) the material shall be ASTM A 213 TP 316H it and for other applications material shall be ASTM A 213 TP 316L. The wall thickness of the tube shall be in accordance with the ANSI B31.1 standard. The bending radius of the tube shall be greater than 6D.		
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-05 PROCESS CONNECTION AND PIPING	PAGE 1 OF 9



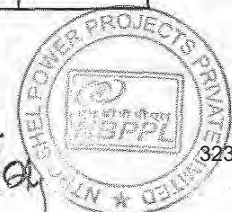
08542

CLAUSE NO.	TECHNICAL REQUIREMENTS	NTPC	
1.02.03	All fittings shall be forged steel and shall conform to ANSI B16.11. The material of forged tube fittings for shaped application (e.g. Tee, elbow etc.) shall be ASTM 182 Gr. 316 H for high pressure/ temperature applications (as defined above) and ASTM 182 Gr. 316L for other applications. The material for bar stock tube fitting (for straight application) shall be 316 SS. Metal thickness in the fittings shall be adequate to provide actual bursting strength equal to or greater than those of the impulse pipe or SS tube, with which they are to be used.		
1.02.04	The source shut-off (primary process root valve) and blow down valve shall be of 1/2 inch size globe valve type for all applications except for air and flue gas service wherein no source shut-off valves are to be provided. For various applications the valve body material, stem material and pressure class shall be as given in Table PCP. The end connections of valves shall be of socket welded type unless otherwise specified in the instrument installation diagrams. The disc and seat ring materials of carbon steel and alloy steel valves be ASTM A-105 and ASTM A-182, Gr. F22, hard faced with stellite (minimum hardness - 350 BHN.) The surface finish of 16 RMS or greater is required in the area of stem packing. The valve design shall be such that the seats can be reconditioned and stem and disc may be replaced without removing the valve body from the line.		
1.02.05	The valve manifolds shall be of 316 stainless steel with pressure rating suitable for intended application. 2-valve manifold and 3-valve manifold shall be used for pressure measurements using pressure transmitters/ pressure switches and differential pressure transmitter/ switches respectively. 5-valve manifold shall be used for remaining applications like DP, flow and level measurements.		
1.02.06	For Pr./D.P gauges in fluid application two-way globe valve on each impulse line to the instrument and in Air / Flue gas application two-way gate valve on each impulse line to the instrument shall be provided near the instrument. These shall be in addition to the three ways gauge cock provided alongwith the pr./D.P gauges.		
2.00.00	AIR SUPPLY PIPING		
2.01.01	All pneumatic piping, fittings, valves, air filter cum regulator, purge Rotameter and other accessories required for instrument air for the various pneumatic devices/ instruments shall be provided. This will include as a minimum air supply to pneumatically operated control valves, actuators, instruments, continuous and intermittent purging requirements etc.		
2.02.00	Instrument air supply shall be provided for continuous purging requirements of local instrument enclosures (LIEs) and any other instrument supplied by the Contractor which requires instrument air. Also for intermittent purging requirements of local instrument enclosures (LIEs) all pipings, fittings valves etc. shall be provided for service air supply to LIEs housing air and flue gas transmitters. Service air supply shall also be provided for any other instrument supplied by the contractor requiring service air. The contractor shall also provide and connect pneumatic tubing to E/P convertors and then to control valves supplied by the Employer but controlled by the C&I Contractor.		
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-05 PROCESS CONNECTION AND PIPING PAGE 2 OF 9



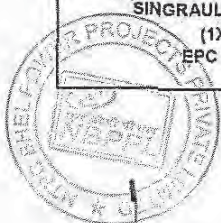
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CLAUSE NO.	TECHNICAL REQUIREMENTS	एन टी पी सी NTPC	
2.03.00	For individual supply line and control signal line to control valve, 1/4-inch size light drawn tempered copper tubing conforming to ASTM B75 shall be used. The thickness of cu-tubing shall not be less than 0.065 inch and shall be PVC coated. The fittings to be used with copper tubes shall be of cast brass, screwed type.		
2.04.00	All other air supply lines of 1/2 inch to 2 inch shall be of mild steel hot dipped galvanized inside and outside as per IS-1239, heavy duty with threaded ends. The threads shall be as per ASA B.2.1. Fittings material shall be of forged carbon steel A234 Gr. WPB galvanized inside and outside, screwed as per ASA B2.1. Dimensions of fittings shall be as per ASA B16.11 of rating 3000 lbs.		
2.05.00	The Employer shall provide instrument air at two points for the boiler area and one point for the turbine area at a convenient point for each unit. Similarly the Employer shall provide service air also at two points for the boiler area and one point for the turbine area at a convenient point for each unit. For air supply to various devices mentioned above, the contractor shall provide 2 inch size GI pipe header with isolation valve from the instrument air and service air terminal points. In the boiler area the 2 inch head shall be provided upto top most elevation of boiler floor and from this 2 inch header, 1 inch sub-header shall be branched off at each floor with isolation valve. From this 1 inch sub-header, branch line of 1/2 inch, with isolation valve shall be provided upto various devices. In the Turbine area the 2 inch head shall be provided upto top most elevation of Turbine floor and from this 2 inch header, 1 inch sub-header shall be branched off at each floor with isolation valve. From this 1 inch sub-header, branch line of 1/2 inch, with isolation valve shall be provided upto various devices. Similar system is to be followed for service air required for intermittent purging in the Local Instrument Enclosures (LIEs) etc.		
2.06.00	All instrument air filters cum regulator set with mounting accessories shall be provided for each pneumatic device requiring air supply. The filter regulators shall be suitable for 10-kg/ sq.cm max. Inlet pressure. The filter shall be of size 5 microns and of material sintered bronze. The air set shall have 2-inch size pressure gauge and built in filter housing blow down valve. The end connection shall be 1/4 inch / 1/2 inch / 3/4 inch NPT as per the requirement to be finalised during detailed engineering.		
2.07.00	All the isolation valves in the air supply line shall be gate valves as per ASTM B62 inside screw rising stem, screwed female ends as per ASA B2.1. Valve bonnet shall be union type & trim material shall be stainless steel, body rating 150 pounds ASA. The valve sizes shall be ½ inch to 2 inch.		
2.08.00	Purge Air Connection for Air and Flue gas Applications The continuous purging with instrument air shall be done, for all air and flue gas measurements, at the process source connection end. Necessary arrangements required for continuous purging shall be provided inside all instrument enclosures and instrument racks for Air and Flue gas applications as per enclosed drawing no. 0000-999-POI-A-034 .		
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-05 PROCESS CONNECTION AND PIPING PAGE 3 OF 9



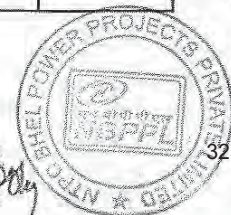
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CLAUSE NO.	TECHNICAL REQUIREMENTS
	For intermittent purging with service air, necessary arrangements inside all the air and Flue gas enclosures shall be provided as per drawing no. 0000-405-POI-A-034. The SS four ways valve provided in the SS tubing shall be used for isolating the transmitter & connecting the service air quick disconnect line. Purging arrangement is not required for Instrument air and service air measurement applications. Purge air lines shall be of mild steel hot dipped galvanised inside and outside as per IS 1239, heavy duty with threaded ends.
3.00.00	INSTALLATION AND ROUTING
3.01.00	All instrument piping, tubing and its accessories shall be supported in a safe manner to prevent excessive vibrations and anchored sufficiently to prevent undue strain on connected equipment. Instrument piping & tubing shall not be routed across equipment removal areas, above or below monorails, cranes, removable gratings, cable trays.
3.02.00	Instrument Piping System
3.02.01	For steam and liquid measurements, the impulse pipe should preferably slope downward from source connection to instrument and instrument shall be installed below the source point. If due to any reason instrument is installed above the source point, the impulse pipe should slope upwards continuously and a 'pigtail' should be provided at the instrument to assure water seal for temperature protection. For vacuum measurements instrument shall be installed above source point and impulse pipe should slope upwards.
3.02.02	Impulse piping for air and flue gas shall slope upwards and instrument shall be installed above source point. If this requirement cannot be met special venting or drain provision shall be provided with vent & drain lines alongwith isolation valves and other accessories including drainpipes. This drain is to be connected to plant drain through open funnel also. Horizontal runs must have a slope of not less than 40 mm per meter and must be adequately supported to maintain a constant slope and to prevent sag in piping.
3.02.03	All impulse piping shall be installed to permit free movement due to thermal expansion. Wherever required expansion loops shall be provided.
3.02.04	Special accessories such as condensing pots/ reservoirs shall be provided and installed wherever required. In any case condensing pots shall be provided for all level measurements in steam and water services, all flow measurement in steam services and flow measurements water services above 120 Deg. C. For drum level measurement required balancing chamber shall be provided and installed.
3.02.05	Colour coding of all impulse pipes shall be done by the Contractor in line with the colour coding being followed for the parent pipes.
3.03.00	Instrument Air & Service Air Piping/ Tubing System
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B
SUB-SECTION-C-05 PROCESS CONNECTION AND PIPING	PAGE 4 OF 9



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CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
03.01	The air supply headers, sub-headers and branch pipes shall be supported properly by clamps or supports to be provided and fabricated by the Contractor. Air supply piping shall be installed with a slope of over 1/100 to prevent accumulation of condensed water within the pipe. Signal/control air tubing shall run with the minimum number of changes in direction. Suitable identification tags shall be provided for easy link up and checking of proper connections. Single and multi tubes shall run with the minimum number of changes in direction. Suitable identification tags shall be provided for easy checkup and for connections.		
4.00.00	PIPING/TUBING SUPPORT Impulse piping and sample piping shall be supported at an interval not exceeding 1.5 meters. Each pipe shall be supported individually using slotted angle mounted clamps with necessary fixtures. Tubing shall run in proper perforated trays with proper cover. Tubing shall be supported inside the trays by aluminium supports. Hangers and other fixtures required for support of piping and trays shall be provided, either by welding or by bolting on walls, ceilings and structures. Hanger clamps and other fastening hardware shall be of corrosion resistant metals and hot-dip galvanized.		
5.00.00	SHOP AND SITE TESTS		
5.01.00	General Requirements		
5.01.01	The equipment and work performed as per this Sub-section shall be subject to shop and site test as per requirements of Sub-section-III E-04 (Quality Assurance & Inspection) other applicable clauses of this Sub-section and Employer approved quality assurance plan.		
5.01.02	Hydrostatic and pneumatic tests shall be performed on all pipes, tubing and systems and shall conform to ANSI B31.1.		
5.02.00	Hydrostatic Testing All instrument piping/ tubing shall be hydrostatically tested upon completion of erection. The test pressure shall be 1.5 times the maximum process pressure. The test shall be performed either with the testing of associated process piping or without the associated process piping (by closing the root valve). In both the cases the instrument shall be isolated by closing the shut-off valve.		
5.03.00	Air Testing All air headers & branch pipes shall be air tested by pressure decay method as per ANSI B31.1. Flexible hoses and short signal tubing shall be tested at normal pressure for leakage. Long signal tubing shall be tested by charging each tube with air at 2 kg/ sq. cm. through a bubbler sight glass. The boiler draft and vacuum piping shall be air tested by the same method as long signal tubing.		
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-C-05 PROCESS CONNECTION AND PIPING
			PAGE 5 OF 9



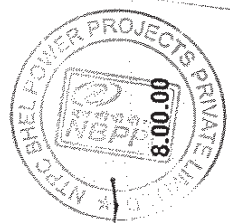


TABLE PCP

System/Line Description	Piping Class	Impulse Pipe Material	Schedule (Size)	Materials for Fitting/Valve Body	Valve Stem Material	Rating of Piping/ Fittings	Pr. Class of Valve
Main Steam/ Upstream of HP bypass and Auxiliary Steam Pressure reducing valve, Drum level	A	ASTM-A335 Gr.P-91	XXS (1/2 inch)	ASTM-A182 Gr.F-91	ASTM-A-182 Gr.F-6a	9000 lb	3000 SPL
BFP discharge/superheater attemperator/ spray to PRDS, Phosphate dosing P/P discharge, BCW pump.	B	ASTM-A106 Gr.C	160 (1/2 inch)	ASTM-A105	ASTM-A-182 Gr.F-6a	8000 lb	2500
Reheater attemperator	C	ASTM-A106 Gr.C	160 (1/2 inch)	ASTM-A105	ASTM-A-182 Gr.F-6a	6000 lb	1500
Hot Reheat/ down stream of Aux. Steam press. Reducing valve upto desuper heater/ Flash tank drain manifold, HP Heater level	D	ASTM-A335 Gr.P-91	160 (1/2 inch)	ASTM-A182 Gr.F-91	ASTM-A-182 Gr.F-6a	3000 lb	1500
Cold reheat upto Tee-off for HP Bypass / Extraction steam to HPH	E	ASTM-A335 Gr.P-22	80 (1/2 inch)	ASTM-A182 Gr.F-22	ASTM-A-182 Gr.F-6a	3000 lb	800

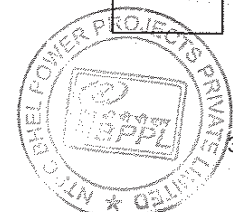
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION VI PART-B	SUB-SECTION - C-05 PCP	PAGE 8 OF 9
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Cold reheat down stream of Tee-off (HP Bypass)	F	ASTM-A106 Gr.C	80 (1/2 inch)	ASTM-A105	ASTM-A-182 Gr.F-6a	3000 lb	800
	G	ASTM-A106 Gr.B	80 (1/2 inch)	ASTM-A105	ASTM-A-182 Gr.F-6a	3000 lb	800
BFP suction/ Condensate System/ Extraction to LPH/ Ext- to BFPT, Deaerator/ auxiliary steam, service air, Instrument air, ECW pump, ACW pump and other low pressure water services.	M	ASTM-A106 Gr.B/C	80 (3/4 inch)	ASTM-A105	ASTM-A-182 Gr.F-6a	3000 lb	800
	N	ASTM-A335 Gr.P22	80 (3/4 inch)	ASTM-A182 Gr.F-22	ASTM-A-182 Gr.F-6a	3000 lb	800

NOTE:

- 1 Rating of piping/fittings/valves etc. is subjected to the final design pressure & temperature during the detailed engineering.
- 2 Material shall be compatible with that of the impulse pipe material and design parameter.

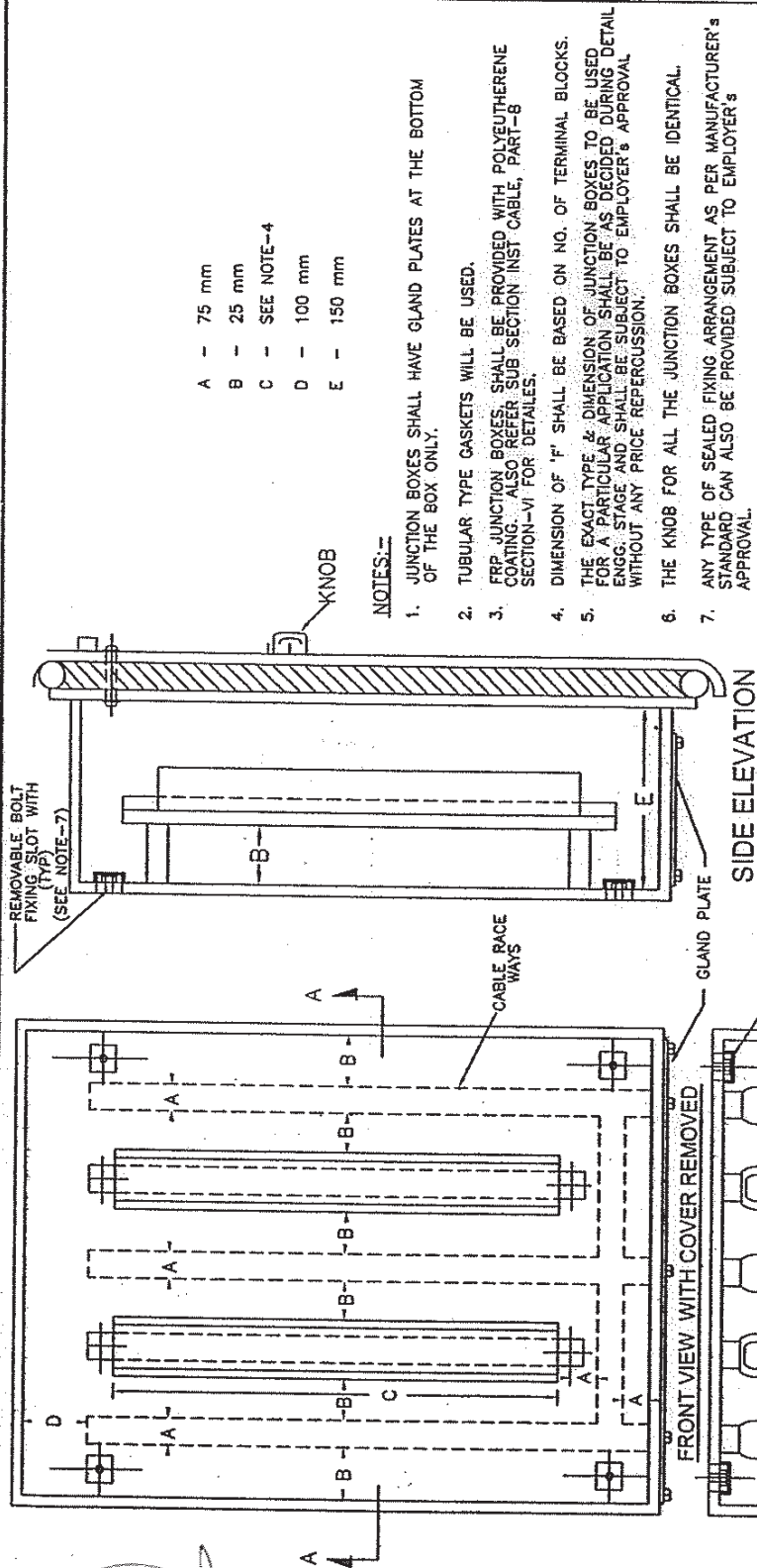


SINGRAULI STPP STAGE-III
(1X500 MW)
EPC PACKAGE

TECHNICAL SPECIFICATION
SECTION VI
PART-B

SUB-SECTION - C-05
PCP

PAGE
9 OF 9



- A - 75 mm
B - 25 mm
C - SEE NOTE-4
D - 100 mm
E - 150 mm

NOTES:-

1. JUNCTION BOXES SHALL HAVE GLAND PLATES AT THE BOTTOM OF THE BOX ONLY.
2. TUBULAR TYPE GASKETS WILL BE USED.
3. FRP JUNCTION BOXES SHALL BE PROVIDED WITH POLYETHYLENE COATING. ALSO REFER SUB SECTION INST CABLE, PART-8 SECTION-VI FOR DETAILS.
4. DIMENSION OF 'F' SHALL BE BASED ON NO. OF TERMINAL BLOCKS.
5. THE EXACT TYPE & DIMENSION OF JUNCTION BOXES TO BE USED FOR A PARTICULAR APPLICATION SHALL BE AS DECIDED DURING DETAIL ENG. STAGE AND SHALL BE SUBJECT TO EMPLOYER'S APPROVAL WITHOUT ANY PRICE REPERCUSSION.
6. THE KNOB FOR ALL THE JUNCTION BOXES SHALL BE IDENTICAL.
7. ANY TYPE OF SEALED FIXING ARRANGEMENT AS PER MANUFACTURER'S STANDARD CAN ALSO BE PROVIDED SUBJECT TO EMPLOYER'S APPROVAL.

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NTPC LIMITED

(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

TYPICAL THERMAL POWER PLANT

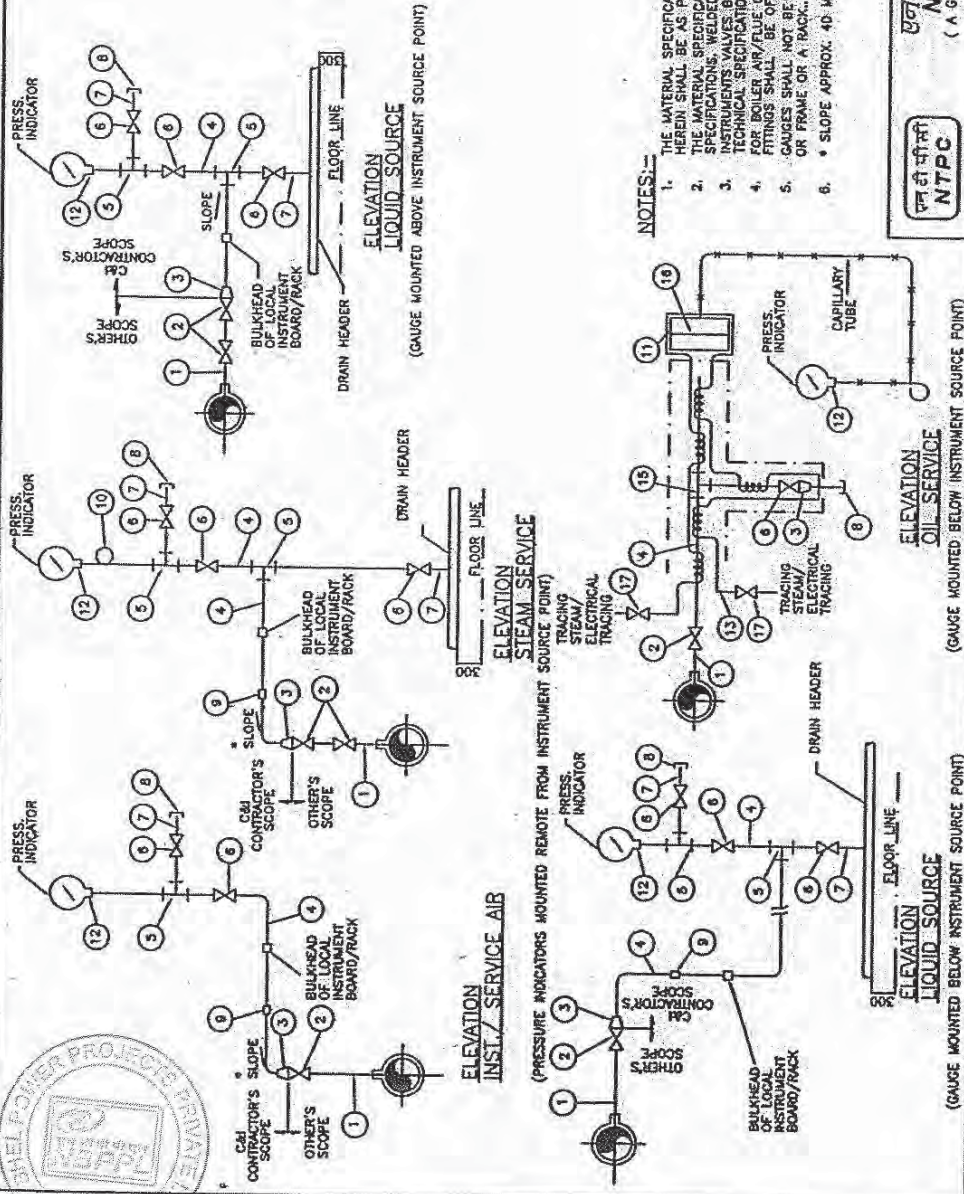
LOCAL JUNCTION BOX CONNECTION DETAILS

REV. NO.	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-017	D

PROJECT	TITLE	DATE	APPD	ARCH.	C&I	E	C	M	DESCRIPTION
	30.11.06	04.03.06							
D	GENERALLY REVISED	JM	KS						
C	GENERALLY REVISED	JM	KS						
B	GENERALLY REVISED	S.K.	A.R.	PS					
A	FIRST ISSUE	S.K.	A.R.	PS					
REV. NO.	DRAWN DESIGN CHKO.								

CLEAR BY

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) CS CAP.
9.	1/2" / 3/4" PIPE UNION
10.	6" SS SYPHON
11.	1/2" BLIND 3000# RF ANSI FLANGE DRILLED AND TAPED FOR 1" NPT PIPE
12.	SUITABLE ADAPTER
13.	1/4" CHROME MOLY STEEL TUBE
14.	
15.	1 1/2" 3/4" SW EQUAL TEE
16.	DAPHRAGM(WATER ELEMENT)
17.	ISOLATION VALVE 316 SS 1/4" SW



- NOTES:-**
- THE MATERIAL SPECIFICATION AND SCHEDULE NO. OF IMPULSE PIPE & NIPPLE AS LISTED HEREIN SHALL BE AS PER TECHNICAL SPECIFICATIONS.
 - THE MATERIAL SPECIFICATION AND RATING OF FITTINGS AS LISTED SHALL BE AS PER TECHNICAL SPECIFICATIONS. WELDED/THREADED FITTINGS SHALL CONFORM TO ANSI-B.16-11.
 - TECHNICAL SPECIFICATIONS: STEEL MATERIAL AND PRESSURE CLASS SHALL BE AS PER TECHNICAL SPECIFICATIONS.
 - FOR BOILER AIR/FLUE GAS SERVICES SOURCE CONNECTIONS IMPULSE PIPING AND ALL FITTINGS SHALL BE OF 3/4" NB SIZE.
 - GAUGES SHALL NOT BE MOUNTED ON THE PIPE. IT WILL BE MOUNTED ON A CHANNEL OR FRAME OR A RACK.
 - * SLOPE APPROX. 40 MM / METRE.

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एन टी पी सी लिमिटेड NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION	
PROJECT TYPICAL THERMAL POWER PROJECT (STATION C&I PACKAGE)	
TITLE INSTRUMENT INSTALLATION DIAGRAM (FOR PRESSURE GAUGE)	
SIZE A3	SCALE N.T.S.
DRG. NO. 0000-405-POI-A-022	REV. NO. A

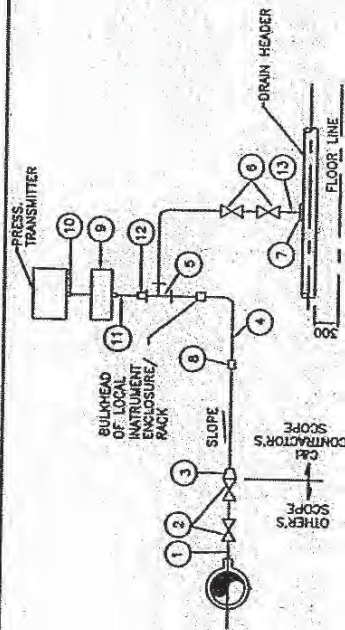
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A	FIRST ISSUE									26.04.06



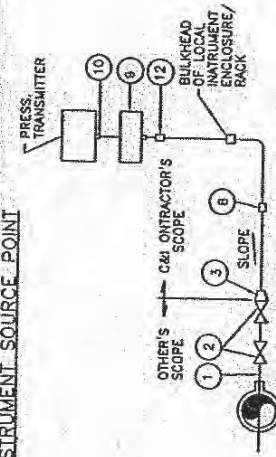
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LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1/2" x 3/4" NPS SCH. 80/160 X 3/8" NIPPLE OF WATER, SAME AS THAT OF MAIN PIPE.
2.	3/4" 7/1" SW GLOBE VALVE.
3.	3/4" 1/2" 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 SW 1/2" CS/AS COUPLER
8.	1/2" PIPE UNION
9.	3/8" VALVE MANIFOLD (FOR DETAIL SEE DRAWING NO. 0000-405-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 SW 1/2" NPT(M) CS/AS NIPPLE



ELEVATION
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT
LIQUID PRESSURE MEASUREMENT



ELEVATION
TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT
LIQUID PRESSURE MEASUREMENT



ELEVATION
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT
VACUUM PRESSURE MEASUREMENT

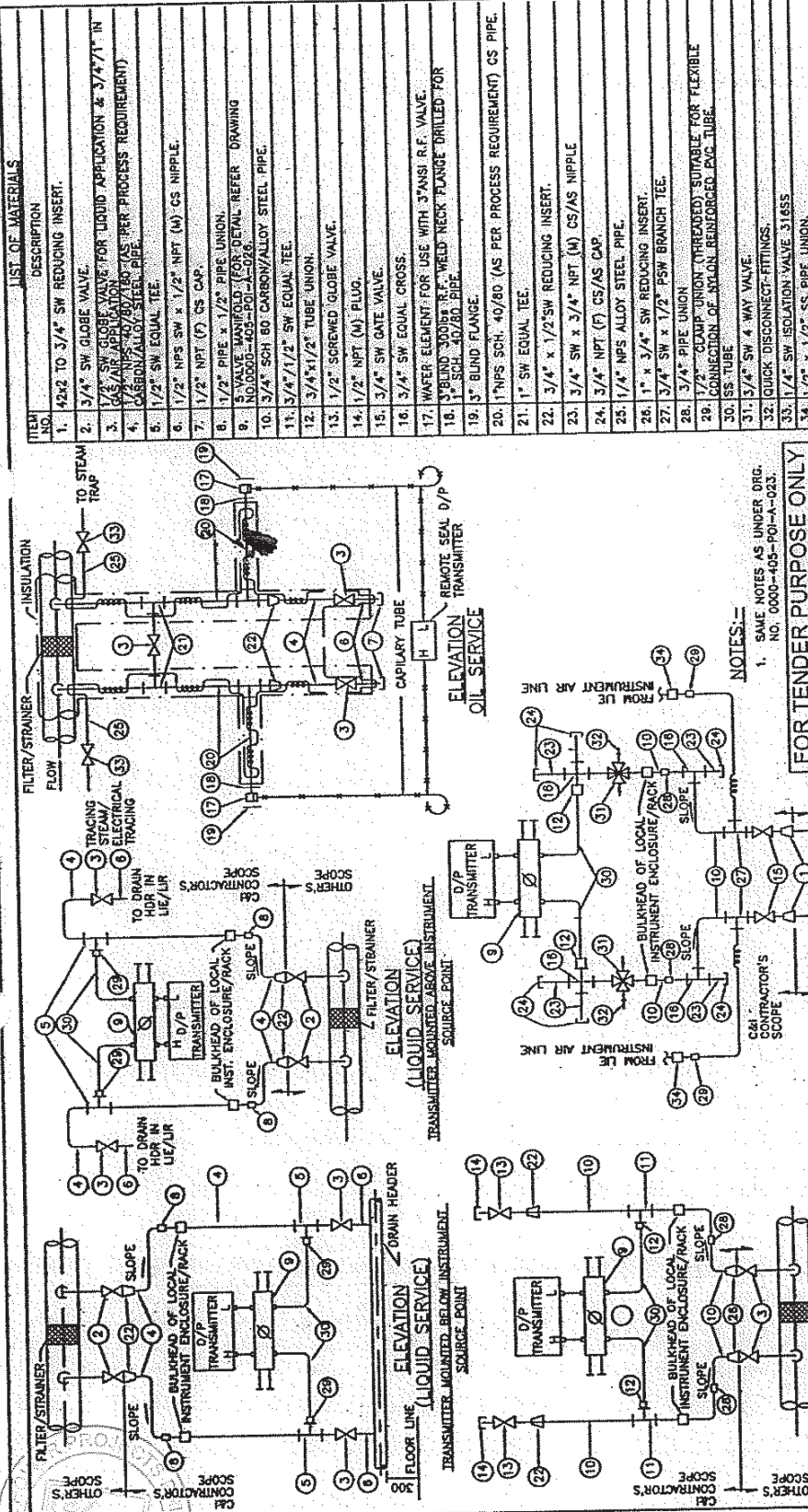
- NOTES:-
1. SAME NOTES UNDER DRG. NO. 0000-405-POI-A-023.
 2. FOR VACUUM APPLICATION OTHER PORT OF TRANSMITTER SHALL BE KEPT OPEN TO ATMOSPHERE.

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 एन टी सी लिमिटेड NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION		प्रोजेक्ट TYPICAL THERMAL POWER PROJECT (STATION C&I PACKAGE)	
टिपल INSTRUMENT INSTALLATION DIAGRAM (PRESSURE MEASUREMENT USING PRESS /DP TRANSMITTERS STEAM/LIQUID VACUUM)		REV. NO. A	
SIZE A3	SCALE N.T.S.	DRG. NO. 0000-405-POI-A-025	REV. NO. A

ELEVATION
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT
STEAM PRESSURE MEASUREMENT

REV. NO.	DESCRIPTION	DATE	APPD	ARCH.	C&I	E	C	M	CHKD.	DESIGN	DRWN.	CHECKED BY
A	FIRST ISSUE	20.04.08										



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ENGINEERING DIVISION

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ELEVATION
FIELD GAS SERVICE/DIRTY AIR SERVICE

ELEVATION
CLEAN GAS/AIR SERVICE

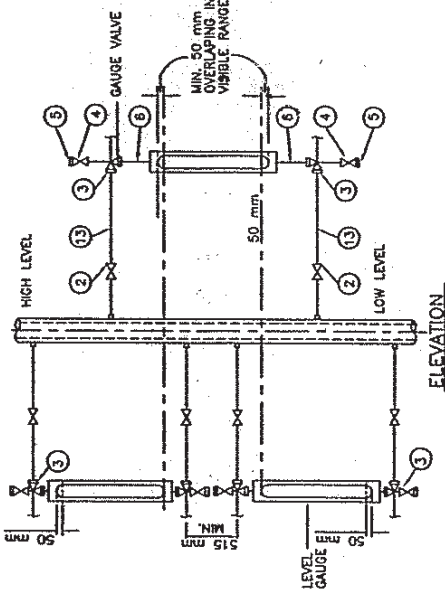
**TYPICAL THERMAL POWER PROJECT
(STATION C&I PACKAGE)**

NAME _____ INSTRUMENT INSTALLATION DIAGRAM _____ DIE PRESS MEASUREMENT (LIQUID, OIL, AIR/GAS SERVICE)

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	APPROVED BY					DATE	SIZE	SCALE	DRG. NO.	REV. NO.
					W	E	C	CAI	ARCH.					
A	FIRST ISSUE									26.04.06	A3	N.T.S.	0000-405-POI-A-030	A

LIST OF MATERIALS

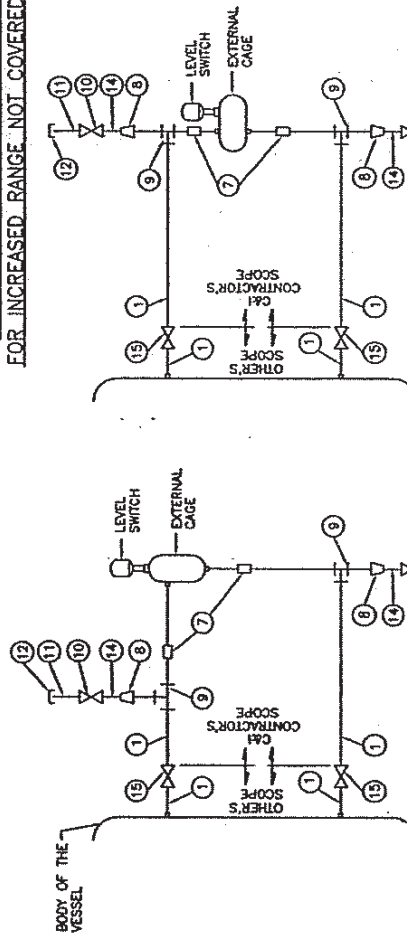
ITEM NO.	DESCRIPTION
1.	3/4" NPS SCH 40/80/160 PBT (AS PER PROCESS REQUIREMENT) CARBON TANGIT STEEL PIPE.
2.	3/4" SW GLOBE VALVE.
3.	3/4" SW UNION.
4.	3/4" NPT GLOBE VALVE.
5.	3/4" NPT (M) CAP.
6.	3/4" NPT (F) UNION CONNECTION.
7.	1" SW EQUAL UNION.
8.	1" x 1/2" SW REDUCING INSERT.
9.	1" SW EQUAL TEE.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



ELEVATION

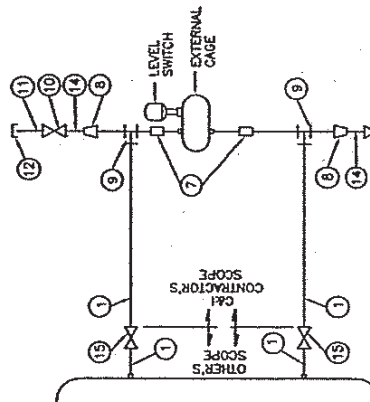
LOCAL LEVEL INDICATION USING GAUGE GLASS

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



ELEVATION

FLOAT OR DISPLACER OPERATED EXTERNAL CAGE TYPE LEVEL SWITCH INSTALLATION



ELEVATION

FLOAT OR DISPLACER OPERATED EXTERNAL CAGE TYPE LEVEL SWITCH INSTALLATION

NOTES:—

- FOR LEVEL GAUGE 3/4" AND FOR LEVEL SWITCH 1" PROCESS CONNECTION SHALL BE PROVIDED.
- NOTES UNDER DRG. NO. 0000-405-POI-A-023 (WHICHEVER ARE RELEVANT).

FOR TENDER PURPOSE ONLY

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ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT (STATION C&I PACKAGE)	
TITLE		INSTRUMENT INSTALLATION DIAGRAM (LEVEL GAUGE & SWITCHES)	
REV. NO.	SCALE	DRG. NO.	REV. NO.
A	AS	0000-405-POI-A-031	A
DATE	DATE	DATE	DATE
26.04.06	26.04.06	26.04.06	26.04.06
APPD	ARCH.	DATE	DATE
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CLEARED BY			
DESCRIPTION			
FIRST ISSUE			
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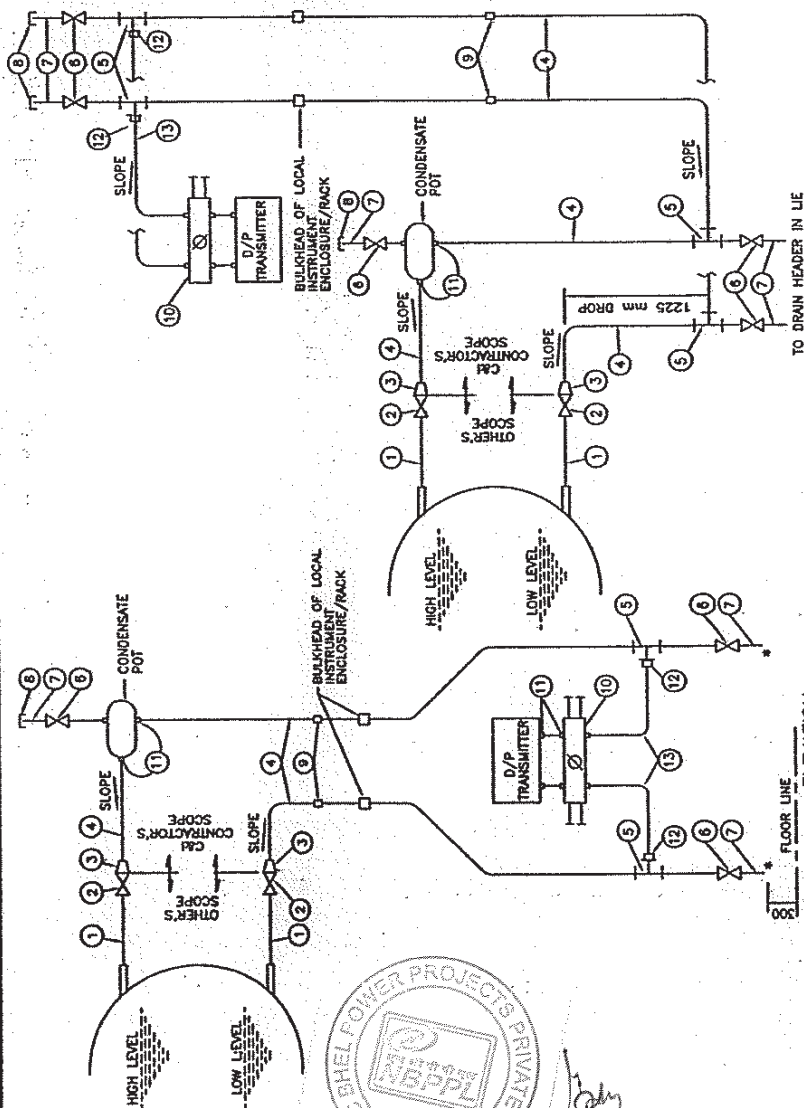
LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1" NPS SCH. 40/80/160 XXS/PS1 (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 SW 1/2" NPT(M) CS/AS NIPPLE.
8.	1/2" NPT (F) CS CAP.
9.	1/2" PIPE UNION.
10.	5-VALVE MANIFOLD (FOR DETAILS' REF. DRG. NO. 00000-405-POI-A-028).
11.	SUITABLE ADAPTER.
12.	1/2" PIPE x 1/2" TUBE UNION.
13.	S.S. TUBE.

NOTES:-

1. SAME NOTES AS UNDER DRG. NO. 00000-405-POI-A-023. (WHICHEVER ARE RELEVANT).

* TO DRAIN HEADER IN LIE/UR.



TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT

ELEVATION

TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

FOR TENDER PURPOSE ONLY

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

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ENGINEERING DIVISION

PROJECT		TYPICAL THERMAL POWER PROJECT (STATION C&I PACKAGE)	
TITLE		INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT USING D/P TRANSMITTERS)	
REV. NO.	DESCRIPTION	SCALE	DRG. NO.
A	FIRST ISSUE	A3	0000-405-POI-A-032
DRAWN DESIGN CHKD.		DATE	REV. NO.
APPROVED		28.04.06	A
Cleared by		DATE	REV. NO.
M E C C&I		28.04.06	A
SH 1 OF 2			

LIST OF MATERIALS

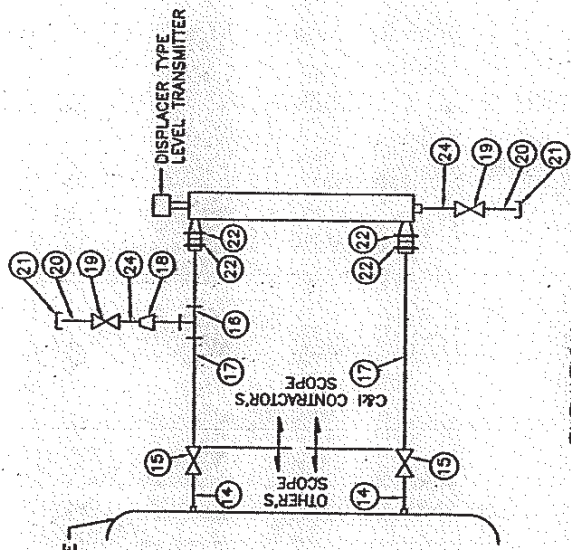
ITEM NO.	DESCRIPTION
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	2" NPS SCH. 40/80 (AS PER PROCESS REQUIREMENT) VESSEL NOZZLE
15.	2" SW GLOBE VALVE
16.	2" SW EQUAL TEE
17.	2" NPS SCH. 40/80 CS/AS PIPE
18.	2" x 3/4" SW REDUCING INSERT
19.	3/4" SW GLOBE VALVE
20.	3/4" NPS SW x 3/4" NPT (M) CS/AS NIPPLE
21.	3/4" NPT (F) CS CAP
22.	300 LBS RAISED PHASE WELD NECK FLANGE
23.	2" ANSI FLANGE OF LEVEL TRANSMITTER
24.	3/4" NPS SCH. 40/80 CARBON STEEL PIPE

NOTES:-

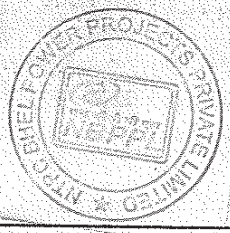
1. SAME NOTES AS UNDER DRG. NO.0000-405-POI-A-033 (WHICHEVER ARE RELEVANT).

FOR TENDER PURPOSE ONLY

 एन टी सी लिमिटेड NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION		प्रोजेक्ट TYPICAL THERMAL POWER PROJECT (STATION C&I PACKAGE)		REV. NO.
टाइटल INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT USING DISPLACER TYPE TRANSMITTERS)		ड्रॉ. नं. 0000-405-POI-A-032 SH 2 OF 2		A
SIZE	SCALE	DATE	APPROVED	ARCH.
A3	N.T.S.	28.04.08		



ELEVATION
DISPLACER TYPE LEVEL TRANSMITTER WITH SIDE CONNECTION

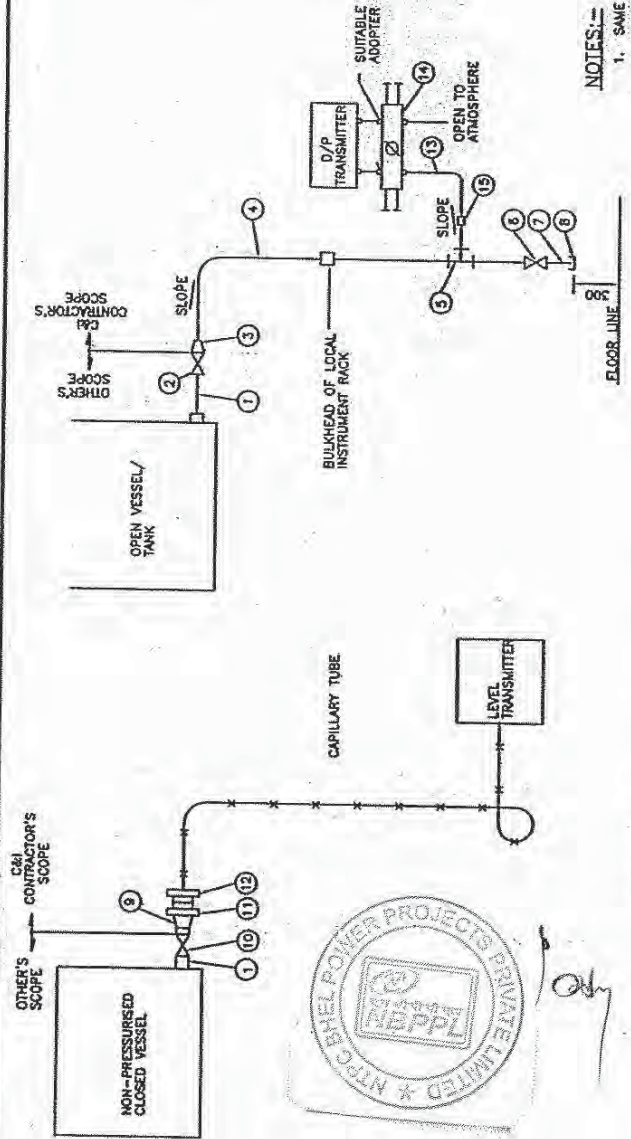


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REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	DATE
A	FIRST ISSUE									28.04.08

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	3/4" x 1" NPS 40/80 CARBON STEEL PIPE.
2.	3/4" SW GLOBE VALVE.
3.	3/4" x 1/2" SW REDUCING INSERT.
4.	1/2" NPS SCH. 40/80 CS PIPE.
5.	1/2" SW EQUAL TEE.
6.	1/2" SW GLOBE VALVE.
7.	1/2" NPS SW 1/2" NPT(M) CS NIPPLE.
8.	1/2" NPT (F) CS CAP.
9.	3/4" TO 4" EXPANDER.
10.	3/4" BUTT WELDED GATE VALVE.
11.	4" ANSI 300 lbs REF. WELD NECK FLANGE.
12.	TRANS. MATCHING FLANGE WITH FLUSH DIAPHRAGM OF LEVEL TRANSMITTER.
13.	3" SS TUBE.
14.	3-VALVE MANIFOLD (FOR DETAIL REF. DRG. NO. 0000-405-POI-A-033).
15.	1/2" PIPE x 1/2" TUBE UNION.



NOTES:-

1. SAME NOTES UNDER DRG. NO. 0000-405-POI-A-023.
2. FOR VACUUM APPLICATION OTHER PORT OF TRANSMITTER SHALL BE KEPT OPEN TO ATMOSPHERE.

ELEVATION

LEVEL MEASUREMENT OF VISCOUS OR CORROSIVE LIQUID
IN CLOSED VESSEL USING FLUSH DIAPHRAGM/WAFER TYPE
LEVEL TRANSMITTER WITH REMOTE SEAL

ELEVATION

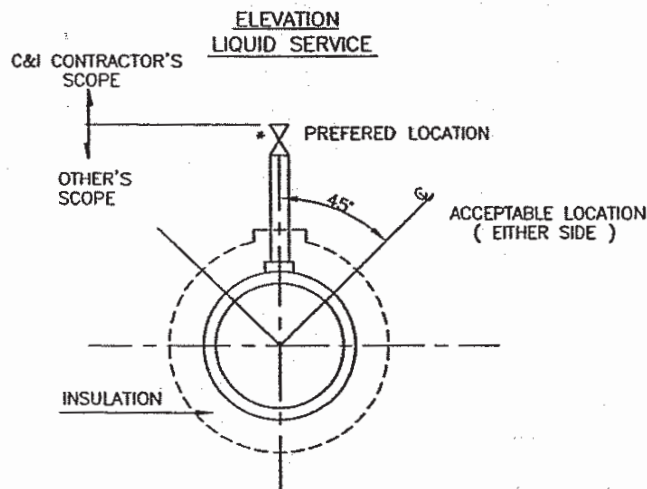
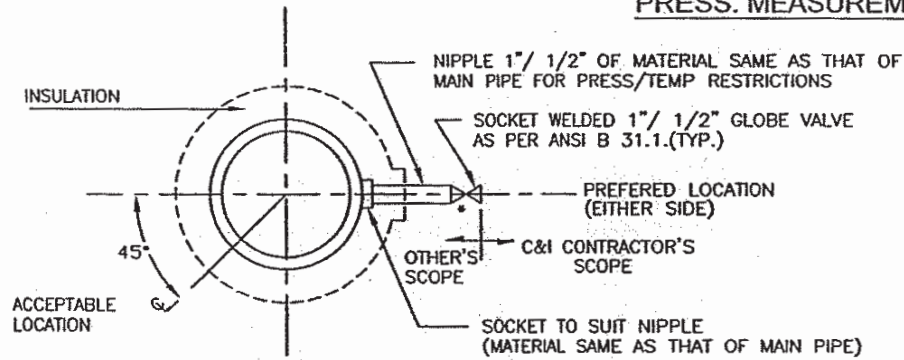
LEVEL MEASUREMENT OF CLEAN LIQUID IN AN OPEN VESSEL
USING D/P TRANSMITTER

FOR TENDER PURPOSE ONLY

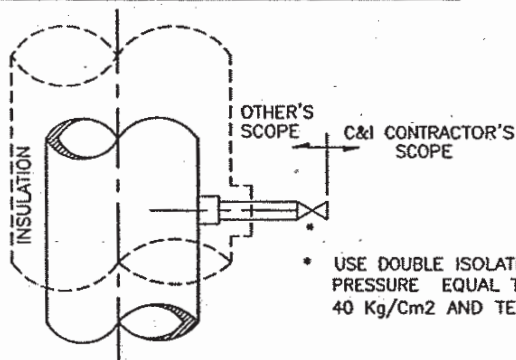
एन टी पी सी लिमिटेड NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION		PROJECT TYPICAL THERMAL POWER PROJECT (STATION C&I PACKAGE)	
TITLE INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT-OPEN VESSEL)		REV. NO. A	
SCALE N.T.S.		DRG. NO. 0000-405-POI-A-033	
SIZE A3		DATE 26.04.06	
APPROVED BY (Signature)		APPROVED DATE 26.04.06	
DESIGNER (Signature)		DESIGN DATE 26.04.06	
CHECKED BY (Signature)		CHECKED DATE 26.04.06	
DESCRIPTION A FIRST ISSUE		REVISION A	

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PRESS. MEASUREMENT



ELEVATION STEAM SERVICE PRESSURE CONNECTION ON HORIZONTAL PIPE



ELEVATION LIQUID OR STEAM SERVICE PRESSURE CONNECTIONS ON VERTICAL PIPES

- USE DOUBLE ISOLATION VALVES FOR PRESSURE EQUAL TO OR EXCEEDING 40 Kg/Cm² AND TEMP. MORE THAN 280°C.

FOR TENDER PURPOSE ONLY

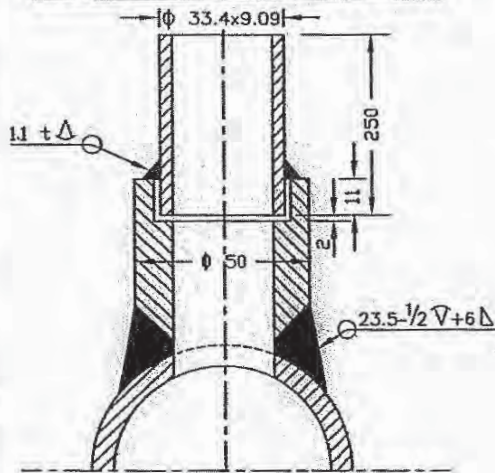
										एन टी पी सी लिमिटेड NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION				
PROJECT										TYPICAL THERMAL POWER PROJECT (STATION C&I PACKAGE)				
TITLE										INSTRUMENT SOURCE CONNECTION DETAILS				
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	H	E	C	C&I	APPRO.	DATE	SIZE	SCALE	DWG. NO.	REV. NO.
A	FIRST ISSUE										A4	N.T.S.	0000-405-POI-A-035	A
Cleared by										Sh-1 of 14				

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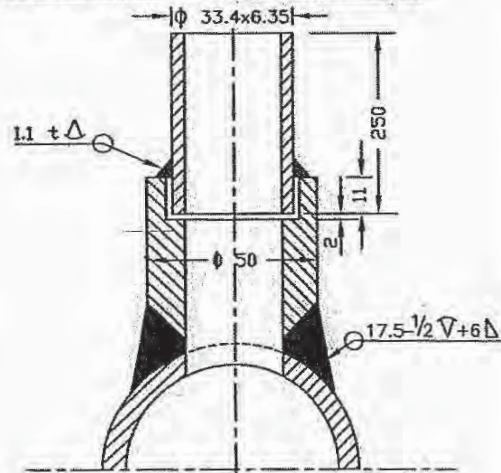
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PRESSURE MEASUREMENT

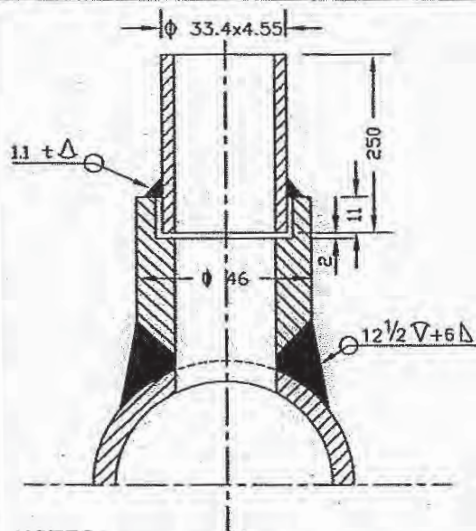
(SYSTEM PR. >40Kg/Sq Cm CL 9000)



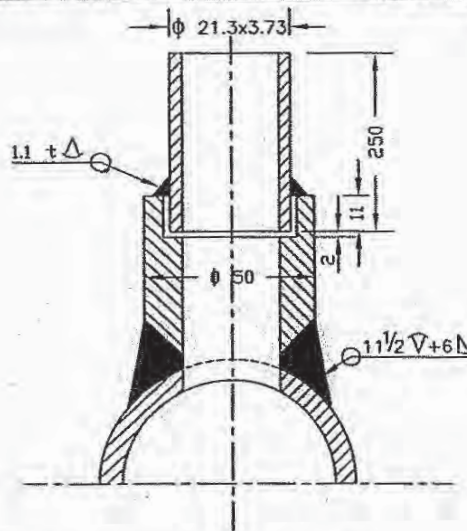
(SYSTEM PR. >40Kg/Sq Cm CL 6000)



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



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



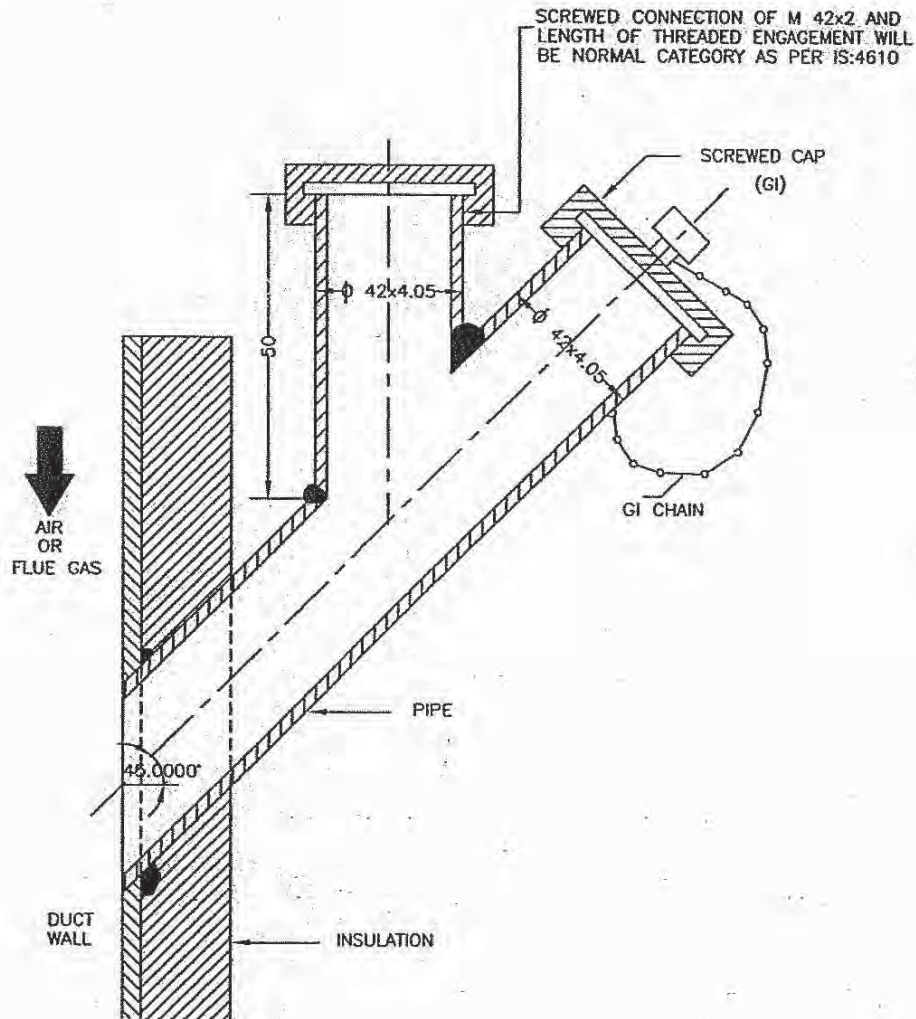
NOTES:-

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 & TEMP. = >280°C.
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 ALIGNMENT WITH HOLE IN THE COUPLING.
8. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.

FOR TENDER PURPOSE ONLY

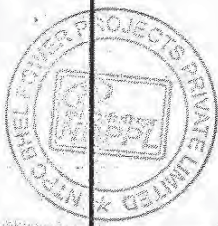
एन टी पी सी लिमिटेड NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION PROJECT TYPICAL THERMAL POWER PROJECT (STATION C&I PACKAGE)										
TITLE INSTRUMENT SOURCE CONNECTION DETAILS										
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	H	E	C	EN	APPR.	DATE
SIZE A4 SCALE N.T.S. DRG. NO. 0000-405-POI-A-035										
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PRESS. MEASUREMENTNOTES:-

1. THIS TYPE OF PRESSURE CONNECTION SHALL BE PROVIDED FOR PRESSURE MEASUREMENTS IN AIR AND FLUE GAS DUCT/FURNACE.
2. DIMENSIONS ARE INDICATIVE ONLY.

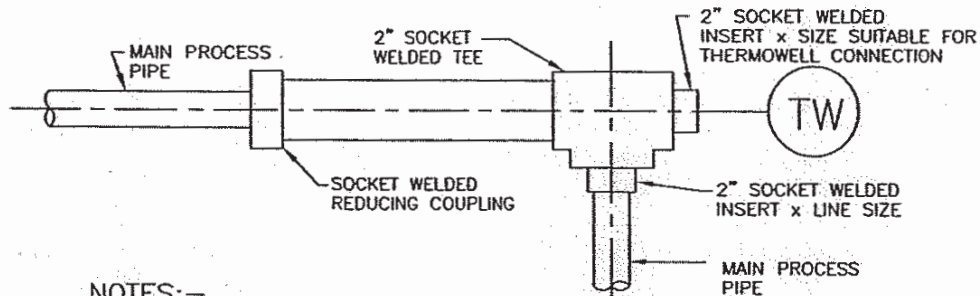
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<table border="1" style="width: 100%;"> <tr> <td style="width: 15%;">A</td> <td style="width: 35%;">FIRST ISSUE</td> <td style="width: 10%;">DESIGN</td> <td style="width: 10%;">CHECK</td> <td style="width: 10%;">M</td> <td style="width: 10%;">E</td> <td style="width: 10%;">C</td> <td style="width: 10%;">CLI</td> <td style="width: 10%;">APPR.</td> <td style="width: 10%;">DATE</td> </tr> <tr> <td colspan="2">DESCRIPTION</td> <td>DESIGN</td> <td>CHECK</td> <td>M</td> <td>E</td> <td>C</td> <td>CLI</td> <td>APPR.</td> <td>DATE</td> </tr> <tr> <td colspan="2"></td> <td colspan="8">Cleared by</td> </tr> </table>										A	FIRST ISSUE	DESIGN	CHECK	M	E	C	CLI	APPR.	DATE	DESCRIPTION		DESIGN	CHECK	M	E	C	CLI	APPR.	DATE			Cleared by							
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DESCRIPTION		DESIGN	CHECK	M	E	C	CLI	APPR.	DATE																														
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SIZE A4		SCALE N.T.S.		DRG. NO. 0000-405-POI-A-035				REV. NO. A																															

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TEMP. MEASUREMENTNOTES:-

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).

THERMOWELL SUITABLE FOR THE BOSS

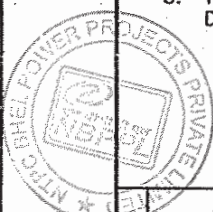
TEMP. BOSS

DIMENSIONS SUITABLE FOR
INCLINED INSTALLATION SCREWED WELDED
CONNECTIONS AS PER PROCESS CONNECTION.

NOTES:-

1. INCLINED INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MIN. 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF 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).

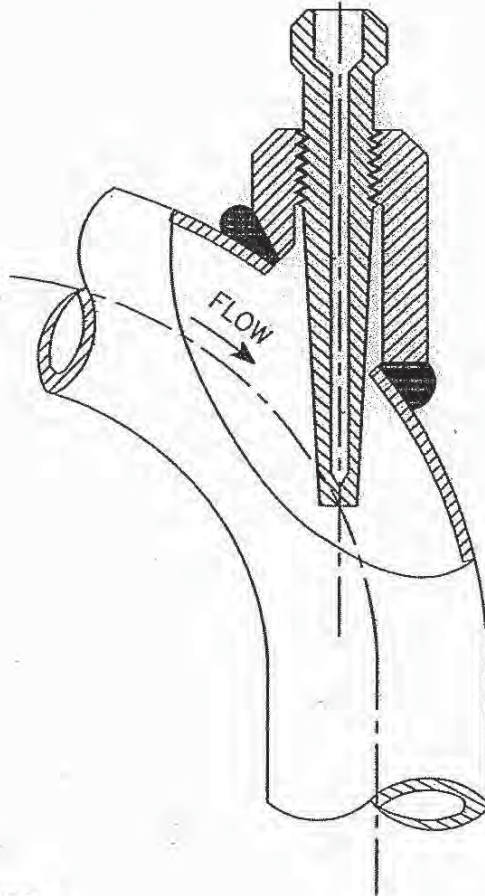
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										PROJECT TYPICAL THERMAL POWER PROJECT (STATION C&I PACKAGE)							
TITLE INSTRUMENT SOURCE CONNECTION DETAILS										SIZE A4		SCALE N.T.S.		DRG. NO. 0000-405-POI-A-035		REV. NO. A	
A FIRST ISSUE										DRAWN DESIGNED CHD. M E C CSE INCH APPD. DATE		CHECKED BY		SH-4 OF 14			

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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.

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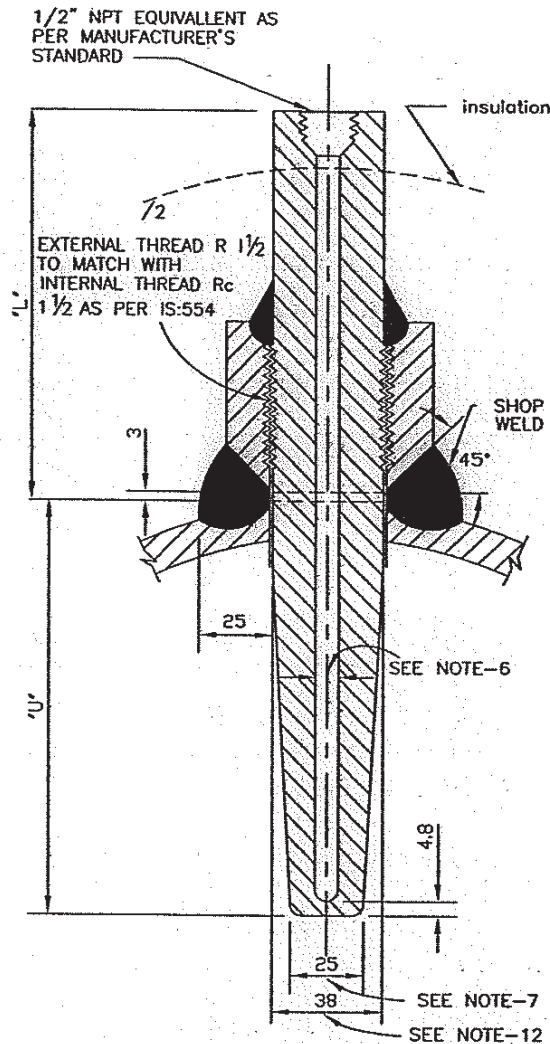
FOR TENDER PURPOSE ONLY

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REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	APPRO.	DATE																					
A	FIRST ISSUE																														
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SIZE	SCALE	DRG. NO.	REV. NO.																												
A4	N.T.S.	0000-405-POI-A-035	A																												

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TEMP. MEASUREMENT



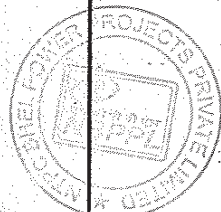
NOTES:—

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 ALIGNMENT 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. WILL BE SUITABLE TO MATCH THE STUB DIMENSIONS AS PER RC 1 1/2
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

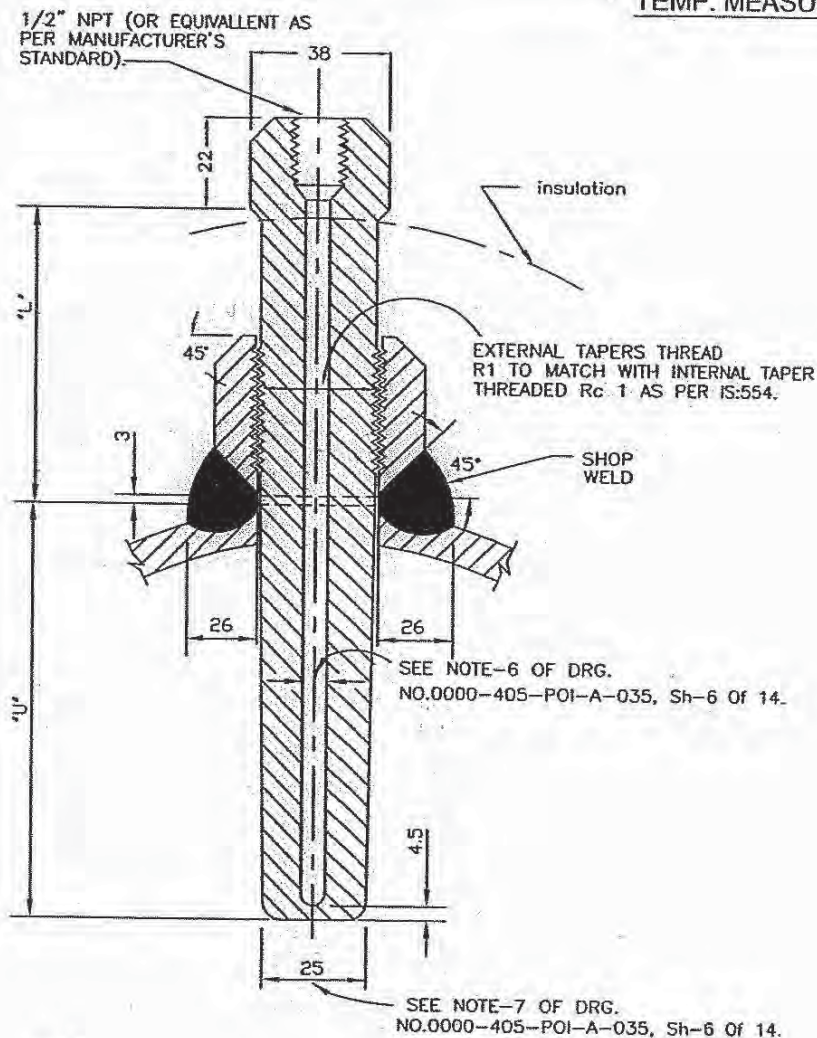
 एन टी पी सी लिमिटेड NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION										
PROJECT TYPICAL THERMAL POWER PROJECT (STATION C&I PACKAGE)										
TITLE INSTRUMENT SOURCE CONNECTION DETAILS										
REV. NO.	DESCRIPTION	DESIGN	DESIGN	CHKD.	M	E	C	CHKD.	APPRO.	DATE
A	FIRST ISSUE									
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SIZE	A4	SCALE	N.T.S.	DRG. NO.	0000-405-POI-A-035				REV. NO.	A
Sh-8 of 14										

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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. 0000-405-POI-A-035, Sh-6 Of 14.

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एन टी पी सी लिमिटेड NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION PROJECT TYPICAL THERMAL POWER PROJECT (STATON C&I PACKAGE) TITLE INSTRUMENT SOURCE CONNECTION DETAILS																															
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REV. NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.	DATE
A	FIRST ISSUE					
REV. NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.	DATE
A	FIRST ISSUE					

PROJECT	TITLE
TYPICAL THERMAL POWER PROJECT SG, TG AND BOP PACKAGE	THERMOCOUPLE DIMENSION DEFINITIONS

SIZE	SCALE	N.T.S.	DWG. NO.	REV. NO.
A4			0000-999-POI-A-055	A

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NTPC
 (A GOVERNMENT OF INDIA ENTERPRISE)
 ENGINEERING DIVISION
 THERMAL POWER PROJECT
 SG, TG AND BOP PACKAGE

TEMPERATURE TRANSMITTER (WHEREVER APPLICABLE)

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