

CLAUSE NO.	TECHNICAL REQUIREMENTS	
<p>2.00.00</p> <p>2.01.00</p> <p>2.01.01</p> <p>2.01.02</p> <p>2.01.03</p> <p>2.01.04</p> <p>2.01.05</p> <p>2.01.06</p> <p>2.01.07</p> <p>2.01.08</p> <p>2.01.09</p> <p>2.01.10</p>	<p>DESIGN AND CONSTRUCTIONAL FEATURE</p> <p>Inter Plant Cabling</p> <p>Interplant cabling for main routes shall be laid along overhead trestles/duct banks. Cables from main plant to switchyard control room shall be laid in overhead trestles or duct bank. In case of Duct banks, pull-pits shall be filled with sand and provided with a PCC covering. Directly buried cables, if essential, shall not have concentration of more than 4 cables in one route. Cables crossing Railway line (if applicable) shall be laid underground through nearest culvert. Necessary statutory clearance if required shall be taken by Bidder. All HT, LT and control cable shall be armoured.</p> <p>Transformer yard In transformer yard cables shall be laid in overhead trestle. The main cable routes coming out from Main plant building and crossing the Transformer yard shall be laid in overhead trestles. In transformer yard, trestle height for rail/road crossing shall be suitable for movement of Generator Transformer with bushing.</p> <p>Trenches PCC flooring of built up trenches shall be sloped for effective drainage with sump pits and sump pumps.</p> <p>No sub zero level cable vault/trenches shall be provided below control building/switchgear rooms in main plant.</p> <p>Cable Vault The cable vault/ / cable spreader room space below the HT / LT switchgear room, Control Rooms, unit control equipment room, Programmer room, UPS, Charger & Battery Rooms, shall have 800 mm wide and 2.1 m high movement passage all around the cable trays in the cable vault/ cable spreader room for easy laying/maintenance of cables</p> <p>Cable vaults shall be provided with adequate drainage facilities for drainage of fire water. Each cable vault should have at least two doors. Exit signs shall be provided near doors for personnel escape in case of emergency</p> <p>Boiler Area Cable trays in boiler & ESP area shall be supported from the boiler and ESP structures. The same shall be coordinated with SG/ESP contractor. Cable trays in these areas shall be in vertical formation to avoid dust accumulation. No cable trenches shall be provided in boiler/ESP area.</p> <p>Two separate cable routes shall be provided for cable routing of working and standby drives or different set/group (say 50% capacity) of auxiliaries.</p> <p>OffSite Area For feeder in bidder's scope for offsite areas, overhead cable tray arrangement shall be followed. However cable trenches/slit may also be acceptable, for some areas, if found to be required during detailed engineering. Cable trenches provided shall be separated from fuel oil area to avoid oil accumulation.</p> <p>The cable slits to be used for motor/equipment power/control supply shall be sand filled & covered with PCC after cabling.</p> <p>Sizing criteria, derating factors for the cables shall be met as per respective chapters. However for the power cables, the minimum conductor size shall be 6 sq.mm. for aluminium conductor and 2.5 sq.mm. for copper conductor cable.</p>	
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2</p>	<p>SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION</p> <p>Page 2 of 21</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS	
2.01.11	<p>Conscious exceptions to the above guidelines may be accepted under special conditions but suitable measures should be taken at such location to:</p> <ul style="list-style-type: none"> • Meet all safety requirements • Safeguard against fire hazards, mechanical damage, flooding of water, oil accumulation, electrical faults/interferences, etc 	
3.00.00	EQUIPMENT DESCRIPTION	
3.01.00	Cable trays, Fittings & Accessories	
3.01.01	Cable trays shall be ladder/perforated type as specified complete with matching fittings (like brackets, elbows, bends, reducers, tees, crosses, etc.) accessories (like side coupler plates, etc. and hardware (like bolts, nuts, washers, G.I. strap, hook etc.) as required. Cable tray shall be ladder type for power & control cables and perforated for instrumentation cables.	
3.01.02	Cable trays, fittings and accessories shall be fabricated out of rolled mild steel sheets free from flaws such as laminations, rolling marks, pitting etc. These (including hardware) shall be hot dip galvanized as per Clause No. 3.13.00 of this chapter.	
3.01.03	Cable trays shall have standard width of 150 mm, 300 mm & 600 mm and standard lengths of 2.5 metre. Thickness of mild steel sheets used for fabrication of cable trays and fittings shall be 2 mm. The thickness of side coupler plates shall be 3 mm.	
3.01.04	Cable troughs shall be required for branching out few cables from main cable route. These shall be U-shaped, fabricated of mild steel sheets of thickness 2 mm and shall be hot dip galvanised as per Clause No. 3.13.00 of this chapter. Troughs shall be standard width of 50 mm & 75 mm with depth of 25 mm.	
3.01.05	The tolerance for cable tray and accessories shall be as per IS 2102 (Part-1). Tolerance Class: - Coarse	
3.02.00	Support System for Cable Trays	
3.02.01	Cable tray support system shall be pre-fabricated out of single sheet as per enclosed tender drawings.	
3.02.02	<p>Support system for cable trays shall essentially comprise of the two components i.e. main support channel and cantilever arms. The main support channel shall be of two types : (i) C1:- having provision of supporting cable trays on one side and (ii) C2:-having provision of supporting cable trays on both sides. The support system shall be the type described hereunder</p> <ol style="list-style-type: none"> Cable supporting steel work for cable racks/cables shall comprise of various channel sections, cantilever arms, various brackets, clamps, floor plates, all hardwares such as lock washers, hexagon nuts, hexagon head bolt, support hooks, stud nuts, hexagon head screw, channel nut, channel nut with springs, fixing studs, etc. The system shall be designed such that it allows easy assembly at site by using bolting. All cable supporting steel work, hardwares fittings and accessories shall be prefabricated factory galvanised. The main support and cantilever arms shall be fixed at site using necessary brackets, clamps, fittings, bolts, nuts and other hardware etc. to form various arrangements required to support the cable trays. Welding of the components shall not be allowed. However, welding of the bracket (to which the main support channel is bolted) to the overhead beams, structural steel, insert plates or reinforcement bars will be permitted. Any cutting or welding of the galvanised surface shall be brushed and red lead primer, oil primer & aluminium paint shall be applied 	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 3 of 21

CLAUSE NO.	TECHNICAL REQUIREMENTS	
	<p>d. All steel components, accessories, fittings and hardware shall be hot dip galvanised after completing welding, cutting, drilling and other machining operation.</p> <p>e. The typical arrangement of flexible support system is shown in the enclosed drawings and described briefly below: The main support channel and cantilever arms shall be fabricated out of 2.5 thick rolled steel sheet conforming to IS 1079.</p> <p>f. Cantilever arms of 320 mm, 620mm and 750 mm in length are required, and shall be as shown in the enclosed drawing. The arm portion shall be suitable for assembling the complete arm assembly on to component constructed of standard channel section. The back plate shall allow sufficient clearance for fixing bolt to be tightened with tray in position.</p> <p>g. Support system shall be able to withstand</p> <ul style="list-style-type: none"> • weight of the cable trays • weight of the cables (75 Kg/Metre run of each cable tray) • Concentrated load of 75 Kg between every support span. • Factor of safety of minimum 1.5 shall be considered. 	
3.02.03	The size of structural steel members or thickness of sheet steel of main support channel and cantilever arms and other accessories as indicated above or in the enclosed drawings are indicative only. Nevertheless, the support system shall be designed by the bidder to fully meet the requirements of type tests as specified. In case the system fails in the tests, the components design modification shall be done by the Bidder without any additional cost to the Employer. The bidder shall submit the detailed drawings of the system offered by him alongwith the bid.	
3.02.04	Four legged structure shall be provided wherever there is change in elevation and change in direction	
3.02.05	<p>FOR COAL HANDLING PLANT/FGD PLANT/ ESP AREA THE FOLLOWING SHALL ALSO BE APPLICABLE:</p> <p>a) All overhead cable routes shall be along the route of the conveyor gallery on separate supporting structures and cables shall be laid in vertical trays. The bottom of the steel shall be such that the existing facilities, movement of trucks/human beings etc. does not get affected. The cable trestle shall have a minimum 600mm clear walk way and shall have maintenance platforms as required. The bottom of the steel supporting structure shall be generally at 3.0M above the grade level except for rail/road crossings where it shall be at 8.0M above grade level. Tap offs from the overhead cable trestle can be through shallow trenches with prior approval of the Employer. Directly buried cable, if essential, shall not have concentration of more than 4 cables on one route.</p> <p>b) Cable trenches shall be provided only in Switchgear/MCC rooms.</p> <p>c) Cables shall not be routed through the conveyor galleries except for the equipment located in the conveyor galleries for a particular conveyor i.e. protection switches, receptacles etc.</p> <p>d) Cables for PCS and BSS shall be routed along the conveyors through GI conduits.</p>	
3.03.00	Pipes, Fittings & Accessories	
3.03.01	Pipes offered shall be complete with fittings and accessories (like tees, elbows, bends, check nuts, bushings, reducers, enlargers, coupling caps, nipples etc.) The size of the pipe shall be selected on the basis of maximum 40% fill criteria	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 4 of 21

CLAUSE NO.	TECHNICAL REQUIREMENTS	
<p>3.03.02</p> <p>3.03.03</p> <p>3.03.04</p> <p>3.03.05</p> <p>3.03.06</p> <p>3.04.00</p> <p>3.04.01</p> <p>3.04.02</p> <p>3.05.00</p> <p>3.05.01</p>	<p>GI Pipes shall be of medium duty as per IS: 1239</p> <p>Duct banks shall be High Density PE pipes encased in PCC (10% spare of each size, subject to minimum one) with suitable water-proof manholes.</p> <p>Hume pipes shall be NP3 type as per IS 458.</p> <p>TERNE Coated Flexible Steel Conduits shall be water proof and rust proof made of heat resistant lead coated steel. Conduit diameter shall be uniform throughout its length. Internal surface of the conduit shall be free from burrs and sharp edges. Conduits shall be complete with necessary accessories for proper termination of the conduit with junction boxes and lighting fixtures</p> <p>HDPE pipes and conduits shall be PE-80, PN-10 type as per IS 4984/IS 8008 part-I.</p> <p>Junction Boxes</p> <p>Junction box shall be made of Fire retardant material. Material of JB shall be Thermoplastic or thermosetting or FRP type. The box shall be provided with the terminal blocks, mounting bracket and screws etc. The cable entry shall be through galvanized steel conduits of suitable diameter. The JB shall have suitable for installing glands of suitable size on the bottom of the box. The JB shall be suitable for surface mounting on ceiling/structures. The JB shall be of grey color RAL 7035. All the metal parts shall be corrosion protected. Junction box surface should be such that it is free from crazings, blisterings, wrinkling, colour blots/striations. There should not be any mending or repair of surface. JB's will be provided with captive screws so that screws don't fall off when cover is opened. JB's mounting brackets should be of powder coated MS. Type test reports for the following tests shall be furnished:-</p> <p>(a) Impact resistance for impact energy of 2 Joules (IK07) as per BS EN50102</p> <p>(b) Thermal ageing at 70deg C for 96 hours as per IEC60068-2-2Bb.</p> <p>(c) Class of protection shall be IP 55.</p> <p>(d) HV test.</p> <p>Terminal blocks shall be 1100V grade, of suitable current rating, made up of unbreakable polyamide 6.6 grade. The terminals shall be screw type or screw-less (spring loaded) / cage clamp type with lugs. Marking on terminal strips shall correspond to the terminal numbering in wiring diagrams. All metal parts shall be of non-ferrous material. In case of screw type terminals the screw shall be captive, preferably with screw locking design. All terminal blocks shall be suitable for terminating on each side the required cables/wire size. All internal wiring shall be of cu. Conductor PVC wire.</p> <p>Terminations & Straight Through Joints</p> <p>Termination and jointing kits for 33kV, 11 kV, 6.6 KV and 3.3 kV grade XLPE insulated cables shall be of proven design and make which have already been extensively used and type tested. Termination kits and jointing kits shall be Pre-moulded type or heat shrinkable type. Further Cold shrinkable type termination and jointing kits are also acceptable. The Cold shrinkable type kits shall be type tested as per relevant standards. Calculation to withstand the required fault level shall also be furnished in case of cold shrinkable type kits. 33 kV, 11 kV, 6.6 KV and 3.3kV grade joints and terminations shall be type tested and Type test reports as per IS:13573 Part-II and IEC60502 shall be furnished. Also, heat shrink material shall comply with requirements of ESI 09-13 (external tests). Critical components used in cable accessories shall be of tested and proven quality as per relevant product specification/ESI specification. Cable joints and terminations should be with FRLS properties as per IEC 60754-1&2. Kit contents shall be supplied from the same source as were used for type testing. The kit shall be complete with the tinned copper solderless</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 5 of 21

CLAUSE NO.	TECHNICAL REQUIREMENTS	
<p>3.05.02</p> <p>3.05.03</p> <p>3.06.00</p> <p>3.06.01</p> <p>3.07.00</p> <p>3.07.01</p> <p>3.08.00</p> <p>3.08.01</p> <p>3.09.00</p> <p>3.09.01</p>	<p>crimping type cable lugs & ferrule or mechanical connectors (wherein bolts are tightened that shear off at an appropriate torque) as per DIN standard suitable for aluminium compacted conductor cables.</p> <p>Straight through joint and termination shall be capable of withstanding the fault level of 21 KA for 0.12 Sec. with dynamic peak of 52 KA for 33 KV system & of 40 kA for 0.12 sec with a dynamic peak of 100 kA for 11 kV, 6.6 KV & 3.3 KV system. Straight through joints shall have provisions for shield connection and earthing wherever required and complete with all accessories and consumables suitable for storage without deterioration at a temperature of 50 deg. C with shelf life of more than five years. 1.1 kV grade straight through joints shall also be of proven design</p> <p>1.1 KV grade Straight Through Joint shall be of proven design.</p> <p>Cable glands Cable shall be terminated using double compression type cable glands. Testing requirements of Cable glands shall conform to BS:6121 and gland shall be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected.</p> <p>Cable lugs/ferrules Cable lugs/ferrules shall be solderless crimping type suitable for power and control cables as per the DIN 46239. Aluminium solderless crimping lugs/ ferrules shall be used for Aluminium cables and Copper lugs/ferrules shall be used for Copper cables. Bimetallic washers or bimetallic type lugs shall be used for bimetallic connections.</p> <p>Crimping tool for crimping (from 1.5sqmm cable to 630sqmm cables) above mentioned lugs shall be of Hexagonal Type crimp profile, with suitable die of crimp match code. Characteristics of crimping tool:</p> <ol style="list-style-type: none"> 1) To should generate enough pressure to pass pull out test as per IEC 61238-1. Relevant type test to be produced for the sizes specified in the tender. 2) Tool die shall be replaceable for assorted sizes and crimp code to be mentioned on both part the die. 3) Tool should be compliant of testing according to IEC, UL and GS standards. <p>Tool shall have features such as:</p> <ul style="list-style-type: none"> • Auto retraction system • Manual retraction stop. • Feedback signals for improper pressure • Better battery capacity and with status display • Flexible and rotating head for easy crimping. <p>Trefoil clamps Trefoil clamps for single core cables shall be pressure die cast aluminum or fibre glass or nylon and shall include necessary fixing accessories like G.I. nuts, bolts, washers, etc. Trefoil clamps shall have adequate mechanical strength, when installed at 1 mtr intervals, to withstand the forces generated by the peak value of maximum system short circuit current.</p> <p>Cable Clamps & Ties The cable clamps/ties required to clamp multicore cables shall be of SS-316 material, 12mm wide, polyster coated ladder lock type. The clamps/ties shall have self locking arrangement</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 6 of 21

CLAUSE NO.	TECHNICAL REQUIREMENTS	
	<p>& shall have sufficient strength. The cable clamps/ties shall be supplied in finished individual pieces of suitable length to meet the site requirements.</p>	
3.10.00	Receptacles	
3.10.01	<p>Receptacles boxes shall be fabricated out of MS sheet of 2mm thickness and hot dipped gavanised or of die-cast aluminium alloy of thickness not less than 2.5 mm. The boxes shall be provided with two nos. earthing terminals, gasket to achieve IP55 degree of protection, terminal blocks for loop-in loop-out for cable of specified sizes, mounting brackets suitable for surface mounting on wall/column/structure, gland plate etc. The ON-OFF switch shall be rotary type heavy duty, double break, AC23 category, suitable for AC supply. Plug and Socket shall be shrouded Die-cast aluminium. Socket shall be provided with lid safety cover. Robust mechanical interlock shall be provided such that the switch can be put ON only when the plug is fully engaged and plug can be withdrawn only when the switch is in OFF position. Also cover can be opened only when the switch is in OFF position. Wiring shall be carried out with 1100 V grade PVC insulated stranded aluminium/copper wire of adequate size. The Terminal blocks shall be of 1100 V grade. The Terminal blocks shall be of 1100 V grade made up of unbreakable polyimide 6.6 grade with adequate current rating and size. The welding receptacles shall be provided with RCCB/RCD of 30mA sensitivity having facility for manual testing/checking of operation of RCCB/RCD. Location and Minimum no of RC type receptacle TG and SG area shall be provided as per Annex-I attached.</p>	
3.11.00	<p>Cable Drum Lifting Jack</p> <p>The jack for cable drum lifting shall be of screw type with 10 ton capacity. The cable drum jacks shall be manufactured from fabricated steel. The spindles supplied with the cable drum jack shall be manufactured using BSEN-24 grade steel bar with locking collars. Jack nests shall be of SG cast steel. Cable drum jack supplied shall have undergone load testing and reports for the same shall be submitted. At least Two Nos. of jacks shall be supplied for NTPC use. Contractor has to make arrangements for his own jacks for cable reeling/unreeling under his scope of installation.</p>	
3.12.00	Galvanising	
3.12.01	<p>Galvanising of steel components and accessories shall conform to IS:2629 , IS4759 & IS:2633. Additionally galvanising shall be uniform, clean smooth, continuous and free from acid spots.</p>	
3.12.02	<p>The amount of zinc deposit over threaded portion of bolts, nuts, screws and washers shall be as per IS:1367 . The removal of extra zinc on threaded portion of components shall be carefully done to ensure that the threads shall have the required zinc coating on them as specified</p>	
3.13.00	Welding	
3.13.01	<p>The welding shall be carried out in accordance with IS:9595. All welding procedures and welders qualification shall also be followed strictly in line with IS:9595</p>	
4.00.00	INSTALLATION	
4.01.00	Cable tray and Support System Installation	
4.01.01	<p>Cables shall run in cable trays mounted horizontally or vertically on cable tray support system which in turn shall be supported from floor, ceiling, overhead structures, trestles, pipe racks, trenches or other building structures.</p>	
4.01.02	<p>Horizontally running cable trays shall be clamped by bolting to cantilever arms and vertically running cable trays shall be bolted to main support channel by suitable bracket/clamps on both top and bottom side rails at an interval of 2000 mm in general. For vertical cable risers/shafts cable trays shall be supported at an interval of 1000mm in general. Fixing of cable trays to cantilever arms or main support channel by welding shall not be accepted.</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 7 of 21

23/PS-PEM-MAX			
CLAUSE NO.	TECHNICAL REQUIREMENTS		
	Cable tray installation shall generally be carried out as per the approved guidelines/ drawings. Vendor shall design the support system along with tray, spacing etc in line with tray loadings/drawings.		
4.01.03	The cantilever arms shall be positioned on the main support channel with a minimum vertical spacing of 300 mm unless otherwise indicated.		
4.01.04	The contractor shall fix the brackets/ clamps/ insert plates using anchor fasteners. Minimum size of anchor fasteners shall be M 8 X 50 and material shall be stainless steel grade 316 or better. Anchor fastener shall be fixed as recommended by manufacturer and as approved by site engineer. For brick wall suitable anchor fasteners shall be used as per the recommendations of manufacturer. Make of anchor fasteners subject to QA approval and the same shall be finalized at pre-award stage.		
4.01.05	All cable way sections shall have identification, designations as per cable way layout drawings and painted/stenciled at each end of cable way and where there is a branch connection to another cable way. Minimum height of letter shall be not less than 75 mm. For long lengths of trays, the identification shall be painted at every 10 meter. Risers shall additionally be painted/stenciled with identification numbers at every floor.		
4.01.06	In certain cases it may be necessary to site fabricate portions of trays, supports and other non standard bends where the normal prefabricated trays, supports and accessories may not be suitable. Fabricated sections of trays, supports and accessories to make the installation complete at site shall be neat in appearance and shall match with the prefabricated sections in the dimensions. They shall be applied with one coat of red lead primer, one coat of oil primer followed by two finishing coats of aluminium paint.		
4.01.07	In fire prone areas, like Boiler, TG, fuel oil area and any other strategic location etc, fire retardant paint to be applied after installation cables.		
4.02.00	Conduits/Pipes/Ducts Installation		
4.02.01	The Contractor shall ensure for properly embedding conduit pipe sleeves wherever necessary for cabling work. All openings in the floor/roof/wall / cable tunnel/cable trenches made for conduit installation shall be sealed and made water proof by the Contractor.		
4.02.02	GI pull wire of adequate size shall be laid in all conduits before installation. Metallic conduit runs at termination shall have two lock nuts wherever required for junction boxes etc.		
4.02.03	Conduit runs/sleeves shall be provided with PVC bushings having round edge at each end. All conduits/pipes shall have their ends closed by caps until cables are pulled. After cables are pulled, the ends of conduits/pipes shall be sealed with Glass wool/Cement Mortar/Putty to prevent entrance of moisture and foreign material		
4.02.04	Exposed conduit/pipe shall be adequately supported by racks, clamps, straps or by other approved means. Conduits /pipe support shall be installed square and true to line and grade with an average spacing between the supports as given below, unless specified otherwise		
	Conduit /pipe size (dia).	Spacing	
	Upto 40 mm	1 M	
	50 mm	2.0 M	
	65-85 mm	2.5 M	
	100 mm and above	3.0 M	
4.02.05	For bending of conduits, bending machine shall be arranged at site by the contractor to facilitate cold bending. The bends formed shall be smooth.		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 8 of 21

CLAUSE NO.	TECHNICAL REQUIREMENTS	
<p>4.03.00</p> <p>4.03.01</p> <p>4.04.00</p> <p>4.04.01</p> <p>4.04.02</p> <p>4.04.03</p> <p>4.04.04</p> <p>4.04.05</p> <p>4.04.06</p> <p>4.04.07</p>	<p>Junction Boxes Installation</p> <p>Junction boxes shall be mounted at a height of 1200mm above floor level or as specified in the drawings and shall be adequately supported/mounted on masonry wall by means of anchor fasteners/ expandable bolts or shall be mounted on an angle, plate or other structural supports fixed to floor, wall, ceiling or equipment foundations.</p> <p>Cable Installation</p> <p>Cable installation shall be carried out as per IS:1255 and other applicable standards.</p> <p>For Cable unloading, pulling etc following guidelines shall be followed in general:</p> <p>a) Cable drums shall be unloaded, handled and stored in an approved manner on hard and well drained surface so that they may not sink. In no case shall be drum be stored flat i.e. with flange horizontal. Rolling of drums shall be avoided as far as possible. For short distances, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum. In absence of any indication, the drums may be rolled in the same direction as it was rolled during taking up the cables. For unreeling the cable, the drum shall be mounted on suitable jacks or on cable wheels and shall be rolled slowly so that cable comes out over the drum and not from below. All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends. Cable ends shall be provided with sealed plastic caps to prevent damage and ingress of moisture.</p> <p>b) While laying cable, ground rollers shall be used at every 2 meter interval to avoid cable touching ground. The cables shall be pushed over the rollers by a gang of people positioned in between the rollers. Cables shall not be pulled from the end without having intermediate pushing arrangements. Pulling tension shall not exceed the values recommended by cable manufacturer. Selection of cable drums for each run shall be so planned so as to avoid using straight through joints. Care should be taken while laying the cables so as to avoid damage to cables. If any particular cable is damaged, the same shall be repaired or changed to the satisfaction of Project Manager.</p> <p>Cables shall be laid on cable trays strictly in line with cable schedule</p> <p>Power and control cables shall be laid on separate tiers inline with the approved guidelines/drawings. The laying of different voltage grade cables shall be on different tiers according to the voltage grade of the cables. In horizontal tray stacks, H.T. cables shall be laid on top most tier and cables of subsequent lower voltage grades on lower tiers of trays. Single core cable in trefoil formation shall be laid with a distance of four times the diameter of cable between trefoil center lines and clamped at every one metre. All multicore cables shall be laid in touching formation. Power and control cables shall be secured fixed to trays/support with cable clamps/ties with self locking arrangement. For horizontal trays arrangements, multicore power cables and control cables shall be secured at every five meter interval. For vertical tray arrangement, individual multicore power cables and control cables shall be secured at every one meter. After completion of cable laying work in the particular vertical tray, all the control cables shall be binded to trays/supports by cable clamps/ties with self locking arrangement at every five meter interval and at every bend. Fibre Optical cable shall be laid in trenches/trays or as decided by Employer.</p> <p>Bending radii for cables shall be as per manufacturer's recommendations and IS:1255.</p> <p>Where cables cross roads/rail tracks, the cables shall be laid in hume pipe/ HDPE pipe.</p> <p>No joints shall be allowed in trip circuits, protection circuits and CT/PT circuits. Also joints in critical equipment in main plant area shall not be permitted. Vendor shall identify and accordingly procure the cable drum length.</p>	
<p>TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2</p>	<p>SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION</p> <p>Page 9 of 21</p>

023/PS-PEM-MAX													
CLAUSE NO.	TECHNICAL REQUIREMENTS												
4.04.08	In each cable run some extra length shall be kept at suitable point to enable one LT/two HT straight through joints to made, should the cable develop fault at a later stage. Control cable termination inside equipment enclosure shall have sufficient lengths so that shifting of termination in terminal blocks can be done without requiring any splicing.												
4.04.09	Wherever few cables are branching out from main trunk route troughs shall be used.												
4.04.10	Wind loading shall be considered for designing support as well Cable trays wherever required.												
4.04.11	Where there is a considerable risk of steam, hot oil or mechanical damage cable routes shall be protected by barriers or enclosures.												
4.04.12	The installation work shall be carried out in a neat workman like manner & areas of work shall be cleaned of all scraps, water, etc. after the completion of work in each area every day. Contractor shall replace RCC/Steel trench covers after the Installation work in that particular area is completed or when further work is not likely to be taken up for some time.												
4.04.13	Separation At least 300mm clearance shall be provided between: - HT power & LT power cables, - LT power & LT control/instrumentation cables,												
4.04.14	Segregation 1) Segregation means physical isolation to prevent fire jumping. 2) All cables associated with the unit shall be segregated from cables of other units. 3) Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire. Power and control cables for AC drives and corresponding emergency AC or DC drives shall be laid in segregated routes. Cable routes for one set of auxiliaries of same unit shall be segregated from the other set. 4) In switchyard, control cables of each bay shall be laid on separate racks/trays.												
4.04.15	Minimum number of spare cores required to be left for interconnection in control cables shall be as follows: Minimum number of spare cores required to be left for interconnection in control cables shall be as follows: <table><tr><td>No. of cores in cable</td><td>No. of spare cores</td></tr><tr><td>2C,3C</td><td>NIL</td></tr><tr><td>5C</td><td>1</td></tr><tr><td>7C-10C</td><td>2</td></tr><tr><td>14C and above</td><td>3</td></tr></table>			No. of cores in cable	No. of spare cores	2C,3C	NIL	5C	1	7C-10C	2	14C and above	3
No. of cores in cable	No. of spare cores												
2C,3C	NIL												
5C	1												
7C-10C	2												
14C and above	3												
4.04.16	Directly Buried Cables a) Cable trenches shall be constructed for directly buried cables. Construction of cable trench for cables shall include excavation, preparation of sieved sand bedding, riddled soil cover, supply and installation of brick or concrete protective covers, back filling and compacting, supply and installation of route markers and joint markers. Laying of cables and providing protective covering shall be as per IS:1255 and the enclosed drawings showing cabling details. b) RCC cable route and RCC joint markers shall be provided wherever required. The voltage grade of the higher voltage cables in route shall be engraved on the marker. Location of underground cable joints shall be indicated with cable marker with an additional inscription "Cable Joint". The marker shall project 150 mm above ground												
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION										
			Page 10 of 21										

CLAUSE NO.	TECHNICAL REQUIREMENTS	
	<p>and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road crossings and drain crossings. Top of cable marker/joint marker shall be sloped to avoid accumulation of water/dust on marker.</p> <p>4.04.17 Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry, and at every 20 meters in cable tray/trench runs. Cable tags shall also be provided inside the switchgear, motor control centers, control and relay panels etc. where a number of cables enter together through a gland plate. Cable tag shall be of rectangular shape for power cables and control cables. Cable tag shall be of 2 mm thick aluminum with number punched on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280. Alternatively, the Contractor may also provide cable tags made of nylon, cable marking ties with cable number heat stamped on the cable tags. The cable tag requirements mentioned above shall prevail over Tag requirements mentioned elsewhere in this document for HT power, LT power & control cables.</p> <p>4.04.18 While crossing the floors, unarmoured cables shall be protected in conduits upto a height of 500 mm from floor level if not laid in tray.</p> <p>4.05.00 Cable Terminations & Connections</p> <p>4.05.01 The termination and connection of cables shall be done strictly in accordance with cable termination kit manufacturer" instructions, drawings and/or as directed by Project Manager. Cable jointer shall be qualified to carryout satisfactory cable jointing/termination. Contractor shall furnish for review documentary evidence/experience reports of the jointers to be deployed at site.</p> <p>4.05.02 Work shall include all clamps, fittings etc. and clamping, fitting, fixing, plumbing, soldering, drilling, cutting, taping, preparation of cable end, crimping of lug, insulated sleeving over control cable lugs, heat shrinking (where applicable), connecting to cable terminal, shorting and grounding as required to complete the job to the satisfaction of the Project Manager.</p> <p>4.05.03 The equipment will be generally provided with undrilled gland plates for cables/conduit entry. The Contractor shall be responsible for punching of gland plates, painting and touching up. Holes shall not be made by gas cutting. The holes shall be true in shape. All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively sealed by 2mm thick aluminium sheets.</p> <p>4.05.04 Control cable cores entering control panel/switchgear/MCC/miscellaneous panels shall be neatly bunched, clamped and tied with self locking type nylon cable ties with de interlocking facility to keep them in position.</p> <p>4.05.05 All the cores of the control cable to be terminated shall have identification by providing ferrules at either end of the core, each ferrule shall be indelible, printed single tube ferrule and shall include the complete wire number and TB number as per the drawings. The ferrule shall fit tightly on the core. Spare cores shall have similar ferrules with suffix sp1, sp2, ---etc along with cable numbers and coiled up after end sealing.</p> <p>4.05.06 All cable terminations shall be appropriately tightened to ensure secure and reliable connections.</p> <p>5.00.00 EARTHING SYSTEM</p> <p>5.01.00 Earthing system shall be in strict accordance with IS:3043 and Indian Electricity Rules/Acts</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 11 of 21

023/PS-PEM-MAX		TECHNICAL REQUIREMENTS		
CLAUSE NO.				
	<p>The earthing system shall be designed for a life expectancy of at least forty (40) years, for a system fault current of 63 kA for 1.0 sec. The minimum rate of corrosion of steel for selection of earthing conductor shall be 0.12mm per year.</p> <p>Earthing system network/earthmat shall be interconnected mesh of mild steel rods buried in ground in the plant. All areas under contractor scope of supply shall be interconnected together by minimum two parallel conductors. The Contractor shall furnish the detailed design and calculations for Employer's approval. Contractor shall obtain all necessary statutory approvals for the system. All the columns shall be earthed by nearby risers and earthmat grid spacing shall be maximum 10 mts. Minimum two nos of risers shall be provided for each equipment in SG area. Separate dedicated riser shall be provided for C&I earthing purpose and also for Lightning down conductor connection purpose. Sufficient nos of risers near the equipment shall be provided as per the system requirement. Ring type earthing around the offsite building shall be provided with interconnection of with main grid at minimum two points.</p>			
5.02.00	The earth conductors shall be free from pitting, laminations, rust, scale and other electrical, mechanical defects			
5.03.00	The material of the earthing conductors shall be as follows:			
	1)	Conductors above ground level and in built up trenches.	-	Galvanized steel
	2)	Conductors buried in earth	-	Mild steel
	3)	Earth electrodes	-	Mild steel rod
5.04.00	The sizes of earthing conductors for various electrical equipments shall be as below:			
	Equipment	Earth conductor buried in earth	Earth conductor above ground level & in built-up trenches	
	a)	Main earth grid	Min 40 mm dia. MS rod or as per actual calculation whichever is more	65 x 8mm GS flat
	b)	33kV/11kV/6.6kV/3.3 kV/ switchgear equipment and 415V switchgear	---	65 x 8mm GS flat
	c)	415 V MCC/ Distribution boards / Transformers	---	50 x 6mm GS flat
	d)	LT Motors above 125 KW	---	50 x 6mm GS flat
		25 KW to 125 KW	---	25 x 6mm GS flat
		1KW to 25 KW	---	25 x 3mm GS flat
		Fractional House power motor	---	8 SWG GS wire
	e)	Control panel & control desk	---	25 x 3 mm GS flat
	f)	Push button station / Junction Box	---	8 SWG GI wire
	g)	Columns, structures, cable trays and bus ducts enclosures	---	50 x 6mm GS flat
	h)	Crane, rails, rail tracks & other non-current carrying metal parts		25 x 6mm GS flat
5.05.00	Metallic frame of all electrical equipment shall be earthed by two separate and distinct connections to earthing system, each of 100% capacity, Crane rails, tracks, metal pipes and conduits shall also be effectively earthed at two points. Steel RCC columns, metallic stairs,			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2		SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 12 of 21

CLAUSE NO.	TECHNICAL REQUIREMENTS	
	<p>and rails etc. of the building housing electrical equipment shall be connected to the nearby earthing grid conductor by one earthing ensured by bonding the different sections of hand rails and metallic stairs. Metallic sheaths/screens, and armour of multi-core cables shall be earthed at both ends. Metallic Sheaths and armour of single core cables shall be earthed at switchgear end only unless otherwise approved. Every alternate post of the switchyard fence shall be connected to earthing grid by one GS flat and gates by flexible lead to the earthed post. Railway tracks within the plant area shall be bonded across fish plates and connected to earthing grid at several locations. Portable tools, appliances and welding equipment shall be earthed by flexible insulated cable.</p> <p>5.06.00 Each continuous laid lengths of cable tray shall be earthed at minimum two places by G.S. flats to earthing system, the distance between earthing points shall not exceed 30 meter. Wherever earth mat is not available, necessary connections shall be done by driving an earth electrode in the ground</p> <p>5.07.00 Neutral points of HT transformer shall be earthed through NG resistors. The Contractor shall connect the NGR earthing point to earth electrodes by suitable earth conductors.</p> <p>5.08.00 Neutral connections and metallic conduits/pipes shall not be used for the equipment earthing. Lightning protection system down conductors shall not be connected to other earthing conductors above the ground level.</p> <p>5.09.00 Connections between earth leads and equipment shall normally be of bolted type. Contact surfaces shall be thoroughly cleaned before connections. Equipment bolted connections after being tested and checked shall be painted with anti corrosive paint/compound.</p> <p>5.10.00 Suitable earth risers as approved shall be provided above finished floor/ground level, if the equipment is not available at the time of laying of main earth conductor.</p> <p>5.11.00 Connections between equipment earthing leads and between main earthing conductors shall be of welded type. For rust protection the welds should be treated with red lead compound and afterwards thickly coated with bitumen compound. All welded connections shall be made by electric arc welding.</p> <p>5.12.00 Resistance of the joint shall not be more than the resistance of the equivalent length of conductors.</p> <p>5.13.00 Earthing conductors buried in ground shall be laid minimum 600 mm below grade level unless otherwise indicated in the drawing. Back filling material to be placed over buried conductors shall be free from stones and harmful mixtures. Back filling shall be placed in layers of 150 mm.</p> <p>5.14.00 Earthing conductors embedded in the concrete floor of the building shall have approximately 50 mm concrete cover.</p> <p>5.15.00 A minimum earth coverage of 300 mm shall be provided between earth conductor and the bottom of trench/foundation/underground pipes at crossings. Earthing conductors crossings the road can be installed in pipes. Wherever earthing conductor crosses or runs at less than 300 mm distance along metallic structures such as gas, water, steam pipe lines, steel reinforcement in concrete, it shall be bonded to the same.</p> <p>5.16.00 Earthing conductors along their run on columns, walls, etc. shall be supported by suitable welding / cleating at interval of 1000mm and 750mm respectively.</p> <p>5.17.00 Earth pit shall be of treated type & shall be constructed as per IS:3043. Electrodes shall be embedded below permanent moisture level. Minimum spacing between electrodes shall be 600mm. Earth pits shall be treated with salt and charcoal as per IS:3043. Test links shall be</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 13 of 21

023/PS-PEM-MAX		TECHNICAL REQUIREMENTS		
CLAUSE NO.				
	provided with bolted arrangement alongwith each earth pit, in order to facilitate measurement of earth resistance as & when required.			
5.18.00	On completion of installation continuity of earth conductors and efficiency of all bonds and joints shall be checked. Earth resistance at earth terminations shall be measured and recorded. All equipment required for testing shall be furnished by contractor.			
5.19.00	Earthing conductor shall be buried at least 2000mm outside the fence of electrical installations. Every alternate post of the fences and all gates shall be connected to earthing grid by one lead.			
5.20.00	Other Requirements of Earthing System:			
	Standard/Code	IEEE 80, IS 3043		
	Earthing System			
	Life expectancy	40 Years		
	System Fault Level	System Fault Level 63 KA for 1 sec		
	Soil resistivity	Actual as per site conditions.		
	Min. Steel corrosion	0.12mm/year		
	Depth of burial of main earth conductor	600mm below grade level; where it crosses trenches, pipes, ducts, tunnels, rail tracks, etc., it shall be at least 300mm below them.		
	Conductor joints	By electric arc welding, with resistance of joint not more than that of the conductor.		
	Welds to be treated with red lead for rust protection and then coated with bitumen compound for corrosion protection.			
	Surface resistivity	- Gravel 3000 ohm-meter - Concrete 500 ohm-meter		
6.00.00	LIGHTNING PROTECTION SYSTEM			
6.01.01	Lightning protection system shall be in strict accordance with IEC : 62305 and latest IS standards.			
6.01.02	Lightning conductor shall be of 25x6mm GS strip when used above ground level and shall be connected through test link with earth electrode/earthing system			
6.01.03	Lightning system shall comprise of air terminations, down conductors, test links, earth electrode etc. as per approved drawings.			
6.02.00	Down Conductors			
	1. Down conductors shall be as short and straight as practicable and shall follow a direct path to earth electrode.			
	2. Each down conductor shall be provided with a test link at 1000 mm above ground level for testing but it shall be in accessible to interference. No connections other than the one direct to an earth electrode shall be made below a test point.			
	3. All joints in the down conductors shall be welded type.			
	4. Down conductors shall be cleated on outer side of building wall, at 750 mm interval or welded to outside building columns at 1000 mm interval.			
	5. Lightning conductor on roof shall not be directly cleated on surface of roof. Supporting blocks of PCC/insulating compound shall be used for conductor fixing at an interval of 1500 mm.			
	6. All metallic structures within a vicinity of two meters of the conductors shall be bonded to conductors of lightning protection system.			
	7. Lightning conductors shall not pass through or run inside GI Conduits.			
	8. Testing link shall be made of galvanized steel of size 25x 6mm.			
	9. Pulser system for lightning shall not be accepted.			
	10. Hazardous areas handling inflammable/explosive materials and associated storage areas shall be protected by a system of aerial earths.			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION	Page 14 of 21

CLAUSE NO.	TECHNICAL REQUIREMENTS	
<p>7.00.00</p> <p>7.02.00</p> <p>7.02.01</p>	<p>TESTS</p> <p>Type Test reports shall be furnished for the following</p> <p>Type tests on Cable Trays support system</p> <p>a) Test 1A:</p> <p>On main support channel type-C2 for cantilever arms fixed on one side only. A 3.5 meter length of main support channel shall be fixed vertically at each end to a rigid structure as per the fixing arrangement as shown in the enclosed drawing. Eight (8) nos. 750 mm cantilever arms shall be fixed to the main channel and each arm shall be loaded over the outboard 600 mm with a uniform working load of 100 kg. Subsequently a point load of 100 kg shall be applied on arm 2. A uniform proof load on all the arms equal to twice the working load shall be then be applied. Deflections shall be measured at the points shown in the enclosed drawings and at the following load intervals:</p> <ul style="list-style-type: none"> i) Working load ii) Working load + point load iii) Off load iv) Proof load + point load v) Off load <p>The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied.</p> <p>B) Test 1B:</p> <p>Test 1A shall be repeated with Eight Cantilever arms uniformly loaded and with the same point load on arm 2</p> <p>Test 2: On Main support channel type -C2 for cantilever arms fixed on both sides</p> <p>a) Test 2A: A 3.5 m length of main support channel C2 for cantilever arms fixing on both sides shall be fixed at each end to rigid structure as per the fixing arrangement as shown in the enclosed drawing. Six (6), 750 mm cantilever arms shall be attached to each sides and each arm uniformly loaded to a working load of 100 kg over the out board 600 mm. A point load of 100 kg shall than be applied to arm 2, followed by a uniform proof load of twice the working load on all the arms; deflection shall be measured at points shown in the enclosed drawings at the following load intervals.</p> <ul style="list-style-type: none"> i) Working load ii) Working load + Point load iii) Off load iv) Proof load + Point load v) Off load <p>The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied</p> <p>b) Test 2 B: The test 2 A shall be repeated with the assembly but with an asymmetrical load on the C2 column and point load applied to arm 8. The 100 kg and 200 kg uniformly distributed loads shall be applied to the upper three arms on one side and the lower three arms on the opposite side.</p> <p>Test 3 : Tests on Channel Fixed on Beam/Floor</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 15 of 21

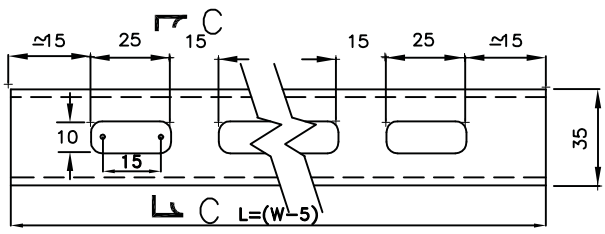
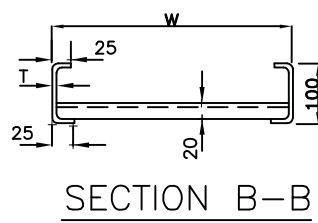
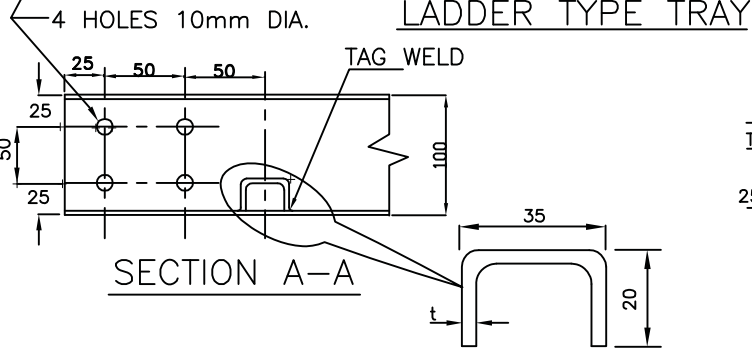
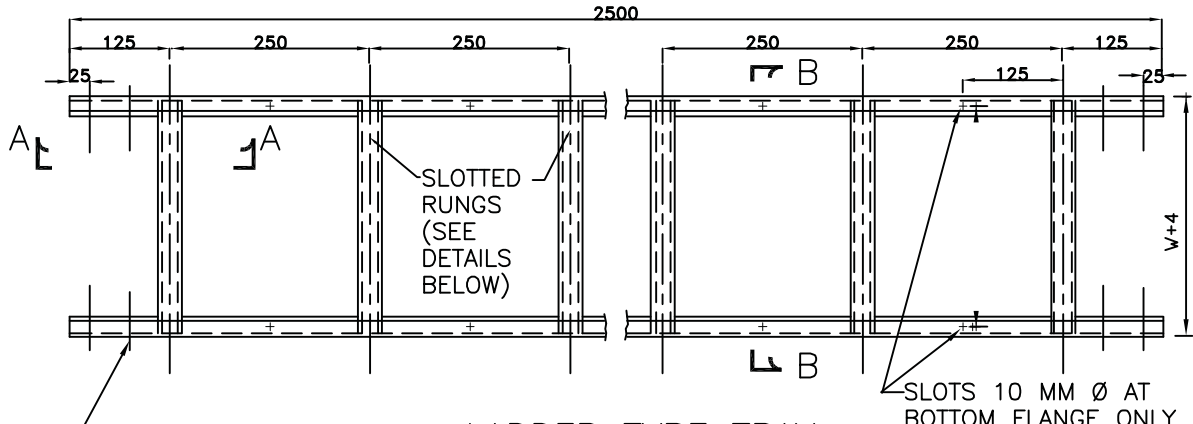
CLAUSE NO.	TECHNICAL REQUIREMENTS	
	<p>A length of main support channel section shall be fixed to steel structure/floor and have loads applied as shown in the drawing enclosed and as detailed below</p> <p>a) Test 3A : A length of steel structure shall be rigidly supported. It should be fitted on a meter length of channel section using beam clamps welded/bolted. A point load of 1200 kg shall be applied to the centre point via two brackets. No distortion or pulling of the components shall take place.</p> <p>b) Test 3B: With the components assembled as in Test 3A, two perpendicular point loads of 600 kg shall be simultaneously applied at positions 150 mm either side of the centre line, no distortion or pulling of the components shall take place.</p> <p>c) Test 3C: With the components assembled as in Test 3A, a perpendicular point load shall be applied at a point 150 mm on one side of the centre line.</p> <p>The load shall be gradually increased to the maximum value that can be applied without causing distortion or pulling of the components. This value shall be recorded.</p> <p>Test 4 : Channel Insert Test</p> <p>A 2.5 m length of C1 channel fixed to the concrete wall/ steel structure as per actual site installation conditions. 6 nos. of 750 mm cantilever arms shall be attached to C1 channel as shown in enclosed drawing. Each arm uniformly loaded to a working load of 100 kg over the out board 600 mm. A point load of 100 kg shall then be applied to arm 2, followed by a uniform proof load of twice the working load on all the arms; deflection shall be measured at points shown in the enclosed drawings at the following load intervals.</p> <ul style="list-style-type: none"> i) Working Load ii) Working Load + Point Load iii) Off Load iv) Proof Load + Point Load v) Off load <p>The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied</p> <p>Test 5 : Channel nut slip characteristics (what ever applicable)</p> <p>Tests 5A1,5A2,5A3 : A length of channel C1 section 200mm long shall have fitted bracket with the two bolt fixing as shown in drawing enclosed. With loads applied at the position shown in drawing enclosed nut slip shall be determined with bolt torque of 30NM, 50 NM and 65 NM No fewer than three measurements shall be made for each torque setting.</p> <p>A minimum loading of 720 kg shall be obtained before nut slip with bolt torque of 65 NM.</p> <p>Tests 5B1,5B2,5B3: The length of channel C1 section 200 mm long shall have fitted bracket with the one bolt fixing as shown in drawing enclosed. With loads applied at the position shown in drawing, nut slip shall be determined with bolt torques of 30 NM, 50 NM and 65 NM. No fewer than three measurements shall be made for each torque setting.</p>	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 16 of 21

CLAUSE NO.	TECHNICAL REQUIREMENTS	
	<p>A minimum loading of 350 kg shall be obtained before nut slip with a bolt torque of 65 NM.</p> <p>Test 6 Weld Integrity Test</p> <p>After deflection test as per test 1A, 1B, 2, 3 & 4 weld integrity shall be checked by magnetic particle inspection to detect sub-surface cracks developed, if any.</p> <p>7.02.02 Cable termination kit and straight through joints should have been tested as per IS:13573 for 3.3kV grade & above.</p> <p>7.03.00 Routine/ Acceptance Tests</p> <p>7.03.01 Routine Tests</p> <ul style="list-style-type: none"> a) Routine tests as per specification and applicable standards shall be carried out on all requirements/items covered in the specification. b) Physical & dimensional check on all equipments as per approved drawings/standards c) HV/IR as applicable. d) Check/measurement of thickness of paint/zinc coating/nickel-chrome plating as per specification & applicable standard. <p>7.03.02 Acceptance Test</p> <ul style="list-style-type: none"> a) Galvanising Tests as per applicable standards b) Welding checks c) Deflection tests on cable trays: One piece each of 2.5m length of cable tray of 300mm & above shall be taken as sample from each offered lot. It shall be supported at both end & loaded with uniform load of 76 kg/meter along the length of cable tray. The maximum deflection at the mid-span of each size shall not exceed 7mm. d) Proof load tests on cable tray support system i) Tests on Main Support Channel shall be done if only C1 Channel are in scope of supply and cantilever arms shall be fitted on one side. This test shall be same as test 4 of type test. ii) Test on Main Support Channel shall be done with C2 channel and cantilever arms fitted on both sides, if C2 channels are in scope of supply. This test shall be same as test 2A of type test. Then test (i) above shall not be done. iii) Nut slip characteristic test (it shall support minimum load of 350kg before nut slips with a bolt torque of 65 NM). This test shall be same as test 5B3 of type test. The procedure for carrying out tests at "d" above shall be as per details given in Type Tests in specification thereafter Die-Penetration test shall be carried out to check weld integrity. e) The above acceptance tests shall be done only on one sample from each offered lot. <p>8.00.00 COMMISSIONING</p> <p>8.01.01 The Contractor shall carry out the following commissioning tests and checks after installation at site. In addition the Contractor shall carry out all other checks and tests as recommended by the Manufacturers or else required for satisfactory performance..</p> <p>8.01.02 Cables</p> <ul style="list-style-type: none"> a) Check for physical damage b) Check for insulation resistance before and after termination/jointing. 	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 17 of 21

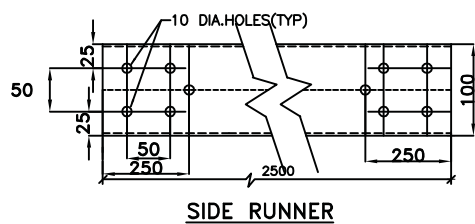
023/PS-PEM-MAX		TECHNICAL REQUIREMENTS												
CLAUSE NO.														
		c)	HT cables shall be pressure tested (test voltage as per IS:7098) before commissioning.											
		d)	Check of continuity of all cores of the cables.											
		e)	Check for correctness of all connections as per relevant wiring diagrams. Any minor modification to the panel wiring like removing/inserting, shorting, change in terminal connections, etc., shall be carried out by the Contractor.											
		f)	Check for correct polarity and phasing of cable connections.											
		g)	Check for proper earth connections for cable glands, cable boxes, cable armour, screens, etc.											
		h)	Check for provision of correct cable tags, core ferrules, tightness of connections.											
8.02.00			Cable trays / supports and accessories											
		1)	Check for proper galvanizing/painting and identification number of the cable trays/supports and accessories.											
		2)	Check for continuity of cable trays over the entire route.											
		3)	Check that all sharp corners, burrs, and waste materials have been removed from the trays supports.											
		4)	Check for earth continuity and earth connection of cable trays.											
8.03.00			Earthing and Lightning protection system											
		1)	Earth continuity checks.											
		2)	Earth resistance of the complete system as well as sub-system.											
9.00.00			ELECTRICAL LAYOUT PHILOSOPHY:											
			While developing the layout the bidder must give due consideration to the following requirements:											
		a)	Adequate distance shall be maintained between the transformers. As basic guidelines following norms will be adhered to:											
		1)	Transformers shall be separated from the adjacent building/structures and from each other by a minimum distance as defined below or by a fire wall of two hours of fire resisting of height at least 600 mm above bushing / pressure relief vent whichever is higher.											
			<table><tr><td>Oil capacity of individual transformer (in liters)</td><td>Clear separating distance (in meters)</td></tr><tr><td>5,000 to 10,000</td><td>8.0</td></tr><tr><td>10,001 to 20,000</td><td>10.0</td></tr><tr><td>20,001 to 30,000</td><td>12.5</td></tr><tr><td>Over 30,001</td><td>15.0</td></tr></table>	Oil capacity of individual transformer (in liters)	Clear separating distance (in meters)	5,000 to 10,000	8.0	10,001 to 20,000	10.0	20,001 to 30,000	12.5	Over 30,001	15.0	
Oil capacity of individual transformer (in liters)	Clear separating distance (in meters)													
5,000 to 10,000	8.0													
10,001 to 20,000	10.0													
20,001 to 30,000	12.5													
Over 30,001	15.0													
		2)	In case of auxiliary transformers having an aggregate oil capacity in excess of 2300 liters but individual oil capacity of less than 5000 liters, the maximum separating distance between transformers and surrounding building shall be at least 6M unless they are separated by fire separating walls or are protected by high velocity spray system.											
		3.)	Rail track shall be provided in Transformer yard for movement of each transformer. The rail track in Transformer yard shall be connected with TG area rail track The Foundation top of transformer & rail top shall be at EL +/- 0.0M. Bus duct support or Transformer body shall be at least 8.0M from A-Row of TG building to clear the movement of GT/ Stator/UT/ST/UAT on rail line. Jacking pads shall be provided where the rail track changes the direction. Mooring post shall be provided on rail track for handling the transformers.											
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2		SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 18 of 21										

CLAUSE NO.	TECHNICAL REQUIREMENTS																			
	<p>4) For each transformer a pit shall be provided all around at a distance of 1.5 m (minimum) from transformer outer edge. A sump pit shall be provided for each pit. A common oil retention pit per unit shall be provided to hold oil quantity of the largest transformer (by volume) & 10 minutes of water quantity of HVW spray system for the largest transformer. Sump pit of individual transformer shall be connected to common oil retention pit of that unit.</p> <p>5) Rail track shall be provided for all outdoor transformers up to road for movement of each transformer of size more than or equal to 7.5MVA Transformer. Jacking pads shall be provided where the rail track changes the direction. Jacking pad shall also be provided at the location of installation of transformer and mooring post shall be provided on rail track for handling the transformers.</p> <p>6.) The Transformer fencing shall be at 1.0 M (minimum) distance from the pit wall. The Height of fencing shall be 2.5 M (minimum) and fencing shall have personal entry gate and removable type fencing/gate for transformer withdrawal.</p> <p>7) The transformer firewall, pit sizing and clearances from adjacent building/structures etc. shall be as per IS 1646/CBIP manual on Transformer</p> <p>8) However, for all outdoor transformers of oil capacity less than 2000 litre, a trench of suitable size shall be provided all around at a distance of 1.0 m (minimum) from transformer outer edge. A sump pit shall be provided for each trench.</p> <p>b) Layout requirements for Electrical MCC/switchgear rooms</p> <p>1. Separate Switchgear Rooms shall be provided for each unit. For TG building, all HT boards shall be provided in HT switchgear room at only one floor and all LT boards shall be provided in LT switchgear room at only one floor</p> <p>2. The following clearances shall be maintained for HT Switchboard.</p> <p>a.) Front Clearance</p> <table border="0"> <tr> <td>i) For one Row of Swgr.</td> <td>-</td> <td>2.0 M (Min)</td> </tr> <tr> <td>ii) For two Rows of Swgr.</td> <td>-</td> <td>2.5 M (Min)</td> </tr> </table> <p>b.) Back Clearance - 1.5 M (Min.)</p> <p>c.) Side Clearance</p> <p>Min. 800 mm, however provision to be made for any additional panel in future at both ends. Therefore end clearance shall be 800+width of panel (including spare panels/dummy panels etc.)</p> <p>3. The following clearances shall be maintained for LT Switchboard.</p> <p>a.) Front Clearance</p> <table border="0"> <tr> <td>i) For one Row of Swgr</td> <td>-</td> <td>1.5M (Min)</td> </tr> <tr> <td>ii) For two Rows of Swgr</td> <td>-</td> <td>1.5/1.75M depending upon the depth of panels etc</td> </tr> </table> <p>b.) Back Clearance</p> <table border="0"> <tr> <td>i) For single front</td> <td>-</td> <td>1.0M (Min)</td> </tr> <tr> <td>ii) For double front</td> <td>-</td> <td>1.5M (Min)</td> </tr> </table>	i) For one Row of Swgr.	-	2.0 M (Min)	ii) For two Rows of Swgr.	-	2.5 M (Min)	i) For one Row of Swgr	-	1.5M (Min)	ii) For two Rows of Swgr	-	1.5/1.75M depending upon the depth of panels etc	i) For single front	-	1.0M (Min)	ii) For double front	-	1.5M (Min)	
i) For one Row of Swgr.	-	2.0 M (Min)																		
ii) For two Rows of Swgr.	-	2.5 M (Min)																		
i) For one Row of Swgr	-	1.5M (Min)																		
ii) For two Rows of Swgr	-	1.5/1.75M depending upon the depth of panels etc																		
i) For single front	-	1.0M (Min)																		
ii) For double front	-	1.5M (Min)																		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION Page 19 of 21																		

023/PS-PEM-MAX CLAUSE NO.		TECHNICAL REQUIREMENTS		
		<p>c.) Side Clearance:Min. 800 mm, however provision to be made for any additional panel in future at both ends. Therefore end clearance shall be 800 mm + width of panel.</p> <p>For offsite areas, HT Switchboard clearances shall be followed wherever both LT & HT switch boards are in the same MCC room.</p> <p>4. Height of HT/LT Switchgear Room and Boiler MCC room</p> <p>i) With Bus Duct – 4.5 m (min)</p> <p>ii) Without Bus Duct – 4.0 m (min)</p> <p>Further no vertical bracings shall be envisaged in HT/LT switchgear room and associated cable vault area.</p> <p>5. Cable trench/Cable vault</p> <p>For LT switchgear/MCC room at EL 0.0M, 1400 wide x 1400 deep cable trench shall be provided to route the cables. Horizontal cable trays shall be routed in cable trenches.</p> <p>c) Minimum clear working space </p>		



SLOTTED RUNGS
(TO SUIT TRAY WIDTH)



SIDE RUNNER

1

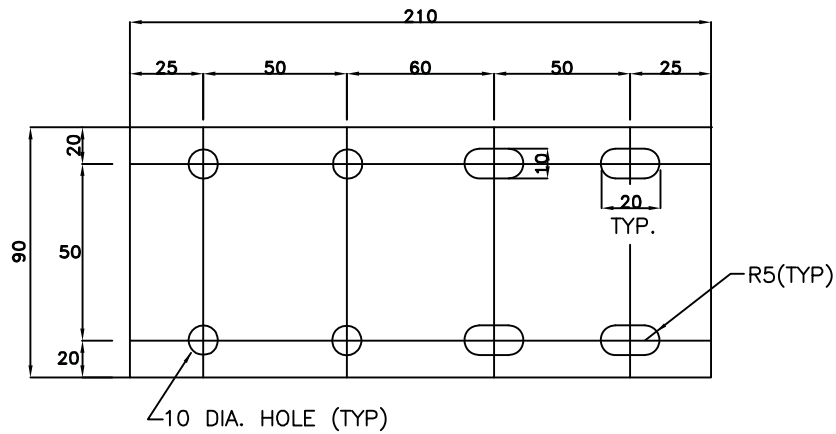
W	150	300	450	600
L	145	295	445	595
T	2	2	2	2
t	2	2	2	2

FOR GENERAL NOTES REFER SHEET 14 OF 14

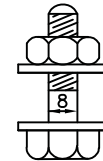
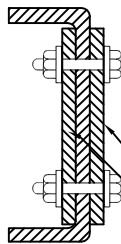


TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.
SHT. 02 OF 14



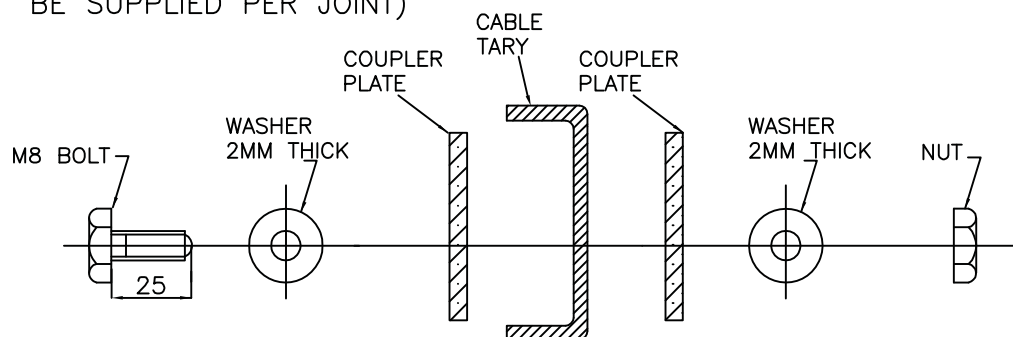
**SIDE COUPLER PLATE FOR
LADDER/PERFORATED TYPE TRAYS**
 1 (600/450/300/150W TRAYS)
 QTY. REQUIRED/TRAY SECTION : 4 NOS.



QTY. REQD/TRAY SECTION

- A) 16 NOS. M8 BOLTS
- B) 16 NOS. NUTS
- C) 32 NOS. WASHERS

(2 NOS. COUPLER PLATES
OF 3 MM THICKNESS TO
BE SUPPLIED PER JOINT)

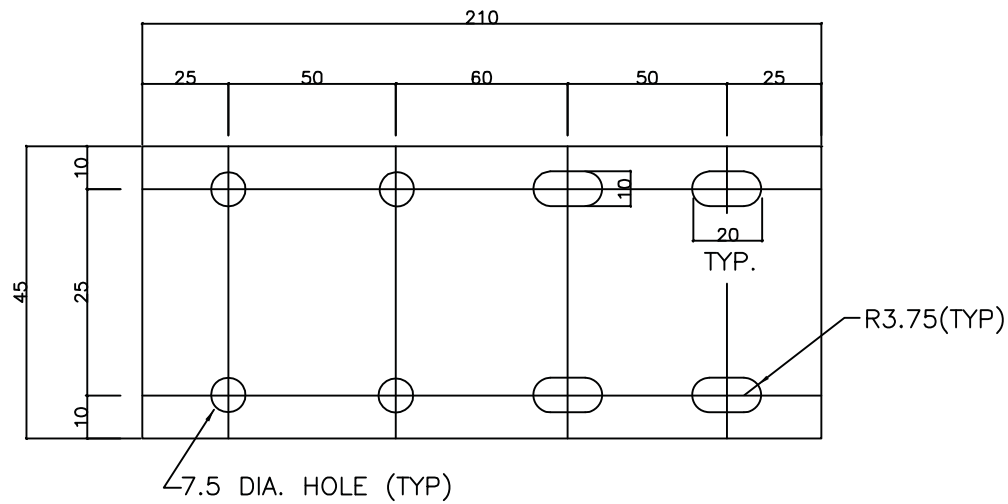


SEQUENCE OF M8 BOLT, WASHER, NUT, COUPLER PLATE & CABLE TRAY
FOR TYPICAL CABLE TRAY JOINT

FOR GENERAL NOTES REFER SHEET 14 OF 14

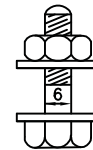
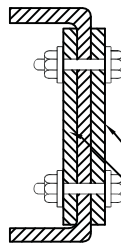


**TYPICAL DETAILS OF CABLE TRAYS AND
ACCESSORIES**



**SIDE COUPLER PLATE FOR
PERFORATED TYPE TRAYS**
(100/50W TRAYS)

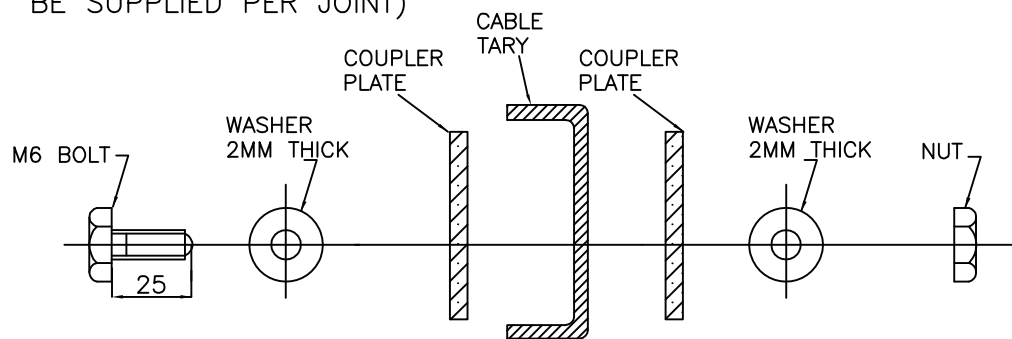
QTY. REQUIRED/TRAY SECTION : 4 NOS.



QTY. REQD/TRAY SECTION

- A) 16 NOS. M6 BOLTS
- B) 16 NOS. NUTS
- C) 32 NOS. WASHERS

(2 NOS. COUPLER PLATES
OF 3 MM THICKNESS TO
BE SUPPLIED PER JOINT)



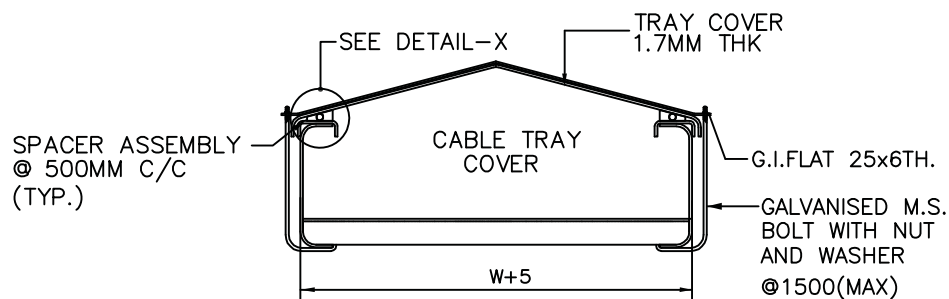
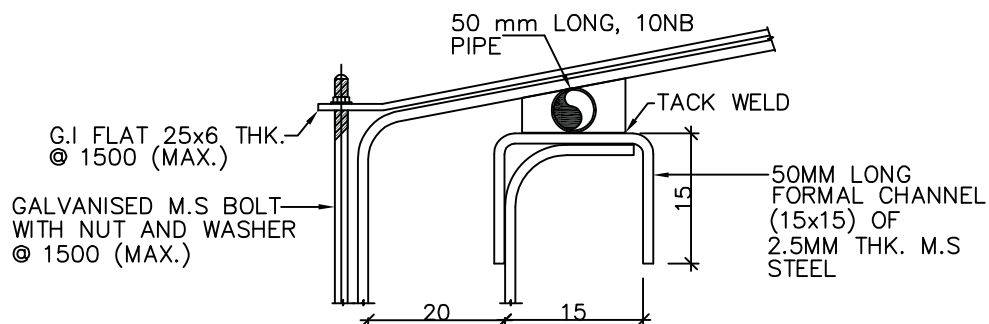
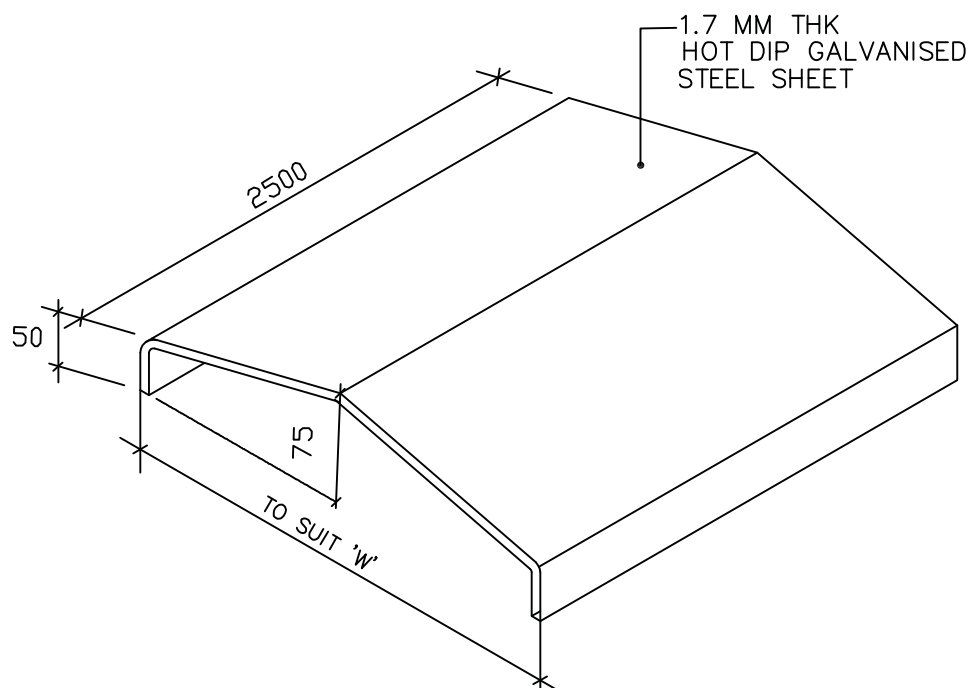
SEQUENCE OF M6 BOLT, WASHER, NUT, COUPLER PLATE & CABLE TRAY
FOR TYPICAL CABLE TRAY JOINT

FOR GENERAL NOTES REFER SHEET 14 OF 14



**TYPICAL DETAILS OF CABLE TRAYS AND
ACCESSORIES**

DWG. NO.

COVER FIXING (TYP.)DETAIL-XCABLE TRAY COVER

FOR GENERAL NOTES REFER SHEET 14 OF 14

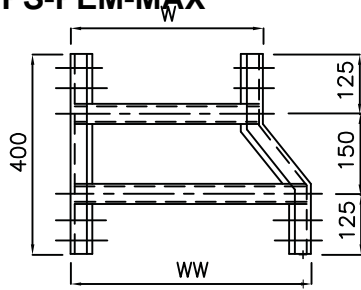


TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

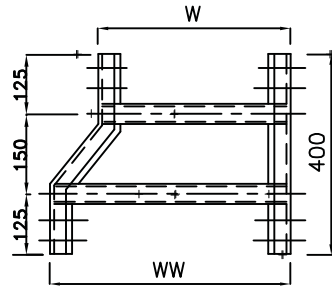
DWG. NO.

SHT. 05 OF 14 Page No. REV of 01

1500633/2023/PS-PEM-MAX

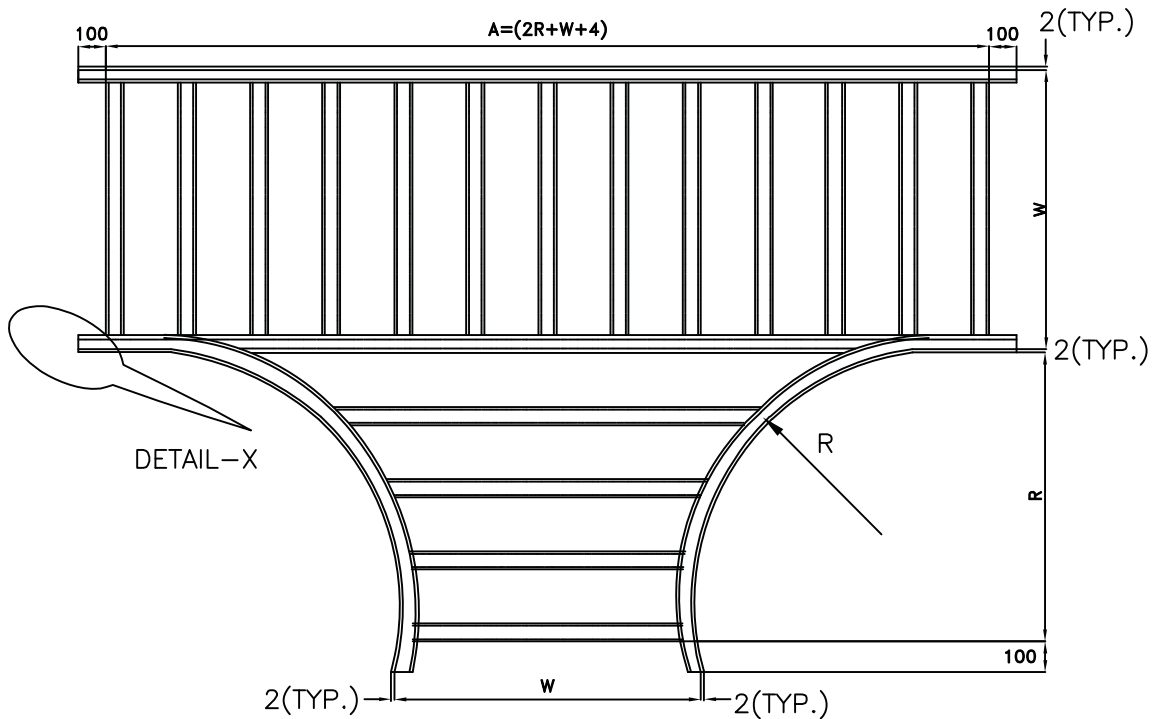


LEFT HAND REDUCER



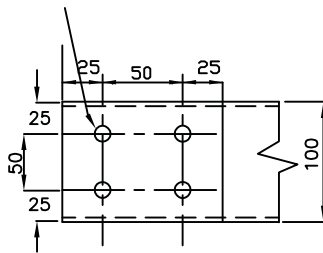
RIGHT HAND REDUCER

WW	W	DEPTH
600	450	100
600	300	100
600	150	100
450	300	100
300	150	100

LADDER TYPE

DETAIL-X

10mm DIA. HOLES



WIDTH W	BENDING RADIUS R	DEPTH	A			
			W			
			150	300	450	600
150, 300, 450 & 600	600	100	1354	1504	1654	1804

LADDER TYPE

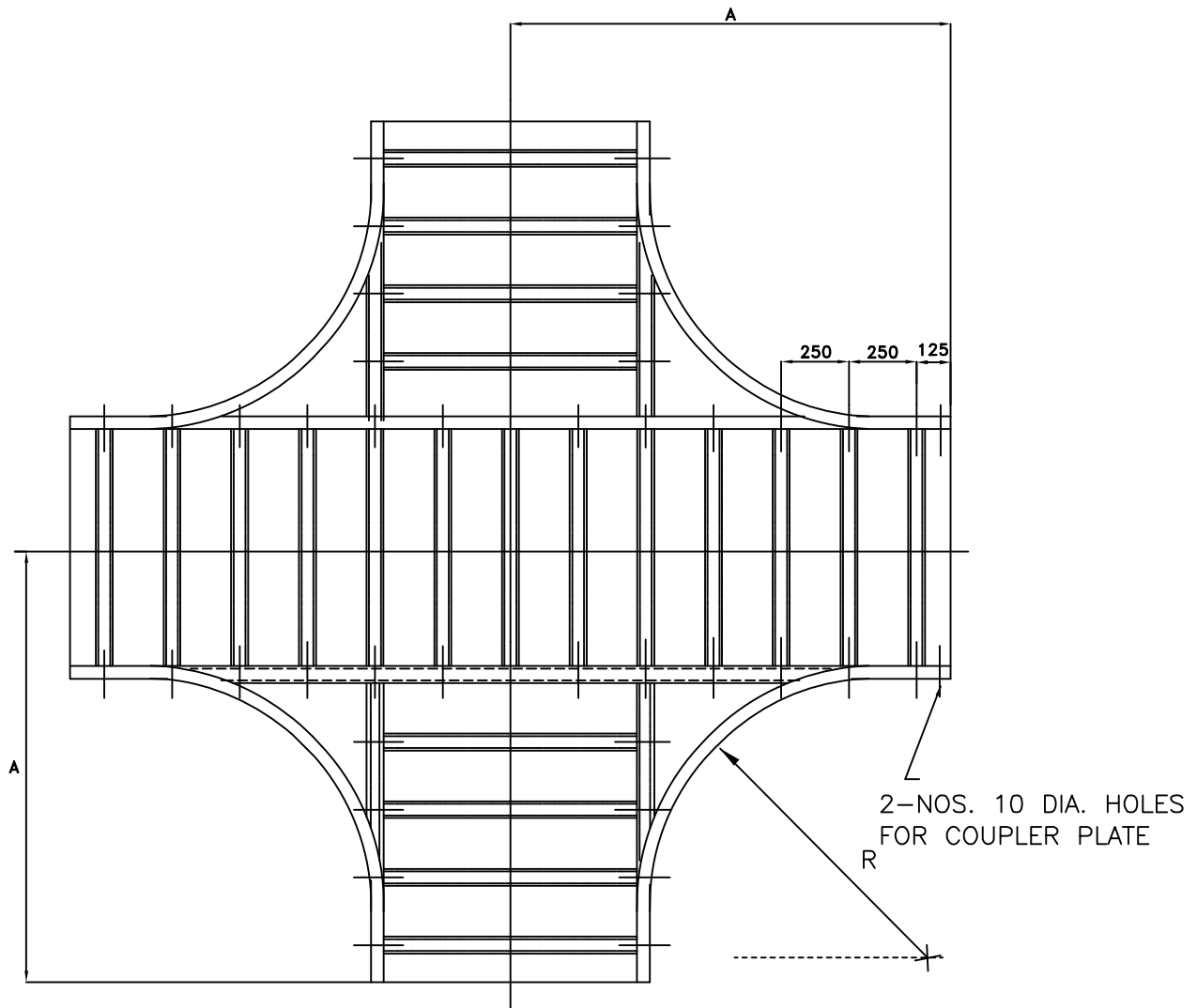
FOR GENERAL NOTES REFER SHEET 14 OF 14

TYPICAL DETAILS OF CABLE TRAYS AND
ACCESSORIES

Page 312 of 480

DWG. NO.

SHT. 06 OF 14 Page No. 312 of 480 REV. 01



HORIZONTAL CROSS-PLAN

1

WIDTH W	BENDING RADIUS R	$A=R+W/2+100$
600	600	1000
450	600	925
300	600	850

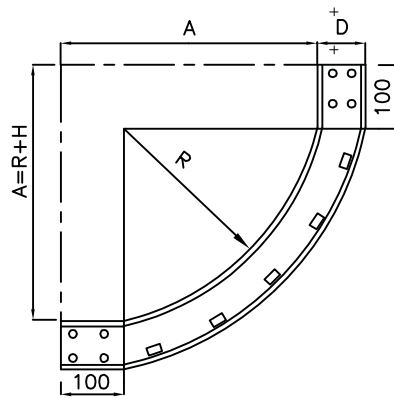
FOR GENERAL NOTES REFER SHEET 14 OF 14



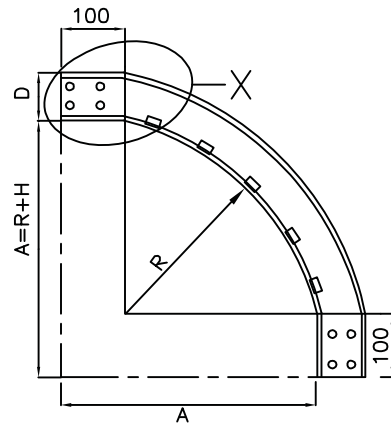
TYPICAL DETAILS OF CABLE TRAYS AND
ACCESSORIES

DWG. NO.

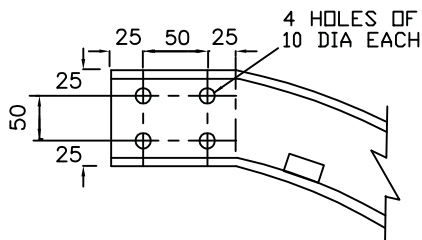
1500633/2023/PS-PEM-MAX



INSIDE TYPE



OUTSIDE TYPE

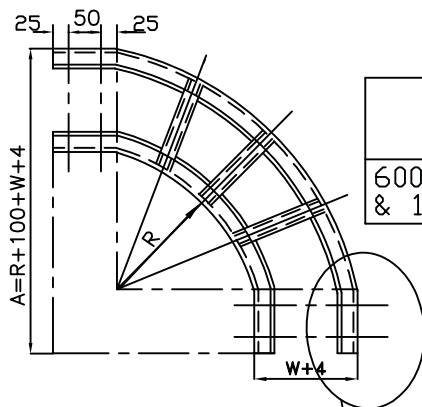


ENLARGED VIEW OF "X"

VERTICAL ELBOW 90 DEG UP/DOWN

INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A
600, 450, 300 & 150	600	100	700

90° VERTICAL BEND - LADDER TYPE



LADDER TYPE

X (AS ABOVE)

HORIZONTAL ELBOW 90 DEG

INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A			
			150	300	450	600
600, 450, 300 & 150	600	100	854	1004	1154	1304

90° HORIZONTAL BEND - LADDER TYPE

LADDER TYPE ACCESSORIES

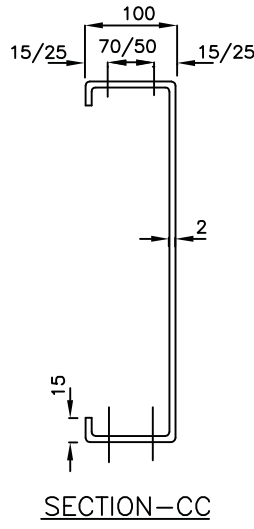
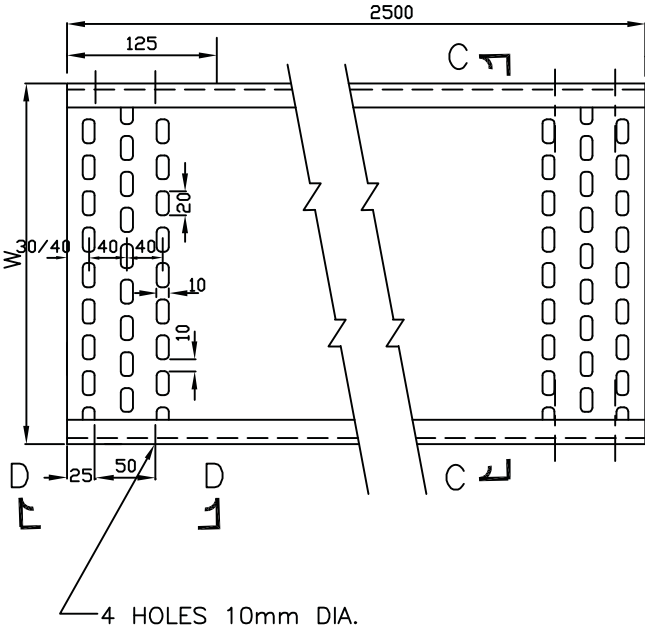
FOR GENERAL NOTES REFER SHEET 14 OF 14



TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

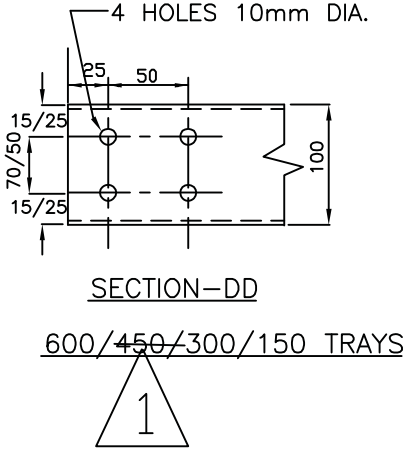
DWG. NO.

SHT. 08 OF 14 REV. 01

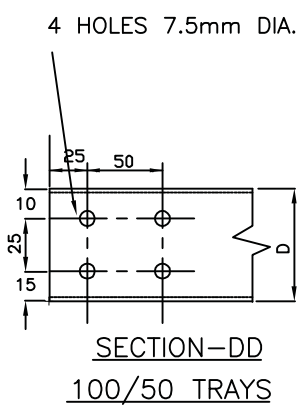


600/450/300/150 TRAYS

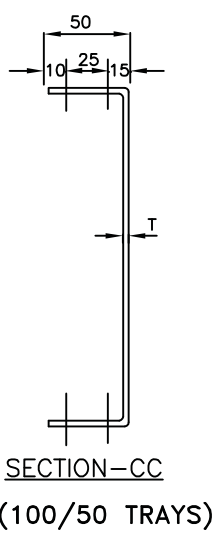
1



600/450/300/150 TRAYS



100/50 TRAYS



TRAY WIDTH W (mm)	600	450	300	150	100	50
TRAY DEPTH D (mm)	100	100	100	100	50	50
T (mm)	2	2	2	2	2	2

PERFORATED TYPE TRAY

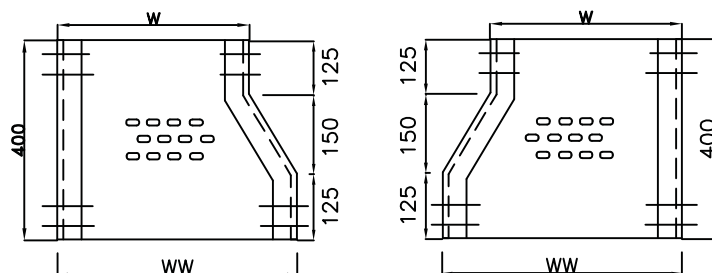
1

FOR GENERAL NOTES REFER SHEET 14 OF 14



TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.

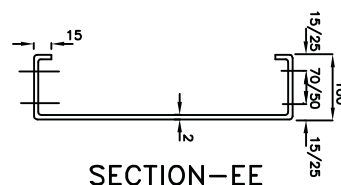
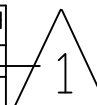


LEFT HAND REDUCER

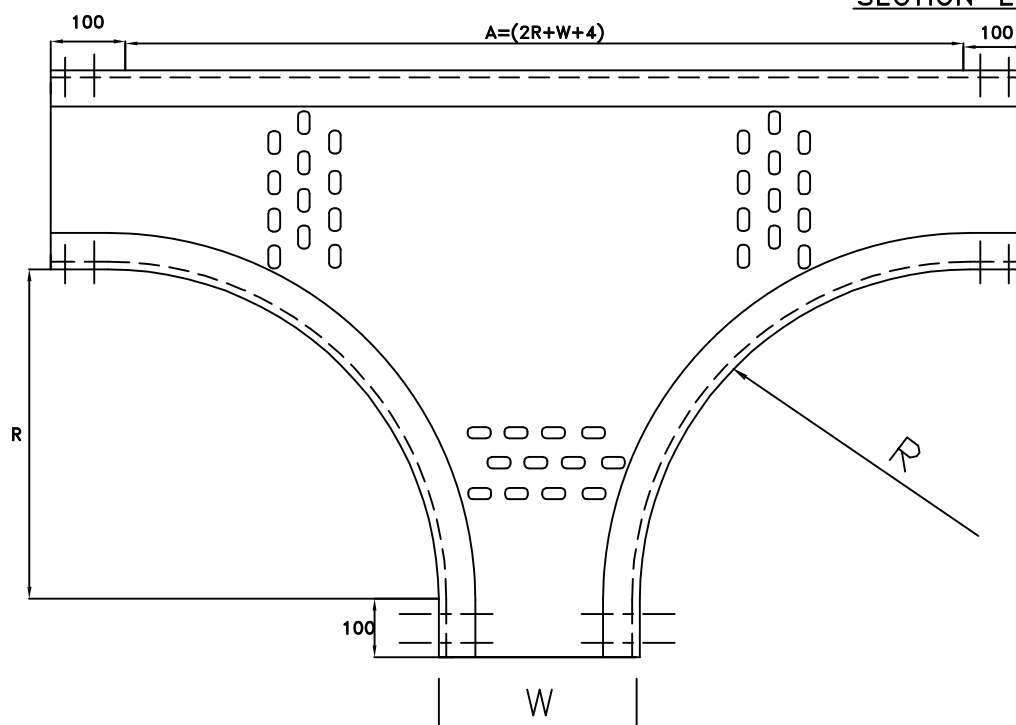
RIGHT HAND REDUCER

PERFORATED TYPE

WW	W	DEPTH
600	450	100
600	300	100
600	150	100
450	300	100
300	150	100

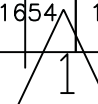
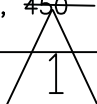


SECTION-EE



TEE

WIDTH W	BENDING RADIUS R	DEPTH	A			
			W			
			150	300	450	600
150, 300, 450 & 600	600	100	1354	1504	1654	1804



PERFORATED TYPE

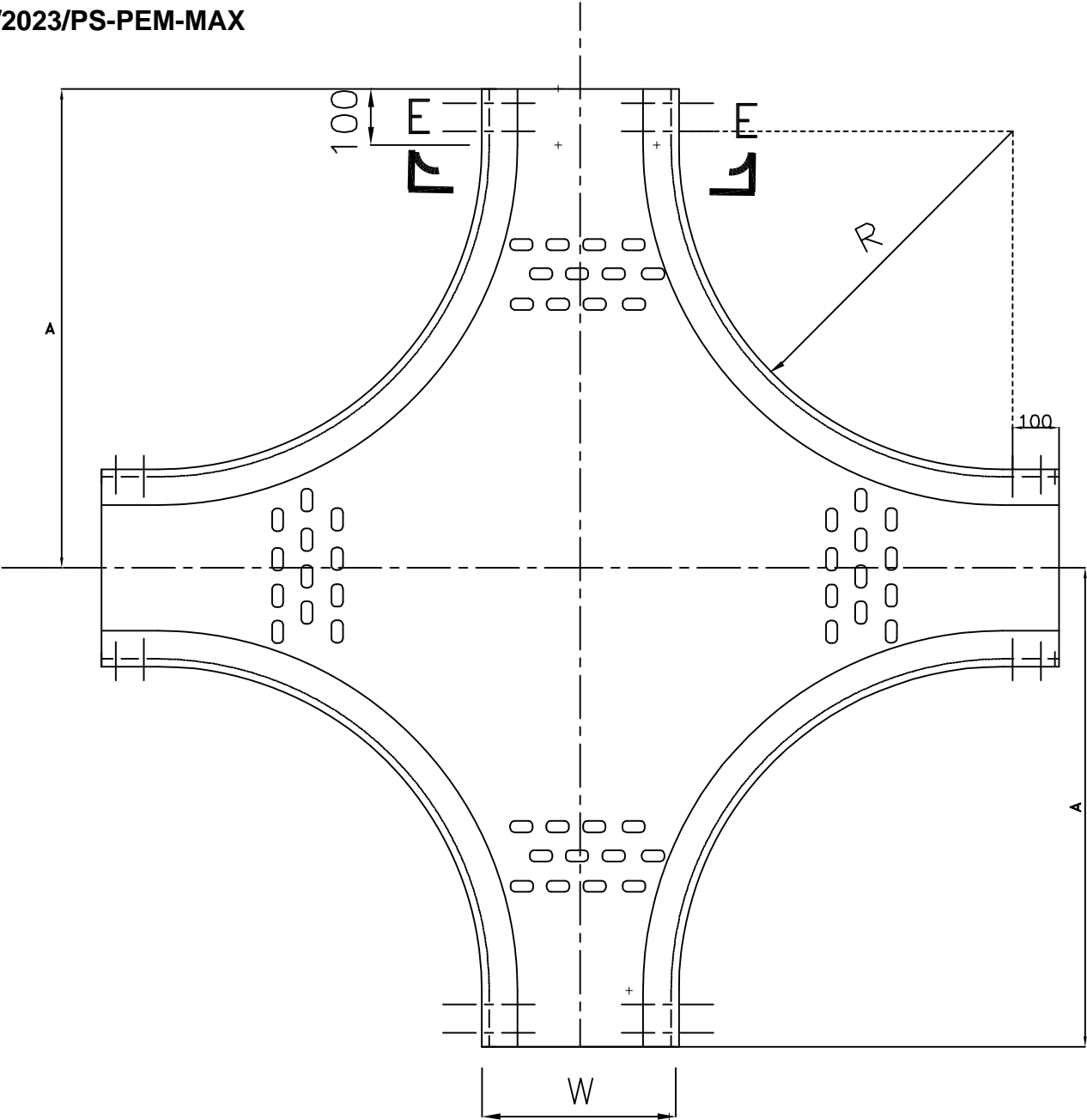
FOR GENERAL NOTES REFER SHEET 14 OF 14



TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.

SHT. 10 OF 14 REV. 01 Page No. 316 of 479



CROSS

1	WIDTH	BENDING	$A=R+W/2+100$
	W	RADIUS R	
	600	600	1000
	450	600	925
	300	600	850

FOR GENERAL NOTES REFER SHEET 14 OF 14

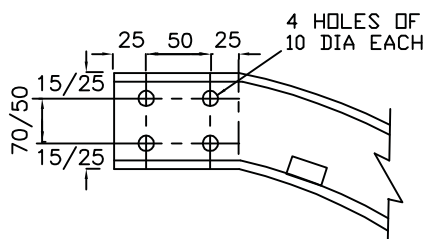
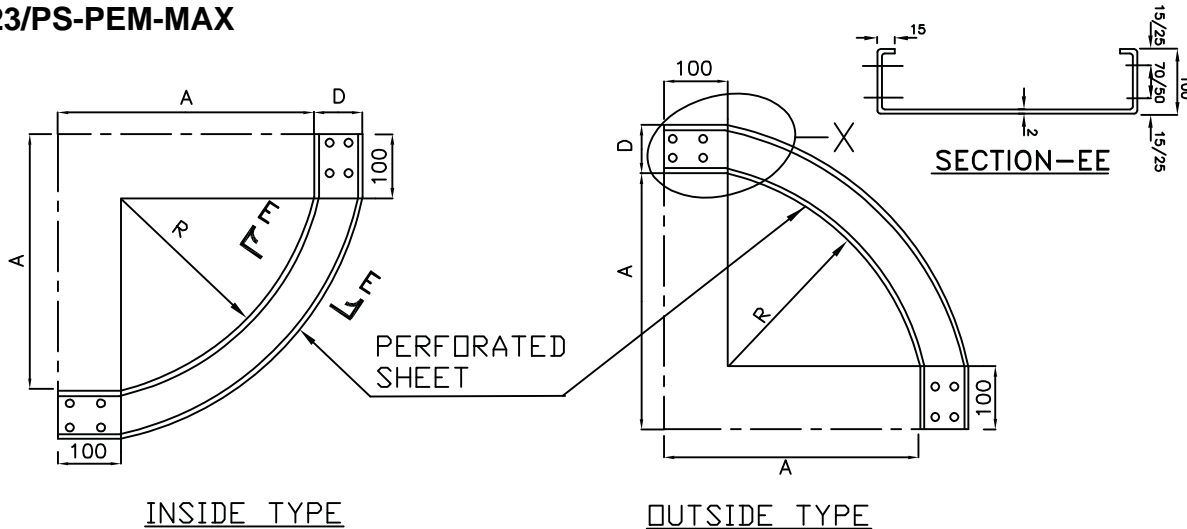


TYPICAL DETAILS OF CABLE TRAYS AND
ACCESSORIES

DWG. NO.

SHT. 11 OF 14 REV. 01

1500633/2023/PS-PEM-MAX



ENLARGED VIEW OF "X"

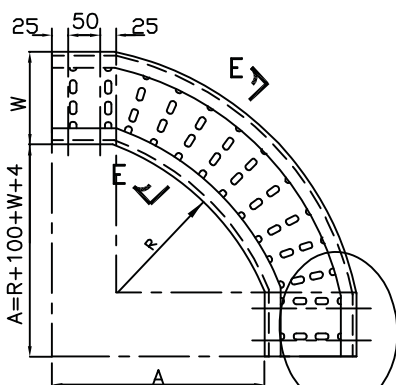
VERTICAL ELBOW 90 DEG UP/DOWN

INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A
600, 450, 300 & 150	600	100	700

1

90° VERTICAL BEND - PERFORATED TYPE

HORIZONTAL ELBOW 90 DEG



INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A			
			150	300	450	600
150, 300, 450 & 600	600	100	854	1004	1154	1304

1

1

X (AS ABOVE)

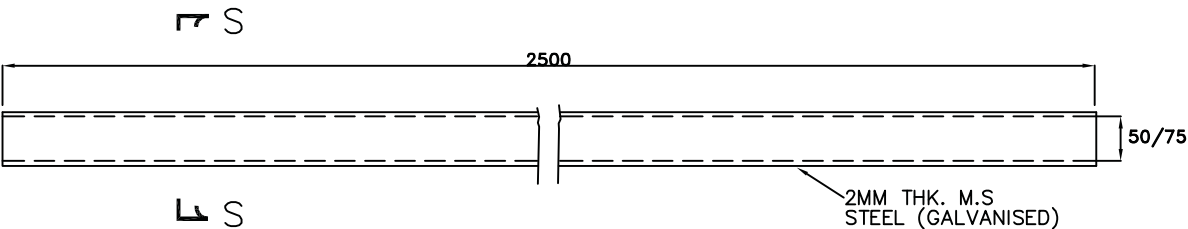
90° HORIZONTAL BEND - PERFORATED TYPE

FOR GENERAL NOTES REFER SHEET 14 OF 14

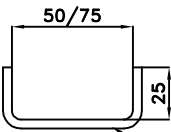


TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

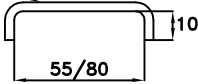
DWG. NO.



SECTION S-S



2MM THK. M.S STEEL (GALVANISED)



COVER FOR CABLE TROUGHS

CABLE TROUGHS

FOR GENERAL NOTES REFER SHEET 14 OF 14



TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.
SHT. 13 OF 14

NOTES:-

1. THE CABLE TRAYS AND ACCESSORIES SHALL BE MADE OF 2mm HOT ROLLED M.S.SHEET CONFIRMING TO IS:1079. ALL THE COUPLER PLATE SHALL BE OF 3 MM THICK.
2. THE CABLE TRAYS AND ACCESSORIES SHALL BE HOT DIP GALVANISED AS PER IS 2629. THE MASS OF ZINC COATING SHALL BE 610 gm/m AND THICKNESS SHALL BE 75 MICRONS (MINIMUM).
3. FOR LADDER TYPE CABLE TRAYS AND ACCESSORIES, ALL RUNGS SHALL BE SLOTTED.
4. PERFORATED TRAYS SHALL BE FABRICATED OUT OF A SINGLE M.S. SHEET.
5. THE DIMENSIONS OF ALL BENDS, TEES, CROSSES, ETC. FOR PERFORATED CABLE TRAYS SHALL BE THE SAME AS FOR LADDER TYPE TRAY FITTINGS.
6. SIDE CHANNELS OF PERFORATED TRAY ACCESSORIES SHALL BE WELDED WITH THE PERFORATED SHEET AT INTERVALS OF 100mm.
7. LENGTH OF WELDING SHALL NOT BE LESS THAN 25mm. WELDING SHALL BE AS PER IS 9595.
8. PREFERABLY SINGLE MS PERFORATED SHEET SHALL BE USED AS BASE OF ALL PERFORATED TYPE TRAY ACCESSORIES. HOWEVER, IF USE OF PIECES OF PERFORATED SHEET IS UNAVOIDABLE FOR BASE, PIECES SHALL BE WELDED WITH EACH OTHER IN LINE WITH THE ABOVE.
9. ALL TRAY CORNERS SHALL BE FREE OF SHARP EDGES & SMOOTH.
10. THE DEPTH, WIDTH AND LENGTH OF TRAYS AND ACCESSORIES SHALL BE WITHIN A TOLERANCE $\pm 2\text{MM}$
 ~~PER RELEVANT IS~~
11. TO FACILITATE ASSEMBLY, ALL ACCESSORIES AT ENDS SHALL HAVE 100mm STRAIGHT PORTION.
12. ALL NUTS, BOLTS, WASHERS ETC., SHALL BE HOT DIP GALVANISED AS PER IS 1367 FOR SIZES ABOVE 12MM AND ELECTROPLATED/ELECTROGALVANISED FROM SIZE BELOW 12MM.
13. ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE.
14. TRAY ACCESSORIES SHOWN IN THIS DRAWING SHALL BE FACTORY FABRICATED FOR USE AT SITE AS PER APPROVED LAYOUT DRAWINGS. FOR SPECIFIC SITE REQUIREMENTS (E.G. IRREGULAR ANGLE BENDS SUCH AS 30°/60° BENDS, ETC) AS PER SITE LAYOUT CONDITIONS, TRAY ACCESSORIES SHALL BE FABRICATED AT SITE FROM THE STRAIGHT LENGTH OF RESPECTIVE SIZES AS REQUIRED. GALVANISATION DAMAGED DURING CUTTING/WELDING OPERATIONS SHALL BE BRUSHED AND RED LEAD PRIMER, OIL PRIMER AND ALUMINIUM PAINT SHALL BE APPLIED BEFORE INSTALLATION OF THE ACCESSORIES.
15. WIDTH OF CABLE TRAYS PROPOSED TO BE USED FOR PROJECT ARE AS UNDER :
 LADDER TYPE CABLE TRAY (MM) : 600, ~~450~~, 300 & 150.
 PERFORATED TYPE CABLE TRAY (MM) : 600, ~~450~~, 300, 150, 100 & 50.
16. 600MM WIDE CABLE TRAY SHALL BE SUITABLE FOR WEIGHT OF 100KG/M INCLUDING LIVE LOAD OF RUNNING LENGTH OF CABLE TRAY.
17. CABLE TROUGHS SHALL BE USED FOR BRANCHING OUT FEW CABLES FROM MAIN CABLE ROUTE.
18. MAKE OF ALL ITEMS SHALL BE AS PER ~~BHEL/CUSTOMER~~ NTPC QA APPROVAL.
19. CABLE TROUGHS OR 50/100MM WIDE PERFORATED TYPE TRAY SHALL BE USED FOR LOCAL CABLING/BRANCHING OUT FEW CABLES FROM MAIN ROUTE.



TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.

SHT. 14 OF 14 Page No. 38 of 470 REV. 01

B

CUSTOMER :			PROJECT			SPECIFICATION :						
QUALITY PLAN			TITLE			NUMBER :						
BIDDER/ :			QUALITY PLAN			SPECIFICATION						
VENDOR			NUMBER PED-506-00-Q-006, REV-01			TITLE						
SYSTEM			ITEM AC/ELECT. MOTORS BELOW 55KW (LV)			SECTION						
SHEET 1 OF 2			REFERENCE DOCUMENT			VOLUME III						
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.0	ASSEMBLY	1.WORKMANSHIP 2.DIMENSIONS 3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE 1.SHADE	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-	
			MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	2	-	-	
			MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	-	
2.0	PAINTING		MA	VISUAL	SAMPLE	MANUF'R'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC. 2.OVERALL DIMENSIONS & ORIENTATION	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	2	1		NOTE -1 & NOTE-3
			MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-	NOTE -1 & NOTE-3
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									

Page No. 322 of 479



NTPC LTD.
 (ENGINEERING DIVISION)
 ENGINEERING OFFICE COMPLEX
 A-8A, SEC-24, NOIDA, U.P. 201301
 PH.: 011-8-2596872 FAX: 011-91-4410208

TRANSMITTAL FOR DOCUMENTS

FROM : DGM (QA)

REF. : 01/CQA/0000-SPL-

DATE :03/08//2010

TO: M/s ABB Limited,

Phase Plot No. 5 & 6

Peenya Industrial Area,

Bangalore 560 058

CC :RIO-Bangalore, NTPC LTD

CC: Sh. P.K.Basu, DGM-QA-Elect

Please find enclosed following documents for necessary action at your end as indicated in purpose code

S. No.	Item	RQP No	Rev No	No. of Copies	Purpose code	Remarks
01	LT MOTOR 55 KW-200 KW	0000-999-QVE-P-259	00	1	11	

- 1.Approved in CAT-1
- 2.Approved in CAT-II With comments resubmit
- 3.Not APPROVED- CAT-III
- 4.Approved in CAT-IV(For information only)
- 5Released for Fabrication/Construction

- 6.for your comments
- 7.Revised as per your comments
8. For your approval
- 9.for your information
- 10.As-built
- 11.Approved for Reference subject to approval of Endorsement sheet

SIGNATURE :

NAME :


O.P.NIRANJAN

FORMAT NO. : QS-01-DIV-P-02/F2-

ENGINEERING DIVISION

ABB

ABB LTD.,
Phase Plot No 5& 6
Peenya Industrial
Area, Bangalore -
560058

MANUFACTURER'S
NAME AND ADDRESS

ABB LTD.,
Phase Plot No 5& 6
Peenya Industrial
Area, Bangalore -
560058

REFERENCE QUALITY PLAN

ITEM /EQUIPMENT : LT MOTOR
SUB-SYSTEM : 55 KW - 200KW

QPN NO.: NTPC-RQP-001
REV. NO.: 00
DATE: 29-07-2010
PAGE: 1 OF 6

SIGN. OF
MGR'S

QPN NO.: 0000-999 - QVE - P - 259
REV. NO.: 0
DATE: 30/07/10
PAGE: 1 OF 6
VALID UPTO: 29/07/13

REVIEWED BY:
V. SIVRASTAV
O. P. NIRANJAN
P. K. BASU

APPROVED BY:
AK DUTTA

TO BE FILLED IN BY NTPC

QPN NO.: 0000-999 - QVE - P - 259
REV. NO.: 0
DATE: 30/07/10
PAGE: 1 OF 6
VALID UPTO: 29/07/13

REVIEWED BY:
V. SIVRASTAV
O. P. NIRANJAN
P. K. BASU

APPROVED BY:
AK DUTTA

COMPONENT
&
OPERATION

CHARACTERISTICS

CLASS

TYPE OF
CHECK

QUANTUM OF CHECK

REFERENCE
DOCUMENT

ACCEPTANCE
NORM

FORMAT
OF
RECORD

AGENCY

REMARKS

SL. NO

2

3

4

5

6

7

8

9

10

11

1

INCOMING INSPECTION

A

BUGHT OUT ITEMS

1

a) Surface defects
b) Dimn. Conformity
c) Hardness
d) Tensile strength
e) Chemical composition

Major
Major
Major
Major
Major

Visual
Measure
Mech.
Mech
Chem

100%
1 sample/lot
1 sample/lot
1 sample/lot
1 sample/lot

--
1 sample/lot
1 sample/lot
1 sample/lot

No defect
ABB Drawing
FG150-3GYN951001/
FG200-3GYN951002

No defect
ABB Drawing
3GT961001
3GYN 951008/
3GYN951019

Inspn.
report
Suppl.
TC
-do-
-do-

P
P
V
V
V
V

-
-
V
V
V
V

ABB to ensure the
concentricity (bore and
the spigot) of End shields
is maintained as per the
specification. Records to
be maintained.
Lot to be witnessed by
ABB

2

a) Thickness
b) Burr height
c) Grade
d) Core loss (before and after ageing)
e) Magnetic Induction test.
f) Insulation Resistance

Major
Major
Major
Major
Major
Major

Measure
Measure
Measure
Electrical
Electrical
Electrical

1 sample/lot
-do-
-do-
-do-
-do-
-do-

1 sample/lot
-do-
-do-
-do-
-do-
-do-

ABB Drawing
3GT961001
3GYN 951008/
3GYN951019

-do-
-do-
-do-
-do-
-do-
-do-

Suppl.
TC
-do-
-do-
-do-
RM
certificate

W
W
W
W
V
V

V
V
V
V
V
V

Lot to be witnessed by
ABB

3

a) Dimn. Conformity
(Core length & inner diameter)
b) Stacking Factor
c) Slot alignment
c) cleanliness

Major
Major
Major
Major

Measure
Measure
Visual
Visual

1 sample/lot
1 sample/lot
-do-
-do-

1 sample/lot
1 sample/lot
-do-
-do-

ABB Drawing
3GYN 951008/
3GYN951019

No Burr / Foreign
Particles

Inspn.
Report
Inspn.
Report
-do-
-do-

P
P
W
P

V
V
V
-

Co relation between raw
material, bought out items
and finished motor shall
be maintained for
verification

4

a) ALUMINIUM
DIE-CAST
ROTOR

Major
Major
Major
Major

Chemical
Electrical
Visual
Mech

1 sample/lot
1 sample/lot
100%
1 sample/lot

One Sample
per lot
-do-
-do-

3GT952001
-do-
-do-
ABB Drawing

Sup TC
Inspn.
Report
-do-
-do-

V
WV
WV
WV

-
V
V
V

Witness by ABB every
3 months

LEGEND: * RECORDS IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION
** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION, AS
APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS W
FORMAT NO.: QS-01-QAI-P-10/FI-R1

1/1

ENGG. DIV -QA&I

Page 324 of 480

Page No. 324 of 479

[illegible]

[illegible]

LEGEND: * RECORDS, IDENTIFIED WITH "ICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION
** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION AS APPROPRIATE. CHIP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO.: QS-01-QA1-P-10/F1-R1

114

ENGG. DIV./O&I

Note: # NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of inspection.

MANUFACTURER'S NAME AND ADDRESS		REFERENCE QUALITY PLAN				TO BE FILLED IN BY NTPC				
ABB LTD., Phase Plot No 5& 6 Peenya Industrial Area, Bangalore - 560038		ITEM /EQUIPMENT : LT MOTOR SUB-SYSTEM : 55 KW - 200KW	QP NO.: NTPC-RQP-001 REV. NO.: 00 DATE : 29-07-2010 PAGE : 4 OF 6	SIGN. OF MGR'S	QP NO.: 0000-999 - QVE - P - 259 REV. NO.: 0 DATE : 30/07/10 PAGE : 4 OF 6 VALID UPTO: 29/07/13	REVIEWED BY: V SHRIVASTAVA O P NIRANJAN P K BASU	APPROVED BY:	AGENCY		REMARKS
SL. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD		
1.	2.	3.	4.	5.	M	CN	8.	9.	D	11.
15	Brazing Alloys Rods	Chemical composition	Major	Chemical	1 sample/lot	--	3GYN 954406	Suppl TC	V	-
16	PAINTS	a) Shade b) Shelf life	Major Minor	Measure Visual	1 sample/lot 100%	--	As per Customer Requirement As per Manuf. Recommends.	Shade Card Suppl TC	P	-
B-1	Coil Forming	a) Conductor diameter b) No of turns	Major Major	Measure Visual	100% 100%	--	Winding sheet Winding sheet	- -	P P	-
2	WOUND STATOR	a) Resistance b) H.V. Test c) Surge test	Major Major Major	Electrical Electrical Electrical	100% 100% 100%	100% 100% 100%	Winding sheet IS - 325 WI - 01	Inspn. record - do - - do -	W/V W/V W/V	V V V
3	VPI	d) Overhang Dimensions (by snap gauge) e) Application of Trophicalisation gel on Winding Overhang	Minor Major	Measure Visual	100% 100%	-- 100%	ABB Drawings -do-	-do- -do-	W/V W/V	- V
		a) Preheating b) Vacuum created c) Viscosity d) Gel time e) Air pressure f) Curing Cycle	Major Major Major Major Major Major	Mechanical Mechanical Measure Measure Mechanical Mechanical	100% 100% Once daily Once in a month 100% 100%	100% 100% Once daily Once in a month 100% 100%	WI-02 -do- -do- Resin Manf Std WI-02 -do-	Inspn Record -do- -do- -do- -do- -do-	W W W W W W	V V V V V V
<p>LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.</p> <p>** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION AS APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W".</p> <p>FORMAT NO.: QS-01-QAI-P-10/F1-R1</p> <p>Note: * NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of inspection.</p>										

ENGG. DIT, QA&I

1/1

ABB		MANUFACTURER'S NAME AND ADDRESS		REFERENCE QUALITY PLAN				TO BE FILLED IN BY NTPC			
ABB LTD., Phase Plot No 5& 6 Peenya, Industrial Area, Bangalore - 560058		ITEM /EQUIPMENT : LT MOTOR SUB-SYSTEM : 55 KW - 200KW		QIP NO.: NTPC-RQP-001	SIGN. OF MFGERS	QIP NO.: 0000-999 - QVE - P - 259	REVIEWED BY:	APPROVED BY:	REMARKS		
SL. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY		
1.	2.	3.	4.	5.	M		8.	9.	10.	11.	
II INPROCESS INSPECTION											
1	Machined rotor	a) Dimension- OD b) Runout	Critical	Measure	100%	--	ABB Drg	Insp	P	-	Effective Control of Material / Sub Assemblies according to internal specifications to be maintained
2	Rotor Assembly	Dynamic Balancing	Critical	Mech.	100%	100%	ISO 1940 / G2.5	Record	P	V	Rotor and Fan balanced separately
3	Fan	Dynamic Balancing	Critical	Mech.	100%	100%	ISO 1940 / G2.5	Record	P	V	
4	Assembly	a) Rotor and stator selection as per BOM b) T box location and casketing c) Name plate preparation and fixing	Major	Visual	100%	--	As per specification	-	P	-	
III FINAL INSPECTION											
A TYPE TEST											
Type test approval / clearance to be obtained from NTPC Egg. before offering for inspection											
B ROUTINE TEST											
a)	Name plate verification	Major	Visual	100%	100%	1 each type	Approved Data sheet Do/Drg	Test Result	P	W	W
b)	Mounting dimensions	Major	Measure	100%	100%	1 each type	IS : 325	-	P	W	W
c)	Space heater insulation resistance and H.V. test	Major	Electrical	100%	100%	100%	do	Test record	P	W	W
d)	Resistance of stator winding	Major	Electrical	100%	100%	100%	IS : 325/ NTPC Tech. Specification IS : 325	Test record	P	W	W
e)	Insulation resistance before & after H.V. test of stator winding	Major	Electrical	100%	100%	100%	IS : 325/ NTPC Tech. Specification IS : 325	Test record	P	W	W
f)	No load test at rated voltage	Major	Electrical	100%	100%	100%	IS : 325/ NTPC Tech. Specification IS : 325	Test record	P	W	W

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION
 ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION AS APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

Note: NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of inspection

ENG. DIV./QA&I

1/1

FORMAT NO.: QS-01-QAI-P-10/F1-R1

MANUFACTURER'S NAME AND ADDRESS		REFERENCE QUALITY PLAN				TO BE FILLED IN BY NTPC					
ABB LTD., Phase Plot No 5&6 Peenya Industrial Area, Bangalore - 560058		ITEM /EQUIPMENT : LT MOTOR		Q.P. NO.: NTPC-ROP-001		Q.P. NO.: 0000-999 - QVE - P - 259		REVIEWED BY: V SHIRIVASTAVA O P NIRANJAN P K BASU		APPROVED BY: [Signature]	
		SUB-SYSTEM : 55 KW - 200KW		REV. NO.: 00		DATE : 29-07-2016		REV. NO.: 0 DATE : 30/07/16		V SHIRIVASTAVA O P NIRANJAN P K BASU	
		CHARACTERISTICS		DATE : 29-07-2016		PAGE : 6 OF 6		PAGE : 6 OF 6		VALID UPTO: 29/07/19	
		CLASS		TYPE OF CHECK		QUANTUM OF CHECK		REFERENCE DOCUMENT		ACCEPTANCE NORM	
SL. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	M	C/N	7.	8.	9.	10.	REMARKS
1.	2.	3.	4.	5.							

		g) H.V. test between Ph to Ph & Ph to earth	Major	Electrical	100%	100%	100%	ADS & IS325	ADS & IS325	IS : 4029/Data sheet	Test record	✓	P	W	W	
		h) Locked rotor test	Major	Electrical	100%	100%	100%	IS : 4029	IS : 4029	IS : 4029/Data sheet	Test record	✓	P	W	W	
		i) Reduced voltage running	Major	Electrical	100%	100%	100%	IS : 325	IS : 325	IS : 325	Test record	✓	P	W	W	
		j) Over speed test at 120% of rated speed for 2 min.	Major	Electrical	100%	100%	100%	Data sheet / No Abnormal Vibration	Data sheet / No Abnormal Vibration		Test record	✓	P	W	W	
		k) Vibration measurement at rated speed & voltage	Major	Measure	100%	100%	100%	IS:12075	IS:12075	IS:12075	Test record	✓	P	W	W	
		l) Test for degree of protection with 0.1mm feeler gauge wire	Major	Visual	100%	100%	1 sample/ rating/lot	IS-325/IS4029	IS-325/IS4029		Test record	✓	P	W	W	
		m) Direction of rotation	Major	Electrical	100%	100%	100%	Approved data Sheet	Approved data Sheet	Approved data Sheet	-do-	✓	P	W	W	
		n) Completeness of assembly & Accessorise	Major	Visual	100%	100%	100%	-do-	-do-	-do-	-do-	✓	P	W	W	
		o) Air Gap Measurement	Major	Measure	100%	100%	1 Sample/Lot	ABB Drawing	ABB Drawing	ABB Drawing	-do-	✓	P	W	W	
C	PAINTING	a) Paint shade	Minor	Visual	100%	100%	100%	Approved data sheet	Approved data sheet	Approved data sheet			P	W	W	
		b) Paint thickness	Minor	Measure	100%	100%	100%	NTPC spec/Data Sheet/WI-04	NTPC spec/Data Sheet/WI-04	NTPC spec/Data Sheet/WI-04			P	W	W	
		c) Scratch test (adhesion test)	Minor	Measure	100%	100%	1 each type	-do-	-do-	-do-			P	W	W	No peel off for Adhesion test
D	PACKING	a) Fixing of key in keyway	Minor	Visual	100%	100%	100%	-do-	-do-	-do-			P	-	-	
		b) Mounting pad	Minor	Visual	100%	100%	100%	-do-	-do-	-do-			P	-	-	
		c) Sturdiness of packing	Minor	Visual	100%	100%	100%	-do-	-do-	-do-			P	-	-	
		d) Case marking	Minor	Visual	100%	100%	100%	-do-	-do-	-do-			P	-	-	

LEGEND: * RECORDS IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION
 ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION AS APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

Note: # NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of inspection

FORMAT NO.: QS-01-QAI-P-10/FI-RI

1/1


ENGG. DIV./QA&I



SUB-SECTION–E-42

MOTORS

<p>TALCHER THERMAL POWER PROJECT STAGE-III (2 X 660 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.:CS-4540-001A-2</p>
---	--

CLAUSE NO.		QUALITY ASSURANCE																			
TESTS/CHECKS		MOTOR																			
		Visual	Dimensional	Make/Type/Rating /General Physical Inspection	Mech/Chem. Properties	NDT /DP/MP/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-4722 /IS- 9283/IS 2148/IEC60034\IEC 60079-II/IS-12615	Vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion	
TEMS/COMPONENTS		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Plates for stator frame, end shield, spider etc.		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Shaft		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Magnetic Material		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Rotor Copper/Aluminium		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Stator copper		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
SC Ring		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Insulating Material		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Tubes, for Cooler		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Sleeve Bearing		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Stator/Rotor, Exciter Coils		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Castings, stator frame, terminal box and bearing housing etc.		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Fabrication & machining of stator, rotor, terminal box		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Wound stator		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Wound Exciter		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Rotor complete		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Exciter, Stator, Rotor, Terminal Box assembly		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Accessories, RTD, BTD, CT, Space heater, antifriction bearing, gaskets etc.		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	

TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC.NO.: CS-4540-001A-2		SUB-SECTION –E-47 MOTOR		Page 1 of 2	
--	--	---	--	----------------------------	--	----------------	--


CLAUSE NO.	QUALITY ASSURANCE												
Complete Motor	Y	Y	Y	Y								Y	Y
Note:													
1. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, following methodology to be followed for Inspection Categorization:													
Note for LT Motor:													
i) Motor rating up to 50 KW: Inspection CAT- III : Acceptance of Motor up to 50 KW is based on COC of the Manufacturer and Main Contractor confirming as follows:													
"It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequency variation, hot starts, pull out torque, starting KVA/KW, temperature rise, distance between center of stud gland plate and tested in accordance with approved drawing /data sheets."													
ii) Motor rating above 50 KW & less than 75 KW: Inspection CAT- II as per NTPC approved MQP : Acceptance of Motor rating above 50 KW & less than 75 KW is based on NTPC review of Routine Test inspection report as per IS:12615 - 2018 (including latest revision) duly witnessed by main contractor along with COC of the Manufacturer and Main Contractor confirming as follows:													
"It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequency variation, hot starts, pull out torque, starting KVA/KW, temperature rise, distance between center of stud gland plate, space heater and tested in accordance with approved drawing /data sheets."													
iii) Motor rating 75 KW & above: Inspection CAT-I : As per NTPC approved MQP.													
2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard													
3. Makes of major bought out items for HT motors will be subject to NTPC approval.													
4. Y1 = for HT Motor / Machines only.													
5. For LT Motors, stator core stack length & grade, no load loss and winding resistance w.r.t. type tested motor for IE2/IE3 shall be checked/verified in addition to													
Compliance of relevant standard IS:12615/IEC requirement. In case actual results are not within the tolerance limit as declared by manufacturer during QP submission, the motor shall be subjected to efficiency test.													
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC.NO.: CS-4540-001A-2								SUB-SECTION –E-47 MOTOR				Page 2 of 2


ANNEXURE-I


- | | | | | |
|------|---|--|--------------------------------------|------------------------------|
| 1.0 | Design ambient temperature | : | 50 °C | |
| 2.0 | Maximum acceptable kW rating of LV motor | : | 200KW * | |
| 3.0 | Installation (Indoors/ Outdoors) | : | As required | |
| 4.0 | Details of supply system | | | |
| | a) | Rated voltage (with variation) | : | 415/240V \pm 10% |
| | b) | Rated frequency (with variation) | : | 50 Hz + 3 % to - 5% |
| | c) | Combined voltage & freq. variation | : | 10% (sum of absolute values) |
| | d) | System fault level at rated voltage | : | 50 kA for 1 sec |
| | e) | Short time rating for terminal boxes | : | |
| | | o 90 kW and above (Breaker Controlled) | : | 50 KA for 0.2 sec. |
| | | o Below 90 kW (Contactor Controlled) | : | 50 KA protected by HRC fuse |
| | f) | LV System grounding | : | Solidly |
| 5.0 | Class of insulation: Refer Clause 7.03.00 of customer specification-motors. | | | |
| 6.0 | Minimum voltage for starting :Refer Clause 10.00.00 of customer specification- general electrical specification | | | |
| 7.0 | Power cables data | : | Shall be given during detailed engg. | |
| 8.0 | Earth Conductor Size & Material | : | Shall be given during detailed engg. | |
| 9.0 | Space heater supply | : | 240 V, 1 ϕ , 50 Hz | |
| 10.0 | Rating up to which Single phase motor | : | Acceptable below 0.2 kW | |
| 11.0 | Locked rotor current: Refer Clause 10.00.00 of customer specification- general electrical specification | | | |
| 12.0 | Flame-proof motor: Refer Clause 7.03.00 of customer specification-motors. | | | |
| 13.0 | Makes | : | BHEL/ Customer approval | |
| 14.0 | Tests: As per customer specification | | | |


*** LT motors of continuous duty shall be energy efficient IE3 class conforming to IS-12615**


Also detail Customer spec. for Motors to be referred as enclosed with the specification to be referred.

CLAUSE NO.	Bidder's Name								
	DE-1B	LT MOTORS							
	A.	GENERAL							
	5.	Manufacturer & Country of origin. (Shall be as per approved QA make)							
	6.	Equipment driven by motor							
	7.	Motor type							
	8.	Quantity							
	B.	DESIGN AND PERFORMANCE DATA							
	18.	Frame size							
	19.	Type of duty							
	20.	Type of enclosure /Method of cooling/ Degree of							
	21.	Applicable standard to which motor generally							
	22.	Efficiency class as per IS 12615							
	23.	(a)Whether motor is flame proof	Yes/No						
		(b)If yes, the gas group to which it conforms as per IS:2148							
	24.	Type of mounting							
	25.	Direction of rotation as viewed from DE END							
	26.	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)							
	27.	Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)							
	28.	Maximum continuous load demand of driven							
	29.	Rated Voltage (volts)							
	30.	Permissible variation of :							
		a. Voltage (Volts)							
		b. Frequency (Hz)							
		c. Combined voltage and frequency							
	31.	Rated speed at rated voltage and							
	32.	At rated Voltage and frequency:							
		a. Full load current							
	<table border="1"> <tr> <td>EPC PACKAGE FOR</td> <td>TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2</td> <td>DB07: MOTORS</td> <td>PAGE 13 OF 17</td> </tr> </table>					EPC PACKAGE FOR	TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2	DB07: MOTORS	PAGE 13 OF 17
	EPC PACKAGE FOR	TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2	DB07: MOTORS	PAGE 13 OF 17					

CLAUSE NO.	Bidder's Name		
	b. No load current		
33.	Power Factor at		
	a. 100% load		
	b. NO load		
	c. Starting.		
34.	Efficiency at rated voltage and frequency,		
	a. 100% load		
	b. 75% load		
	c. 50% load		
35.	Starting current (amps) at		
	a. 100 % voltage		
	b. 85% voltage		
	c. 80% voltage		
36.	Minimum permissible starting Voltage (Volts)		
37.	Starting time with minimum permissible voltage		
	a. Without driven equipment coupled		
	b. With driven equipment coupled		
38.	Safe stall time with 100% and 110% of rated		
	a. From hot condition		
	b. From cold condition		
39.	Torques :		
	a. Starting torque at min. permissible voltage(kg-		
	b. Pull up torque at rated voltage.		
	c. Pull out torque		
	d. Min accelerating torque (kg.m) available		
	e. Rated torque (kg.m)		
40.	Stator winding resistance per phase (ohms at 20		
41.	GD ² value of motors		
<div> <div>EPC PACKAGE FOR</div> <div> TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2 </div> <div>DB07: MOTORS</div> <div>PAGE 14 OF 17</div> </div>			

CLAUSE NO.	Bidder's Name				
	42.	No of permissible successive starts when motor is in hot condition			
	43.	Locked Rotor KVA Input			
	44.	Locked Rotor KVA/KW			
	45.	Vibration limit :Velocity (mm/s)			
	46.	Noise level limit (dBA)			
	C.	CONSTRUCTIONAL FEATURES			
	1.	Stator winding insulation			
		a. Class & Type			
		b. Winding Insulation Process			
		c. Tropicalised (Yes/No)			
		d. Temperature rise over specified maximum ambient temperature of 50 deg C			
		e. Method of temperature measurement			
		f. Stator winding connection			
	2.	Main Terminal Box			
		a. Type			
		b. Location(viewed from NDE side)			
		c. Entry of cables(bottom/side)			
		d. Recommended cable size(To be matched with cable size envisaged by owner)			
		e. Fault level (MVA),Fault level duration(sec)			
		f. Cable glands & lugs details (shall be suitable for			
	3.	Type of DE/NDE Bearing			
	4.	Motor Paint shade			
	5.	Weight of			
		a. Motor stator (KG)			
		b. Motor Rotor (KG)			
		c. Total weight (KG)			
	D.	List of accessories.			
	EPC PACKAGE FOR		TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2	DB07: MOTORS	PAGE 15 OF 17

CLAUSE NO.	Bidder's Name			
	1.	3 Space Heaters (Applicable for 30 KW & above motor) (Nos./Power in watts/supply voltage)		
	2.	Terminal Box for Space Heater (Yes/No)		
	3.	Speed switch (Yes/No)		
	4.	Insulation of bearing (Yes/No)		
	5.	Noise reducer(Yes/No)		
	6.	Grounding pads		
		i) No and size on motor body		
		ii) Nos on terminal Box		
	7.	Vibration pads		
		i) Nos and size		
		ii) Location		
	8.	Any other fitments		
	E.	List of curves.		
	1.	Torque speed characteristic of the motor		
	2.	Thermal withstand characteristic		
	3.	Starting. current Vs. Time		
	4.	Starting. current Vs speed		
	5.	P.F. and Effi. Vs Load		
	F.	Additional Data to be filled for each rating of DC Motor		
	1.	Rated armature voltage (Volt)		
	2.	Rated field excitation (Amp)		
	3.	Permissible % variation in voltage		
	4.	Minimum Permissible Starting voltage (volt)		
	5.	At rated voltage		
	i)Full load Armature current.(Amp)			
	ii)Full load Field current (Amp)			
EPC PACKAGE FOR		TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2	DB07: MOTORS	PAGE 16 OF 17

CLAUSE NO.	Bidder's Name		
		iii) No load Armature current (Amp)	
	6.	Full load Field current (Amp)	
	7.	No load Armature current (Amp)	
	8.	Minimum permissible field current (Amp) to avoid	
		i) Maximum permissible voltage	
		ii) Rated voltage	
		iii) Minimum Permissible Voltage	
	9.	Resistance (indicative Values) in ohm	
		i) Armature winding (Arm + IP + Series) at 25	
		ii) Field Winding at 25 deg. C	
	10..	Inductance (indicative values)	
		i) Armature winding	
		ii) Field winding	
	11	Value of trimmer resistance (ohm) to be connected in series with the shunt field to	
		i) 220 V DC	
		ii) 250 V DC	
		iii) 187 V DC	
	12	Value of the external resistance (ohm) required to be connected in series with armature during starting only	
	13	Technical data sheet for external resistance box	
	14	GA drawing of motor	
	15	Starting time calculation	
	16	Starter resistance design calculation	
	17	Electrical connection diagram of motor	
	EPC PACKAGE FOR		TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2

ANNEXURE-

Page No. 339 of 479

Page No. 340 of 479

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

1. For the purpose of clarity, it may please be noted that the information given in regard to the cables to be routed through WinPath as per the system elaborated below is called "Cable List", while the term "Cable Schedule" applies to the cable list with routing information added after routing has been carried out.
2. The cable list shall be entered as an MS Excel file in the format as per enclosed template EXT_CAB_SCH_FORMAT.XLS. No blank lines, special characters, header, footer, lines, etc. shall be introduced in the file. No changes shall be made in the title line (first line) of the template.
3. The field properties shall be as under:
 - a. UNITCABLENO: A/N, up to sixteen (16) characters; each cable shall have its own unique, unduplicated cable number. In case this rule is violated, the cable cannot be taken up for routing.
 - b. FROM: A/N, up to sixty (60) characters; the "From" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
 - c. TO: A/N, up to sixty (60) characters; the "To" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
 - d. PURPOSE: A/N, up to sixty (60) characters; the purpose (i.e. power cable/ indication/ measurement, etc.) to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
 - e. REMARKS: A/N, up to forty (40) characters; Any information pertinent to routing to be specified here (e.g., cable number of the cable redundant to the cable number being entered). Information in excess of 40 characters will be truncated after 40 characters.
 - f. CABLESIZE: A/N, 7 characters exactly as per the codes indicated below shall be specified here. The program cannot route cables described in any other way/ format.
 - g. PATHCABLENO: Field reserved for utilization by the program. User shall not enter any information here.
4. One list shall be prepared for each system/ equipment (i.e., separate and unique cable lists shall be prepared for each system).
5. The cables shall be described as per the scheme listed below:

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

(A) SYSTEM VOLTAGE CODES:

(ac) A = 11KV, B = 6.6KV, C = 3.3KV, D = 415V, E = 240V, F = 110V

(dc) G = 220V, H = 110V, J = 48V, K = +24V, L = -24V

(B) CABLE VOLTAGE CODES:

A = 11KV (Power cables)

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

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

(C) CABLE CODES

PVC Copper

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

PVC Aluminium

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

XLPE Copper


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

XLPE Aluminium

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

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

	2X660 MW Talcher STPP	
	C&I SPECIFICATION FOR FUEL OIL HANDLING SYSTEM	
<div>CONTROL AND INSTRUMENTATION FOR FUEL OIL HANDLING SYSTEM</div>		

	2 X 660MW TALCHER STPP	
	TECHNICAL SPECIFICATION (C&I) FOR FUEL OIL HANDLING SYSTEM	
<div>C&I SPECIFIC TECHNICAL REQUIREMENT</div>		

	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) FOR FUEL OIL HANDLING SYSTEM	
<ol style="list-style-type: none"> 1. The control system for Fuel Oil Handling system shall be DDCMIS based (BHEL's scope). Profibus based controls and conventional controls (hardwired 4-20mA/DI/DO) are envisaged for this package. 2. Bidder to provide Profibus PA protocol compatible PT(Pressure Transmitters),DPT(Differential Pressure Transmitters),TT(Temperature Transmitters) and Flow/Level Transmitters(DP type) for entire Fuel Oil Handling system. 3. All motorized valves shall be supplied with Non-intrusive Profibus based Electric Actuator (with integral starter) for Fuel Oil Handling package along with necessary interface units for linking to corresponding Control System as applicable. The interface of these actuators with DCS shall be with PROFIBUS DP interface. All actuator settings including torque, limit shall be possible without opening the actuator cover and LCD indication shall be available integral to actuator body. Open/Close command termination logic suitably built inside the actuator Details shall be referring in the specification. 4. All ON, OFF, INCHING type electric actuators shall be PROFIBUS DP compatible. PROFIBUS DP protocol based actuators shall have two (redundant) PROFIBUS DP ports for connecting the redundant PROFIBUS DP cables. That is if one PROFIBUS DP cable is cut or not working/not available, then complete actuator functionality shall be available through the second redundant cable without any manual intervention. 5. Profibus based electronic positioner (as per standard and proven practice of valve OEM) is to be provided with all the pneumatic operated control valves. 6. The Profibus protocol design shall be further validated by BHEL and approved by NTPC during detailed engineering and any variation/changes required based on DDCMIS system requirements and actual field installation, operational philosophy etc. shall be considered by bidder without any implications. 7. Bidder to note that all transmitters (other than Profibus compatible transmitters) shall be smart type and shall have 4-20mA DC signal with superimposed digital communication (HART). 8. Profibus DP based IMC in LV SWGR/MCC (BHEL's scope) shall be provided. 		

|

	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) FOR FUEL OIL HANDLING SYSTEM	
<p>9. Redundancy of instruments to be provided by bidder shall be as follows:-</p> <p>(i) Triple redundancy for all analog and binary inputs required for protection of system/drives.</p> <p>(ii) For all other control functions dual redundancy of the sensors shall be provided by the bidder.</p> <p>10. Bidder to provide Comprehensive Annual Maintenance Services (AMS) for three (03) years after warranty period for Profibus instruments of Fuel Oil Handling System.</p> <p>11. Bidder shall provide the following :-</p> <p>a) Configuration/ diagnostic tool for Non-intrusive profibus based actuators – 5 Nos. or 5% of total quantity of actuator whichever is more.</p> <p>b) Configuration/ diagnostic tool for all Profibus based instruments – 2 Nos of each make.</p> <p>Bidder shall also provide all required software (lifetime licensed) and hardware (cables/connectors, Tablet/ Laptop etc.) along with these tools.</p> <p>12. Bidder to provide Junction Boxes in field for termination of all the instruments.</p> <p>13. All Temperature sensors shall be Duplex type and temperature transmitter shall be provided for all temperature measurement applications. Bidder to provide temperature transmitter along with compensating cable, JB/Rack & other erection hardware.</p> <p>14. Bidder to note that Instrumentation Cable shall be as per Electrical Cable scope matrix attached elsewhere in the Specification.</p> <p>15. Bidder to provide atleast 20% spare terminals in Junction boxes,LIE/LIRs etc.</p> <p>16. All the transmitters supplied by Bidder shall be LIE/LIR mounted . The LIE/LIRs shall be in Bidder's scope of supply.</p> <p>17. All the instruments having contact with corrosive media shall be provided with chemical/diaphragm seal.</p> <p>18. Epoxy coated painting is required for all I & C Equipment & Instruments.</p> <p>19. All field instruments enclosure shall be IP65, local panel/cabinet enclosure shall be IP 55, unless otherwise specified.</p>		

|

	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) FOR FUEL OIL HANDLING SYSTEM	
<p>20. The solenoid operated valves/Dampers/Gate shall have a limit switch for open/close feedback.</p> <p>21. The type of level indicator can be float and board type which is also subject to acceptance by NTPC/customer.</p> <p>22. All weather Local Panel fitted with integral Air Conditioner shall be provided by the Bidder for housing analyzers etc. if the same are not kept in AC rooms.</p> <p>23. JB provided on the valves for manually operated valves Limit switches (open/close)wherever specified.</p> <p>24. All field instruments/analyzers/actuators/sov/control valves etc. shall be hooked with DDCMIS based control system as per requirement mentioned elsewhere in the specification.</p> <p>25. All the wetted parts of the instruments including the accessories like root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments as well as valves shall be of SS-316 material, suitable pressure class and same shall be in bidder's scope . Double root valves for all pressure tapping where the pressure exceeds 40 Kg./sq.cm. shall be provided by the bidder.</p> <p>26. All electrical devices like switches/ transmitters/ controller/ analyzer/ solenoid valves which are located in the in hazardous areas shall be made intrinsically safe by providing suitable type of transformer isolated barrier / Zener barrier of standard make & shall be provided with explosion proof enclosure suitable for hazardous areas described in National Electric Code (USA), Article 500, Class-I, Division-I or EN60079-14 or shall comply with the essential requirements of ATEX directives.</p> <p>27. All measuring instruments/equipment/analysers and subsystems offered by the Bidder shall be from reputed experienced manufacturers ((from BHEL/customer approved vendor list) of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards. Further, Bidder to meet the provenness criteria for all the supplied C&I items mentioned elsewhere in the specification.</p>		

|

	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) FOR FUEL OIL HANDLING SYSTEM	
<p>28. 230 V AC UPS Power supply shall be provided by BHEL at a single point, further distribution to various instruments/equipment of the system shall be in bidder scope. Bidder to include necessary power distribution board in his scope. Any power supply other than the above, if required by any instrument/equipment has to be derived by the bidder from the above supply & all necessary hardware for the same shall be in bidder scope. Further, Bidder to furnish UPS load data during detailed engineering in BHEL format.</p> <p>29. Bidder to provide mandatory spares for C&I items as per mandatory spares list.</p> <p>30. Bidder to perform tests of C&I items/instruments/systems as per Quality plans/type test attached in the specification.</p> <p>31. Bidder's representative shall be present at BHEL-PEM for 3 man-days, for preparation of Control scheme of Fuel Oil handling system. All the expenses like boarding, lodging and travel, air fare etc. shall be in bidder's scope.</p> <p>32. Bidder's presence is required for 3 Man days (Excluding travel time) at EDN Bangalore during FAT of DDCMIS for certifying correctness & completeness of implementation of Control logic. Intimation regarding FAT shall be given 2 days in advance. All the expenses like boarding, lodging and travel, air fare etc. shall be in bidder's scope.</p> <p>33. Bidder's presence is required for 15 Man days (in three visits) at site during commissioning of DDCMIS for assistance related to process correctness. Three visits shall be made with total 15 Man days(excluding travel time) in which one visit shall be of 5 man days each. All the expenses like boarding, lodging and travel, air fare etc. shall be in bidder's scope.</p> <p>34. Bidder shall furnish Instrument Schedule, Control Scheme, I/O list, Drive list, Cable Schedule, Cable interconnection, Instrument/SOV/Analyzers Installation diagram, Instrument/Analyzer datasheets, JB grouping, SOV grouping, Annunciation list, List of Instruments/devices for Profibus/HART, configuration diagram for Profibus based actuators/instruments in BHEL approved format. Also, editable database format like MS Excel, MS Access etc. of these documents shall also be provided by Bidder.</p> <p>35. Bidder shall provide complete Instrumentation for control, monitoring and operation of entire Fuel Oil handling System. The requirements given are to be read in conjunction with detailed Technical specification. Further in case of any discrepancy in the requirement, the more stringent requirement as per</p>		

	2X660 MW Talcher STPP	SECTION: C SUB SECTION : C&I
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) FOR FUEL OIL HANDLING SYSTEM	
<p>interpretation of BHEL/customer shall prevail without any commercial implication.</p> <p>36. The quantity of instruments for the system shall be as per tender P&ID wherever provided of the respective system as a minimum, for bidding purpose. However, Bidder shall also include in his proposal all the instruments and devices that are needed for the completeness of the plant auxiliary system/ equipment supplied by the bidder, even if the same is not specifically appearing in the P & ID. During detail engineering if any additional instruments are required for safe & reliable operation of plant, bidder shall supply the same without any price implication</p> <p>37. All panels, cabinets shall be provided with a continuous bare copper ground bus. The ground bus shall be bolted to the panel structure on bottom on both sides. The bolts shall face inside of panels. The system ground shall be isolated from the panel ground with suitable isolators. All internal component grounds or common shall be connected to the system ground, which shall be fabricated of copper flat (size 25mm x 6mm min., length as applicable).</p> <p>38. Bidder to provide erection hardware including junction boxes, canopies, structural steel as required.</p> <p>39. Bidder shall ensure that various C&I instruments /equipment like electronic transmitters / transducers, Temperature elements and other instruments/ local devices etc. that are being furnished by the Bidder, are of the same make, series and family of hardware to the extent possible so as to ensure smooth and optimal maintenance.</p>		

ACTUATORS

|

023/PS-PEM-MAX		CLAUSE NO.		TECHNICAL REQUIREMENTS		<div>एनटीपीसी NTPC</div>		
1.00.00		ELECTRICAL ACTUATORS		General Requirements		Actuators shall be designed for valve operation to ensure proper function in accordance with specifications given below and complying to EN15714-2 or equivalent. All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions.		
4.00.00		REQUIREMENT FOR NON-INTRUSIVE PROFIBUS ACTUATOR						
4.01.00		Type		<div>1. The actuators shall have integral starters with built in SPP (Single Phasing Preventer). 415 V, 3 phase 3 wire power supply shall be given to the actuator from switch board as applicable through a switch fuse unit. Control voltage of the motor starter shall be 110 V AC / 24 V DC, derived suitably from 415V power supply.</div> <div>2. The actuators shall be Non- Intrusive electric actuator. All actuator settings including torque, limit shall be possible without opening the actuator cover and LCD indication shall be available integral to actuator body</div>				
4.02.00		Rating		<div>1. Supply Voltage & frequency: 415V +/- 10%, 3 Phase, 3 Wire & 50HZ +/- 5%.</div> <div>2. Sizing: Open/Close at rated speed against designed differential pressure at 90% of rated voltage. For ON/OFF type: Three successive open-close operations or 15 minutes, whichever is higher. For inching type: 150 starts per hour or required cycles, whichever is higher</div>				
4.03.00		Construction		<div>1. Enclosure: Totally enclosed weatherproof, minimum IP-68 degree of protection.</div> <div>2. Manual Wheel: Shall disengage automatically during motor operation.</div>				
4.04.00		Motor		Type: Squirrel cage induction motor suitable for Direct On-Line (DOL) starting Enclosure: Totally enclosed, self-ventilated Insulation: Class F. Temperature rise 70 Deg C. over 50 Deg C ambient. Bearings: Double shielded, grease lubricated antifriction				
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE				TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: CS-4540-001A-2		SUB-SECTION-III-C-17 ELECTRICAL ACTUATORS		PAGE 1 OF 4


CLAUSE NO.	<div data-bbox="646 128 1036 155">TECHNICAL REQUIREMENTS</div> <div data-bbox="1281 100 1395 163">एनटीपीसी NTPC</div>		
<div data-bbox="237 390 321 415">4.05.00</div> <div data-bbox="394 390 535 474">Position / Torque Transmitter</div> <div data-bbox="237 506 321 531">4.06.00</div> <div data-bbox="394 506 513 562">Local Operation</div> <div data-bbox="237 590 321 615">4.07.00</div> <div data-bbox="394 590 542 615">LCD Display</div> <div data-bbox="237 705 321 730">4.08.00</div> <div data-bbox="394 705 472 730">Wiring</div> <div data-bbox="237 762 321 787">4.09.00</div> <div data-bbox="394 762 500 816">Terminal Block</div> <div data-bbox="237 821 321 846">4.10.00</div> <div data-bbox="394 821 542 846">Accessories</div> <div data-bbox="237 936 321 961">4.11.00</div> <div data-bbox="394 936 542 991">SIL Certification</div>	<p data-bbox="594 191 1425 359">Earth Terminals: Two Protection: Single Phasing Protection, Over-heating protection through Thermostat (as applicable) and wrong phase sequence protection shall be provided over and above other protection features standard to bidder's design. Suitable means shall be provided to diagnose the type of fault locally.</p> <p data-bbox="639 390 1425 474">The Position/ Limit measurement shall be done using absolute encoders which will give information of position/ limit in both the directions. Electronic measurement of torque shall be provided.</p> <p data-bbox="639 506 1425 562">It shall be possible to operate the actuator locally also. Lockable local/remote selection shall be provided on the actuator.</p> <p data-bbox="639 590 1425 674">A local LCD display shall be provided to give information regarding actuator alarms, status and valve position indications as a minimum in local.</p> <p data-bbox="639 705 1029 730">Suitable voltage grade copper wire.</p> <p data-bbox="639 762 1300 787">For power cables, the grade of TBs shall be minimum 650V.</p> <p data-bbox="639 821 1425 877">All required accessories for calibration / settings/ configuration of various parameters of actuator shall be provided.</p> <p data-bbox="639 936 1170 961">All actuators shall be certified for SIL 2 or better.</p> <div data-bbox="1013 968 1395 1010">d e e</div>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: CS-4540-001A-2	SUB-SECTION-IIIC-17 ELECTRICAL ACTUATORS	PAGE 2 OF 4

023/PS-PEM-MAX		<div> <div>एनटीपीसी</div> <div>NTPC</div> </div>	
CLAUSE NO.	TECHNICAL REQUIREMENTS		
	REQUIREMENT FOR NON-INTRUSIVE PROFIBUS ACTUATOR		
4.12.00	Interfaces	<p>For ON-OFF and INCHING type actuators interface with the control system shall be through fieldbus network.</p> <p>a) Open/ close commands, open/ close feedback status, disturbance signal etc. shall be available to the Control System through the fieldbus network along with diagnostics. The detailed diagnostics including the actuator operating data shall be available to the DDCMIS through the fieldbus network.</p> <p>b) All actuators shall be Profibus compatible.</p> <p>If Profibus DP protocol is envisaged then actuator shall have two (redundant) Profibus DP ports for connecting the redundant Profibus DP cables. That is if one profibus cable is cut or not working/ not available, then complete actuator functionality shall be available through the second redundant cable without any manual intervention. Also, for Profibus DP cable connection, suitable connector integral to the actuator, or external devices/ accessories (mounted inside minimum IP65 protection class enclosure) shall be provided so that the actuator can be isolated online from the profibus network without disturbing the Profibus communication of other actuators of the segment.</p> <p>c) Open/close command termination logic shall be suitably built inside actuator.</p> <p>d) For all actuators GSD and DTM files are to be provided which shall be configured/ tested with DCS for proper interfacing and diagnostics.</p>	
4.13.00	Terminal Box	Suitable terminals/ connectors, integral to actuator, for terminating fieldbus cables and power cables shall be provided. Necessary glands for power cables and armored fieldbus cables shall be provided.	
4.14.00	Training	Contractor shall provide training on Non-Intrusive Fieldbus Electric Actuator along with detail training on Foundation Fieldbus/ Profibus interface used in actuator for Employer's personnel.	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO.: CS-4540-001A-2	SUB-SECTION-IIIC-17 ELECTRICAL ACTUATORS
		PAGE 3 OF 4	


1500633/2023/PS-PEM-MAX

	DATASHEET FOR MOTORISED VALVE ACTUATOR (2X660MW Talcher STPP)		SPECIFICATION NO.:	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE:06/03/2020
			SHEET 1	OF 4
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL *	* PROJECT	2X660 MW TALCHER STPP		
	OFFER REFERENCE			
	* TAG NO. SERVICE			
	* DUTY	<input type="checkbox"/> ON / OFF ** <input type="checkbox"/> INCHING		
	* LINE SIZE (inlet/outlet): MATERIAL			
	* VALVE TYPE	<input type="checkbox"/> GLOBE <input type="checkbox"/> GATE <input type="checkbox"/> REG. GLOBE <input type="checkbox"/> BUTTERFLY		
	* OPENING / CLOSING TIME			
	* WORKING PRESSURE			
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF -20 to 70 DEG C AND RELATIVE HUMIDITY OF 0-95% IN HOT HUMID AND TROPICAL ATMOSPHERE AND HIGHLY POLLUTED AT PLACES OF COAL DUST AND FLY DUST		
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY		
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY		
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY		
	CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF, DUST TIGHT SUITABLE FOR OUTDOOR USE WITHOUT CANOPY, NEMA6/IP:68	
MECHANICAL POSITION INDICATOR		TO BE PROVIDED FOR 0-100% TRAVEL		
BEARINGS		DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.		
GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION		METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.		
SIZING		OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 85% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING SERVICE - 150 STARTS/HR MINIMUM & FOR REGULATING SERVICE - 600 STARTS/HR MINIMUM as per IEC60034-1		
HANDWHEEL as per standard EN 12570:2000	* REQUIRED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
	* ORIENTATION	<input type="checkbox"/> TOP MOUNTED <input type="checkbox"/> SIDE MOUNTED		
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.			
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY		
	MOTOR MAKE / MODEL / TYPE / RATING (KW) (REFER NOTE NO. 6 & 7)	BIDDER TO SPECIFY		
	@ MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT-INCLUSIVE OF I.S. TOLERANCE		
	ACTUATOR APPLICABLE WIRING DIAGRAM (TO BE DECIDED DURING DETAILED ENGINEERING)	BIDDER TO FURNISH WIRING DIAGRAM		
	COLOUR SHADE	<input type="checkbox"/> BLUE (RAL 5012) <input type="checkbox"/> SIEMENS GRAYRAL 7030/32 <input checked="" type="checkbox"/> TO BE DECIDED DURING DETAILED ENGINEERING		
	PAINT TYPE	<input type="checkbox"/> ENAMEL <input type="checkbox"/> EPOXY CONFIRMING TO CORROSION CATEGORY C5-I <input checked="" type="checkbox"/> TO BE DECIDED DURING DETAILED ENGINEERING		
	SHAFT RPM	BIDDER TO SPECIFY		
	OLR SET VALUE	BIDDER TO SPECIFY		
	@ STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		


1500633/2023/PS-PEM-MAX

	DATASHEET FOR MOTORISED VALVE ACTUATOR (2X660MW Talcher STPP)		SPECIFICATION NO.:	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE:06/03/2020
			SHEET 2	OF 4
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
	@ PWR SUPP TO MTR / STARTER	415V, 3PH, AC		
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER ■ 230 V ■ 110 V		
	@ ENCLOSURE CLASS OF MOTOR	<input type="checkbox"/> IP 67 ■ <input type="checkbox"/> IP 68 ■ FLAME PROOF TO BE DECIDED DURING DETAILED ENGINEERING		
	@MOTOR BEARING WITH 2 EARTH TERMINALS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI FRICTION		
	@ INSULATION CLASS	CLASS F. TEMPERATURE RISE 70 Deg C. OVER 50 Deg C AMBIENT		
	@ WINDING TEMP PROTECTION	■ THERMOSTAT (3 Nos., 1 IN EACH PHASE)		
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED (THERMISTOR PTC)		
INTEGRAL STARTER	INTEGRAL STARTER	■ REQUIRED <input type="checkbox"/> NOT REQUIRED		
	TYPE OF SWITCHING DEVICE	<input type="checkbox"/> CONTACTORS ■ CONTACTORS(REVERSING TYPE) ■ THYRISTORS		
	TYPE	<input type="checkbox"/> CONVENTIONAL ■ NON-INTRUSIVE PROFIBUS		
	IF NON-INTRUSIVE PROFIBUS (REFER BELOW POINT a – g)			
	a) INTERFACE WITH CONTROL SYSTEM	■ PROFIBUS <input type="checkbox"/> HARDWIRED		
	b) FIELDBUS PROTOCOL	<input type="checkbox"/> PROFIBUS DP <input type="checkbox"/> PROFIBUS PA <input type="checkbox"/> FOUNDATION FIELDBUS		
	c) REDUNDANT PORTS(IN CASE,PROFIBUS DP PROTOCOL)	■ REQUIRED <input type="checkbox"/> NOT REQUIRED		
	d)TORQUE/LIMIT MEASUREMENT TRANSMITTER(REFER NOTE NO.9)	■ REQUIRED <input type="checkbox"/> NOT REQUIRED		
	e)POSITION MEASUREMENT TRANSMITTER(REFER NOTE NO.9)	■ REQUIRED <input type="checkbox"/> NOT REQUIRED		
	f)LCD DISPLAY INTEGRAL TO ACTUATOR BODY(REFER NOTE NO.10)	■ REQUIRED <input type="checkbox"/> NOT REQUIRED		
	g) SIL CERTIFICATION(SIL 2 OR BETTER)	■ REQUIRED <input type="checkbox"/> NOT REQUIRED		
	STEP DOWN CONT. TRANSFORMER	■ REQUIRED		
	OPEN / CLOSE PB	■ REQUIRED <input type="checkbox"/> NOT REQUIRED		
	STOP PB	■ REQUIRED <input type="checkbox"/> NOT REQUIRED		
	INDICATING LAMPS	■ REQUIRED <input type="checkbox"/> NOT REQUIRED		
	LOCAL REMOTE S/S(LOCKABLE)	■REQUIRED <input type="checkbox"/> NOT REQUIRED		
	STATUS CONTACTS FOR MONITORING	■ REQUIRED <input type="checkbox"/> NOT REQUIRED		
	INTEGRAL STARTER DISTURBED SIGNAL (TO BE DECIDED DURING DETAILED ENGINEERING)	REQUIRED MOTOR THERMOSTSTRIP O/L RELAY OPTD, CONT./POWER SUPPLY FAILED,S/S IN LOCAL/REMOTE/OFF MODE,TORQUE SWITCH OPEN/CLOSE CUT OFF/STOP PB OPTD,VALVE JAMMED ETC)		
	ACTION ON LOSS OF EXTERNAL ELECTRIC POWER	<input type="checkbox"/> STAYPUT <input type="checkbox"/> FAIL SAFE TO BE DECIDED DURING DETAILED ENGINEERING		
INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter) DATASHEET & WIRING DIAGRAM OF	TYPE OF ISOLATING DEVICE	<input type="checkbox"/> INTERPOSING RELAY ■ OPTO COUPLER TO BE DECIDED DURING DETAILED ENGINEERING		
	QUANTITY	<input type="checkbox"/> 2 NOs. ■ 3 NOs. TO BE DECIDED DURING DETAILED ENGINEERING		
	DRIVING VOLTAGE	<input type="checkbox"/> 20.5 – 24V DC <input type="checkbox"/> _____ V DC		
	DRIVING CURRENT	<input type="checkbox"/> 125mA MAX <input type="checkbox"/> _____ mA MAX		

1500633/2023/PS-PEM-MAX


	DATASHEET FOR MOTORISED VALVE ACTUATOR (2X660MW Talcher STPP)		SPECIFICATION NO.:	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE:06/03/2020
			SHEET 3	OF 4
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
ISOLATION DEVICE TO BE PROVIDED(NOT APPLICABLE FOR NON- INTRUSIVE PROFIBUS ACTUATOR)	LOAD RESISTANCE	<input checked="" type="checkbox"/> > 192 ohms - <25 k ohms <input type="checkbox"/> > _____ ohms - < _____ ohms		
TORQUE SWITCH (NOT APPLICABLE FOR NON- INTRUSIVE PROFIBUS ACTUATOR)	MFR & MODEL NO.	BIDDER TO SPECIFY		
	OPEN / CLOSE	<input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos. / <input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos		
	CONTACT TYPE	2 NO + 2 NC		
	RATING	5A 240V AC AND 0.5A 220V DC		
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE		
	ACCURACY	+3% OF SET VALUE		
LIMIT SWITCH (NOT APPLICABLE FOR NON- INTRUSIVE PROFIBUS ACTUATOR)	MFR & MODEL NO.	BIDDER TO SPECIFY		
	OPEN : INT : CLOSE	<input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2 Nos.	2 Nos. (ADJ.)	<input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2Nos.
	CONTACT TYPE	2 NO + 2 NC		
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V		
	ACCURACY	2% OF SET VALUE		
POSITION TRANSMITTER (ALSO REFER NOTE NO.9)	POSITION TRANSMITTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	MFR & MODEL NO.	BIDDER TO SPECIFY		
	TYPE	<input checked="" type="checkbox"/> ELECTRONIC (2 WIRE) R/I CONVERTER <input checked="" type="checkbox"/> ELECTRONIC (2 WIRE) CONTACTLESS TO BE DECIDED DURING DETAILED ENGINEERING		
	SUPPLY	<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/>		
	OUTPUT	<input checked="" type="checkbox"/> 4-20mA		
	ACCURACY	± 1% FS		
SPACE HEATER	@SPACE HEATER	REQUIRED		
	@ POWER SUPPLY (NON NTEGRAL)	240V AC,1 PH.,50 Hz		
	@ POWER SUPPLY (INTEGRAL)	BIDDER TO SPECIFY		
	@ RATING			
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED		
	ENCL CLASS ACTUATOR/MOTOR T.B.	@ <input checked="" type="checkbox"/> IP 68 @ <input checked="" type="checkbox"/> TO BE DECIDED DURING DETAILED ENGINEERING		
	@ EARTHING TERMINAL	REQUIRED		
	PLUG & SOCKET	<input checked="" type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED (TO BE DECIDED DURING DETAILED ENGINEERING)		
	NO. OF PINS REQUIRED	<input checked="" type="checkbox"/> 9 PINS <input checked="" type="checkbox"/> 13 PINS (TO BE DECIDED DURING DETAILEDENGINEERING)		
	NOS. OF PLUG & SOCKET	<input type="checkbox"/> 1 Nos. for ON/OFF <input type="checkbox"/> 2 NOS.(for inching duty)		
CABLE GLANDS	@ POWER CABLE GLAND	QUANTITY & SIZE TO BE DECIDED DURING DETAILED ENGINEERING		
	@ SPACE HEATER CABLE GLAND			
	CONTROL CABLE GLANDS-1			


1500633/2023/PS-PEM-MAX

	DATASHEET FOR MOTORISED VALVE ACTUATOR (2X660MW Talcher STPP)		SPECIFICATION NO.:	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE:06/03/2020
			SHEET 4	OF 4
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
	CONTROL CABLE GLANDS-2			
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY	_____ Kg.	
NOTES: <ol style="list-style-type: none"> SCOPE: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY. CODES & STANDARDS: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH: IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691, IS-4722, IEC 60947-5-1 AND EN 15714-3 :2010 OR LATEST VERSION. TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C. CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED. THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION.THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE. THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING. THE MOTOR SHALL BE CAPABLE OF STARTING AT 85 PERCENT OF RATED VOLTAGE RUNNING AT 80 PERCENT OF RATED VOLTAGE AT RATED TORQUE AND 85 PERCENT RATED VOLTAGE AT 33 PERCENT EXCESS RATED TORQUE FOR A PERIOD OF 5 MINUTES EACH IN ADDITION TO ABOVE REQUIREMENTS FOR LIMIT/TORQUE SWITCH, MECHANICAL END STOP WITH ACCURACY OF 2% SHALL BE SUPPLIED. THE POSITION/LIMIT MEASUREMENT SHALL BE DONE USING ABSOLUTE ENCODERS WHICH WILL GIVE INFORMATION OF POSITION/LIMIT IN BOTH THE DIRECTIONS.ELECTRONIC MEASUREMENT OF TORQUE SHALL BE PROVIDED A LOCAL LCD DISPLAY SHALL BE PROVIDED TO GIVE INFORMATION REGARDING ACTUATOR ALARMS, STATUS AND VALVE POSITION INDICATION AS A MINIMUM IN LOCAL. IT SHOULD BE POSSIBLE TO OPERATE THE ACTUATOR LOCALLY. LOCKABLE LOCAL/REMOTE SELECTION SHALL BE PROVIDED ON THE ACTUATOR. LOCAL POSITION INDICATOR SHALL BE PROVIDED FOR 0 TO 100 % TRAVEL. CONTROL WIRING SHALL BE SUITABLE VOLTAGE GRADE COPPER WIRE OF 1.5 SQ. MM. ENDURANCE: RATED TORQUE RANGE SHOULD BE BASED ON ISO 5211, ISO5210. TAG PLATE SHALL BE CONFIRMING TO STANDARD BS-15714. THE ACTUATORS SHALL BE DESIGNED TO BE SELF-LOCKING UPON LOSS OF POWER. MOTOR SHALL BE DESIGNED TO CLOSE IN 30 SECS. FROM FULL OPEN POSITION AND SHALL HAVE ADEQUATE CAPACITY TO OPEN AND CLOSE UNDER FULL UNBALANCED DESIGN PRESSURE. AUTOMATIC PHASE CORRECTION FACILITY AND POTENTIAL FREE CONTACT FOR ANNUNCIATION OF POWER FAILURE SHALL BE PROVIDED. LIMIT SWITCHES SHALL BE SILVER PLATED WITH HIGH CONDUCTIVITY AND NON-CORROSIVE TYPE. CONTACT RATING SHALL BE SUFFICIENT TO MEET THE REQUIREMENT OF CONTROL SYSTEM SUBJECT TO A MINIMUM OF 60 V, 6 VA RATING. PROTECTION CLASS SHALL BE IP67. SUITABLE TERMINALS/CONNECTORS.INTEGRAL TO ACTUATORS ,FOR TERMINATING FIELDBUS(PROFIBUS-DP) CABLES AND POWER CABLES SHALL BE PROVIDED.NECESSARY GLANDS FOR POWER CABLES AND ARMORED FIELDBUS CABLES SHALL BE PROVIDED. THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +5% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%. ACTUATOR SHALL ATTAIN FULL SPEED OPERATIONS BEFORE VALVE LOAD IS ENCOUNTERED AND IMPART AN UNSEATING BLOW TO START THE VALVE IN MOTION (HAMMER BLOW EFFECT). OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 90% OF RATED VOLTAGE. 				
NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @ BE FILLED BY ES				

NAME	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL
				NAME
SIGNATURE				SIGNATURE


FIELD & MEASURING INSTRUMENTS


CLAUSE NO.	TECHNICAL REQUIREMENTS			
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 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, switches and gauges 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 on as required basis with in quoted lump sum price. 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	<p>All instruments envisaged for sea water applications, shall be provided with wetted parts made of Monel/ Hastelloy C or any other material (if provenness experience of the proposed material for such applications is established by contractor).</p> <p>For Chlorine application: Instruments shall be provided with wetted parts (e.g. diaphragm seal, etc.) made of Hastelloy C. Also, filled liquid shall be Fluorolube oil/ Inert Hydrocarbon / CTFE etc., for these applications.</p> <p>For applications of FECL3 solution: Instruments shall be provided with wetted parts (e.g. diaphragm seal, etc.) made of Tantalum.</p>			
1.06.00	For coastal areas, all instruments shall be provided with durable epoxy/ polyurethane coating for housings and all exposed surfaces of the instruments.			
1.07.00	The instruments which are proposed to be used for PG test as indicated in the tender P&IDs shall meet the minimum requirements specified in ASME PTC or subsequent clauses in this chapter whichever is better.			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 1 OF 34


CLAUSE NO.	TECHNICAL REQUIREMENTS																					
2.00.00	SPECIFICATION FOR ELECTRONIC TRANSMITTERS																					
2.01.00	<p>SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF PRESS AND DP BASED FLOW / LEVEL MEASUREMENTS</p> <p>Microprocessor based 2 wire loop powered electronic transmitter with 4-20 mA DC HART/ 'Profibus PA complying to IEC 61158.) output signal shall be provided.</p> <table><tr><th>Range</th><th>Accuracy (For calibrated Range)</th><th>Turndown (For span)</th><th>Stability (% of Calibrated range)</th></tr><tr><td><=400mmwc</td><td>0.1%</td><td>20:1</td><td>+/-0.2% for 1 year</td></tr><tr><td>>400mmwc</td><td>0.060%</td><td>50:1</td><td>+/-0.25 % for 10 year</td></tr><tr><td>>250 kg/cm2</td><td>0.065%</td><td>10:1</td><td>+/- 0.15 % for 5 years</td></tr></table> <p>Above parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only.</p> <p>Transmitter shall have weather proof IP-67 metallic housing with durable corrosion resistant coating, integral digital display with self-indicating diagnostics, Plug and socket type electrical connection for HART and ½ "NPT (F) for Profibus type Transmitter, calibration using HART/Fieldbus calibrator, 2/3/5 Valve non integral manifold and rack with canopy. For HART transmitter SIL 2 certification is required.</p> <p>For primary air and flue gas applications, DPT shall be provided for pressure measurement below range of 2000 mmwc.</p> <p>For corrosive, viscous, solid bearing, slurry type process fluids, suitable diaphragm seal shall be provided. Parts below seal shall be removable for cleaning. Entire volume shall be completely filled with inert liquid suitable for instruments. LVDT type transmitter is not acceptable.</p>				Range	Accuracy (For calibrated Range)	Turndown (For span)	Stability (% of Calibrated range)	<=400mmwc	0.1%	20:1	+/-0.2% for 1 year	>400mmwc	0.060%	50:1	+/-0.25 % for 10 year	>250 kg/cm2	0.065%	10:1	+/- 0.15 % for 5 years		
Range	Accuracy (For calibrated Range)	Turndown (For span)	Stability (% of Calibrated range)																			
<=400mmwc	0.1%	20:1	+/-0.2% for 1 year																			
>400mmwc	0.060%	50:1	+/-0.25 % for 10 year																			
>250 kg/cm2	0.065%	10:1	+/- 0.15 % for 5 years																			
2.02.00	<p>GUIDED WAVE RADAR TYPE LEVEL TRANSMITTER</p> <table><tr><td>Type</td><td>Microprocessor based 2 wire type (loop powered), HART protocol compatible Guided wave radar transmitter.</td></tr><tr><td>Principle</td><td>TDR (Time domain reflectometry)</td></tr><tr><td>Probe Type & Material</td><td>(i) Coaxial probe of SS316/316L. If required, probe shall be suitable for overfill prevention. (ii) Rod probe, cable probe of SS316/SS316L can be used for applications wherever coaxial probe is not suitable.</td></tr><tr><td>Output signal</td><td>4-20 mA DC along with superimposed digital signal (based on HART protocol), suitable for over fill prevention.</td></tr><tr><td>Accuracy</td><td>+/- 0.5% of calibrated span or minimum 5mm.</td></tr><tr><td>Power supply</td><td>24 VDC +/- 10%.</td></tr><tr><td>Housing</td><td>Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.</td></tr><tr><td>Adjustment/ calibration</td><td>Using hand held HART calibrator/ centralized PC based system (as applicable).</td></tr><tr><td>Zero & span</td><td>Continuous, temper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument</td></tr></table>				Type	Microprocessor based 2 wire type (loop powered), HART protocol compatible Guided wave radar transmitter.	Principle	TDR (Time domain reflectometry)	Probe Type & Material	(i) Coaxial probe of SS316/316L. If required, probe shall be suitable for overfill prevention. (ii) Rod probe, cable probe of SS316/SS316L can be used for applications wherever coaxial probe is not suitable.	Output signal	4-20 mA DC along with superimposed digital signal (based on HART protocol), suitable for over fill prevention.	Accuracy	+/- 0.5% of calibrated span or minimum 5mm.	Power supply	24 VDC +/- 10%.	Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.	Adjustment/ calibration	Using hand held HART calibrator/ centralized PC based system (as applicable).	Zero & span	Continuous, temper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument
Type	Microprocessor based 2 wire type (loop powered), HART protocol compatible Guided wave radar transmitter.																					
Principle	TDR (Time domain reflectometry)																					
Probe Type & Material	(i) Coaxial probe of SS316/316L. If required, probe shall be suitable for overfill prevention. (ii) Rod probe, cable probe of SS316/SS316L can be used for applications wherever coaxial probe is not suitable.																					
Output signal	4-20 mA DC along with superimposed digital signal (based on HART protocol), suitable for over fill prevention.																					
Accuracy	+/- 0.5% of calibrated span or minimum 5mm.																					
Power supply	24 VDC +/- 10%.																					
Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.																					
Adjustment/ calibration	Using hand held HART calibrator/ centralized PC based system (as applicable).																					
Zero & span	Continuous, temper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument																					
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 2 OF 34																		

CLAUSE NO.	TECHNICAL REQUIREMENTS		<div>एनटीपीसी NTPC</div>																																													
2.03.00	<table><tr><td>adjustment</td><td colspan="3">without any level in the tank/sump etc.</td></tr><tr><td>Display</td><td colspan="3">Integral digital display.</td></tr><tr><td>Load Impedance</td><td colspan="3">500 ohms (minimum).</td></tr><tr><td>Electromagnetic compatibility</td><td colspan="3">Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2</td></tr><tr><td>Mounting</td><td colspan="3">(i) External cage shall be provided where ever side mounting is required. External cage and other mounting accessories to be provided by the contractor. (ii) Where ever top mounting is required, all mounting accessories, stilling well (as required) etc., shall be provided by the contractor. (iii) All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations.</td></tr></table> <p>Note: Four wire type transmitters can also be provided for applications where 2- wire transmitter has some technical limitations, subject to employer's approval during detailed engineering stage. However, in such cases isolated 4-20 mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 240V AC / 24V DC.</p>				adjustment	without any level in the tank/sump etc.			Display	Integral digital display.			Load Impedance	500 ohms (minimum).			Electromagnetic compatibility	Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2			Mounting	(i) External cage shall be provided where ever side mounting is required. External cage and other mounting accessories to be provided by the contractor. (ii) Where ever top mounting is required, all mounting accessories, stilling well (as required) etc., shall be provided by the contractor. (iii) All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations.																										
	adjustment	without any level in the tank/sump etc.																																														
	Display	Integral digital display.																																														
	Load Impedance	500 ohms (minimum).																																														
	Electromagnetic compatibility	Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2																																														
	Mounting	(i) External cage shall be provided where ever side mounting is required. External cage and other mounting accessories to be provided by the contractor. (ii) Where ever top mounting is required, all mounting accessories, stilling well (as required) etc., shall be provided by the contractor. (iii) All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations.																																														
	Ultrasonic Type level Transmitter																																															
	<table><tr><th>S.No.</th><th>Features</th><th colspan="2">Essential/Minimum requirement</th></tr><tr><td>1.</td><td>Type of Transmitter</td><td colspan="2">Non-contact Microprocessor based 2 wire type (loop powered), HART protocol compatible Ultrasonic transmitter.</td></tr><tr><td>2.</td><td>Output signal</td><td colspan="2">4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol).</td></tr><tr><td>3.</td><td>Accuracy</td><td colspan="2">+/- 0.5% of calibrated span or minimum 5mm.</td></tr><tr><td>4.</td><td>Power supply</td><td colspan="2">24 V DC +/- 10%.</td></tr><tr><td>5.</td><td>Temperature compensation</td><td colspan="2">To be provided within transducer.</td></tr><tr><td>6.</td><td>Housing</td><td colspan="2">Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.</td></tr><tr><td>7.</td><td>Adjustment/calibration/ maintenance</td><td colspan="2">Using hand held HART calibrator/ centralized PC based system (as applicable).</td></tr><tr><td>8.</td><td>Zero and Span adjustment</td><td colspan="2">Continuous, tamper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument without any level in the tank/sump etc.</td></tr><tr><td>9.</td><td>Sensor Material</td><td colspan="2">Corrosion resistant material to suit individual application requirement.</td></tr><tr><td>10.</td><td>False signal tolerance</td><td colspan="2">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></table>				S.No.	Features	Essential/Minimum requirement		1.	Type of Transmitter	Non-contact Microprocessor based 2 wire type (loop powered), HART protocol compatible Ultrasonic transmitter.		2.	Output signal	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol).		3.	Accuracy	+/- 0.5% of calibrated span or minimum 5mm.		4.	Power supply	24 V DC +/- 10%.		5.	Temperature compensation	To be provided within transducer.		6.	Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.		7.	Adjustment/calibration/ maintenance	Using hand held HART calibrator/ centralized PC based system (as applicable).		8.	Zero and Span adjustment	Continuous, tamper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument without any level in the tank/sump etc.		9.	Sensor Material	Corrosion resistant material to suit individual application requirement.		10.	False signal tolerance	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.	
	S.No.	Features	Essential/Minimum requirement																																													
	1.	Type of Transmitter	Non-contact Microprocessor based 2 wire type (loop powered), HART protocol compatible Ultrasonic transmitter.																																													
2.	Output signal	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol).																																														
3.	Accuracy	+/- 0.5% of calibrated span or minimum 5mm.																																														
4.	Power supply	24 V DC +/- 10%.																																														
5.	Temperature compensation	To be provided within transducer.																																														
6.	Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.																																														
7.	Adjustment/calibration/ maintenance	Using hand held HART calibrator/ centralized PC based system (as applicable).																																														
8.	Zero and Span adjustment	Continuous, tamper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument without any level in the tank/sump etc.																																														
9.	Sensor Material	Corrosion resistant material to suit individual application requirement.																																														
10.	False signal tolerance	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.																																														
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2																																														
SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)		PAGE 3 OF 34																																														

CLAUSE NO.	<div> <div>TECHNICAL REQUIREMENTS</div> <div>एनटीपीसी NTPC</div> </div>		
2.04.00	11.	Range	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.
	12.	Display	Integral digital display
	13.	Diagnostics	Loss of echo alarm etc.
	14.	Load Impedance	500 ohms (minimum).
	15.	Electrical Connection	Plug and socket
	16.	Accessories	<ul style="list-style-type: none"> All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations. All mounting accessories required for erection and commissioning shall be provided. For hazardous area, explosion proof enclosure as described in NEC article 500
	<p>Note:</p> <ol style="list-style-type: none"> Contractor can also provide Radar type transmitter as per above specification in place of ultrasonic transmitter subject to approval by Employer during detailed Engineering. Sonic frequency based transmitters can also be provided under "ultrasonic transmitters" category for fly ash silo level. Four wire type transmitters can also be provided for applications where 2- wire transmitter has some technical limitations, subject to employer's approval during detailed engineering stage. However, in such cases isolated 4-20 mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 240V AC / 24V DC. For applications where transmitter location is not accessible, the transmitter shall have separate sensor unit and electronic unit for such applications. It shall be possible to mount the electronic unit at accessible location. <p>HART Hand Held calibrator</p> <p>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 for that specific type of transmitter.</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
PAGE 4 OF 34			

CLAUSE NO.	TECHNICAL REQUIREMENTS			
3.00.00	Temperature Elements and accessories			
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-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
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 5 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p>provided for external signal cable connection. TE terminal head shall be spring loaded for positive contacts with the thermo well</p> <p>4 Insulation and sheathing of RTD : Mineral (magnesium oxide) insulation and SS316 sheath,</p> <p>5 Calibration and accuracy : As per IEC-751/ DIN-43760 Class-A for RTD</p> <p>6 Accessories : Thermo well and associated fittings</p> <p>7 Standard : IEC-751/ DIN-43760 for RTD and ASME PTC-19.3 for Thermo-well.</p> <p>NOTES :</p> <p>1) The specifications for RTDs of winding/ bearings of motor/pump, can be as per their manufacturer standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice. However the type of RTD shall be Pt100.</p> <p>2) The specifications of temp elements for air conditioning & ventilation system / process can be as per system manufacturer's standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice.</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 6 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS			
3.04.00	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.			
3.05.00	Not Used			
3.06.00	TEMPERATURE TRANSMITTER Minimum technical requirements shall be as follows: Single input/Dual input temperature transmitter shall be 2-wire loop powered directly from 4-20mA input cards of DDCMIS. Transmitter shall be fully compatible with thermocouples and RTDs being provided. It shall be capable to handle Pt-100 RTD, Thermocouple –K, R & S types (selectable through HART/ Profibus terminal/calibrator).Temperature compensation for T/C shall be performed in the transmitter itself. In case of failure (open or burn-out) of RTD/thermocouple, transmitter shall provide low temperature output. Transmitter shall be HART/Fieldbus (Profibus PA complying to IEC 61158)compatible, have EMC compatibility as per EN 61326, weather proof IP-67 metallic housing with durable corrosion resistant coating, plug and socket type electrical connection for HART and 1/2" NPT(F) connection for Fielbus , integral digital display with self-indicating diagnostics, operating ambient temperature of 85 deg C without display & 70 deg C with display, suitable for 2 inch pipe mounting in enclosure/rack . Composite Accuracy shall be as follows :. RTD =<0.25% of 0-250 deg C span, T/C -K type =<0.2 % of 0-600 deg C span, CJC accuracy (for T/C) shall be < 1 deg C.			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 7 OF 34


CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>		
	<p>Notes :</p> <ol style="list-style-type: none">Dual input temperature transmitter shall have bump less changeover facility to second sensor in case first sensor fails. This changeover is to be alarmed in control system.Composite accuracy is to be calculated as summation of all applicable accuracies of temperature transmitter for converting sensor input to output (e.g., A/D accuracy, basic accuracy, digital 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.Above mentioned parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only.Dual input temperature transmitters can also be accepted in place of single input TT.			
3.07.00	<p>Din rail temperature transmitter 4-20mA HART based 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. Accuracy of Din rail should be \therefore RTD $\leq 0.4\%$ of 0-250 deg C span, T/C -K type $\leq 0.4\%$ of 0-600 deg C span, CJC accuracy (for T/C) shall be < 1 deg C. Other specifications shall be as mentioned in clause 3.06.00. Exact applications shall be as defined in PART-A of specifications.</p>			
3.08.00	<p>Multi Input Temperature transmitter (Temperature Multiplexer)</p> <p>For only information related temperature inputs fieldbus based Multi input temperature transmitters can be provided. Transmitters shall be capable of withstanding ambient temperature upto 85 deg C. Maximum number of inputs per such temperature transmitter shall be eight. One (1) no. input shall be kept as spare wired upto TBs of field mounted panel in each multi input TT. These shall be installed in field mounted panels with minimum IP 55 protection class. Exact applications shall be as defined in PART-A of specifications.</p>			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 8 OF 34


CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी NTPC</div>
5.00.00				
	<p>IMPACT HEAD TYPE FLOW ELEMENT</p> <p>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 SS 316 L.</p> <p>Accuracy shall be 1.0% of actual value or better. Repeatability shall be + 0.1% of actual value or better.</p> <p>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 instrument tag no. for the flow element shall be punched on a stainless steel plate and affixed to the element.</p>			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 9 OF 34

1500633/2023/PS-PEM-MAX


CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एन टी पी सी NTPC</div>
	<p>Flushing arrangement shall be provided.</p> <p>For quantity and line size etc., refer Part-A.</p> <p>Dual path transit time clamp-on Ultrasonic Flow meter may also be used for measurement of CW flow.</p>			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 10 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी NTPC</div>
12.00.00	SPECIFICATION FOR CORIOLIS FLOW TRANSMITTER			
	Type	Coriolis		
	Material of Wetted Parts	316 SS		
	Material of Housing	304L SS		
	Accuracy	± 0.2% of Rate		
	Repeatability	± 0.1% of Rate		
	Output	4-20 mA DC, HART Compatible		
	Power Supply	230 VAC or 24VDC operated		
	Process Temperature range	0-200 degree Celsius		
	Others	Drain / purging arrangement shall be provided as per standard practice.		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 22 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS																	
	<p>Notes: Coriolis Mass flow meter upstream of Burners shall be sized to measure minimum flow corresponding to one burner operation and maximum BMCR rating flow with 25% margin.</p> <p>The offered Coriolis type flow transmitter shall be suitable for intended application. Contractor shall submit flow and sizing calculation for Employer's approval. For each type of Coriolis type flow transmitter general arrangement and assembly drawing and cable wiring diagram shall be submitted for Employer's approval.</p>																	
13.00.00	SPECIFICATION FOR FLOW ELEMENTS																	
13.01.00	<table><tr><td>Orifice Plate</td><td></td></tr><tr><td>Features</td><td>Essential/Minimum Requirements</td></tr><tr><td>Type</td><td>Concentric as per ASME PTC-19.5 (Part-II), ISA RP-3.2, 1960 or BS-1042, ISO 5167</td></tr><tr><td>Material</td><td>316 SS</td></tr><tr><td>Thickness</td><td>3 mm for main pipe diameter up to 300 mm and6 mm for main pipe dia above300 mm.</td></tr><tr><td>Tappings</td><td>Flanged weld neck or D & D/2 with 3 pairs of tapping (as applicable). Root valves to be provided in all the tappings. However for flow elements in CPU, DM & PT plant- 2 Pairs of Tappings shall be provided as minimum.</td></tr><tr><td>Beta Ratio</td><td>0.34 to 0.7</td></tr></table>				Orifice Plate		Features	Essential/Minimum Requirements	Type	Concentric as per ASME PTC-19.5 (Part-II), ISA RP-3.2, 1960 or BS-1042, ISO 5167	Material	316 SS	Thickness	3 mm for main pipe diameter up to 300 mm and6 mm for main pipe dia above300 mm.	Tappings	Flanged weld neck or D & D/2 with 3 pairs of tapping (as applicable). Root valves to be provided in all the tappings. However for flow elements in CPU, DM & PT plant- 2 Pairs of Tappings shall be provided as minimum.	Beta Ratio	0.34 to 0.7
Orifice Plate																		
Features	Essential/Minimum Requirements																	
Type	Concentric as per ASME PTC-19.5 (Part-II), ISA RP-3.2, 1960 or BS-1042, ISO 5167																	
Material	316 SS																	
Thickness	3 mm for main pipe diameter up to 300 mm and6 mm for main pipe dia above300 mm.																	
Tappings	Flanged weld neck or D & D/2 with 3 pairs of tapping (as applicable). Root valves to be provided in all the tappings. However for flow elements in CPU, DM & PT plant- 2 Pairs of Tappings shall be provided as minimum.																	
Beta Ratio	0.34 to 0.7																	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 23 OF 34														

CLAUSE NO.	TECHNICAL REQUIREMENTS																																															
13.04.00	NOT USED																																															
14.00.00	NOT USED																																															
15.00.00	PROCESS ACTUATED SWITCHES																																															
	<table><tr><th>FEATURES</th><th colspan="3">ESSENTIAL / MINIMUM REQUIREMENTS</th></tr><tr><td></td><td>Pressure/ Draft Switches/ DP Switches</td><td>Temperature switches</td><td>Level switches</td></tr><tr><td>Sensing Element</td><td>Piston actuated for high pressure and diaphragm or bellows for low pr./ vacuum</td><td>Vapor pressure sensing, liquid filled bellow type with SS bulb and capillary (5 m minimum, to suit application)</td><td>Capacitance types, float type, conductivity type, RF type, Ultrasonic type as per suitability to the application. .</td></tr><tr><td>Material</td><td>316 SS</td><td>Bulb 316 SS/ capillary 304 SS</td><td>316 SS</td></tr><tr><td>End connection</td><td>½ inch NPT (F)</td><td>½ inch NPT (F)</td><td>Manufacturer standard</td></tr><tr><td>Over range/ proof pressure</td><td>150% of maximum operating pr.</td><td>-</td><td>150% of maximum operating pr.</td></tr><tr><td>Repeatability</td><td colspan="3">+/- 0.5% of full range</td></tr><tr><td>No. of contacts</td><td colspan="3">2 No.+2NC. SPDT snap action dry contact</td></tr><tr><td>Rating of contacts</td><td colspan="3">60 V DC, 6 VA (or more if required by DDCMIS)</td></tr><tr><td>Elect. Connection</td><td colspan="3">Plug in socket.</td></tr><tr><td>Set point adjustment</td><td colspan="3">Provided over full range.</td></tr></table>				FEATURES	ESSENTIAL / MINIMUM REQUIREMENTS				Pressure/ Draft Switches/ DP Switches	Temperature switches	Level switches	Sensing Element	Piston actuated for high pressure and diaphragm or bellows for low pr./ vacuum	Vapor pressure sensing, liquid filled bellow type with SS bulb and capillary (5 m minimum, to suit application)	Capacitance types, float type, conductivity type, RF type, Ultrasonic type as per suitability to the 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 maximum operating pr.	-	150% of maximum operating pr.	Repeatability	+/- 0.5% of full range			No. of contacts	2 No.+2NC. SPDT snap action dry contact			Rating of contacts	60 V DC, 6 VA (or more if required by DDCMIS)			Elect. Connection	Plug in socket.			Set point adjustment	Provided over full range.		
FEATURES	ESSENTIAL / MINIMUM REQUIREMENTS																																															
	Pressure/ Draft Switches/ DP Switches	Temperature switches	Level switches																																													
Sensing Element	Piston actuated for high pressure and diaphragm or bellows for low pr./ vacuum	Vapor pressure sensing, liquid filled bellow type with SS bulb and capillary (5 m minimum, to suit application)	Capacitance types, float type, conductivity type, RF type, Ultrasonic type as per suitability to the 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 maximum operating pr.	-	150% of maximum operating pr.																																													
Repeatability	+/- 0.5% of full range																																															
No. of contacts	2 No.+2NC. SPDT snap action dry contact																																															
Rating of contacts	60 V DC, 6 VA (or more if required by DDCMIS)																																															
Elect. Connection	Plug in socket.																																															
Set point adjustment	Provided over full range.																																															
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 24 OF 34																																												

CLAUSE NO.	TECHNICAL REQUIREMENTS				<div>एनटीपीसी NTPC</div>
	Dead band adjustment	Adjustable/ fixed as per requirement of application.			
	Enclosure	Weather and dust proof as per IP-55, metallic housing.			
	Accessories	Siphon, snubber, chemical seal, pulsation dampeners as required by process	Thermo well of 316 SS and packing glands	All mounting accessories	
	Mounting	Suitable for enclosure/ rack mounting or direct mounting	Suitable for rack mounting or direct mounting	-	
	Power Supply (wherever required)	As per Contractor's Standard practice.			
	Notes :-				
	1) 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.				
	2) Pressure/ Diff pressure switches for very low press/ DP measurements can have sensor material other than SS316 in case of any technical limitation and the offered product is standard product of the manufacture for very low pressure applications.				
	3) Repeatability can be upto +/-1% of full range in case of switches with diaphragm seals or very low pressure/DP range.				
	4) The specifications of switches for air conditioning & ventilation system / process can be as per system manufacturer's standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice.				
16.00.00	NOT USED				
	SOLENOID VALVES				
	Solenoid valves shall fulfil the following requirements:				
17.00.00					
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2		SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	
				PAGE 25 OF 34	

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	<div><div>a.</div><div>Type 2/3/4 way SS 316/Forged Brass (depending on the application subject to Employer's approval during detailed Engg.)</div></div> <div><div>b.</div><div>Power supply : 24 V DC \pm 10%.</div></div> <div><div>c.</div><div>Plug and socket electrical connection.</div></div> <div><div>d.</div><div>Insulation : Class 'H'</div></div> <div><div>e.</div><div>IP Class : IP65</div></div>			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 26 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी NTPC</div>
19.05.00	<p>Electronic Flow-Meter</p> <p>The electronic flow meter shall include flow sensor and flow indicator cum integrator / totaliser and shall include all required accessories for satisfactory operation. The flow meter shall be based on full bore electromagnetic principle and shall be electronic type of proven design, make and model acceptable to the owner.</p> <p>The Bidder shall submit all necessary technical literature and details of selection criteria of the instrument offered to substantiate the model selected. The Bidder shall also furnish list of similar installation along with feed back on satisfactory performance of the instruments.</p> <p>The flow meter shall meet or exceed the following requirement :</p> <div><div>(a) Output</div><div>:</div><div>4-20 mA DC Isolated output</div></div> <div><div>(b) Accuracy</div><div>:</div><div>± 0.5% of calibrated span or better *</div></div> <div><div>(c) Repeatability</div><div>:</div><div>± 0.2% of calibrated span or better</div></div> <div><div>(d) Power Supply</div><div>:</div><div>240V AC ± 10%, 50 HZ ± 5%/ 24 V DC, to be arranged by the contractor.</div></div> <div><div>(f) Protection class</div><div>:</div><div>IP-55</div></div> <div><div>(e) Flow tube</div><div>:</div><div>SS304</div></div> <div><div>(f) liner</div><div>:</div><div>Hard Rubber</div></div> <p>The flow meter shall provide local indication for instantaneous flow. It should also be possible to get local display for daily and monthly discharge. The flow meter shall indicate totaliser/ integrator to get the daily and monthly discharge as stated above.</p>			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 27 OF 34

CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी NTPC</div>
21.00.00	Limit switches			
	For offsite plant (except PT, DM, Chlorination, chemical treatment, Liquid effluent treatment) application Limit switches shall be silver plated with high conductivity and non corrosive type. Contact rating shall be sufficient to meet the requirement of DDCMIS subject to a minimum of 60 V, 6 VA rating. Protection class shall be IP 55.			
	For main plant application limit switches are to be provided as per contractor standard and proven practice.			
	For PT, DM, Chlorination system , chemical treatment, Liquid effluent treatment plant , limit switches of manual valves and solenoid operated on-off valves shall be of inductive proximity type and shall be mounted inside the enclosure: pl. refer the minimum specification requirement below .			
	Operating voltage Range		10-40 V DC	
	Sensing system		Inductive Proximity type , 2 Wire	
	Sensor Contact Type		NO	
	Reverse polarity and short circuit protection		Yes	
	IP Class-Sensor		IP67	
	IP Class-Enclosure(Switch box)		IP67	
	Cable entry-Enclosure(Switch box)		2no-1/2" NPT	
	Casing material-Sensor		Brass /SS	
	Enclosure(Switch box) Housing material		FRP or SS	
	Operating Ambient temp(sensors)		-5 to 70 deg C	
Max allowed Voltage Drop across sensor		5 V		
Standard applicable		EN 60947-5-2 or equivalent.		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2		SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
				PAGE 28 OF 34

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	SS 316	SS 316	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		


12	Accessories	Blow out disc, SS Thermowell siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	Gasket for all KEL-F shield for transparent type vent and drain valves of Steel/SS as per CS/Alloy process Requirement.
13	Material of Bourdon/ movement	316 SS / 304 SS	316 SS / 304 SS

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.

CLAUSE NO.	TECHNICAL REQUIREMENTS			
6.00.00	FIELD MOUNTED LOCAL JUNCTION BOXES (AS PER STANDARD AND PROVEN Practice of vendor <div><div>(i)</div><div>No. of ways</div><div>12/24/36/48/64/72/96/128 with 20% spares terminals.</div></div> <div><div>(ii)</div><div>Material and Thickness</div><div>4mm thick Fiberglass Reinforced Polyester (FRP).</div></div> <div><div>(iii)</div><div>Type of terminal blocks</div><div>Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm². A M6 earthing stud shall be provided.</div></div> <div><div>(iv)</div><div>Protection Class</div><div>IP: 55 min. for indoor & IP-65 min for outdoor applications.</div></div> <div><div>(v)</div><div>Grounding</div><div>To be provided.</div></div> <div><div>(vi)</div><div>Color</div><div>RAL 7035</div></div>			
11.00.00	CONDUITS AND CABLE TRAYS TO BE PROVIDED AS PER STANDARD AND PROVEN PRACTISE OF CONTRACTOR.			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-4540-001A-2	SUB-SECTION-IIIC-07 INSTRUMENTATION CABLES	PAGE 6 OF 6

PROVENESS CRITERIA

5.00.00 INSTRUMENTS (PRIMARY & SECONDARY)

- (i) Type of Instrument

(ii) Make / Model

(iii) Name of Power Station
(Location & Address)

(iv) Unit Size (MW)

(v) Commissioning date


Whether above instruments have
atleast one (1) year satisfactory
operation
in one (1) power station having
unit rating of 200 MW or above.


Yes/No

(vi) Client's certificate attached

Yes/No

PROCESS CONNECTION AND PIPING

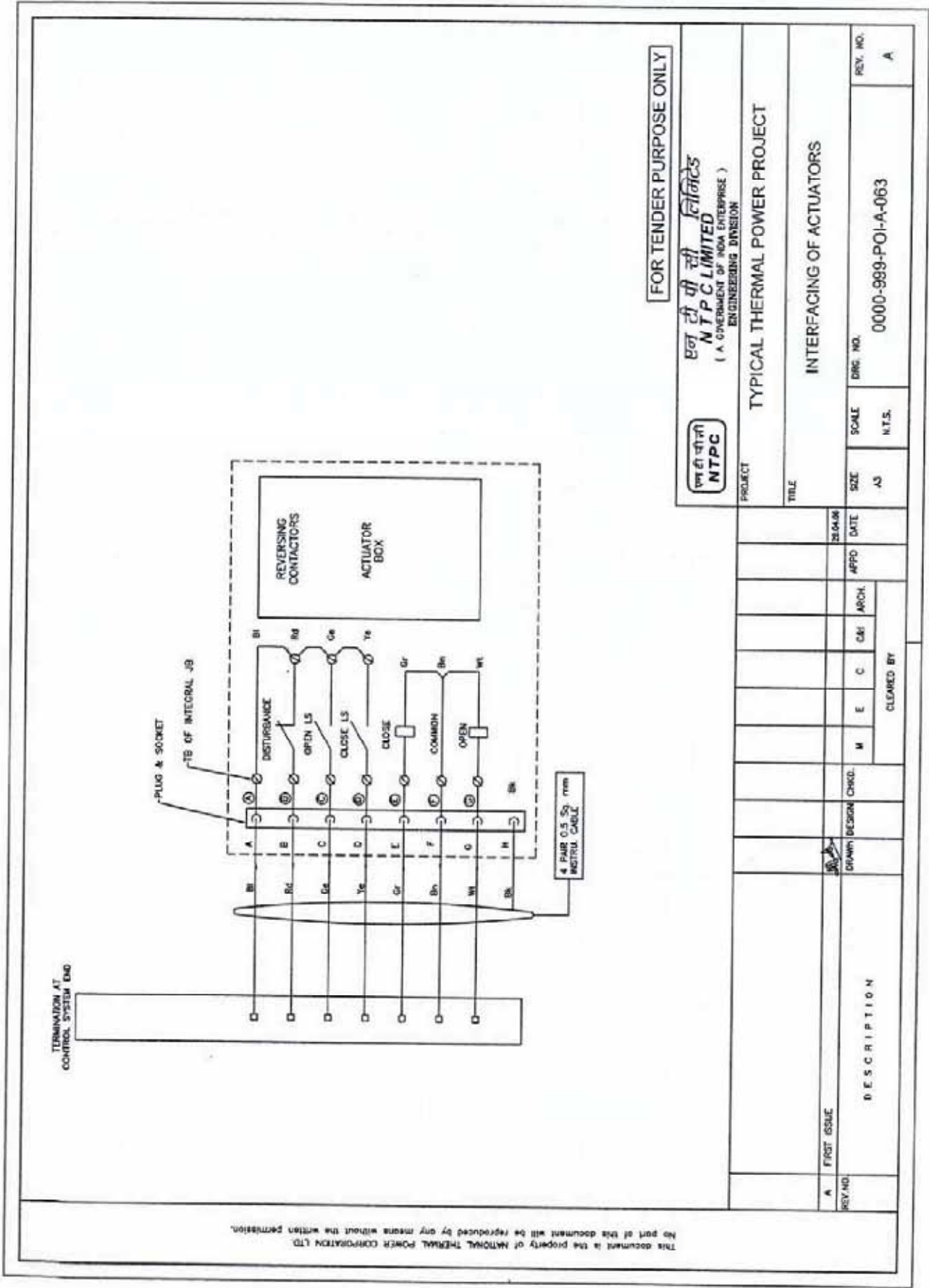
CLAUSE NO.	TECHNICAL REQUIREMENTS										
	PROCESS CONNECTION AND PIPING										
1.00.00	PROCESS CONNECTION PIPING Process connection & piping including all impulse piping, sample piping, pneumatic piping/tubing, valves, valve manifolds, fittings and all other accessories required for proper installation & completeness of impulse piping system, sampling piping system and air supply system shall be provided by the Contractor on as required basis. The rating of material of impulse pipes, tubes, fittings, valves and their installation thereof shall conform to the latest edition of standards as per following table: <table><tr><td>Impulse Pipes, Tubes (Material, Rating)</td><td>ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70</td></tr><tr><td>Valves (Material, Pr. Class, Size)</td><td>ASTM A182/ASTM A105 as per ASME 16.34</td></tr><tr><td>Fittings (Size, Rating, Material)</td><td>ANSI B31.1, ANSI B31.1a, ASME B16.11-2009</td></tr><tr><td>Installation Schemes</td><td>BS 6739-2009, ANSI/ISA 77.70</td></tr></table> Instrument air filters cum regulator set with mounting accessories shall be provided for pneumatic device requiring air supply.			Impulse Pipes, Tubes (Material, Rating)	ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70	Valves (Material, Pr. Class, Size)	ASTM A182/ASTM A105 as per ASME 16.34	Fittings (Size, Rating, Material)	ANSI B31.1, ANSI B31.1a, ASME B16.11-2009	Installation Schemes	BS 6739-2009, ANSI/ISA 77.70
Impulse Pipes, Tubes (Material, Rating)	ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70										
Valves (Material, Pr. Class, Size)	ASTM A182/ASTM A105 as per ASME 16.34										
Fittings (Size, Rating, Material)	ANSI B31.1, ANSI B31.1a, ASME B16.11-2009										
Installation Schemes	BS 6739-2009, ANSI/ISA 77.70										
1.01.00	All transmitters and switches (except for fuel oil applications) shall be suitably grouped together and mounted inside (i) Local Instruments Enclosures (LIE) in case of Open Areas of the Plant like Boiler Area, Coal Handling, Chimney Area, FGD area, CW Pump House, DM Plant, PT Plant, Ash Handling Plant etc. (ii) Local Instrument Racks (LIR) in case of covered areas like Turbine Area, Generator Area etc. (iii) Local Indicators/Gauges shall also be suitably grouped in Local Instrument Racks In case grouping is not possible and these are to be installed individually, canopy with suitable mounting arrangement shall be provided. All electric actuators, pneumatic control valves, Junction Boxes, Solenoid boxes and Local control panels which are not installed inside building, suitable canopy shall be provided and design of canopy shall be approved by Employer during detailed engineering.										
1.02.00	Local Instrument Enclosures (LIEs) and Local Instrument Racks (LIRs) complete with all fittings, mountings & accessories, drains and Utility Lighting, Cable & Grounding cable etc. shall be provided by the Contractor on as required basis. The Degree of Protection of LIE and JB of LIE/LIR shall be IP-55. The instrument racks shall be constructed from 1.6 mm sheet plate and shall be free standing type constructed of suitable 3 mm thick channel frame of steel and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel and extended beyond the ends of the rack.										
1.03.00	All temperature transmitters shall be suitably grouped together and mounted inside (i) Enclosures in case of open areas of the plant like Boiler Area, Coal Handling,										
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-06 PROCESS CONNECTION AND PIPING								
			PAGE 1 OF 2								

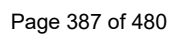
CLAUSE NO.	TECHNICAL REQUIREMENTS																																																																																										
	<p>Chimney Area, FGD area, CW Pump House, DM Plant, PT Plant, Ash Handling Plant etc. and (ii) Racks in case of covered areas like Turbine Area, Generator Area etc. on as required basis. In case grouping is not possible and temperature transmitter is to be installed individually, canopy with suitable mounting arrangement shall be provided.</p>																																																																																										
1.04.00	For skid mounted instruments and instruments integral to equipments, process connection and piping can be in line with bidder's standard and proven practice.																																																																																										
1.05.00	Contractor shall furnish "Certificate of Compliance" of erection of PCP as per NTPC approved documents.																																																																																										
1.06.00	<p>PAINTING COLOR SCHEME FOR IMPULSE PIPING</p> <table><tr><th rowspan="2">S. No.</th><th rowspan="2">Area / Equipment</th><th colspan="2">Impulse Pipe Ground Color</th><th colspan="3">Identification Tag/Band</th></tr><tr><th>Color</th><th>RAL</th><th>Color</th><th>ISC No.</th><th>RAL</th></tr><tr><td>1)</td><td>Air</td><td>Grey</td><td>9002</td><td>Sky Blue</td><td>101</td><td></td></tr><tr><td>2)</td><td>Water</td><td>Grey</td><td>9002</td><td>Sea Green</td><td>217</td><td></td></tr><tr><td>3)</td><td>Steam</td><td>Aluminum</td><td></td><td>Signal Red</td><td>537</td><td>3001</td></tr><tr><td>4)</td><td>Air Steam Mixture</td><td>Aluminum</td><td></td><td>Sky Blue</td><td>101</td><td></td></tr><tr><td>5)</td><td>Gas</td><td>Grey</td><td>9002</td><td>Canary Yellow</td><td>309</td><td></td></tr><tr><td>6)</td><td>Oils</td><td>Grey</td><td>9002</td><td>Light Brown</td><td>410</td><td></td></tr><tr><td>7)</td><td>Pulverized Fuel</td><td>Grey</td><td>9002</td><td>Silver Grey</td><td>628</td><td></td></tr><tr><td>8)</td><td>Fire Installations</td><td>Fire Red</td><td>536 (ISC) 3001 (RAL)</td><td>White</td><td></td><td>9010</td></tr><tr><td>9)</td><td>HP Dosing</td><td>Grey</td><td>9002</td><td>Dark Admiralty Grey</td><td>632</td><td></td></tr><tr><td>10)</td><td>LP Dosing / acid / alkali Piping</td><td>Grey</td><td>9002</td><td>Signal Red</td><td>537</td><td></td></tr><tr><td>11)</td><td>Ash Piping</td><td>Grey</td><td>9002</td><td>French Blue</td><td>166</td><td></td></tr></table> <p>Note: Ground color indicated against each piping shall be followed in case piping is not insulated /cladded.</p>	S. No.	Area / Equipment	Impulse Pipe Ground Color		Identification Tag/Band			Color	RAL	Color	ISC No.	RAL	1)	Air	Grey	9002	Sky Blue	101		2)	Water	Grey	9002	Sea Green	217		3)	Steam	Aluminum		Signal Red	537	3001	4)	Air Steam Mixture	Aluminum		Sky Blue	101		5)	Gas	Grey	9002	Canary Yellow	309		6)	Oils	Grey	9002	Light Brown	410		7)	Pulverized Fuel	Grey	9002	Silver Grey	628		8)	Fire Installations	Fire Red	536 (ISC) 3001 (RAL)	White		9010	9)	HP Dosing	Grey	9002	Dark Admiralty Grey	632		10)	LP Dosing / acid / alkali Piping	Grey	9002	Signal Red	537		11)	Ash Piping	Grey	9002	French Blue	166		
S. No.	Area / Equipment			Impulse Pipe Ground Color		Identification Tag/Band																																																																																					
		Color	RAL	Color	ISC No.	RAL																																																																																					
1)	Air	Grey	9002	Sky Blue	101																																																																																						
2)	Water	Grey	9002	Sea Green	217																																																																																						
3)	Steam	Aluminum		Signal Red	537	3001																																																																																					
4)	Air Steam Mixture	Aluminum		Sky Blue	101																																																																																						
5)	Gas	Grey	9002	Canary Yellow	309																																																																																						
6)	Oils	Grey	9002	Light Brown	410																																																																																						
7)	Pulverized Fuel	Grey	9002	Silver Grey	628																																																																																						
8)	Fire Installations	Fire Red	536 (ISC) 3001 (RAL)	White		9010																																																																																					
9)	HP Dosing	Grey	9002	Dark Admiralty Grey	632																																																																																						
10)	LP Dosing / acid / alkali Piping	Grey	9002	Signal Red	537																																																																																						
11)	Ash Piping	Grey	9002	French Blue	166																																																																																						
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-06 PROCESS CONNECTION AND PIPING	PAGE 2 OF 2																																																																																							

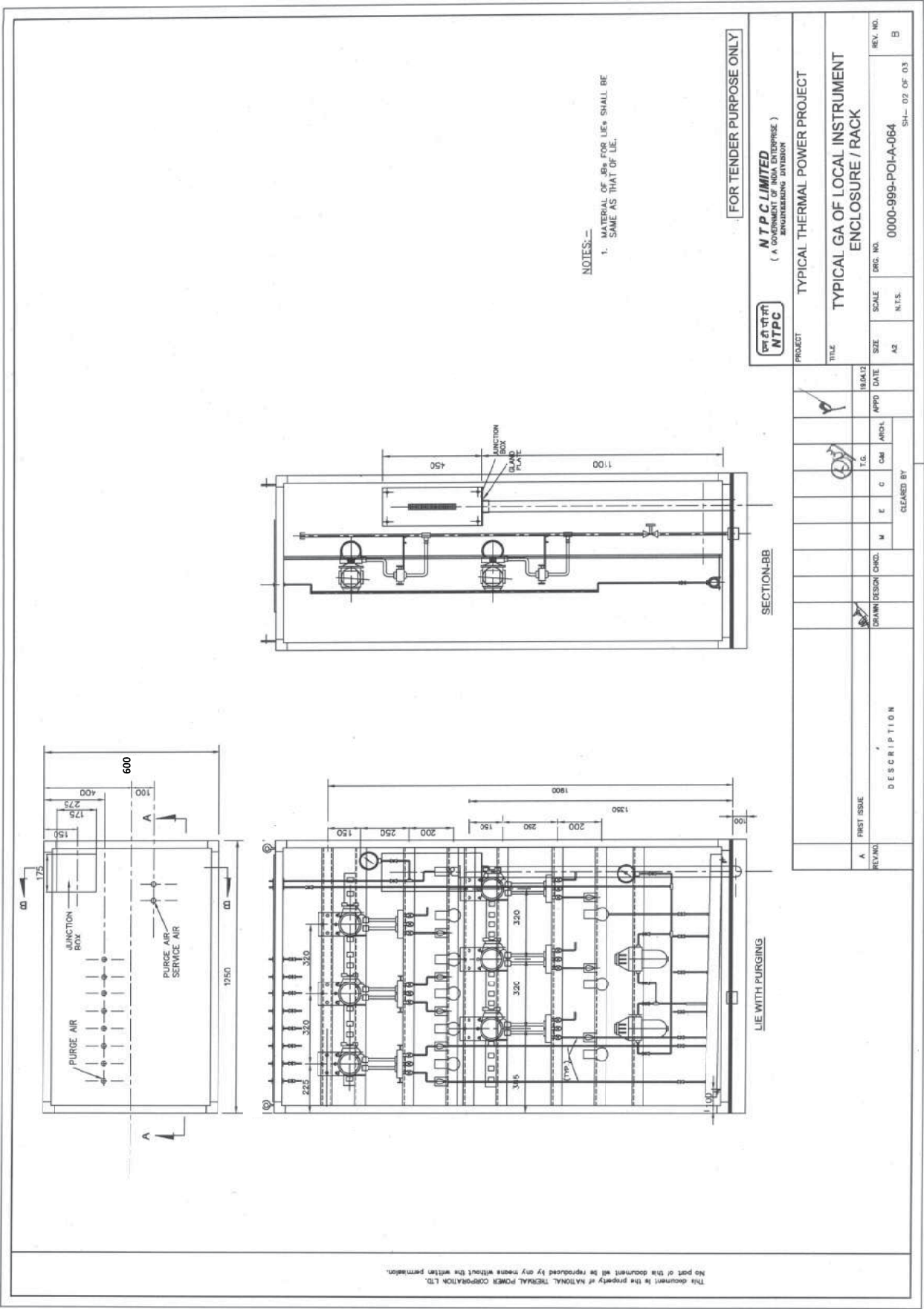
CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
9.00.00			
10.00.00	ANNUAL MAINTENANCE SERVICES		
10.01.00	The requirements specified below are applicable for warranty (defect liability period) and 3 years AMS period.		
10.01.01	The Contractor's scope shall also include providing Post Warranty Maintenance for 3 years after completion of warranty period of the offered profibus systems and all associated components as per specification. The AMS shall include tools and tackle as required; travel, boarding & lodging of service engineer. In the event of any malfunction of the system hardware/system software, experienced service engineer shall be made available at site within 48 hours on the receipt of such information from Employer. Employer personnel will work on system day-to-day basis and wherever possible, Employer shall inform the type of failure of hardware/ software to Contractor based on diagnostic available with the system. However Contractor shall be fully responsible to attend and rectify the root cause and the failure within 48 hrs. Contractor may utilize the spares available with Employer, if necessary and available with Employer at site, which are part of mandatory spares supplied with system as per this specification. However, the consumed spares shall be replenished to Employer within 2 months' time.		
10.02.00	The services under Post Warranty Maintenance Agreement, shall broadly comprise of the following:		
10.02.01	Periodic Maintenance Site visits, minimum four (4) times in a year (total days expected 16 in a year), schedule of visits to be discussed and finalized jointly between Contractor and client after placement of order/ delivery. It shall include inspection of general healthiness of the system, study and advice on daily maintenance, inspection of Hardware & Software, if any problem is reported, running of test programs, on-line servicing and solving reported problems. System shall be checked online.		
10.02.02	Software Maintenance/ Support Contractor shall maintain the existing operating & application software for any debugging requirements to have consistent performance of the system.		
10.02.03	Emergency Service In the event of any malfunction of the profibus system hardware/system software during this period, Service Engineer must report at site within 48 hrs. of report of failure. The system must be brought back within 48 hours after reporting at site.		
10.03.00	Contractor shall note that while carrying out the Annual Maintenance Contract activities, Employer's engineers shall associate with the Contractor. On-job training of these associated engineers shall be covered under this scope. This shall include all items being supplied by Contractor, including any bought out items but not limited to the following: Labour, at no additional cost, to repair any system devices , to provide tests, and adjustment to system devices.		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-4540-001A-2	SUB-SECTION-IIIC-16 PAGE 4 OF 4

INSTRUMENT INSTALLATION DIAGRAM

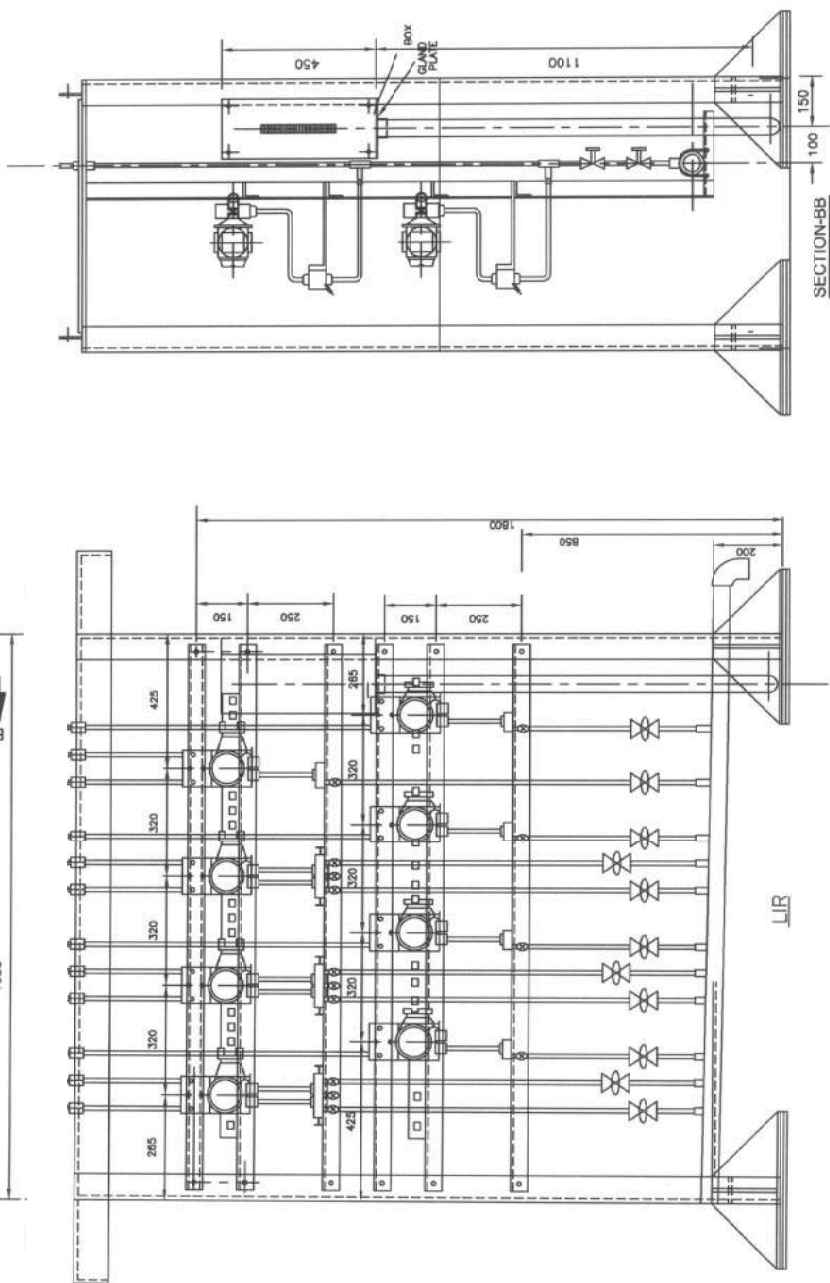








Page 389 of 480



1. MATERIAL OF JB'S FOR LIRs SHALL BE SAME AS THAT OF LIR.

FOR TENDER PURPOSE ONLY

एन टी पी सी
NTPC

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

TYPICAL THERMAL POWER PROJECT

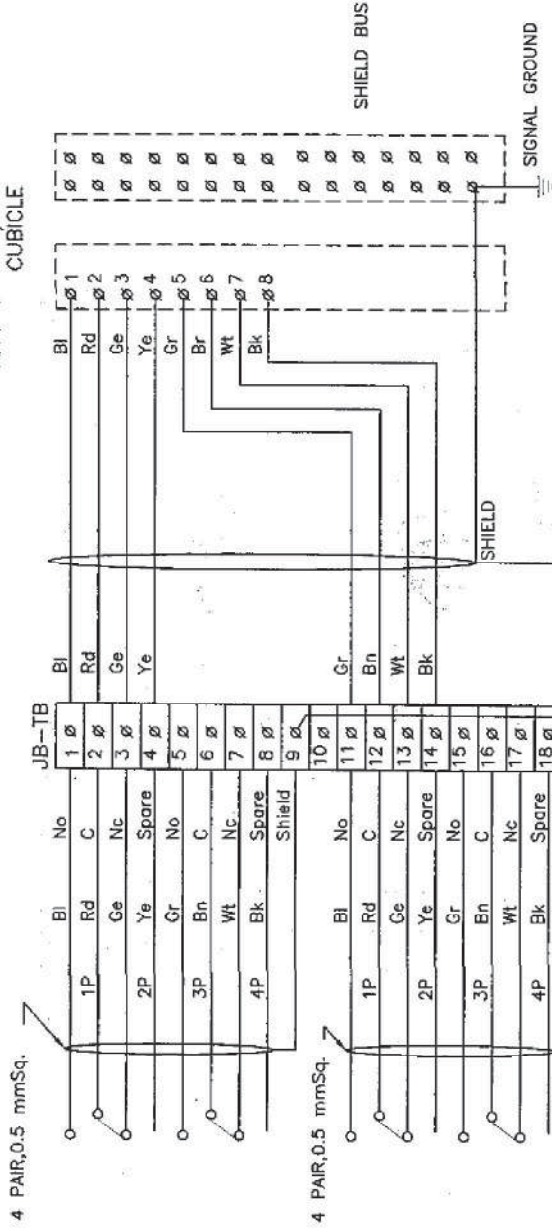
SECTION-AA
LIR WITHOUT PURGING

TYPICAL GA OF LOCAL INSTRUMENT
ENCLOSURE / RACK

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-064	A

DESCRIPTION

MARSHALLING/TERMINATION CUBICLE

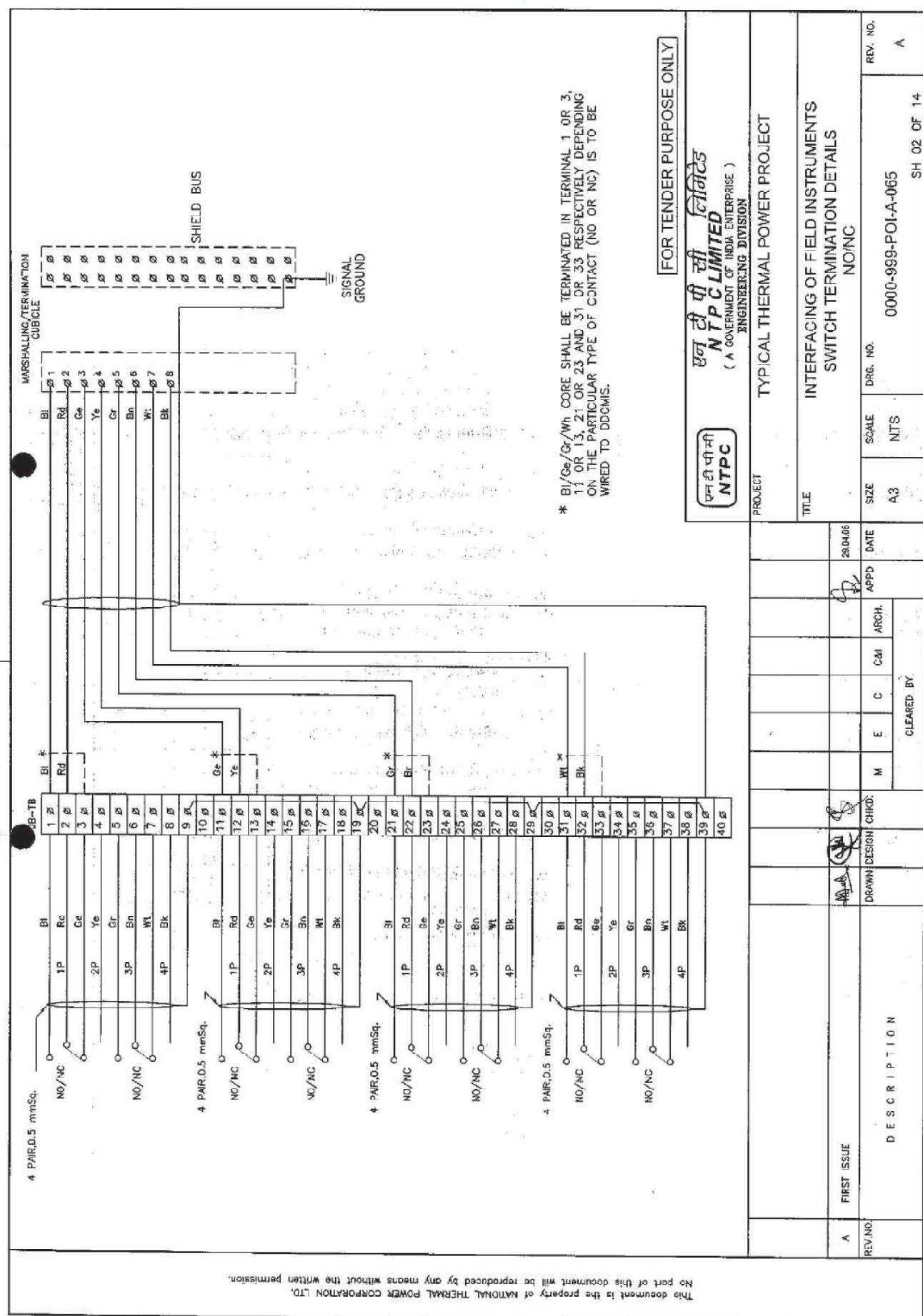


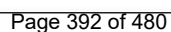
FOR TENDER PURPOSE ONLY

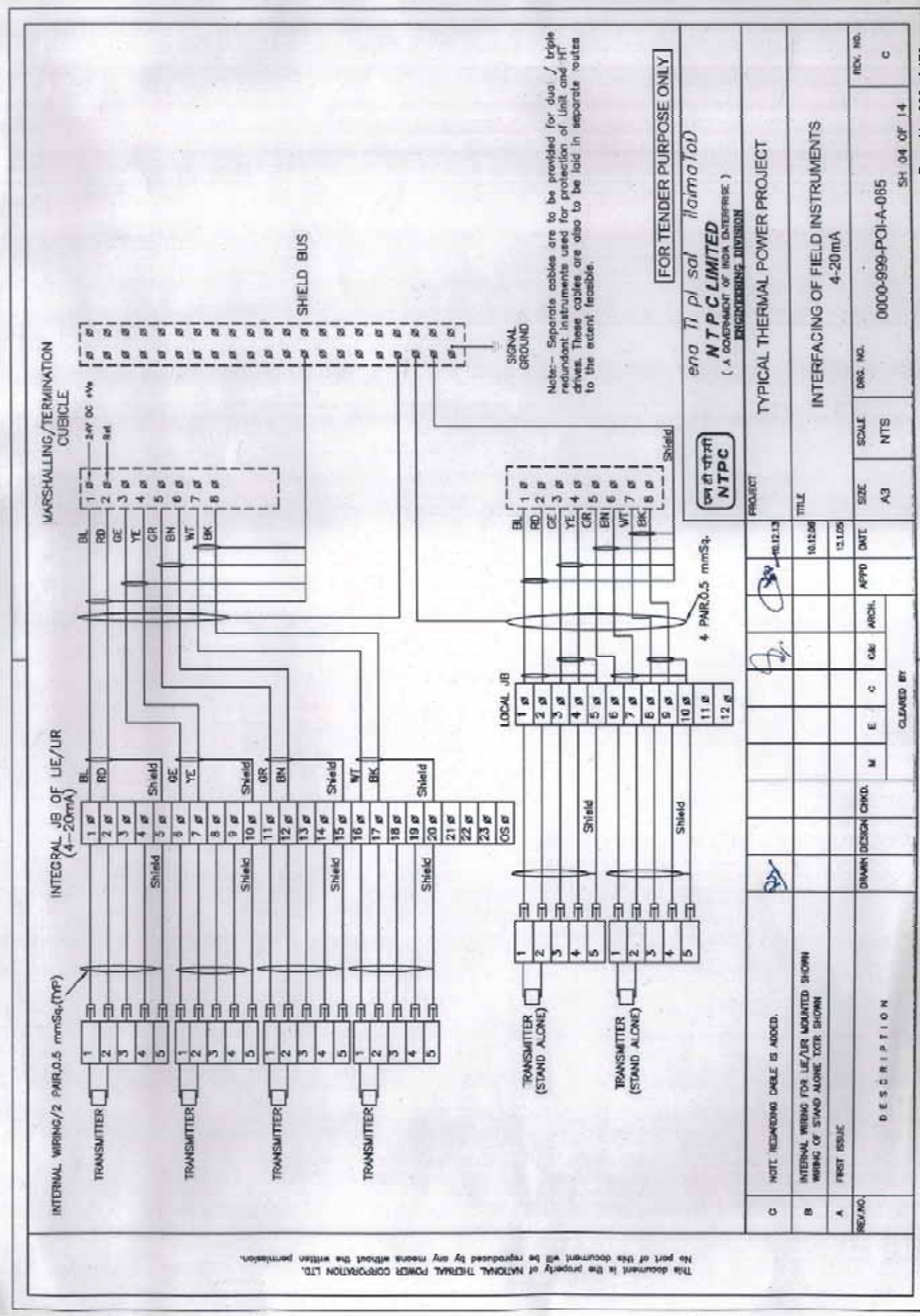
एन टी पी सी लिमिटेड
NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

एन टी पी सी
NTPC

PROJECT		TYPICAL THERMAL POWER PROJECT	
TITLE		INTERFACING OF FIELD INSTRUMENTS/ SWGR SWITCH (COC) TERMINATION DETAILS	
REV. NO.	A	DRG. NO.	0000-999-POI-A-065
SCALE	NTS	SH	01 OF 14
SIZE	A3	REV. NO.	A

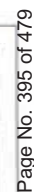




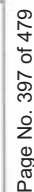


This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

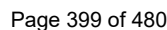
Page 394 of 480

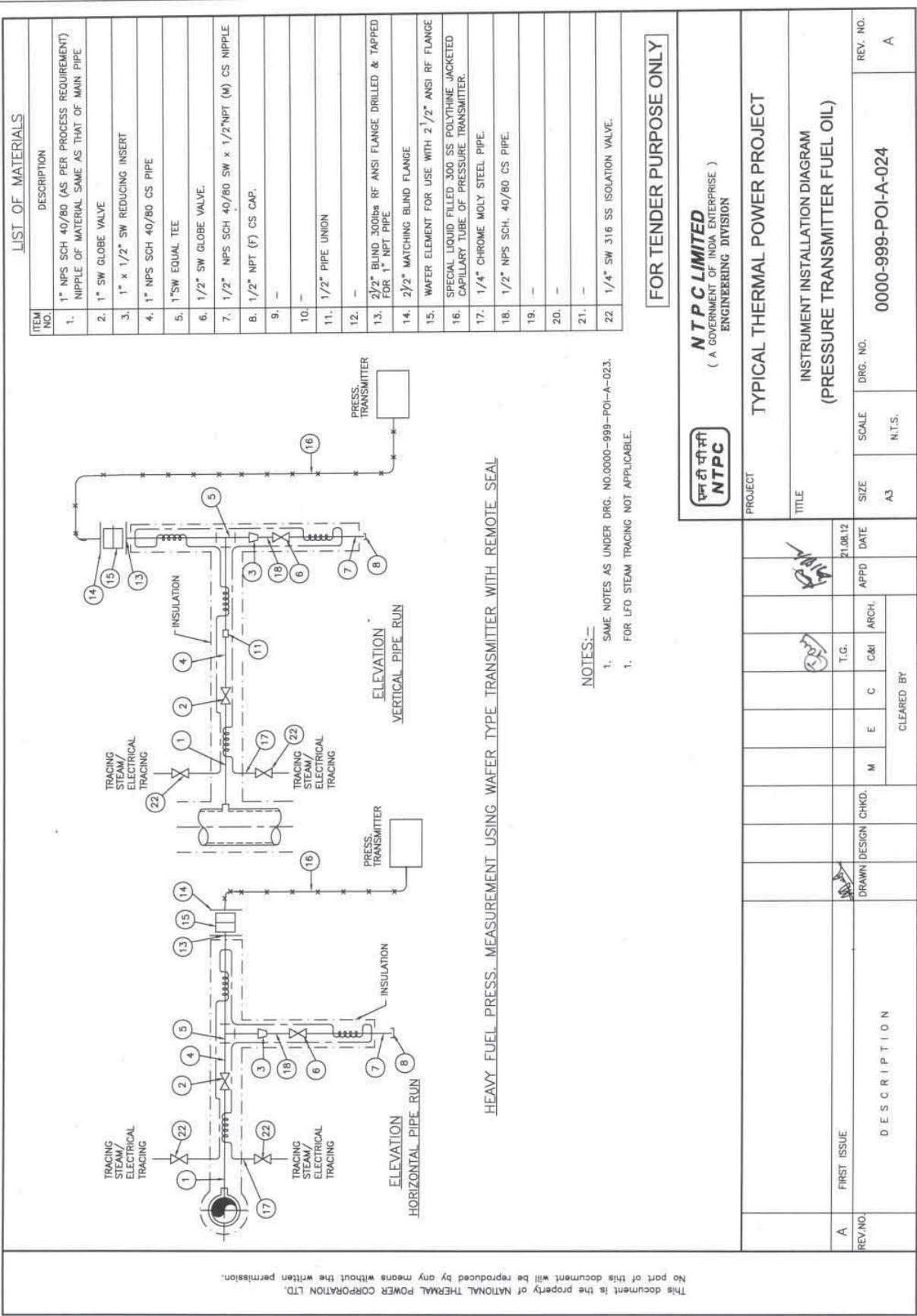


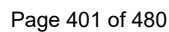


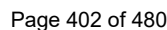


Page No. 398 of 479

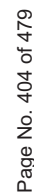








Page No. 403 of 479





DISPLACER TYPE LEVEL TRANSMITTER WITH SIDE CONNECTION

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) CAP.
22.	2" ANSI 300 lbs RAISED PHASE WELD NECK FLANGE.
23.	2" ANSI FLANGE OF LEVEL TRANSMITTER.
24.	3/4" NPS SCH. 40/80 PIPE.

NOTES:-

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

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

एन टी पी सी
NTPC

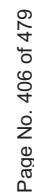
TYPICAL THERMAL POWER PROJECT

INSTRUMENT INSTALLATION DIAGRAM
(LEVEL MEASUREMENT USING DISPLACER TYPE
TRANSMITTERS)

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

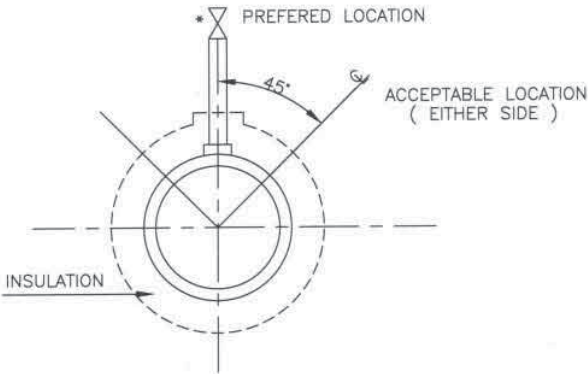
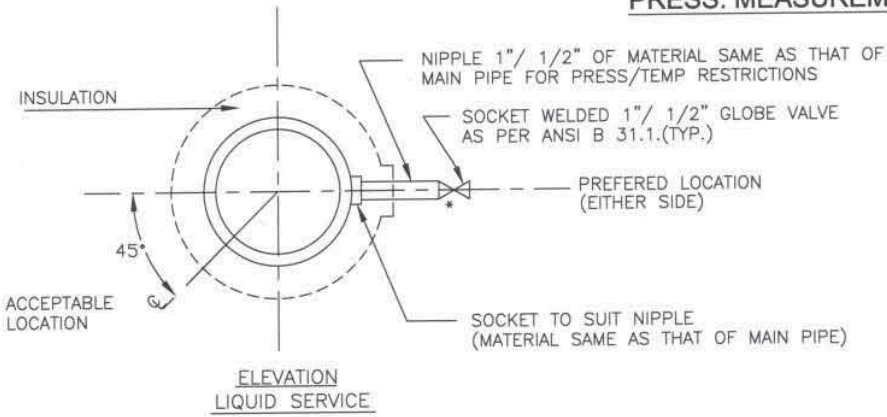
SH 2 OF 2

Page No. 405 of 479

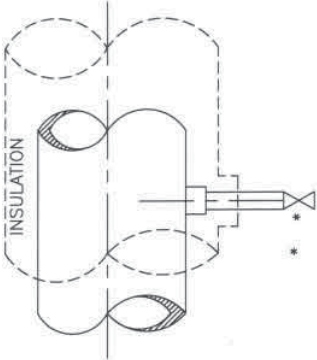


This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

PRESS. MEASUREMENT



PRESSURE CONNECTION ON HORIZONTAL PIPE



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

PRESSURE CONNECTIONS ON VERTICAL PIPES

FOR TENDER PURPOSE ONLY

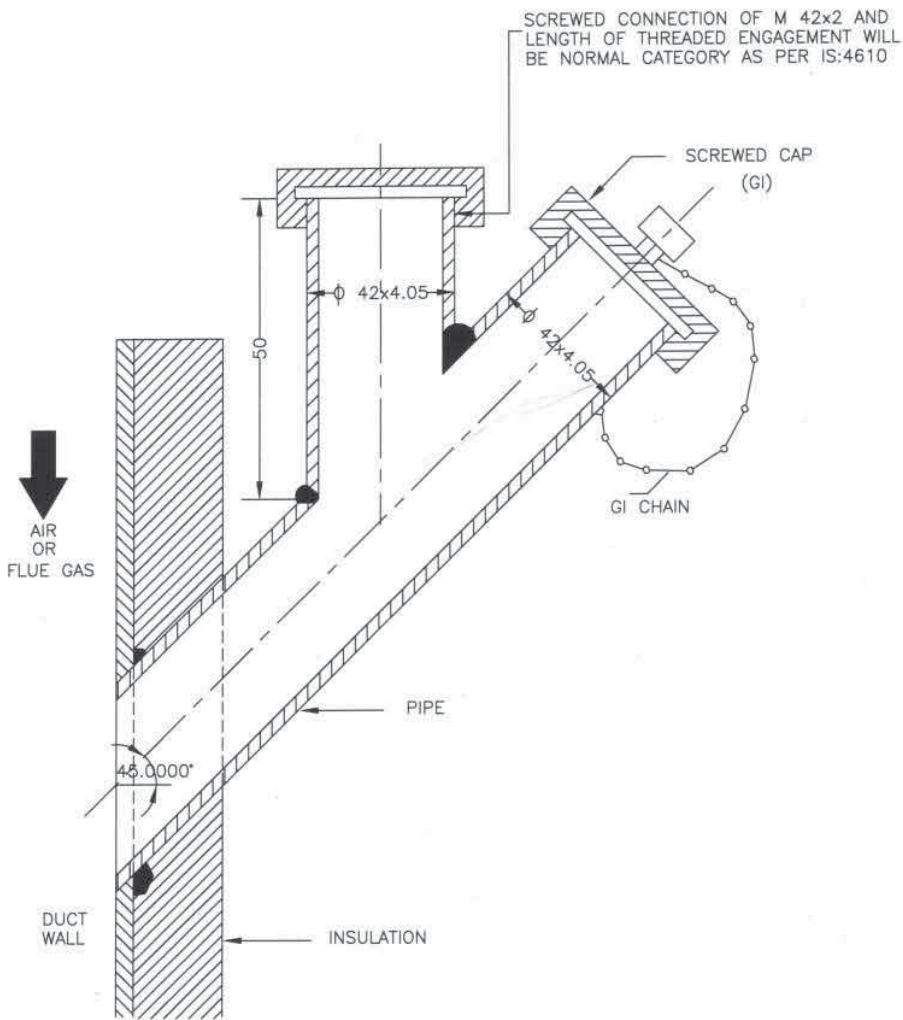
										<div>एन टी पी सी</div> <div>NTPC</div>		<div>NTPC LIMITED</div> <div>(A GOVERNMENT OF INDIA ENTERPRISE)</div> <div>ENGINEERING DIVISION</div>	
										PROJECT TYPICAL THERMAL POWER PROJECT			
										TITLE INSTRUMENT SOURCE CONNECTION DETAILS			
A	FIRST ISSUE									SIZE A4	SCALE N.T.S.	DRG. NO. 0000-999-POI-A-035	REV. NO. A
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CAJ	ARCH.	APPD.	DATE	Sh-1 Of 14	
CLEARED BY													

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

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)				
<p>NOTES:-</p> <ol style="list-style-type: none"> 1. MATERIAL OF THE BOSS AND NIPPLE SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED AND CONFIRM TO ANSI B 16.11. 2. THE LENGTH OF THE NIPPLE SHOULD BE 250mm. 3. THE OTHER END OF THE NIPPLE SHALL BE SOCKET WELDED WITH 1" GLOBE VALVE OF MATERIAL AS PER ANSI B 16.1. 4. TWO ISOLATED VALVES ARE TO BE USED FOR PRESSURE = >40 Kg/Cm2. 5. EDGE HOLE MUST BE CLEAN AND SQUARE OR ROUNDED SLIGHTLY (1/64" RADIUS) FREE FROM BURRS, WIRE EDGES OR OTHER IRREGULARITIES. 6. ORIENTATION OF TAP WILL BE VARY WITH TYPE OF PROCESS FLUID AND NATURE OF RUN OF THE PIPE. 7. ACTIVITIES TO BE COMPLETED AT THE SHOP, WELD THE COUPLING (OR BOSS) ON THE PIPE AND DRILL PRESSURE CONNECTION HOLE (SAME AS I D OF NIPPLE) IN THE PIPE IN ALIGNMENT WITH HOLE IN THE COUPLING. 8. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED. 									
FOR TENDER PURPOSE ONLY									
					NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION				
PROJECT					TYPICAL THERMAL POWER PROJECT				
TITLE					INSTRUMENT SOURCE CONNECTION DETAILS				
A	FIRST ISSUE	DRAWN	DESIGN	CHKD.	M	E	C	T.G.	DATE
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	T.G.	DATE
Cleared By									
SIZE	SCALE	DRG. NO.			0000-999-POI-A-035			REV. NO.	A
A4	N.T.S.							Sh-2 Of 14	

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

PRESS. MEASUREMENT



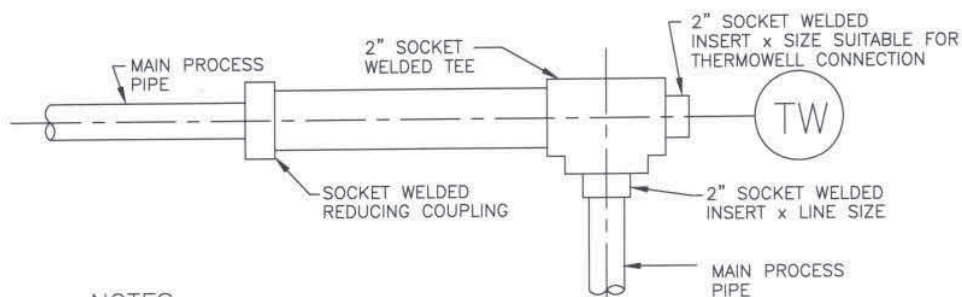
- NOTES:-
- 1. THIS TYPE OF PRESSURE CONNECTION SHALL BE PROVIDED FOR PRESSURE MEASUREMENTS IN AIR AND FLUE GAS DUCT/FURNACE.
 - 2. DIMENSIONS ARE INDICATIVE ONLY.

FOR TENDER PURPOSE ONLY

<div><div>एन टी सी NTPC</div><div>NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION</div></div>															
PROJECT: TYPICAL THERMAL POWER PROJECT															
TITLE: INSTRUMENT SOURCE CONNECTION DETAILS															
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	D&I	ARCH.	APPD.	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
A	FIRST ISSUE											A4	N.T.S.	0000-999-POI-A-035	A
Cleared By										Sh-3 Of 14					

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

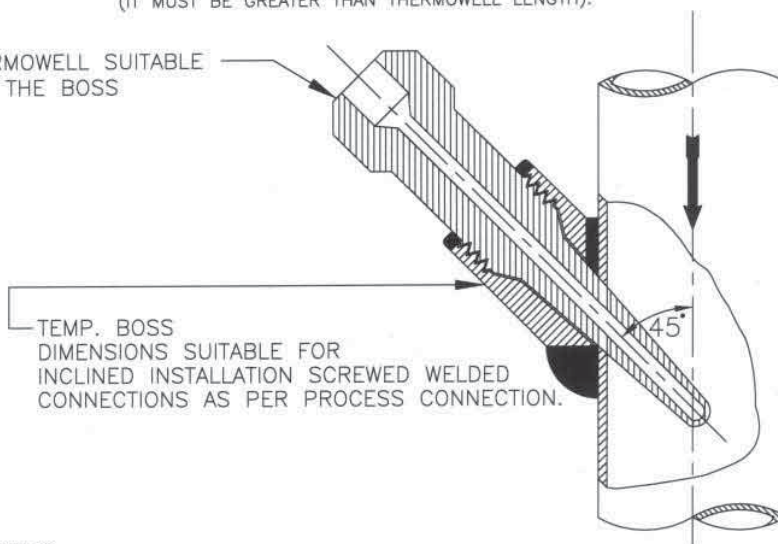
TEMP. MEASUREMENT



NOTES:-

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

THERMOWELL SUITABLE FOR THE BOSS



NOTES:-

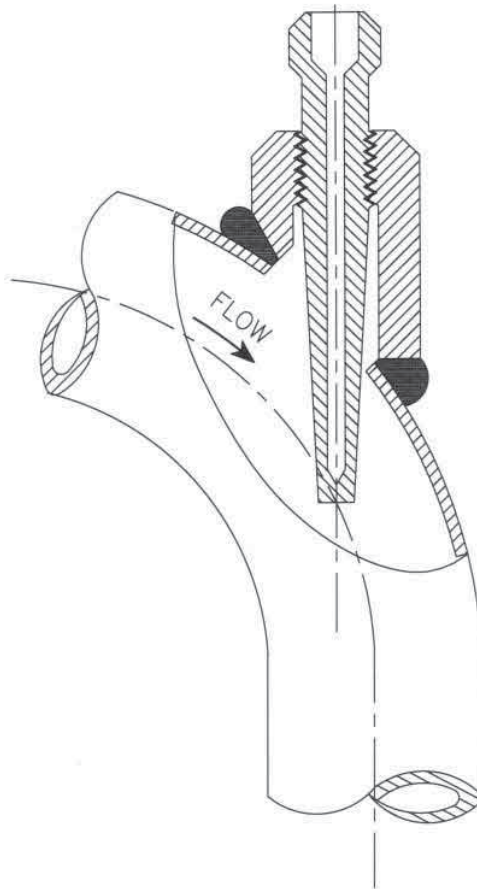
1. INCLINED INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MIN. 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF MIN. 3" SIZE OF MAIN PIPING SPECIFICATION SHALL BE USED.
3. THIS TYPE OF INSTALLATION IS APPLICABLE FOR HORIZONTAL AND VERTICAL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

FOR TENDER PURPOSE ONLY

<div style="display: flex; justify-content: space-between; align-items: center;"> <div> </div> <div> NTPC LIMITED <small>(A GOVERNMENT OF INDIA ENTERPRISE)</small> ENGINEERING DIVISION </div> </div>									
<div style="display: flex; justify-content: space-between;"> <div> PROJECT TYPICAL THERMAL POWER PROJECT (SG PACKAGE) </div> <div> TITLE INSTRUMENT SOURCE CONNECTION DETAILS </div> </div>									
REV. NO. A	DESCRIPTION FIRST ISSUE	DRAWN 	DESIGN 	CHKD. 	W 	E 	C 	APPD. 	DATE 31.08.18
<div style="display: flex; justify-content: space-between;"> <div> SIZE A4 </div> <div> SCALE N.T.S. </div> <div> DRG. NO. 0000-999/102-POI-A-035 </div> <div> REV. NO. A </div> </div>									

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.


TEMP. MEASUREMENT



NOTES:-

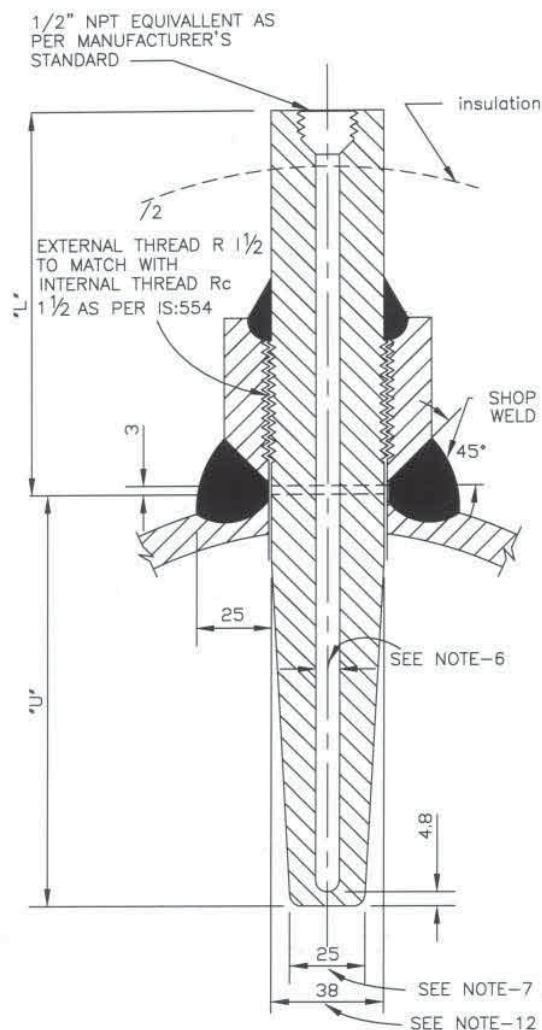
1. FLOW INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MINIMUM 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF ELBOW FORM (AS SHOWN) OF MINIMUM 3" SIZE SHALL BE USED.
3. ELBOW EXPANDER SECTION IN HORIZONTAL PLANE MAY BE USED FOR LIQUID SERVICES.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

FOR TENDER PURPOSE ONLY

<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  <p>NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION</p> </div> <div> <p>PROJECT: TYPICAL THERMAL POWER PROJECT</p> <p>TITLE: INSTRUMENT SOURCE CONNECTION DETAILS</p> </div> </div>															
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CL	ARCH.	APPR.	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
A	FIRST ISSUE											A4	N.T.S.	0000-999-POI-A-035	A
Cleared By															

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

TEMP. MEASUREMENT



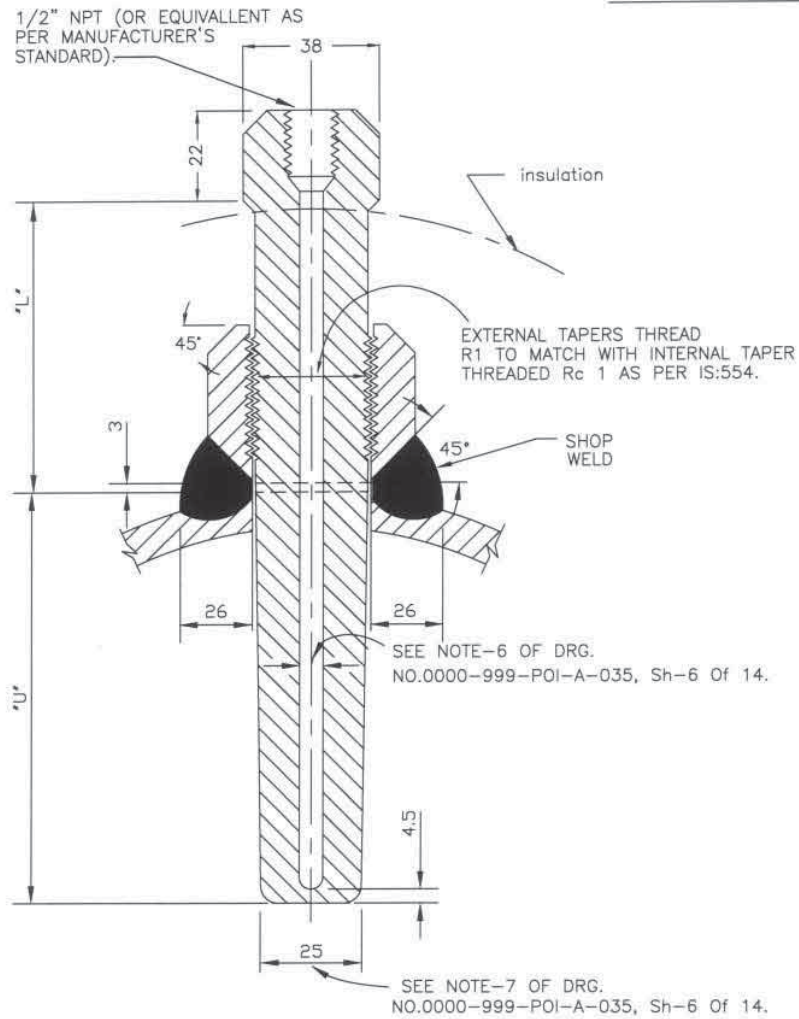
NOTES:-

- THIS TYPE OF TEMPERATURE BOSS SHALL BE USED FOR THE PROCESS PRESS EQUAL/ABOVE 40 Kg/Cm2(g).
- THE MATERIAL OF THE BOSS SHOULD BE SIMILAR TO THAT OF PIPING MATERIAL OF SPECIFICATION.
- ALL WELD TO BE TESTED IN ACCORDANCE WITH APPLICABLE CODES BY MANUFACTURER.
- MATERIAL OF THE THERMOWELL SHALL BE OF 316SS.
- THERMOWELL SHALL BE DRILLED BARSTOCK TYPE.
- INTERNAL BORE OF THE THERMOWELL SHOULD BE SELECTED BASED ON THE NORMAL SIZE OF THE SENSING ELEMENT AS PER ASME,PTC-19.3.
- 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.
- THE TYPE OF TAPERED THERMOWELL SHALL BE USED FOR LIQUID VELOCITIES UP TO 92M.P.S.(300F.T.P.S.).
- THERMOWELL WITH THE INSULATION LAG EXTENSIONS SHALL BE USED WHEREVER APPLICABLE.
- 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.
- ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.
- WILL BE SUITABLE TO MATCH THE STUB DIMENSIONS AS PER RC 1/2
- THE "U" & "L" DIMENSIONS SHALL BE SELECTED BASED ON PARTICULAR APPLICATION AND THE SAME SHALL BE SUBJECT TO OWNER'S APPROVAL DURING DETAILED ENGINEERING.
- ALL DIMENSIONS ARE INDICATIVE ONLY.

FOR TENDER PURPOSE ONLY

<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>एन टी सी NTPC</p> </div> <div style="text-align: center;"> <p>NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION</p> </div> </div>															
PROJECT TYPICAL THERMAL POWER PROJECT															
TITLE INSTRUMENT SOURCE CONNECTION DETAILS															
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	W	E	C	CAJ	ARCH.	APPD.	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
A	FIRST ISSUE											A4	N.T.S.	0000-999-POI-A-035	A
Cleared By															

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

TEMP. MEASUREMENT**NOTES:-**

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

FOR TENDER PURPOSE ONLY

एन टी सी लिमिटेड
NTPC

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT **TYPICAL THERMAL POWER PROJECT**TITLE **INSTRUMENT SOURCE CONNECTION DETAILS**

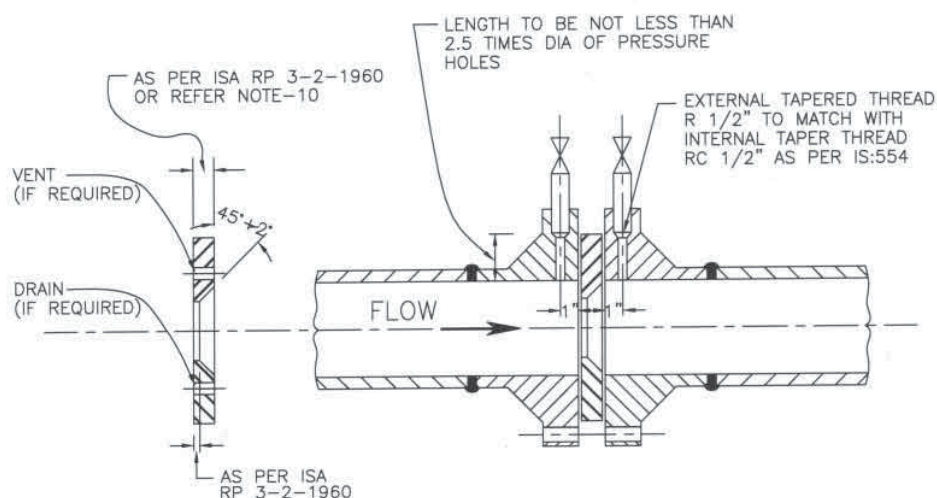
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	W	E	C	CLT	ARCH.	APPD.	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
A	FIRST ISSUE											A4	N.T.S.	0000-999-POI-A-035	A

CLEARED BY

Sh-7 Of 14

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

FLOW MEASUREMENT



NOTES:-

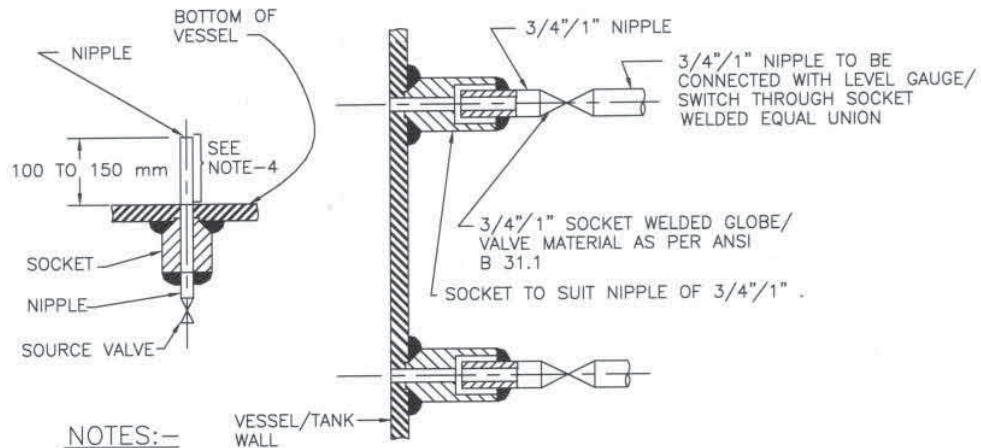
- ORIFICE PLATE MOUNTED BETWEEN FLANGES WITH FLANGE TAPPING (AS SHOWN ABOVE) SHOULD BE LIMITED TO PIPE SIZES OF 2" OR LARGER.
- ORIFICE PLATE SHALL BE MOUNTED BETWEEN PIPING FLANGES WITH THE SHARP EDGE FACING UPSTREAM SUCH THAT CENTRE OF THE CONCENTRIC ORIFICE SHOULD BE WITHIN 0.79 mm (1/32") OF THE AXIS OF THE PIPE.
- TWO GASKETS SHALL BE INSERTED BETWEEN THE PLATE AND THE FLANGES AND INSIDE DIAMETER OF THE GASKETS SHOULD BE ATLEAST 1.5 mm (1/16") GREATER THAN THE INSIDE DIAMETER OF THE PIPE SO THAT THEY DO NOT PROTRUDE INTO THE PIPE.
- PIPING FLANGES SHALL BE ANSI WELD NECK, RAISED FACE TYPE. THE FLANGE IS TO BE ALIGNED WITH THE FACE PERPENDICULAR TO THE FLOW AXIS.
- BIDDER TO SUPPLY ORIFICE PLATE SPECIAL TYPE (HAVING PRESS. CONNECTIONS) OF FLANGES ALONG WITH GASKETS, NIPPLES AND SOURCE VALVES.
- ON HORIZONTAL PIPE RUN PRESSURE CONNECTIONS ARE TO BE TAKEN FROM SIDES FOR LIQUID AND STEAM SERVICE AND FROM TOP FOR DRY GAS SERVICE. FOR PROCESS LIQUIDS INSTALLATION OF PRESSURE TAPS MAY BE ALLOWED WITHIN AN ANGLE OF 45° ELBOW THE HORIZONTAL IN SPECIAL CASES BUT NO BOTTOM CONNECTIONS ARE ALLOWED.
- THE LOCATION OF PRESSURE TAPS MUST BE WITHIN 1.5 mm (1/16") OF THE DISTANCE SPECIFIED.
- MAXIMUM DIAMETER OF PRESS. CONNECTION HOLES SHALL BE AS PER RECOMMENDATIONS OF ASME PTC 19.5. THE DIAMETER OF THE HOLE SHOULD REMAIN THE SAME FOR A DISTANCE NOT LESS THAN 2.5 TIMES OF THE DIAMETER BEFORE EXPANDING INTO THE PRESSURE PIPE.
- THERE MUST BE NO BURRS WIRE EDGES OR OTHER IRREGULARITIES ALONG THE EDGE OF THE HOLE AND IT MUST BE SQUARE AND ROUNDED SLIGHTLY (1/64" RADIUS).
- ORIFICE PLATE SHOULD BE FLAT WITHIN 0.02 mm (0.001") AND THE SURFACE ROUGHNESS SHOULD NOT EXCEED 20 MICRO INCH. THE THICKNESS OF THE ORIFICE PLATE SHOULD BE AS PER EN ISO 5167:2003.
- FOR HORIZONTAL PIPE RUN DRAIN HOLES IN ORIFICE PLATES ARE AT THE BOTTOM (APPROX. TANGENT TO INSIDE DIA OF PIPE) FOR STEAM OR GAS SERVICE. VENT HOLES SHOULD BE LOCATED ON UPPER SIDE FOR INCOMPRESSIBLE FLUID.
- ORIFICE PLATE SHOULD BE OF 316 SS (ASTM A167-54 GRADE-II).
- RECOMMENDED MINIMUM LENGTHS OF STRAIGHT PIPE PRECEDING AND FOLLOWING ORIFICES SHALL BE AS PER EN ISO 5167:2003.
- THREE PAIRS OF PRESSURE TAPS SHALL BE PROVIDED WITH NIPPLES OF REQUIRED LENGTH AND SOURCE VALVES AND THE UN-USED TAPS ARE PLUGGED.
- THE INTERNAL TAPERED CONNECTION WITHIN THE FLANGE FOR PRESSURE TAPS SHOULD BE RC 1/2" AND THE NIPPLE SHOULD ALSO OF EXTERNAL THREADED R 1/2" AS PER IS:554. THE LENGTH OF THREADED ENGAGEMENT SHALL BE AS PER ABOVE STANDARD.

FOR TENDER PURPOSE ONLY

				NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION	
PROJECT		TYPICAL THERMAL POWER PROJECT			
TITLE		INSTRUMENT SOURCE CONNECTION DETAILS			
REV. NO.	DESCRIPTION	DESIGN	CHKD.	APPD.	DATE
A	FIRST ISSUE				
Cleared by		SIZE A4 SCALE N.T.S. DRG. NO. 0000-999-POI-A-035 REV. NO. A Sh-12 of 14			

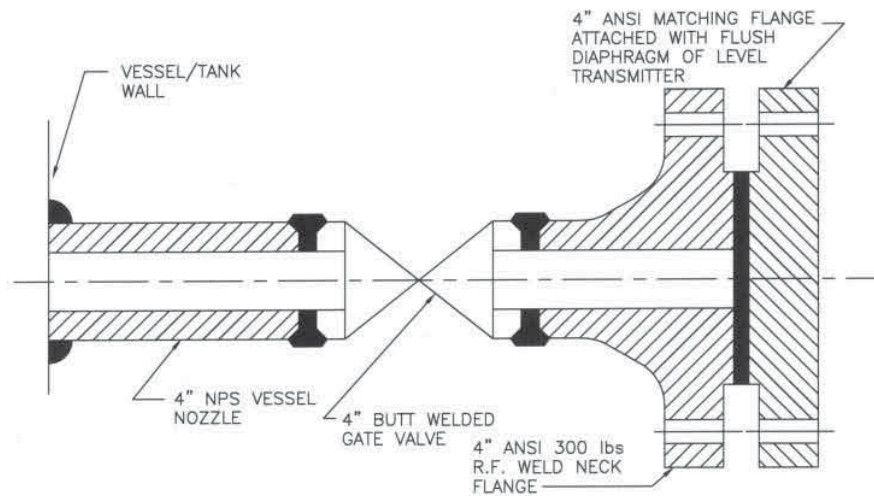
This document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document will be reproduced by any means without the written permission.

LEVEL MEASUREMENT



NOTES:-

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



NOTES:-

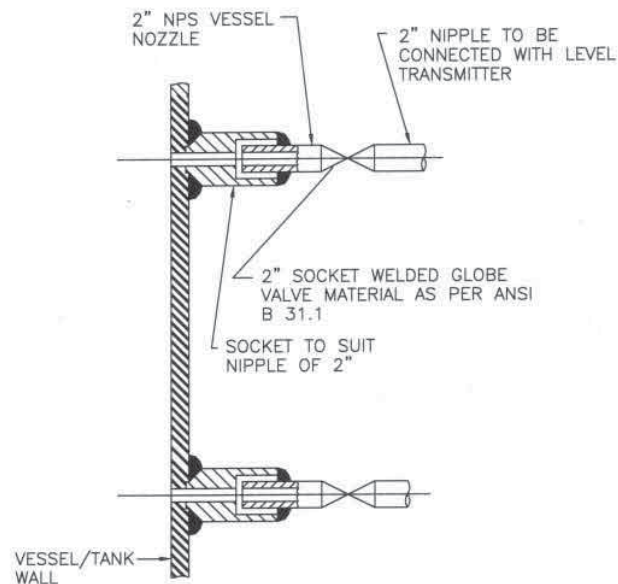
1. THIS TYPE OF PROCESS CONNECTION SHALL BE PROVIDED FOR TANK LEVEL MEASUREMENT OF VISCOUS OR CORROSIVE LIQUID USING FLUSH DIAPHRAGM/WAFER TYPE LEVEL TRANSMITTER.
2. WELDING OF MATCHING FLANGE TO GATE VALVE SHALL BE DONE BY BIDDER.

FOR TENDER PURPOSE ONLY

<div style="display: flex; justify-content: space-between; align-items: center;"> <div> <p>एन टी पी सी NTPC</p> </div> <div> <p>NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION</p> </div> </div>																	
PROJECT: TYPICAL THERMAL POWER PROJECT																	
TITLE: INSTRUMENT SOURCE CONNECTION DETAILS																	
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHD.	M	E	C	CAT	ARCH.	APPD.	DATE	SIZE	SCALE	DRG. NO.	0000-999-POI-A-035	REV. NO.	A
A	FIRST ISSUE											A4	N.T.S.		Sh-13 Of 14		

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

LEVEL MEASUREMENT



NOTES:-

1. THIS TYPE OF PROCESS CONNECTION SHALL BE USED FOR DISPLACER TYPE LEVEL TRANSMITTER.
2. SOURCE CONNECTION ON VESSEL SHOULD NOT BE LOCATED AT PLACES SUBJECTED TO INTERFACE AND TURBULENCE FROM INLETS AND OUTLETS.
3. IF LOWER CONNECTION IS TAKEN FROM BOTTOM OF THE VESSEL THEN THE NIPPLE MUST BE 100 mm TO 150 mm ABOVE THE BOTTOM OF THE VESSEL.

FOR TENDER PURPOSE ONLY



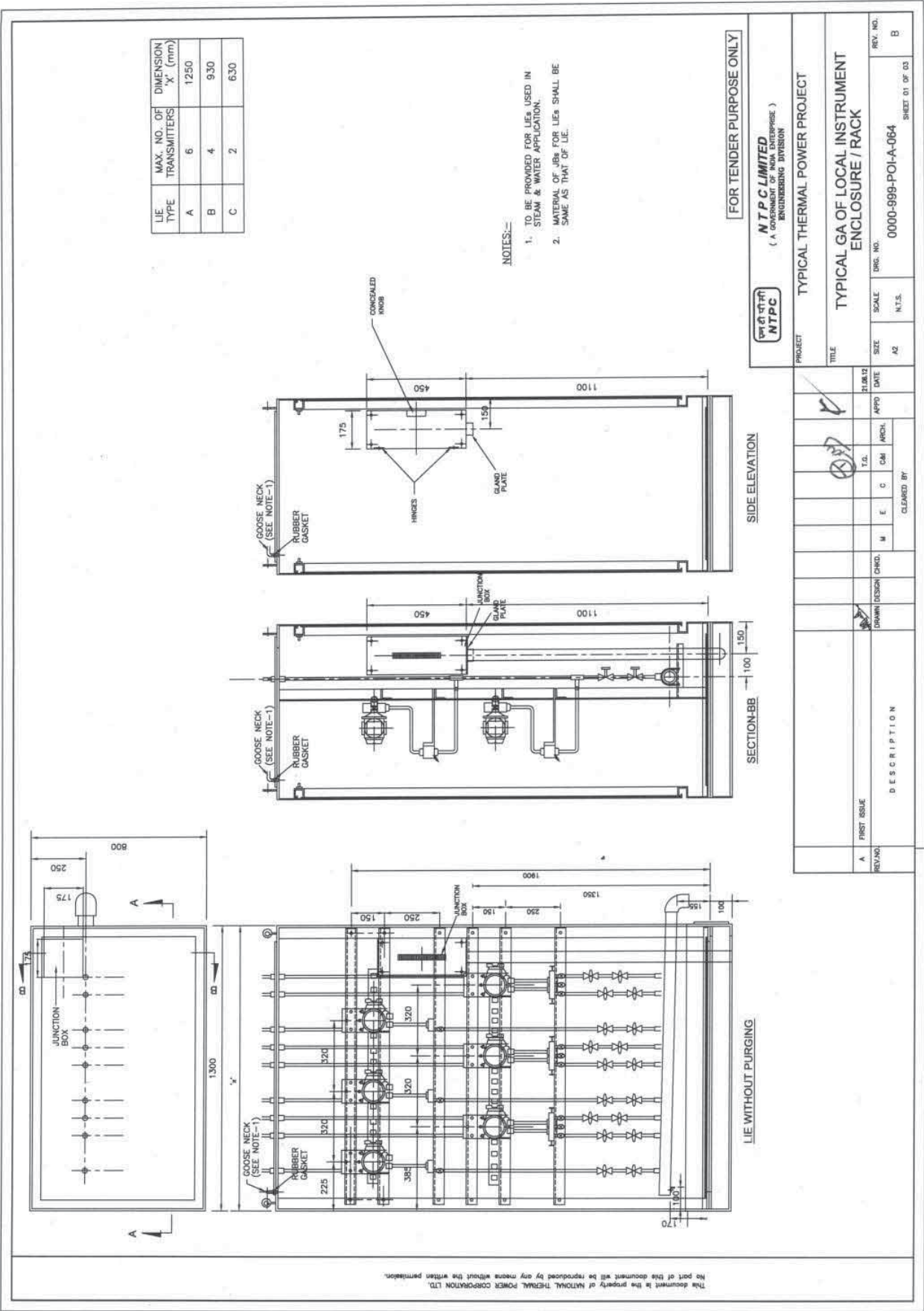
NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

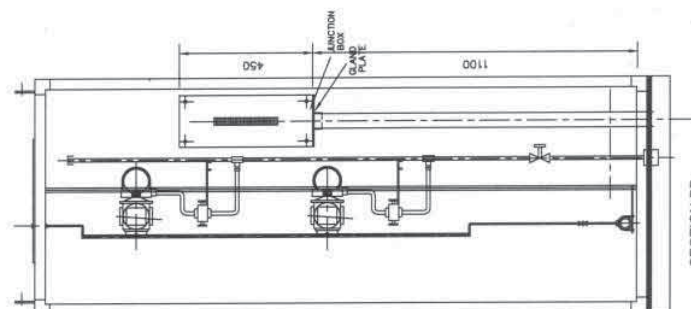
PROJECT TYPICAL THERMAL POWER PROJECT

TITLE INSTRUMENT SOURCE CONNECTION DETAILS

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	W	E	C	CL	ARCH.	APPD.	DATE
A	FIRST ISSUE										31.08.18

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





NOTES: —

1. MATERIAL OF JB₉ FOR LIE₉ SHALL BE SAME AS THAT OF LIE.

FOR TENDER PURPOSE ONLY

SECTION-BB										<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 5px; text-align: center;"> एन टी पी सी लिमिटेड NTPC </div> <div style="text-align: center;"> NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION </div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>PROJECT</div> <div>TYPICAL THERMAL POWER PROJECT</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>TITLE</div> <div>TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>REV. NO.</div> <div>REV. NO.</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>0000-9999-POI-A-064</div> <div>SH- 02 OF 03</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>SCALE</div> <div>DRG. NO.</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>A2</div> <div>N.T.S.</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>DATE</div> <div>DATE</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>APPRO</div> <div>APPRO</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>ARCH.</div> <div>ARCH.</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>CM</div> <div>CM</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>C</div> <div>C</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>E</div> <div>E</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>M</div> <div>M</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>ORIG.</div> <div>ORIG.</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>DESIGN</div> <div>DESIGN</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>DRWN</div> <div>DRWN</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>ISSUE</div> <div>ISSUE</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>REVNO</div> <div>REVNO</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>DESCRIPTION</div> <div>DESCRIPTION</div> </div>									
										<div style="display: flex; justify-content: space-between;"> <div>CHECKED BY</div> <div>CHECKED BY</div> </div>									

LIR TYPE	MAX. NO. OF TRANSMITTERS	DIMENSION 'X' (mm)
A	8	1650
B	6	1330
C	4	1010

NOTE:-
1. MATERIAL OF JBs FOR LIRs SHALL BE SAME AS THAT OF LIR.

FOR TENDER PURPOSE ONLY

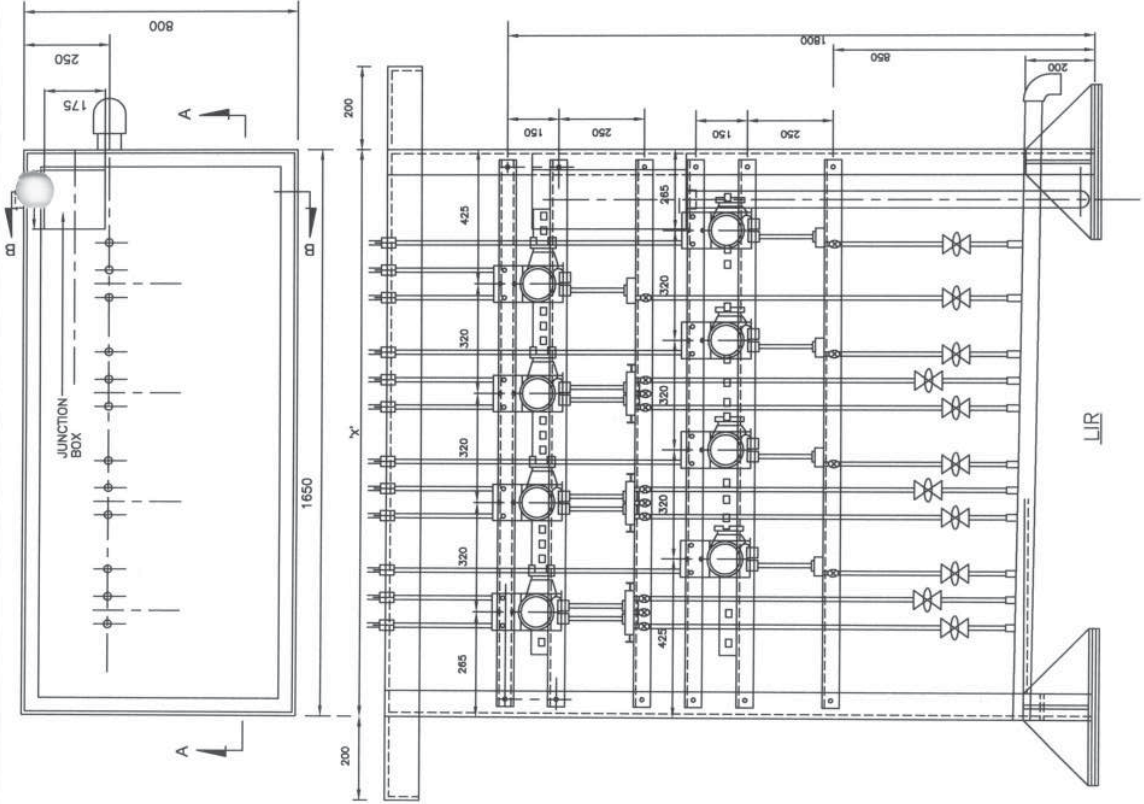
NTPC

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

TYPICAL THERMAL POWER PROJECT

TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK

PROJECT	SCALE	DRG. NO.	REV. NO.
SIZE	N.T.S.	0000-999-FCI-A-064	A
A3		Page No. 419 of 479	
		Sheet 03 of 03	



SECTION-AA
LIR WITHOUT PURGING

DESCRIPTION

REV/NO.	DATE	APPROV.	CHECKED BY
A	21.08.12	1.6	

QUALITY ASSURANCE

MEASURING INSTRUMENTS

Page- 1/2

Item Components Sub System Assembly	Attributes Characteristics								
	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (As applicable)	Hydro Test(R)	Material Test certificate ®
1. PR Gauge (IS-3624)	Y	Y	Y	Y	Y				
2. Temp. Gauge (BS-5235)	Y	Y	Y	Y	Y				
3. Pr./D.P.Switch(BS-6134)	Y	Y	Y	Y	Y	Y			
4. Electronic Transmitter(IEC-60770)	Y	Y	Y	Y	Y	Y			
5. Temp. Switch	Y	Y	Y	Y	Y	Y			
6. Electrical Metering Instrument (IS-1248)	Y	Y	Y	Y	Y	Y			
7. Transducer (IS-14570)	Y	Y	Y	Y	Y	Y			
8. Thermocouples (IEC – 584 / ANSI-MC-96.1)	Y	Y	Y	Y	Y	Y			
9. RTD(IS-2848)	Y	Y	Y	Y	Y	Y			
10. Thermowell	Y		Y				Y	Y	Y
R-Routine Test A- Acceptance Test Y – Test applicable									
Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.									

MEASURING INSTRUMENTS

Page- 2/2

Item Components Sub System Assembly	Attributes Characteristics												
	GA, Dimensions, Paint Thickness (R)	Make, Model, Type, Rating ,BOM(R)	Process / Electrical connection (R)	Calibration/Functional (R)	Requirement as per standard (R)	WPS approval (A)	Non-destructive testing (R)	Calculation for accuracy (R)	HV/ IR Test (R)	IBR Certification as applicable (R)	Hydro test (R)	Material test certificate (A)	Integral Testing of complete System
11. Orifice plate(BS-1042)	Y	Y	Y	Y*	Y	Y* *	Y* *			Y	Y* *	Y	
12. Flow nozzle(BS-1042)	Y	Y	Y	Y*	Y	Y	Y			Y	Y	Y	
13. Impact head type element	Y	Y	Y					Y				Y	
14. Electronics Water Level Indicator (EWLI)	Y	Y	Y		Y		Y		Y	Y	Y	Y	Y
15. Flue Gas & Ambient Air Analysers	Y	Y	Y	Y					Y				Y
16- Analysers	Y	Y	Y	Y			Y		Y	Y	Y	Y	Y
R-Routine Test		A- Acceptance Test				Y – Test applicable							
*Calibration to be carried out on one flow element of each type and size if calibration carried out as type test same shall not be repeated.													
** As applicable													
#Vaccuminasation test of chiller assembly													
Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.													

CLAUSE NO.	QUALITY ASSURANCE																	<div>एन टी पी सी NTPC</div>
	POWER SUPPLY FOR C&I SYSTEMS (UPS/BATTERY/BATTERY CHARGER/ACDB/DCDB)																	
	ITEMS	TESTS	Visual/dimension/rating/ Paint Adhesion/ Thickness (R)															
			General arrangement/BOM/make of components /Mimic ®															
			Efficiency .regulation(R)															
			Input voltage variation (A)															
			Out put voltage and frequency adi. range(A)															
			Preliminary light load test(R)															
			Load transfer retransfer test (R) *															
	AC input failure and return test (R)																	
	Parallel operation and current division(R)																	
	Relative harmonic content(R)																	
	Restart with PRI A.C and battery (separately)(R)																	
	System transfer and retransfer (R) *																	
	Asynchronous transfer(R)																	
Ripple content(R)																		
Load limiter operation (R)																		
IR/HV(R)																		
Tests as per standard & specification (R)&(A)																		
UPS/CONVERTER (IEC-146 PT-4)			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
VOLTAGE STABILISER			Y	Y	Y	Y	Y				Y		Y				Y	
LEAD ACID BATTERY (PLANTE)-IS-1652																	Y	
Ni-CD BATTERY(IS-10918/IEC-623)																	Y	
ACDB/DCDB			Y	Y												Y	Y	
BATTERY CHARGER			Y	Y	Y	Y	Y				Y				Y	Y	Y	
R-Routine Test			A- Acceptance Test					Y – Test applicable										
* Transfer time and Over shoot /under shoot during load & system transfer shall be recorded.																		
Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.																		

CLAUSE NO.	QUALITY ASSURANCE													<div>एनटीपीसी NTPC</div>
	ELECTRICAL ACTUATOR WITH INTEGRAL STARTER													
	Test/Attributes Characteristics ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING	RPM ®	No Load Current ®	IR & HV Test®	Mounting Dimension®	All routine Test as per Standard & Specification®	Correct Phase Sequence®	Operation & Setting of limit Switch/Torque Switch®	Stall Torque/Current (A)	Hand Wheel operation/ Auto de clutch function (A)	Function of Aux. like Potentiometer, space heater, position indicator ®	EPT output ®	Local/ Remote (Open-Stop-Close) Operation®	Safety check (Single phasing, Phase correction, Tripping etc.) (A)
	ELECTRICAL ACTUATOR with Integral Starter , Non-Intrusive Electrical Actuator (EN15714-2)													
	Motor	Y	Y	Y	Y	Y								
	Final Testing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the practices and procedure adopted along with relevant supporting documents.													
	- SIL 2 certificate if applicable													
® - Routine Test (A) - Acceptance Test Y - Test applicable														
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.: 4540-001A-2				SUB-SECTION-E-56 Electrical Actuator				PAGE 1 OF 1				


CLAUSE NO.	QUALITY ASSURANCE													<div>एनटीपीसी NTPC</div>			
	Process, Connection & piping FOR C&I SYSTEMS																
	TESTS	ITEMS	Visual & Dimensions ®	GA, BOM, Layout of component & construction feature, Paint Shade/thickness ®	Flattening,flaring,hydrotest,hardness check as per ASTM standard (A)	Component Ratings ®	Wiring ®	Make, Model, Type, Rating®	IR & HV ®	Review of TC for instrument/devices (R)	Accessibility of TBs/Devices Illumination,grounding ®	Tubing ®	Leak/Hydro test(A)	Chemical/physical properties of material (A)	Proof pressure test,Dismantling & reassembly test,Hydraulic impulse and vibration test (R)	Tests as per standards & specification	
			Local Instrument enclosure	Y	Y		Y	Y	Y	Y	Y	Y	Y				
			Local instruments racks	Y	Y		Y	Y	Y	Y	Y	Y	Y				
			Junction Box	Y	Y*		Y		Y	Y							
			Gauge Board	Y	Y		Y		Y		Y		Y	Y			
			Impulse pipes and tubes	Y		Y			Y						Y		
			Socket weld fittings ANSI B-16.11	Y					Y						Y		Y
			Compression fittings	Y					Y					Y	Y	Y	
			Instrument valves & Valve manifolds	Y					Y					Y	Y		
	Copper tubings ASTM B75	Y					Y								Y		
	*-applicable for painted junction boxes.																
	Note: R-Routine Test																

TYPE TEST REQUIREMENTS

एनटीपीसी
NTPC


CLAUSE NO.	TECHNICAL REQUIREMENTS					<div>एनटीपीसी NTPC</div>
3.00.00	TYPE TEST REQUIREMENT FOR OTHER C&I SYSTEMS					
	Sl. No	Item	Test Requirement	Standard	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate
	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
	1	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes
	2	Instrumentation Cables Twisted & Shielded*				
		-Conductor	Resistance test	VDE-0815	No	Yes
			Diameter test	IS-10810	No	Yes
			Tin Coating test (Persulphate test)	IS-8130	No	Yes
		-Insulation	Loss of mass	VDE 0472	No	Yes
			Ageing in air ovens**	VDE 0472	No	Yes
			Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
			Heat shock	VDE 0472	No	Yes
			Hot deformation	VDE 0472	No	Yes
			Shrinkage	VDE 0472	No	Yes
			Bleeding & blooming	IS-10810	No	Yes
		-Inner sheath***	Loss of mass	VDE 0472	No	Yes
			Heat shock	VDE 0472	No	Yes
			Cold bend/cold impact test	VDE 0472	No	Yes
	TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	PAGE 4 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS				<div>एनटीपीसी NTPC</div>
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
	-Outer sheath	Loss of mass	VDE 0472	No	Yes
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes
		Colour fastness to water	IS-5831	No	Yes
		Cold bend/ cold impact test	VDE-0472	No	Yes
		Oxygen index test	ASTMD-2863	No	Yes
		Smoke Density Test	ASTMD-2843	No	Yes
		Acid gas generation test	IEC-60754-1	No	Yes
	-fillers	Oxygen index test	ASTMD-2863	No	Yes
		Acid gas generation test	IEC-60754-1	No	Yes
	-AL-MYLAR shield	Continuity test		No	Yes
		Shield		No	Yes
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	
				PAGE 5 OF 8	


CLAUSE NO.	TECHNICAL REQUIREMENTS				
		thickness			
		Overlap test		No	Yes
	-Over all cable	Flammability Test	IEEE 383	No	Yes
		Swedish Chimney Test	SEN 4241475	No	Yes
		Noise interference	IEEE Trans-actions	No	Yes
		Dimensional checks	IS 10810	No	Yes
		Cross talk	VDE-0472	No	Yes
		Mutual capacitance	VDE-0472	No	Yes
		HV test	VDE-0815	No	Yes
		Drain wire continuity		No	Yes
<p>* 1.0 All cables to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last Ten years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.</p> <p>2.0 In case the Contractor is not able to submit report of the type test(s) conducted within last Ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract free of cost to the Owner and submit the reports for approval.</p> <p>**These tests shall be carried out as per VDE0207 Part 6 & ASTM D-2116 for TEFLON insulated & outer sheathed cables</p> <p>***Applicable for armoured cables only</p>					
3	DC Power Supply System (Applicable for each model and rating)				
1)The Type Test reports for offered rectifier module and the controller module irrespective of the rectifier bank shall be acceptable					
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	
				PAGE 6 OF 8	

CLAUSE NO.	TECHNICAL REQUIREMENTS				<div>एनटीपीसी NTPC</div>
			Surge Withstand Capability(SWC)	(ANSI / IEEE No C37.90.1)or (IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18).	Yes
			Dry Heat Test	IEC-60068-2-2 No or equivalent	Yes
			Damp Heat test	IEC-60068-2-30 No or IEC-60068-2-78 or equivalent	Yes
			Vibration test	IEC-60068-2-6 No or equivalent	Yes
			Electrostatic discharge test	IEC 61000-4-2 No or equivalent	Yes
			Radio frequency immunity test	IEC-61000-4-6 No or equivalent	Yes
			Electromagnetic field immunity	IEC 61000-4-3 No or equivalent	Yes
			Degree of Protection	IS-13947 or equivalent	Yes
4	Battery ##	As per standard (col 4)	IS-10918 (Ni-Cd Batteries)	No	Yes
			IS-1652 (Lead Acid Plant Batteries)	No	
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	
				PAGE 7 OF 8	


CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी NTPC</div>
	<p>## The contractor shall submit for Employers approval the reports of all the type test as per latest IS-10918 carried out within last ten years from the date of Bid opening and the test(s) should have been either conducted at an independent laboratory or in presence of owner's representative. The complete type test reports shall be for any rating of Battery in a particular group based on plate dimensions being manufactured by supplier.</p> <p>Note:</p> <p>Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.</p>			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.:CS-4540-001A-2	SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	PAGE 8 OF 8

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>REFERENCE CODES AND STANDARDS FOR CONTROL AND INSTRUMENTATION</p> <p>The design, manufacture, inspection, testing & installation of all equipment and system covered under this specification shall conform to the latest editions of codes and standards mentioned below and all other applicable VDE, IEEE, ANSI, ASME, NEC, NEMA, ISA AND Indian Standards and their equivalents.</p> <p>Temperature Measurements</p> <ol style="list-style-type: none">Instrument and apparatus for temperature measurement - ASME PTC 19.3 (1974).Temperature measurement - Thermocouples ANSI MC 96.1 - 1982.Temperature measuremnet by electrical Resistance thermometers - IS:2806.Thermometer - element - Platinum resistance - IS:2848. <p>Pressure Measurements</p> <ol style="list-style-type: none"><ol style="list-style-type: none">Instruments and apparatus for pressure measurement - ASME PTC 19.2 (1964).Electonic transmitters BS:6447.Bourdon tube pressure and vacuum gauges - IS:3624 - 1966.Process operated switch devices (Pr. Switch) BS-6134. <p>Flow Measurements</p> <p>Instruments and apparatus for flow measurements - ASME PTC 19.5 (1972) Interim supplement, Part-II.</p> <p>Measurement of fluid flow in closed conduits - BS-1042.</p> <p>Electronic Measuring Instrument & Control Hardware/ Software</p> <ol style="list-style-type: none">Automatic null balancing electrical measuring instruments - ANSI C 39.4 (Rev. 1973): IS:9319.Safety requirements for electrical and electronic measuring and controlling instrument - ANSI C 39.5 - 1974.Compatability of analog signals for electronic industrial process instruments - ISA - S 50.1 (1982) ANSI MC 12.1 - 1975.Dynamic response testing of process control instrumentation ISA - S 26 (1968).			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 98 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	<ol style="list-style-type: none"> 5. Surge Withstand Capability (SWC) tests - ANSI C 37.90 a/IEEE-472 or suitable class of IEC-255-4 equivalent to ANSI C37.90a/IEEE-472. 6. Printed circuit boards - IPC TM - 650, IEC 326 C. 7. General requirement and tests for printed wiring boards - IS 7405 (Part-I) 1973. 8. Edge socket connectors - IEC 130-11. 9. Requirements and methods of testing of wire wrap terminations DIN 41611 Part-2. 10. Dimensions of attachment plugs & receptacles - ANSI C 73 - 1973 (Supplement ANSI C 73 a - 1980). 11. Direct acting electrical indicating instrument - IS:1248 - 1968 (R). 12. Standard Digital Interface for Programmable Instrumentation - IEEE-488.2 - 1990. 13. Information Processing Systems - Local Area Networks - Part 2 : Logical Link Control - IEEE-802.2 - 1989. 14. Standard for Local Area Networks : Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1985. 15. Supplements A, B, C and E to Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1988. 16. Standard for Local Area Networks : Token - Passing Bus Access Method - IEEE-802.4 - 1985. 17. Standard for Local Area Networks : Token - Ring Access Method and Physical Layer Specification - IEEE-802.5 - 1985. 18. IEEE Guide to Software Requirements Specifications - IEEE-830 - 1984. 19. Hardware Testing of Digital Process Computers - ISA RP55.1 - 1983. 20. Electromagnetic Susceptibility of Process Control Instrumentation - SAMA PMC 33.1 - 1978. 21. Interface Between the Data Terminal Equipment and Data Circuit - Terminating Equipment Employing Serial Binary Data Interchange - EIA-232-D-1987. 22. Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment, Part 3 : Radiated Electromagnetic Field Requirements - IEC 801-3-1984. 			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 99 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
	<div data-bbox="1284 113 1427 184" style="text-align: right;">  </div> <p>Instrument Switches and Contact</p> <ol style="list-style-type: none"> Contact rating - AC services NEMA ICS 2 - 1978 (with revision through May 1983), Part - 2-125, A6000. Contact rating - DC services NEMA ICS 2-1978 Part-2 125, N600. <p>Enclosures</p> <ol style="list-style-type: none"> Type of Enclosures - NEMA ICS Part - 6 - 1978 (with Rev. 1 4/80) through 110.22 (Type 4 to 13). Racks, panels and associated equipment - EIA : RS - 310 C- 1983 (ANSI C 83.9 - 1972). Protection class for Enclosures, cabinets, control panels & desks - IS:2147 - 1962. <p>Apparatus, enclosures and installation practices in hazardous area</p> <ol style="list-style-type: none"> Classification of hazardous area - NFPA 70 - 1984, Article 500. Electrical Instruments in hazardous dust location - ISA - 512.11, 1973. Intrinsically safe apparatus - NFPA 493 1978. Purged and pressurised enclosure for electrical equipment in hazardous location - NFPA 496-1982. Enclosures for Industrial Controls and Systems - NEMA IS 1.1 - 1977. <p>Sampling System</p> <ol style="list-style-type: none"> Stainless steel material of tubing and valves for sampling system - ASTM A 296-82, Grade 7 P 316. Submerged helical coil heat exchangers for sample coolers ASTM D11 92-1977. Water and steam in power cycle - ASME PTC 19.11. Standard methods of sampling system - ASTM D 1066-99. <p>Annunciators</p> <ol style="list-style-type: none"> Specifications and guides for the use of general purpose annunciators - ISA S 19.1, 1979. Surge withstand capability tests - ANSI C 37.90a - 1989/IEEE-472 or suitable class of IEC 255-4 equivalent to ANSI C37.90a 1989/IEEE-472 Damp heat cycling test - IS:2106
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2
GENERAL TECHNICAL REQUIREMENTS	PAGE 100 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
	<p>4. Specification for Electromagnetic Susceptibility - SAMA DMC 33, 1/78</p> <p>Protections</p> <p>1. Relays and relay system associated with electric power apparatus. ANSI C 37.90, 1 - 1989.</p> <p>2. General requirements & tests for switching devices for control and auxiliary circuits including contactor relays - IS:6875 (Part-I) - 1973.</p> <p>3. Turbine water damage prevention - ASME TDP-1-1980.</p> <p>4. Boiler safety interlocks - NFPA Section 85 B - 1984, 85 C - 1991.</p> <p>UPS System</p> <p>1. Practices and requirements for semi-conductor power rectifiers - ANSI C 34.2, 1973.</p> <p>2. Relays and relays system associated with electrical power apparatus - ANSI C 3.90 - 1983.</p> <p>3. Surge withstand capability test - ANSI C 37.90 1 -1989.</p> <p>4. Performance testing of UPS - IEC 146.</p> <p>5. Stationary cells & Batteries Lead Acid type (with tubular positive plates) specification IS-1651-1991.</p> <p>6. Recommended practice for sizing large lead storage batteries for generating stations & sub-stations - IEEE-485-1985.</p> <p>7. Printed Circuit Board - IPC TM 650, IEC 326C.</p> <p>8. General Requirements & tests for printed wiring boards, IS:7405 (Part-I) 1973.</p> <p>Control Valves</p> <p>1. Control valve sizing - Compressible & Incompressible fluids - ISA S 75.01-1985.</p> <p>2. Face to face dimensions of control valves - ANSI B 16.00 - 1973.</p> <p>3. ISA Hand Book of Control Valves - (ISBN : B: 1047-087664-234-2).</p> <p>4. Codes for pressure piping - ANSI B 31.1</p> <p>5. Control Valve leak class - ISA RP 39.6</p>		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 101 OF 114

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p>Process Connection & Piping</p> <ol style="list-style-type: none"> Codes for pressure piping "power piping" - ANSI B 31.1. Seamless carbon steel pipe ASTM - A - 106. Forged & Rolled Alloy steel pipe flanges, forged fittings and valves and parts - ASTM - A - 182. Material for socket welded fittings - ASTM - A - 105. Seamless ferritic alloy steep pipe - ASTM - A - 335. Pipe fittings of wrought carbon steel and alloy steel - ASTM - A - 234. Composition bronze of ounce metal castings - ASTM - B - 62. Seamless Copper tube, bright annealed - ASTM - B - 168. Seamless copper tube - ASTM - B - 75. Dimension of fittings - ANSI - B - 16.11. Valves flanged and butt welding ends - ANSI - B - 16.34. <p>Instrument Tubing</p> <ol style="list-style-type: none"> Seamless carbon steel pipe - ASTM - A 106. Material of socketweld fittings - ASTM - A105. Dimensions of fittings - ANSI - B - 16.11. Code for pressure piping, welding, hydrostatic testing - ANSI B 31.1. <p>Cables</p> <ol style="list-style-type: none"> Thermocouples extension wires/cables - ANSI MC 96.1 - 1992. Requirements for copper conductor-Wiring cables for telecommunications & information processing system - VDE:0815. Colour coding of single or multi-pair cables - ICEA - S - 61-402 (third edition) NEMA WCS - 1979 with revisions thorough 2/83. Insulation & Sheathing compounds for cables : VDE 0207 (Part-4, 5 & 6). Guide design and installation of cable systems in power generating stations (insulation, jacket materials) - IEEE Std. 422-1977. Rules for Testing insulated cables and flexible cables : VVDE - 0472 Requirements of vertical flame propagation test - IEEE 383 - 1974 (R 1980) 		
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-C BID DOC. NO.:CS-4540-001A-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 102 OF 114

2 X 660MW TALCHER TPP

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

SECTION - II

STANDARD TECHNICAL SPECIFICATIONS



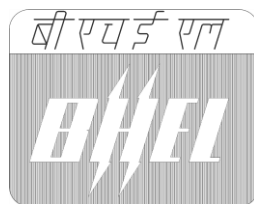
BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT PPEI,
NOIDA-INDIA

2 X 660MW TALCHER TPP

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

SECTION IIA

(STANDARD TECHNICAL SPECIFICATION-MECHANICAL)



BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA



TITLE

STANDARD TECHNICAL SPECIFICATION FOR TANKS

SPECIFICATION NO. PE-TS-STD-166-A001

SECTION IIA

REV 00

DATE

SHEET OF

1.0

SCOPE

The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, proper packing, delivery at site including freight, unloading, storage & handling at site, erection & commissioning, hydro test at site, painting, handing over, tools & tackles, commissioning spares etc. for site fabricated tank as mentioned in different sections of this specification

2.0

CODES & STANDARDS

The design, fabrication & assembly, erection & performance of steel tanks shall comply with all latest statutory regulations and safety codes applicable in the locality where the tanks are to be installed. Tanks shall conform to the latest applicable Indian/British/ USA standards. The vendor shall not be construed to be relieved of his responsibility by virtue of this specification. The tank in general shall conform to the latest editions, as is applicable, out of the following standards.

1

IS-800 Code of practice for use of steel in general building construction

2

IS-803 Code of practice for design, fabrication and erection of vertical mild steel cylindrical welded oil storage tank.

3

IS-804 Specification for rectangular pressed steel tanks

4

IS-805 Code of practice for use of steel in gravity water tank.

5

IS-816 Code of practice for metal arc welding for general construction in MS .

6

IS-817 Code of practice for training and testing for metal arc welder

7

IS-2825 Code of practice for unfired pressure vessel

8

BS-2594 Specification for carbon steel welded horizontal cylindrical storage tank

9

BS-2654 Specification for vertical steel welded storage tanks with butt welded shells for the petroleum industry

10

Indian explosive act and statutory requirements of chief controller of explosives, Nagger. (For oil storage tanks.)

11

Indian Boiler Regulations

12

Indian Factories Act

13

American code for oil tanks API 650

3.0

DESIGN REQUIREMENT

3.1

General Requirement

3.1.1

All tanks will be mild steel tanks. The tanks will be of welded construction and will be designed to withstand satisfactorily the internal forces due to the liquid these tanks have to hold as specified and



TITLE

STANDARD TECHNICAL SPECIFICATION FOR TANKS

SPECIFICATION NO. PE-TS-STD-166-A001

SECTION IIA

REV 00

DATE

SHEET OF

external forces due to wind and seismic forces without deformation or undue strain. The plates will be cold rolled through plate bending machines by several no. of passes to the curvature.

3.1.2 VOID

3.1.3 Vessel seams shall be so positioned that they do not pass through vessel connections.

3.1.4 The inside seam should be ground smooth, suitable for application of corrosion resistant primer. Except where otherwise indicated in the specification, if the stiffening of shell and/ or roof is necessary, tanks will be stiffened from outside.

3.1.5 Flange faces of all nozzles shall be machined and squared with the vessel center line.

3.1.6 All roofs and supporting structures shall be designed to support dead load plus a uniform live load of not less than 150 kg/m² of projected area.

3.1.7 The tanks shall be designed to have all courses truly vertical. Adequate distance between vertical joints in adjacent courses shall be taken so that the distortion is reduced to minimum.

3.1.8 When removing temporary attachments from shell plates, care should be taken that parent plate is not damaged. Holes in plate work to assist in fabrication / erection should be avoided as far as possible. The location of holes and method of filling shall be indicated in the fabrication drawing. Any projection of metal shall be chipped and ground flush with the plate surface. The plate shall not be gouged or torn in process of removing lugs.

3.1.9 In the construction of shell, very care shall be taken to minimize distortion or lack of circularity due to welding or for any other reason.

3.1.10 The successful bidder shall furnish design calculations to BHEL during detailed engineering stage for approval along with the Xerox copies of relevant pages of authentic supporting literature e.g. Code, Hand book, National / international Standards etc. Calculation shall be necessarily done in SI UNITS for the followings: -

- a) The tanks shall be designed as per good engineering practice as applicable and referred code shall be of latest edition.
- b) Plate thickness calculation (different courses of shell plate, bottom plate and roof plate thickness), roof curb angle, top wind girder, intermediate wind girder, tank internal pressure vis –a-vis. allowable value.
- c) Design of roof and roof structures for vertical storage tanks shall be designed based on guidelines given in the book titled “Process equipment design” by Brownell and Young.
- d) Tank stability calculation (wind load / seismic / overturning stability) shall be done as per good engineering practice as applicable and referred code shall be of latest edition. However, factors / coefficients as required for the design of tank shall be obtained from BHEL by the bidder after placement of order.
- e) Vent sizing calculation shall be done as per good engineering practice as applicable and referred code shall be of latest edition.



TITLE

STANDARD TECHNICAL SPECIFICATION FOR TANKS

SPECIFICATION NO. PE-TS-STD-166-A001

SECTION IIA

REV 00

DATE

SHEET OF

- f) Sizing calculation for vent, NaOH / KOH breather, seal pot and breather valve.
- g) Weight calculation of plates, appurtenances & structures separately shall be included in the design calculation/GA.
- h) Staircase / access ladder and hand railing shall be provided as per the relevant codes and standards.

3.1.11 Alignment

- 3.1.11.1 Plates to be joined by butt welding shall be matched accurately. Misalignment in completed vertical joints shall not exceed 10% of the plate thickness or 1.5 mm for plates of 20 mm thick and under, whichever is larger.
- 3.1.11.2 In completed horizontal butt joints, the upper plate shall not project beyond the face of the lower plate at any point by more than 20% of the upper plate thickness with a maximum of 3 mm for plate thickness exceeding 8 mm except that for plate thickness 8 mm and under, the maximum shall be 1.5 mm.
- 3.1.11.3 Each tank shall be properly constructed ensuring perfect vertical alignment within 5 mm and tank circularity within 5 mm on diameter. Local bulging and / or depressions at any location of tank particularly shell shall not be permitted.

3.1.12 WELDING

- 3.1.12.1 Tanks and other attachments shall be welded as per AWS and the qualification of welder should be as specified in ASME.
- 3.1.12.2 Welding sequence shall be so adopted that distortion due to welding shrinkage shall be minimum. Welding procedure specification shall be submitted for approval of BHEL giving details of material, welding position, sequence, type of electrode used, pre-heat & post weld requirement etc as per the code of construction. Brand name of electrodes to be used with proper classification (e.g. E 6013) shall be as per BHEL's approval.
- 3.1.12.3 Welding shall not be carried out when the surface is wet and during periods of rain and high winds unless the welder and the work are properly shielded which should meet the approval of the purchaser.
- 3.1.12.4 Inspection of all welds shall be carried out in accordance with the governing code of construction. All material used by the purchaser such as electrodes, gaskets, bolts, nuts etc shall be conforming to relevant standards of repute and approved by the purchaser prior to use.
- 3.1.13 Each tank shall be complete with access staircase and fittings like drain connection, overflow connection, tank inlet and outlet covers, level gauge glass, fittings with isolation cocks and protection covers, tank vent connection etc all complete with needed accessories for the completeness of the tanks and as specified in data sheet -A.
- 3.1.14 All openings in tank plate shall be well reinforced in approved manner by adding pad plates of adequate size and / or structural sections.



TITLE

STANDARD TECHNICAL SPECIFICATION FOR TANKS

SPECIFICATION NO. PE-TS-STD-166-A001

SECTION IIA

REV 00

DATE

SHEET OF

3.1.15 STAIRCASE / ACCESS LADDER AND HAND RAILING

3.1.15.1 All cylindrical vertical tanks shall be provided with spiral staircase and shall conform to the requirements specified in API 650 unless specified otherwise. All stair treads shall be 32 mm steel fabricated gratings. Each tread, if needed, shall be housed in individual steel fabricated frame which shall be adequately supported from the tank outer periphery. The staircase shall have minimum 750 mm clear width.

3.1.15.2 Access ladder, one (1) for each horizontal cylindrical / rectangular tank shall be provided for access to the tank roof. It shall be steel fabricated having minimum 450 mm width. Ladder stringers shall be heavy steel flats or angle section. All rungs shall be minimum 20 mm Dia rods spaced at not more than 30 cm center to center. All ladders shall have steel fabricated safety cage to the approved construction. Safety cage shall be provided about 2.5 m clear height of the ladder. Access ladder's stringers shall be widely spaced at top for free access to the tank roof.

3.1.15.3 All staircase and roofs of vertical cylindrical tanks shall be provided with pipe hand railings of 1070 mm effective height throughout. Handrails shall be constructed out of 32 NB medium class galvanized steel pipe conforming to ASTM A 53 Gr.B. Handrail posts shall be arranged at spacing not greater than 1850 mm. Two (2) sets of pipes horizontal runners all along the length shall be provided. All welds joints in the handrails shall be ground flush to protect any person getting injured. Steel toe plates of 100 mm flats shall be used. Hand railing shall be fabricated installed in an approved manner as directed by purchaser in accordance with approved drawings.

3.1.16 Unless otherwise specified, for all flanged connections vendor shall furnish suitable counter flanges and necessary nuts, bolts and gaskets materials.

3.1.17 Unless otherwise specified bolts and nuts shall be hexagonal head conforming to ISO -898-1:1999.

3.1.18 Gaskets shall be 3 mm thick full face rubber or CAF. On completion of hydraulic test / water fill test, contractor shall replace the gaskets used during testing at his own cost.

3.1.19 Float level indicators of approved make, as specified in data sheet-A shall be provided.

3.1.20 During erection of tank, shell plates shall be suitably supported both for outside and inside to avoid buckling / collapsing of tank due to high speed wind , gust or severe storm ,if any, occurring during erection.

3.1.21 The contractor shall furnish two (2) grounding pads for each vertical tank. Each pad shall be stainless steel plate 100 mm x 100 mm x 6 mm thick, with two 15 mm holes on 45 mm centers. Pads shall be edge welded to tank shell within 450 mm from the tank base. Two grounding lugs shall be provided for each horizontal tank.

3.2 VERTICAL CYLINDRICAL STORAGE TANKS

3.2.1 The vertical cylindrical storage (non- pressure) tanks shall be of mild steel welded construction and shall be designed in accordance with API-650 / AWWA D - 100. The vertical cylindrical storage tanks shall have slightly sloping bottom towards an adequately sized sump inside the tank to enable complete draining of the tank. The tank shall be designed for a wind pressure and seismic coefficient as specified. While worst of these two shall be increased as per API.



TITLE

STANDARD TECHNICAL SPECIFICATION FOR TANKS

SPECIFICATION NO. PE-TS-STD-166-A001

SECTION IIA

REV 00

DATE

SHEET OF

- 3.2.2 Conical roof shall be self-supported over the tank periphery. The roof shall have a slope of not less than 1 in 16 to ensure drainage of rainwater. Needed roof rafters and purlins adequately designed shall be provided.
- 3.2.3 All plates to be used for fabrication of tank shall be checked and all sides trimmed to make them square.
- 3.2.4 All bottom plates shall have lap weld joints on all sides with overlap not less than five times the plate thickness.
- 3.2.5 All shell course plates shall be taken during bending to prevent plate skewing. For butt weld joints, edges shall be prepared which shall be uniform and smooth throughout. To maintain needed root penetration gap at any butt weld joint, sufficient numbers of erection cleats shall be provided on all sides of outer periphery of each shell plate. Plates for tanks shall be straightened by pressing or by other non-injurious methods.
- 3.2.6 Each shell course shall be of uniform width throughout longitudinal weld in plates. Make up for the course width shall not be permitted. Shell plates in each course width shall be so arranged that all vertical joints are staggered having a minimum of 600 mm stagger. Shell thickness could be reduced in upper courses depending on design requirements but in no case the plate thickness shall be less than 6 mm.
- 3.2.7 The tank height shall be completed by the provision of top curb/ angle which shall be butt welded to the adjacent tank plate courses. The outstanding leg of the curb angle shall be kept outside the tank periphery. All butt weld joints shall be full strength welds but for design of shell plate thickness adequate weld efficiency as recommended by applicable code(s) shall be used.
- 3.2.8 Tank roof shall be supported over steel fabricated central column(s). Adequately sized and spaced rafters and purlins shall be provided. All rafters shall have sliding bolted connections at one end and preferably on the tank periphery side. The roof supporting frame shall have needed tie rods or bracing sets.
- 3.2.9 Roof plates shall have lap joints with lap not less than 25 mm and lap weld over the top surface only. Roof plates shall have continuous fillet welds around the tank curb angle. No joint of roof plate over the supporting frame shall be made.
- 3.2.10 Needed openings for mounting various specified accessories shall be well reinforced in accordance with application codes and as approved. Manhole shall be bolted and shall have hinged covers unless otherwise specified.
- 3.2.11 All inlet pipe nozzles located at the top of tanks shall be provided with internal piping up to 500 mm high above the tank's bottom inside with suitable weir plate at bottom. The inside piping shall be adequately supported and shall be provided with adequately sized vent connection at pipe top.
- 3.2.12 The manhole shall be of hinged & bolted type with nuts, bolts and gaskets with minimum size of 600 mm.
- 3.2.13 NaOH / KOH breather and seal pot shall be located in the bottom / ground level and necessary connection from tank vent to NaOH / KOH breather shall be provided through 200 NB SS pipe. The sizing of NaOH breather and Seal pot shall be decided based on emptying and filling rate of tanks.



TITLE

STANDARD TECHNICAL SPECIFICATION FOR TANKS

SPECIFICATION NO. PE-TS-STD-166-A001

SECTION IIA

REV 00

DATE

SHEET OF

A tentative rate of 5 cum/hr may be considered for both emptying and filling of tank. However, the complete information shall be provided to vendor during detail engineering.

- 3.2.14 Material of construction of all pipes, fittings, valves, nozzles, flanges and counter flanges shall be as per datasheets given at the end of this section.
- 3.2.15 Material of construction for standpipe (if applicable) shall be stainless steel (SS) and size shall not be less than NB 100 unless otherwise specified in Datasheet-A for tanks given at the end of section.
- 3.2.16 Two (2) nos NaOH / KOH breather shall be provided by the bidder for each tank, out of which one shall be used for in-breathing purpose and the other shall be used for out-breathing purpose.
- 3.2.17 The size of the drain and vent valve of standpipes shall be 25 NB and size of the isolating valves (2 nos) for standpipe shall be 50 NB unless otherwise specified in the specification.
- 3.2.18 The overflow pipe from overflow nozzle shall be connected to seal pot.
- 3.2.19 All stair treads and platforms shall be made from gratings

3.3.0 RECTANGULAR TANKS

- 3.3.1 Rectangular tanks shall be fabricated from steel material and shall be designed to withstand internal hydrostatic pressure. In addition these shall be checked for a wind pressure and seismic coefficient as specified wherever applicable. While worst of these two shall be considered, the permissible stress shall be increased as per IS when their effect considered with tank load.
- 3.3.2 Tank bottom and / or side plates shall be of minimum 6 mm thick plate. Corrosion margin of at least 2 mm shall be provided over the design thickness of bottom and / or side plates.
- 3.3.3 To support tank plates and to maintain required unsupported plate length, adequately sized and spaced steel structural closed frame shall be provided inside the tank. Longitudinal and / or vertical structural members to connect and adequately support these frames shall be provided at corners. Horizontal diagonal members / sway bracings at corner shall also be provided.
- 3.3.4 Tank plates cut to size shall be welded on these frames. Plate butt weld joints at other locations shall be eliminated to avoid warping of the plates at free joints. Adequate openings in the structural frames, particularly at the bottom shall be provided to ensure complete unrestricted drainage of tank at one point.
- 3.3.5 Complete assembled tank shall have at its bottom longitudinal steel fabricated bearer beams welded to it. The tank with bearer will rest over number of concrete blocks to be provided by purchaser. The tank shall be adequately bolted / welded to the concrete blocks. Needed inserts / anchor bolts shall be furnished by the bidders. Grouting of tank over concrete blocks in approved manner shall be included in bidder's scope of work, if erection is also awarded to the bidder.
- 3.3.6 Where rectangular tanks are flushed in dual compartments the inside partition plate shall be well reinforced to withstand hydrostatic test pressure completely on one side throughout the full height.



TITLE

STANDARD TECHNICAL SPECIFICATION FOR TANKS

SPECIFICATION NO. PE-TS-STD-166-A001

SECTION IIA

REV 00

DATE

SHEET OF

3.4 HORIZONTAL CYLINDRICAL TANK

3.4.1 The horizontal cylindrical tank with dished ends shall be of mild steel welded construction and shall be designed in accordance with BS- 2594. The tank shall be designed for a wind pressure and seismic coefficient as specified. While worst of these two shall be considered, the permissible stress shall be increased as per IS.

3.4.2 The shell and dished end plate thickness shall be chosen as per design requirement but in no case the dished end and shell plate thickness shall be less than 8 mm.

3.4.3 All seams, longitudinal as well as circumferential, shall be butt welded. Longitudinal seams should not be situated in the lower third of a tank or on the top centre line.

3.4.4 All tank shall be supplied with integral saddle support and shall be designed in accordance with BS- 2594.

4.0 TESTING AND INSPECTION AT MANUFACTURER'S WORKS

4.1 General

4.1.1 The supplier shall provide inspection to establish and maintain quality of workmanship in his works and that of his subcontractors to ensure the mechanical accuracy of components, compliance with drawings identity and acceptability of all materials, parts and equipment. He shall conduct all tests required to ensure that the equipment and material furnished shall conform to requirements of the acceptable codes. All tests and test procedure proposed by manufacturer shall be submitted to the purchaser for their prior approval.

4.1.2 All materials used for manufacture of the equipment under this specification shall be of tested quality. Relevant test certificates shall be made available to the purchaser before the final shop inspection. In case the relevant correlating test certificates are not available, the supplier shall arrange to carry out the necessary tests required by codes at his own cost.

4.1.3 Alloy cast iron and cast steel components shall be tested for both physical and chemical properties in absence of purchaser's representatives. Test bears shall be either integral or taken from the same ladle of material as the casting they represent.

4.2 TESTING AND INSPECTION FOR TANKS

4.2.1 The scope of testing and inspection for pressure vessel / tanks covered in this specification shall generally comprise of the following:

i) Examination and approval of fabrication drawings to ensure that design, materials and fabrication details meet requirement of code and specifications. Purchaser will review these drawings for interface problems and conformity with the general arrangement drawings and accord their approval.

ii) Examination of materials of construction and identification with material test certificates.

iii) All the plates of thickness 50 mm or more shall be ultrasonically tested to ensure freedom from laminations.



TITLE

STANDARD TECHNICAL SPECIFICATION FOR TANKS

SPECIFICATION NO. PE-TS-STD-166-A001

SECTION IIA

REV 00

DATE

SHEET OF

iv) Ensuring the relevant weld procedure and welder qualification tests are in accordance with stipulated code requirements.

v) Inspection of dished end flanges and alloy steel bolting where required.

vi) Inspection during fabrication at appropriate stages including fit ups.

vii) For all butt welds, the root run and final run shall be subjected to dye penetrant or magnetic particle inspection. For all fillet welds the final run shall be subjected to dye penetrant / magnetic particle examination.

viii) Examination of radiographs including radiographic techniques, supervision of other non - destructive tests and heat treatment procedure as required by codes and specifications.

ix) Examination of internal cleanliness before final closure.

x) Dimensional examination of completed vessel including axis marking, proof marking, match marking etc.

xi) Witnessing of hydrostatic, pneumatic or vacuum tests or special tests as required by the code and specification. In case of hydrostatic tests, the test pressure must be kept for a minimum of two hours.

xii) Witnessing cleanliness, preservation, packing and marking.

xiii) Stamping of vessel and issue of certificates.

4.2.2 NON - PRESSURE TANKS

FIELD TESTING

Scope of testing and inspection for non-pressure tanks covered in this specification will comprise of the following:

4.2.2.1 Identification of materials to manufacturer's test certificates.

4.2.2.2 Inspection of plates, edges after edge preparation and checking curvature against template if shell plates sent after rolling.

4.2.2.3 Checking of dimension and match marking.

4.2.2.4 DPT / MPI on all welds (100%).

4.2.2.5 All cross / Tee joints and butt welds to be 10% Radio graphed.

4.2.2.6 For the offered tanks, fill test shall be carried out for at least 24 hours. Atmospheric storage tanks on inside surface shall be leak tested before painting.

4.2.2.7 All quality plans / checklists for various items shall be furnished during detail engineering stage for BHEL / customer's approval and any changes required by BHEL / customer shall be incorporated in the documents and adhered without any price implication. However, minimum requirement of MQP as



TITLE

STANDARD TECHNICAL SPECIFICATION FOR TANKS

SPECIFICATION NO. PE-TS-STD-166-A001

SECTION IIA

REV 00

DATE

SHEET OF

indicated in the technical specification shall be followed. All necessary items as required for inspection and testing of the tank including instruments shall be arranged by the bidder

4.2.3 REPAIR OF LEAKS

- 4.2.3.1 All leaks detected during testing shall be repaired to the satisfaction of the purchaser and on completion retested for leakages as per approved procedure.
- 4.2.3.2 In the joints between roof plates only, pin hole leaks may be repaired by mechanical method. However, where there is any indication of considerable porosity, the leaks shall be sealed by laying down an additional layer of weld over the porous sections.
- 4.2.3.3 In the other joints, whether between shell plates or bottom plates or both, leak shall be repaired by only welding and if necessary, after first cutting out the defective part.

5.0 PAINTING REQUIREMENT

Surface preparation, being a pre-requisite for any paint application, shall be such as to clean the surface thoroughly of any materials which will be conducive to premature failure of the paint substrata. Blast clean type (Grit blasting by copper/ MS/other) shall be decided during detailed engineering for which no commercial implication shall be entertained by BHEL.

All surfaces shall be cleaned of loose substances and foreign materials, such as dirt, rust, scale, oil, grease, welding flux etc. in order that the prime coat is rigidly anchored to virgin metal surface.

Paint shall be applied in accordance with paint manufacturer's recommendation and shall meet the requirement of the exposure condition and specific system of painting thereof.

The above is the minimum requirement to be followed by the successful bidder. Any additional requirement to ensure prevention of atmospheric corrosion shall be provided by the successful bidder without any commercial implication.

6.0 OTHER TECHNICAL REQUIREMENTS

1. All drawings shall be prepared as per BHEL's title block and bear BHEL's drawing No. and customer / consultant's drawing no; which will be forwarded to the successful bidder during detail engineering stage.
2. All the drawings which are required to be furnished to BHEL during detailed engineering stage shall include technical parameters, details of paints, BOQ / BOM etc in tabular form indicating all components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.
3. All testing of tanks shall be done in line with testing requirement of this specification and as finalized during detailed engineering and customer approvals.

2 X 660MW TALCHER TPP**TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM****SECTION-IIB
(FORMAT FOR O& M MANUAL)**

**BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA**

Check List for Operation & Maintenance Manual

Project name:

Project number:

Package Name:

Sl.no. & Sections	Description	Yes	No	Not Applicable	Remarks
1.	Cover page				
1.1	Project Name				
1.2	Customer Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX email address				
1.5	Name and sign of prepared by , checked by & approved by				
2.0	Index				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	Description of Plant				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				
4.0	Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)				
4.1	Pre-Commissioning Checks				
4.2	Transportation and handling at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	Operation Guidelines for plant personal/user/operator				
5.1	Interlock & Protection logic along with the limiting values of protection settings for the				

	equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5.2	Start up and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc with Equipment isolating procedures to be mentioned.				
5.3	Do's & Don't of the equipments.				
5.4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5.5	Parameters to be monitored with normal values and limiting values				
5.6	Trouble shooting with causes and remedial measures				
5.7	Routine operational checks, recommended logs & records				
5.8	Changeover schedule if more than one auxiliary for the same purpose is given				
5.9	Painting requirement and schedule				
5.10	Inspection, repair , Testing and calibration procedures				
6.0	Maintenance guidelines for plant personal				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				
6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				

6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	Statutory and other specific requirements considerations.				

2 X 660MW TALCHER TPP**TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM****SECTION - IIC
(SITE STORAGE AND PRESERVATION MANUAL)**

**BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA**

SITE STORAGE AND PRESERVATION GUIDELINES

FOR

MECHNANICAL BOPs

(Doc No: PE-DC-SSG-A001 REV.00)



PROJECT ENGINEERING MANAGEMENT, POWER SECTOR
BHARAT HEAVY ELECTRICALS LIMITED-NOIDA

CONTENT

- 1 SCOPE OF THE DOCUMENT
- 2 PURPOSE OF STORAGE & PRESERVATION
- 3 MEASURES TO BE TAKEN FOR STORAGE AND PRESERVATION
 - a) GENERAL STORAGE REQUIREMENTS
 - b) GENERAL PRESERVATION REQUIREMENTS
 - c) GENERAL INSPECTION REQUIREMENTS
- 4 TYPE OF STORAGE FOR VARIOUS EQUIPMENT
- 5. CONCLUSION
- 6. STACKING ARRANGEMENT FOR PLATES AND STRUCTURAL STEEL

1. SCOPE OF THE DOCUMENT

This guideline is prepared in intent to provide proper site storage and preservation of the Mechanical, Electrical and C & I items / equipment supplied under various bought out packages/items. This storage procedure shall be followed at different power plant sites by concerned agency for storage and preservation from the date of equipment received at site until the same are erected and handed over to the customer.

2. PURPOSE OF STORAGE & PRESERVATION

Many of the items may be required to be kept in stores for long period. It shall therefore be essential that proper methods of storage and preservation be applied so that items do not deteriorate, loose some of their properties and become unusable due to atmospheric conditions and biological elements.

3. MEASURES TO BE TAKEN FOR STORAGE, HANDLING & PRESERVATION

a) GENERAL STORAGE REQUIREMENTS

1. To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2. The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3. The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. 'No smoking' signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4. Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5. Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
7. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks,

preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

6. At no time shall any materials be stored directly on ground. All materials shall be stored minimum 200 mm above the ground preferably on wooden sleepers

b) GENERAL PRESERVATION REQUIREMENTS

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.
2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.
3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.
4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings
5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.
6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.
7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.
8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.
9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.
11. Following preservatives/preservation methods can be used depending upon type of equipment
 - a. Rust preventive fluid (RPF)
 - b. Rust protective paints
 - c. Tarpaulin covers, in case of outdoor storage
 - d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –
 - Ingress of moisture and corrosion damages.
 - Damage to protective coating.
 - Open ends in pipes, vessels and equipment -
 - In case any open ends are noticed, same shall be capped.
2. Any damages to equipment / materials.
 - In case of any damages, these shall be promptly notified and in all cases, the repairs / rectification shall be carried out.
 - Any items found damaged or not suitable as per project requirements shall be removed from site. If required to store temporarily, they shall be clearly marked and stored separately to prevent any inadvertent use.

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

The types of storage are broadly classified under the following heads:

i **Closed storage with dry and dust free atmosphere. (C)**

The closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated asbestos sheets / galvanised iron sheets for roofing. Brick walls / asbestos sheets can be used to cover all the sides. The floor of the shed can be finished with plain cement concrete suitably glazed. The shed shall be provided with proper ventilation and illumination.



ii **Semi-closed storage. (S)**

The semi closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated / asbestos sheets for roofing. The floor shall be brick paved. If required a small portion of sides can be covered to protect components from rainwater splashing onto the components.





iii Open storage (O)

The open yard shall be levelled, well consolidated to achieve raised ground with the provision of feeder roads for crane approach along with access roads running all sides. One part of the open yard shall be stone pitched, levelled and consolidated with raised ground suitable for storing / stacking heavier and critical components with due space to handle them by cranes etc . Adequate number of sleepers, concrete block etc. to be provided to make raised platforms to stack critical materials.

A separate yard to be identified as “scrap yard” slightly away from main open yard to store wooden/steel scraps, which are to be disposed off. This is required to avoid mix up with regular components as well as to avoid fire hazard.

Some of the components, which are having both machined & un-machined surfaces and are bulky, shall be stored in open storage area on a raised ground and suitably covered with water proof / fire retardant tarpaulin.



1500633/2023/PS-PEM-MAX

The equipment listed below shall be stored and inspected as per requirement mentioned in the table below.

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
Raw material /mechanical items like pipes, plates, structure sections etc.)				
1.	Steel pipes (lined/unlined)	S	Damage , paint, corrosion, rubber lining peeling	Provide end cap
2.	MS Plates	S	Damage, paint, corrosion	
3.	SS Plates	S	Damage	
4.	Non-metallic pipes	S	Damage, cracks	Provide end cap
5.	Stainless steel pipes	S	Damage ,	Provide end cap
6.	MS sections, beams	S	Damage, paint, corrosion	
7.	Cable trays	S	Damage, condition of preservations	
8.	Insulation sheets	S	Damage	
9.	Insulation	C	Damage, packing	
10.	Hangers Rods	S	Damage, paint, packing	
11.	Tubes	S	Damage, paint , packing	Provide end cap
12.	Hume pipes	O	Damage	
13.	Castings	O	Damage, paint, corrosion	
Fabricated mechanical items (pressure vessels, tanks etc.)				
14.	Pressure vessels (unlined)	O	Damage, paint, corrosion,	Covered nozzles
15.	Atmospheric storage tanks (unlined)	O	Damage, paint, corrosion	Covered nozzles

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
16.	Pressure vessels (lined)	S	Damage, paint, corrosion, rubber lining	
17.	Atmospheric storage tanks(lined)	S	Damage, paint, corrosion, rubber lining	
18.	Support structures	O	Damage , paint, corrosion	
19.	Flanges	C	Damage , paint, corrosion	
20.	Fabricated pipes	S	Damage , paint, corrosion	Provide end cap
21.	Vessels internals	C	Damage , paint, corrosion ,packing	
22.	Grills	S	Damage , paint, corrosion	
23.	Angles	S	Damage , paint, corrosion	
24.	Bridge mechanism/clarifier mechanism	O	Damage , paint, corrosion	
25.	Cranes, rails	S	Damage , paint, corrosion	
26.	Stair cases	O	Damage , paint, corrosion	
27.	Ladders/handrails	O	Damage , paint, corrosion	
28.	Fabricated ducts	S	Damage , paint, corrosion	
29.	Isolation Gates	O	Damage , paint, corrosion	
30.	Fabricated boxes/panels	S	Damage , paint, corrosion	
Mechanical components like valves, fittings, cables glands, spares etc.)				
31.	Valves	S	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
32.	Fittings	S	Damage , packing	Provide end cap
33.	Cable glands	C	Damage , packing	
34.	Tools & tackles	C	Damage , packing	
35.	Nut , bolts, washers,	C	Damage , packing	
36.	Gasket & Packings	C	Damage , packing	
37.	Copper tubes	C	Damage , packing, corrosion	Provide end cap
38.	SS tubing	C	Damage , packing	Provide end cap
Rotating assemblies (pumps, blowers, stirrers, fans, compressors etc.)				
39.	Pumps	S	Damage , packing, corrosion	Shaft rotation
40.	Blowers/Compressors	S	Damage , packing, corrosion	Shaft rotation
41.	Agitators/stirrers/radial launders	C	Damage , packing, corrosion	Shaft rotation
42.	Rollers for chlorine tonner mounting	C	Damage , packing, corrosion	
43.	Centrifuge	S	Damage , packing,	
44.	Gear box	C	Damage , packing, corrosion	
45.	Bearings	C	Damage , packing, corrosion	
46.	Fans	S	Damage , packing, corrosion	
47.	Dosing skids	S	Damage , packing, corrosion	
48.	Pump assemblies	S	Damage , packing, corrosion	
49.	Air washers(INTERNALS)	S	Damage , packing	
50.	Air conditioners (split)	C	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
51.	Elevators(CONTAINERIZED)	O	Damage , packing, corrosion	
52.	Chillers/VA machines	S	Damage , packing	
53.	Air handling Unit/Package unit	S	Damage , packing	
54.	Chlorinators & Evaporators	C	Damage , packing	
55.	Ejectors	C	Damage , packing	
56.	Electrolyser	C	Damage , packing	
Miscellaneous items like chain pulley blocks, hoists etc.				
57.	Chain pulley blocks	S	Damage, Packing	
58.	Electric hoists	S	Damage, Packing	
59.	Fire extinguishers	C	Damage, expiry date	
60.	Fork Lift Truck	S	Damage, Packing	
61.	Hydraulic Mobile Crane	O	Damage, Packing	
62.	Mobile Pick Up & Carry Crane	O	Damage, Packing	
63.	Motor boats	O	Damage, Packing	
64.	Safety showers	S	Damage, Packing	
65.	Diffusers/dampers	S	Damage, Packing	
Chemicals and consumables (acid, alkali, paints, oils, reagents and special chemicals)				
66.	Hydro Chloric Acid (HCl)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical
67.	Sulphuric acid (H ₂ SO ₄)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
68.	Sodium hydroxide (NaOH)	Store in canes/ storage tank in dyke area	Date of production/ leakage/ fumes/ breather	hazardous chemical ,breather to be checked for air ingress
69.	Sodium hypo chlorite	To be stored under shed	Date of production/ leakage/ fumes	hazardous chemical ,self-life normally 15-30 days after which strength of chemical decays
70.	Ammonia	S	Date of production/ leakage/ fumes	Store in closed storage tanks, hazardous chemical
71.	CW treatment chemicals	S	Date of production , Self-life	Store in closed canes
72.	RO/UF cleaning chemicals	S	Date of production , Self-life	Store in closed canes
73.	Lime	C	Damage to packing , seepage	Prevent moisture, rain
74.	Alum bricks	C	Damage to packing	Prevent moisture, rain
75.	Poly electrolyte	S		Store in closed storage tanks
76.	Laboratory chemicals(powder)	C	Damage, Packing self-life	
77.	Laboratory chemicals(liquid)	C	Damage, Packing self-life	
78.	Lubrication oils	C	Leakage	
79.	Paints	S	Leakage ,air tightness	
80.	Sand	O	Damage of packing	No hooks
81.	Salt (NaCl)	C	Damage of packing, water ingress	Prevent moisture, rain
82.	Anthracite	S	Damage of packing	
83.	Activated carbon	S	Damage of packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
84.	Thermal insulation	S	Damage of packing	
85.	Cement	C	Damage of packing	Prevent moisture, rain
86.	Gravels	O	Damage of packing	
87.	ION exchange resins	C	Damage , packing	Refer manufacturer guidelines
88.	RO membranes	C	Damage , packing	Refer manufacturer guidelines
89.	UF membranes	C	Damage , packing	Refer manufacturer guidelines
90.	Cleaning chemicals	C	Damage , packing	Refer manufacturer guidelines
91.	Chemicals for analysers/calibration	C	Damage , packing	Refer manufacturer guidelines
Electrical and C & I items (motors, cables etc.)				
92.	Motors	C	Damage , packing	
93.	Cable drums	O	Damage	
94.	Control Panel /control desk, UPS ,JB	S	Damage, Packing	
95.	Instruments(gauges/analysers)	C	Damage	
Special items		As per Manufacturer's item, like Hydrogen cylinders, Ozonator, Analyser, Chlorine dioxide generators etc.		

5. CONCLUSION

Concerned storage agency at site should make sure that loss in equipment performance and wear & tear are minimised through proper storage and preservation. The above are broad guidelines and cover major equipment / materials. However specific storage practices shall be followed as per manufacturer recommendation. All the necessary measures even in addition to the ones mentioned above, if found necessary, should be taken to achieve the objective.

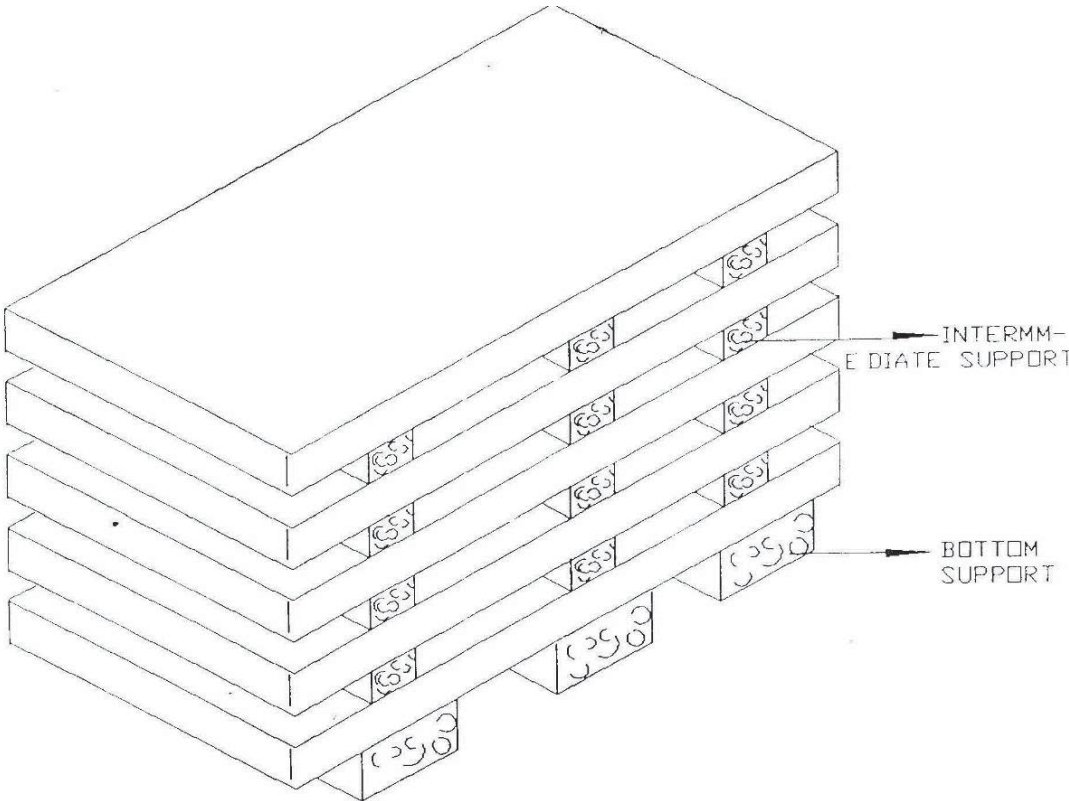


Figure – 1 – PLATE STACKING ARRANGEMENT

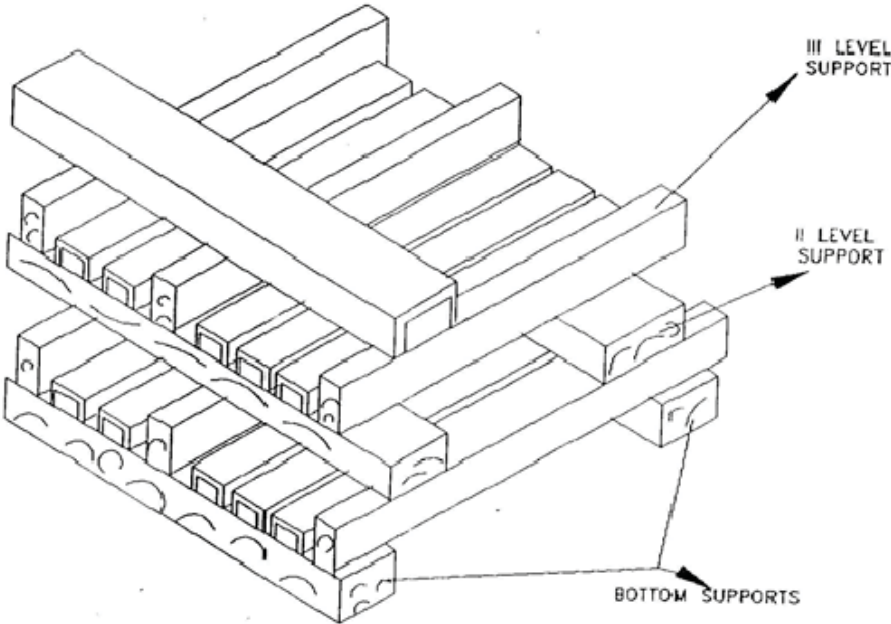


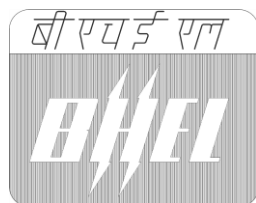
Figure – 2 – STRUCTURAL STEEL STACKING ARRANGEMENT

2 X 660MW TALCHER TPP

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

SECTION - III

DOCUMENTS TO BE SUBMITTED BY BIDDER



BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT PPEI,
NOIDA-INDIA

1500633/2023/PS-PEM-MAX



**TECHNICAL SPECIFICATION FOR
FUEL OIL UNLOADING & STORGAE SYSTEM
2x660 MW TALCHER TPP**

SPECIFICATION NO. PE-TS-497-166-A001

SECTION IIIA

REV – 00

DATE

2 X 660MW TALCHER TPP

**TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM**

SECTION-IIIA



**BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT PPEI,
NOIDA-INDIA**

1500633/2023/PS-PEM-MAX



**TECHNICAL SPECIFICATION FOR
FUEL OIL UNLOADING & STORGAE SYSTEM
2x660 MW TALCHER TPP**

SPECIFICATION NO. PE-TS-497-166-A001

SECTION IIIA

REV – 00

DATE

LIST OF DOCUMENTS TO BE SUBMITTED WITH THE BID

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


- a. Copy of electrical scope between BHEL & vendor dully signed and stamped.
- b. Electrical load list
- c. Deviation schedule with reference to specific clauses of the specification along with reason for such deviation.
- d. Copy of unpriced price bid indicating “QUOTED / NOT QUOTED” / “NOT APPLICABLE” as the case may be.
- e. Compliance cum confirmation certificate

NOTES:

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

DOCUMENTS OTHER THAN ABOVE, IF ANY, SUBMITTED WITH THE OFFER WILL NOT FORM PART OF CONTRACT AND ACCORDINIGLY WILL NOT BE CONSIDRED FOR BID EVALUATION.

1500633/2023/PS-PEM-MAX

	TECHNICAL SPECIFICATION 2X660 MW TALCHER TPP COMPLIANCE CUM CONFIRMATION CERTIFICATE	SPEC. NO.: PE-TS-497-166-A001
		SECTION: IIIB
		REV. NO. 0 DATE
		SHEET 1 OF 2

COMPLIANCE CUM CONFIRMATION CERTIFICATE

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

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions other than those mentioned under "exclusion" and those resolved as per 'Schedule of Deviations', if applicable, with regard to same.
- b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'.
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This shall be within the contracted price with no extra implications to BHEL after award of the contract.
- d) All drawings/ data-sheets/ calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.
- e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified/ intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre - bid discussions, otherwise BHEL/ Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

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

- f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.
- g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.
- h) Guarantee for plant/equipment as applicable, shall be as per relevant clause of GCC /SCC /Other Commercial Terms & Conditions.
- i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities. This clause will apply in case during site commissioning additional requirements emerges due to customer and/ or consultant's comments. No extra claims shall be put on this account.
- j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

1500633/2023/PS-PEM-MAX



TITLE:

**TECHNICAL SPECIFICATION
2X660 MW TALCHER TPP
COMPLIANCE CUM CONFIRMATION
CERTIFICATE**

SPEC. NO.: PE-TS-497-166-A001

SECTION: IIIB

REV. NO. **0** DATESHEET **2** OF **2**

- k) As built drawings shall be submitted as and when required during the project execution.
- l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

SIGNATURE: _____

NAME : _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL



TITLE

STANDARD TECHNICAL SPECIFICATION FOR FO SYSTEM

SPECIFICATION NO. PE-TS-STD -166-A001

SECTION IIIC

REV 00

PRE-BID CLARIFICATION SCHEDULE

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

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

SIGNATURE: _____


NAME : _____

DESIGNATION: _____

COMPANY: _____


DATE: _____

COMPANY SEAL

DEVIATION SHEET (COST OF WITHDRAWAL)									
		PROJECT:- 2X660 MW TALCHER TPP							
PACKAGE:- FUEL OIL UNLOADING AND STORAGE SYSTEM									
TENDER ENQUIRY REFERENCE:-									
NAME OF VENDOR:-									
SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWAL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWAL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWAL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									
PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE									
NAME				DESIGNATIONS		SIGN & DATE			
NOTES:									
1. For self manufactured items of bidder, cost of withdrawl of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.									
2. For directly dispatchable items, cost of withdrawl of deviation will be applicable on the basic price including taxes, duties & freight.									
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.									
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.									
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawl of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.									
6. Bidder shall furnish price copy of above format along with price bid.									
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.									
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.									
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawl of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawl of deviation shall be taken as NIL.									
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.									
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.									
12. Cost of withdrawl is to be given seperately for each deviation. In no event bidder should club cost of withdrawl of more than one deviation else cost of withdrawl of such deviations which have been clubbed together shall be considered as NIL.									
13. In case nature of cost of withdrawl (positive/negative) is not specified it shall be assumed as positive.									
14. In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.									

2 X 660MW TALCHER TPP**TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM****SECTION-IIIF
(ATTACHMENT-3K)**

**BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA**

CLAUSE NO.	PROVENNESS			
4.21	Fuel Oil System: Bidder/ its Sub-vendor should have engineered/ got engineered, supplied, erected, tested and commissioned at least one (1) no. fuel oil handling and storage installations, which should have been in successful operation for minimum one (1) year, consisting of: i) Fuel Oil decanting facilities for road tankers/railway wagons. ii) Fuel oil Storage tanks of capacity not less than 500 cubic meters each. The experience as at (i) and (ii) above in separate installations is also permissible.			
4.22	Not used			
4.23	Selective Catalytic Reduction System The Bidder/Bidder's sub-vendor should meet the qualifying requirements stipulated in any one of the qualifying routes i.e. Route-1 (clause 4.23.1) or Route-2 (clause 4.23.2) or Route-3 (clause 4.23.3) including requirements stipulated in sub clauses of respective Route.			
4.23.1	Route-1 Qualified Selective Catalytic Reduction (SCR) System Manufacturer/ Supplier (QSCRM) The Bidder/Bidder's sub-vendor should have designed, engineered, manufactured/got manufactured/supplied, erected/supervised erection and commissioned/supervised commissioning of at least one (1) no. of ammonia based SCR System, consisting of SCR reactor & Ammonia injection system, with NOx reduction efficiency of not less than 75%, operating in conjunction with pulverised coal fired steam generator for 500MW or higher capacity unit or having minimum 1500T/hr steaming capacity. Further, such SCR System should have been in successful operation for a period not less than one (1) year.			
4.23.2	Route-2 Steam Generator Manufacturer / Indian JV company of Steam Generator manufacturer/ Indian Subsidiary Company of Steam Generator Manufacturer a (i) The Bidder/Bidder's sub-vendor should have designed, engineered, manufactured/got manufactured, erected/ supervised erection and commissioned/supervised commissioning of least one (1) no. of pulverised coal fired steam generator for 200MW or higher capacity unit or having minimum 600T/hr steaming capacity. Further, such Steam Generator should have been in successful operation for a period not less than one (1) year. Alternatively a (ii) The Bidder/Bidder's sub-vendor shall be a Joint Venture (JV) Company incorporated in India under the Companies Act of India, as on the date of techno-commercial bid opening, promoted by (i) an Indian Company registered in India under the Companies Act of India and (ii) a Steam Generator Manufacturer meeting requirements of clause 4.23.2 a (i), created for the purpose of manufacturing Steam Generator sets in India. The Steam Generator Manufacturer shall maintain a minimum equity participation of 26% in the JV Company for a lock-in period of 7 years from the date of incorporation of JV Company and One of the promoters shall be a majority stakeholder who shall maintain a minimum equity participation of 51% in the JV Company for a lock in period of 7 years from the date of incorporation of JV Company or up to the			
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.: CS-4540-001A-2	SUB-SECTION-I-A PROVENNESS	PAGE 16 OF 36

SUB : SUB-QUALIFYING REQUIREMENTS FOR THE FUEL OIL SYSTEM

In order to satisfy the requirement of bidder/subvendor's experience, as indicated in Technical Specification clause no. 4.21.0, Sub-Section-IA, Section-VI, Part-A, we declare that we, M/s..... have engineered/ got engineered, supplied, erected, tested and commissioned atleast one (1) no. of Fuel Oil Handling and storage installations, which is in successful operation for minimum one(1) year consisting of :

- i) Fuel Oil decanting facilities for road tankers/railway wagons.
- ii) Fuel oil Storage tanks of capacity not less than 500 cubic meters each.

The details are given below :

Sl. No.	Description	Station-I	Station-II
1.	Name and address of manufacturer		
2.	Client's Name & its address		
3.	Name & Location of the Plant		
4.	Contract / Order No. & Date		
5.	Date of commissioning		
6.	Capacity of storage tank Cu.M Cu.M
7.	No. of above said storage tank		
8.	Scope of the work for the aforesaid contract including		
	(i) Engineering		
	(ii) Got Engineered		Yes*/No*
			Yes*/No*
	(iii) Supply	Yes*/No*	Yes*/No*
	(iii) Erection		
	(iv) Testing	Yes*/No*	Yes*/No*
	(v) Commissioning	Yes*/No*	Yes*/No*

Signature of authorized signatory.....

Sl. No.	Description	Station-I	Station-II
9	Date of commencement of successful operation		
10.	No. of years in successful operation		
11.	Client's certificate(s) enclosed as Annexure..... to this Attachment-3K		

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

* Strike out whichever is not applicable.

Signature of authorized signatory.....