NORTH KARANPURA STPP (3 X 660MW)
EPC PACKAGE

VOLUME – IIB

TECHNICAL SPECIFICATION
FOR

ABOVE GROUND EARTHING & LIGHTNING PROTECTION MATERIALS

SPECIFICATION NO. : *PE-TS-405-509-E003*
REVISION : *0*

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP (INDIA) – 201301

CONTENTS

IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN TOTO & THAT THERE ARE NO TECHNICAL DEVIATIONS.

BIDDER'S STAMP & SIGNATURE

INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. Two signed and stamped copies of the following shall be furnished by all bidders as technical offer :

    a. Unpriced Price Schedule (Annexure-I: BOQ, as enclosed with the specification).
    b. A copy of this sheet ("Instructions to Bidders for Preparing Technical Offer").
    c. A copy of previous sheet ("Contents").

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

3. No comments/ additions/ deletions shall be made by the bidder on the signed & stamped copy of the specification. Any such changes made by the bidder shall not be considered.

4. Confirmations/ comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference in the technical offer / covering letter shall not be considered by BHEL.

5. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

6. Any changes made by the bidder in the price schedule with respect to the item description/ quantities, notes etc. from those given in Annexure-I of specification [Bill Of Quantities] shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE

PREAMBLE

1.0 The tender document contains two (2) volumes. The bidder shall meet the requirements of all the two volumes.

1.1 Volume-I (CONDITIONS OF CONTRACT)

This consists of four parts as below:-

Volume-IA	:	This part contains instructions to bidders for making bids to BHEL.
Volume-IB	:	This part contains general commercial conditions of the tender & includes provision that vendor is responsible for the quality of item supplied by their sub-vendors.
Volume-IC	:	This part contains special conditions of contract.
Volume-ID	:	This part contains commercial conditions for erection & commissioning site work, as applicable.

1.2 Volume-II TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume-II which comprises of :-

Volume-IIA	:	General Technical Conditions
Volume-IIB	:	Technical Specification including Drawings, if any.

1.2.1 Volume-IIB

This volume is sub-divided into following sections:-

Section-A	:	This section outlines the scope of enquiry.
Section-B	:	This section provides “Project Information”.
Section-C	:	This section indicates technical requirements specific to the contract, not covered in Section-D.
Section-D	:	This section comprises of technical specifications of equipments complete with data sheet A.

Data Sheet – A specifies data and other requirements pertaining to the Equipment.

2.0 The requirements mentioned in Section-C / Data Sheets-A of section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section-D.

SECTION – 'A'
SCOPE OF ENQUIRY

SCOPE OF ENQUIRY

1.0 This specification covers the Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of Above Ground Earthing & Lightning Protection Materials as mentioned in different sections of this specification for the project NORTH KARANPURA STPP (3 X 660MW), EPC.

2.0 It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation at site conditions.

3.0 The general terms and conditions, instructions to bidders and other attachment referred to elsewhere are hereby made part of the tender specification.

4.0 The bidder shall be responsible for and governed by all requirements stipulated hereinafter.

5.0 Bidder shall confirm total compliance to the specification without any deviations from the technical/ quality assurance requirements stipulated.

6.0 The documents shall be in English language and MKS system of units.

SECTION – 'B'
PROJECT INFORMATION

1.00.00 **BACKGROUND**

North Karanpura Super Thermal Power Project (3x660 MW), a pit head coal based thermal power project, is located in Hazaribagh and Chatra districts of Jharkhand State. Basic inputs i.e. coal, water and land have already been tied up. The project is proposed for the States & Union Territories of Northern, Western and Eastern Regions and the State of Jharkhand.

The capacity of the project is 1980 MW comprising of three (3) units of 660 MW each.

1.01.00 **Location and Approach**

The power project is proposed to be located near Tandwa town in Chatra districts in the state of Jharkhand on Hazaribagh-Chatra State highway at a distance of about 50 kms from Hazaribagh city. The nearest commercial airport is Ranchi at a distance of 150 kms from project site. The nearest railhead Khalari Railway Station on Ranchi-Garhwa section of Eastern Railways is about 40 kms from project site.
Major rail/road distances from the project site are as under:

City		Distance Approx. (kms)
Ranchi	:	150
Khalari	:	40

The site is located near Tandwa town having latitude and longitude of about 23^0 50' N to 23º 52' N and 84^0 59' E to 85º 2' E respectively. The Vicinity Plan of the project is placed at **Annexure-I.**

Further to the information given in this sub-section, Bidders are also advised to visit the project site and collect data on local site conditions.

1.02.00 **Land**

About 2245 acres of land is being acquired for the project. About 1500 acres of land is under possession/legal possession and out of 1500 acres, about 890 acres of land is to be used for plant, ash dyke and initial enabling township. No additional land is envisaged to be acquired in plant area. About 15 acres of land is envisaged to be acquired in Hazaribagh city for Township.
Commissioner, Chatra vide dated 25.05.1999 and 14.06.2000 has given in-principle clearance for NKSTPP.

1.03.00 **Water**

Make up water available for this project would be about 22 cusec and will be arranged by constructing a dam/reservoir across river Garhi.

1.04.00 **Fuel (Coal)**

1.04.01 **Coal Requirement, Availability and Linkage**

Coal requirement for the project is estimated as 10.6 Million Tonne/Annum (MTPA), considering a GCV of 3800 kcal/kg. Ministry of Coal vide letter dated 21.10.99 accorded in-principle coal linkage of 10.00 MTPA subject to ratification by Standing Linkage Committee-Long Term (SLC (LT)), of MOC. SLC (LT) in its meeting held on 15.12.2000 firmed up the coal linkage of 10.24 MTPA for the project. Subsequently, the coal linkage was withdrawn by SLC (LT) in its meeting held on 22/23.10.08.

Cabinet Committee on Investment (GOI) in its meeting on 20.02.13 decided in-principle to restore the original coal linkage granted to NKSTPP (i.e. from Magadh Coal Block) with the stipulation that the coal supply will commence during the 13th Five Year Plan. MOC vide letter dated 09.05.2013 restored the coal linkage with the stipulation that the coal supply will commence during the 13th five year plan.

1.04.02 **Coal Transportation**

Coal from Magadh block of North Karanpura Coalfields is proposed to be transported to the project site through conveyor belt system. One external coal handling plant and one internal coal handling plant are envisaged.

1.05.00 **Meteorological Data**

Important meteorological data from nearest observatory at Hazaribag is placed at Annexure-II**.**

1.06.00 **Plant Water Scheme**

The Plant water scheme is described below.

1.06.01 **Condenser Cooling System**

It is proposed to adopt Air Cooled Condenser for the project.

1.06.02 **Equipment Cooling Water (ECW) System (Unit Auxiliaries)**

All plant auxiliaries shall be cooled by De-mineralized water (DM) in a closed circuit. The primary circuit DM water shall be cooled through heat exchangers by auxiliary cooling water system. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system.

1.06.03 **Ash Water System**

It is proposed to have HCSD (High concentration Slurry Disposal) system for combined fly ash and bottom ash. No recirculation of ash water from ash disposal area is envisaged.

1.06.04 **Other Miscellaneous Water Systems**

(a) Raw water shall be used for meeting the Fly ash and bottom ash system requirement etc.

(b) The service water shall be taken from clarified water tank of Pretreatment plant. Service water (wash water) collected from various areas shall be treated using oil water separators, tube settlers, coal settling pits etc. as per requirement and treated water from liquid effluent treatment plant shall be recycled back to the service water system for re-use.

(c) The drinking water requirement of the plant shall be provided from water treatment plant.

(d) Steam Cycle make-up water, makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water and makeup to the hydrogen generation plant shall be provided from Demineralising plant.

(e) The quality of Raw water is enclosed with this sub-section as Annexure-III.

1.07.00 **Criteria for Earthquake Resistant Design of Structures and Equipment**

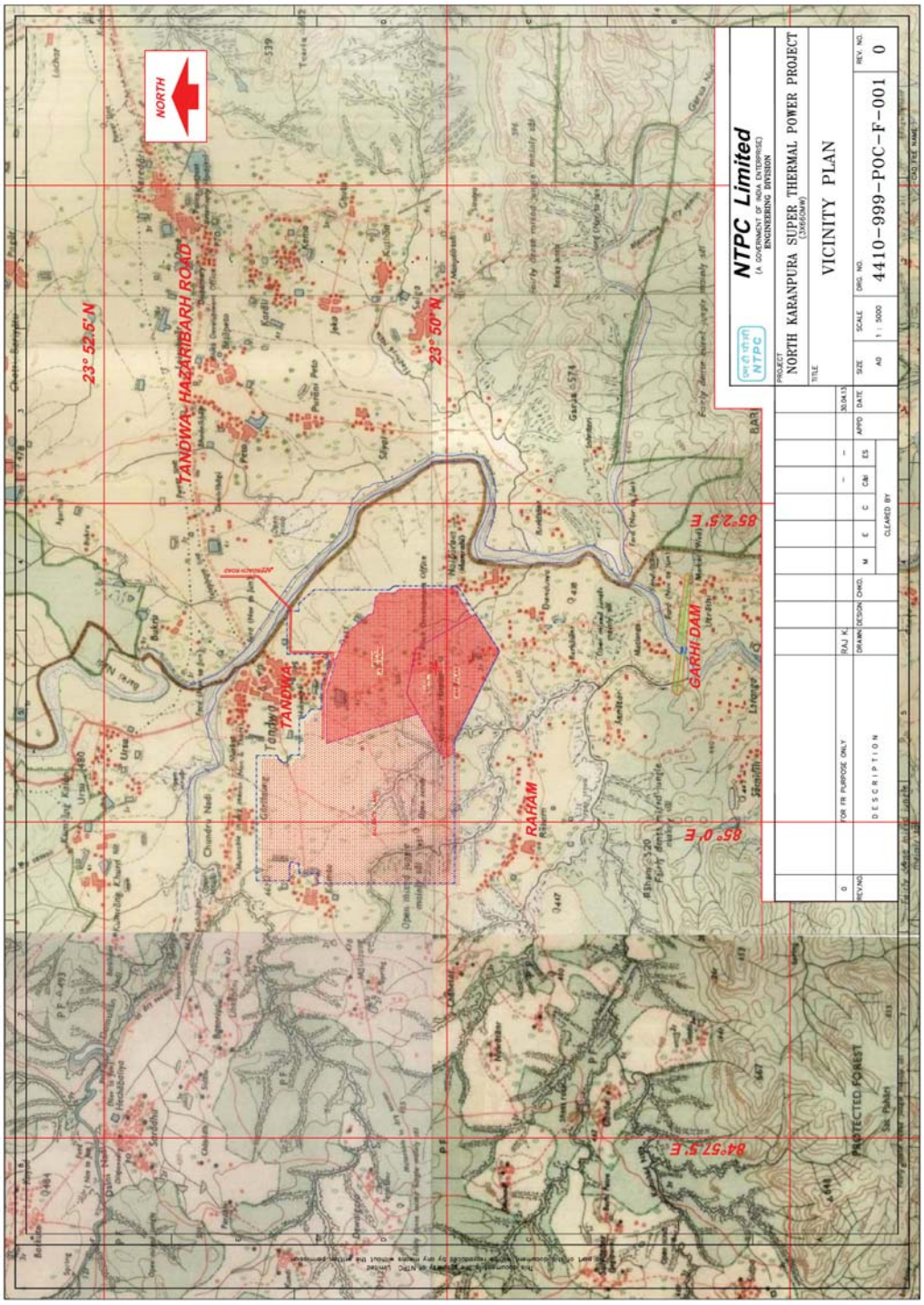
All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in the Part - B of this section.

1.08.00 **Criteria for Wind Resistant Design of Structures and Equipment**

All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given as given in Part B of this section.

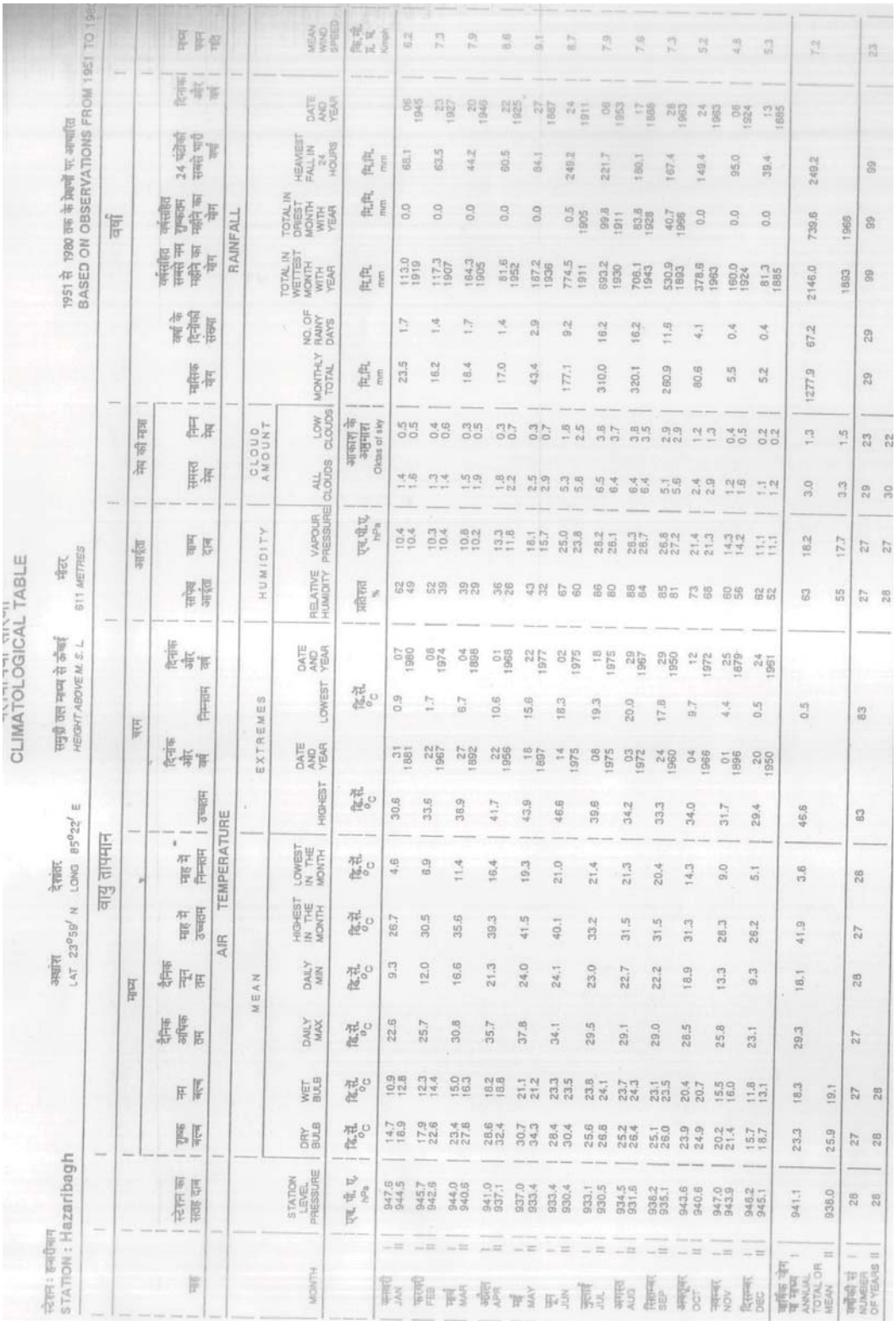
Annexure-I

VICINITY PLAN



Annexure-II

CLIMATOLOGICAL TABLE



CLIMATOLOGICAL TABLE

स्टेशन : हजारीबाग STATION : Hazaribagh

अक्षांश LAT 23°59′ N देशांतर LONG 85°22′ E समुद्री तल मापन से ऊँचाई HEIGHT ABOVE M. S. L. 611 METRES

1951 से 1980 तक के प्रेक्षणों पर आधारित BASED ON OBSERVATIONS FROM 1951 TO 1980

MONTH	STATION LEVEL PRESSURE	MEAN DRY BULB	MEAN WET BULB	MEAN DAILY MAX	MEAN DAILY MIN	HIGHEST IN THE MONTH	LOWEST IN THE MONTH	EXTREMES HIGHEST	EXTREMES DATE AND YEAR	EXTREMES LOWEST	EXTREMES DATE AND YEAR	HUMIDITY RELATIVE HUMIDITY	HUMIDITY VAPOUR PRESSURE	CLOUD AMOUNT ALL CLOUDS	CLOUD AMOUNT LOW CLOUDS	MONTHLY TOTAL	NO. OF RAINY DAYS	TOTAL IN WETTEST MONTH WITH YEAR	TOTAL IN DRIEST MONTH WITH YEAR	HEAVIEST FALL IN 24 HOURS	DATE AND YEAR	MEAN WIND SPEED
	एच. पी. ए. hPa	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C		डि.से. °C		प्रतिशत %	एच.पी.ए. hPa	आकाश के अष्टमांश Oktas of sky		मि.मि. mm		मि.मि. mm	मि.मि. mm	मि.मि. mm		कि.मी. प्र. घं. Kmph
जनवरी JAN	I 947.6	14.7	10.9	22.6	9.3	26.7	4.6	30.6	31 1881	0.9	07 1980	82	10.4	1.4	0.5	23.5	1.7	113.0 1919	0.0	68.1	06 1945	6.2
	II 944.5	18.9	12.8									49	10.4	1.6	0.5							
फरवरी FEB	I 945.7	17.9	12.3	25.7	12.0	30.5	8.9	33.6	22 1967	1.7	08 1974	52	10.3	1.3	0.4	16.2	1.4	117.3 1907	0.0	63.5	23 1927	7.3
	II 942.6	22.6	14.4									39	10.4	1.4	0.6							
मार्च MAR	I 944.0	23.4	15.0	30.8	16.6	35.6	11.4	38.9	27 1892	6.7	04 1896	39	10.8	1.5	0.3	18.4	1.7	164.3 1905	0.0	44.2	20 1946	7.9
	II 940.6	27.6	16.3									29	10.2	1.9	0.5							
अप्रैल APR	I 941.9	28.6	18.2	35.7	21.3	39.3	16.4	41.7	22 1956	10.6	01 1968	36	13.3	1.8	0.3	17.0	1.4	81.6 1952	0.0	60.5	22 1925	8.6
	II 937.1	32.4	18.8									26	11.8	2.2	0.7							
मई MAY	I 937.0	30.7	21.1	37.8	24.0	41.5	19.3	43.9	18 1897	15.6	22 1977	43	18.1	2.5	0.3	43.4	2.9	187.2 1936	0.0	84.1	27 1967	9.1
	II 933.4	34.3	21.2									32	15.7	2.9	0.7							
जून JUN	I 933.4	28.4	23.3	34.1	24.1	40.1	21.0	46.6	14 1975	18.3	02 1975	67	25.0	5.3	1.8	177.1	9.2	774.5 1911	0.5 1905	249.2	24 1911	8.7
	II 930.4	30.4	23.5									60	23.8	5.8	2.5							
जुलाई JUL	I 933.1	25.6	23.8	29.5	23.0	33.2	21.4	39.6	08 1975	19.3	18 1975	86	28.2	6.5	3.8	310.0	16.2	693.2 1930	99.8 1911	221.7	06 1953	7.9
	II 930.5	26.8	24.1									80	28.1	6.4	3.7							
अगस्त AUG	I 934.5	25.2	23.7	29.1	22.7	31.5	21.3	34.2	03 1972	20.0	29 1967	88	28.3	6.4	3.8	320.1	16.2	706.1 1943	83.8 1928	180.1	17 1986	7.6
	II 931.6	26.4	24.3									84	28.7	6.4	3.5							
सितम्बर SEP	I 936.2	25.1	23.1	29.0	22.2	31.5	20.4	33.3	24 1960	17.8	29 1950	85	26.8	5.1	2.9	260.9	11.8	530.9 1893	40.7 1998	167.4	28 1963	7.3
	II 935.1	26.0	23.5									81	27.2	5.6	2.9							
अक्टूबर OCT	I 943.6	23.9	20.4	28.5	18.9	31.3	14.3	34.0	04 1986	9.7	12 1972	73	21.4	2.4	1.2	80.8	4.1	378.8 1963	0.0	149.4	24 1963	5.2
	II 940.8	24.9	20.7									68	21.3	2.9	1.3							
नवम्बर NOV	I 947.0	20.2	15.5	25.8	13.3	28.3	9.0	31.7	01 1896	4.4	25 1979	60	14.3	1.2	0.4	5.5	0.4	160.0 1924	0.0	95.0	06 1924	4.8
	II 943.9	21.4	16.0									56	14.2	1.6	0.5							
दिसम्बर DEC	I 948.2	15.7	11.8	23.1	9.3	26.2	5.1	29.4	20 1950	0.5	24 1961	62	11.1	1.1	0.2	5.2	0.4	81.3 1885	0.0	39.4	13 1885	5.3
	II 945.1	18.7	13.1									52	11.1	1.2	0.2							
वार्षिक योग ANNUAL TOTAL OR MEAN	I 941.1	23.3	18.3	29.3	18.1	41.9	3.8	46.6		0.5		63	18.2	3.0	1.3	1277.9	67.2	2146.0 1893	739.6 1968	249.2		7.2
	II 938.0	25.9	19.1									55	17.7	3.3	1.5							
वर्षों की संख्या NUMBER OF YEARS	I 28	27	27	27	28	27	28	83		83		27	27	29	23	29	29	99	99	99		23
	II 28	28	28									28	27	30	22							

1.00.00 **General Requirements**

1.01.00 For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% shall be considered. The equipment shall operate in a highly polluted environment. However, for equipment in air conditioned areas, design ambient temperature shall be 35 deg.C, if 2x100% air conditioning system is provided.

1.02.00 All equipments shall be suitable for rated frequency of 50Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification. The step-up voltage level for the project shall be 400 KV. The turbo generator unit will be connected to its own step-up transformers for feeding power into the EHV grid. The overall system shall be designed considering voltage variation of +/- 5% and fault level of 50kA for 400KV and 40kA for 220 KV system. Under black start condition the minimum fault level of 1000 MVA shall be considered at 400KV voltage level and voltage variation at 400kV may be considered as +/-10% till system stabilization.

1.03.00 Contractor shall provide fully compatible electrical system, equipments, accessories and services for the entire station/plant in his scope as well as those specifically required by the Employer.

1.04.00 All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and International Codes & Standards, especially the Indian Statutory Regulations.

1.05.00 The auxiliary AC voltage supply arrangement shall have 33 kV, 11 kV, 3.3KV and 415V systems. It shall be designed to limit voltage variations as given below under worst operating condition:

a)	33KV/11KV/3.3KV (MV)	+/- 6%
b)	415 V/240 V	+/- 10%
c)	220V DC	-15% to +10% However the nominal continuous DC power supply shall be 240V.

1.06.00 The voltage level for motors shall be as follows:

a)	Upto 0.2 KW	:	Single phase 240V AC / 3 phase 415V AC
b)	Above 0.2 KW and upto 200 KW	:	3 phase, 415V AC
c)	Above 200 KW and upto 1500 KW	:	3 phase, 3.3 kV AC
d)	Above 1500 KW	:	11 kV

The bidder may adopt 415V/3.3 KV for the drives rated in the range of 160-210 KW.

For CHP conveyor motor's rating above 160 kW, 3.3 KV, three phase AC supply is to be used.

The voltage rating of the drives indicated above is for basic guideline. Minor variations in above can be accepted on case to case basis based on techno-economic considerations of the various sub-systems.

Voltage rating for special purpose motors viz, VFD and screw compressors, shall be as per manufacturer's standard. All the motors ratings on Stacker/ reclaimer shall be 415V ac supply only.

1.07.00	The preferred AC control supply voltage shall be 110V for all 415 V non breaker controlled feeders. Control supply voltages other than above may be offered by bidder based on the bidder's standard proven practice.
1.08.00	The designed fault levels for 11 KV & 3.3 KV systems shall be restricted to 40 kA rms for 1 second and 50 kA rms for 1 second for 415 V systems. The 33 KV system equipments shall have a minimum short circuit fault withstand rating of 12.5 kA for 1 second.
1.09.00	The nominal voltage of main DC system shall be 220V. DC batteries shall be designed for continuous float operation with trickle charge, hence all the associated components like batteries, battery chargers, DC motors, relays, contactors, timers etc shall be suitable for continuous operation at the maximum continuous battery float voltage including suitable temperature correction factors. The operational limits of variation of DC voltage is (+)10 % to (-)15%. In addition, the bidder may propose 110V, 48V or 24V systems as per requirements of control and instrumentation of his equipment and design.
1.10.00	The Contractor shall furnish calculations of maximum loading and fault levels under the most onerous conditions for the various equipment/systems as defined else where in the specification to prove adequacy of their parameters. In case any equipment or system is found to be inadequate, it shall be changed/ modified without any additional liability to the Employer.

SECTION – 'C'
SPECIFIC TECHNICAL REQUIREMENTS

1.0 SCOPE OF ENQUIRY

1.1 This enquiry covers the supply of Above Ground Earthing & lightning protection materials conforming to this specification.

1.2 General technical requirements of Above Ground Earthing & Lightning Protection Materials are indicated in Section-D and Datasheet-A. Project specific technical/ quality requirements/ changes are listed in Section-C.

1.3 The stipulations of Section-C, followed by those of Datasheet-A shall prevail in case of any conflict between the stipulations of Section-C, Datasheet-A & Section-D.

2.0 BILL OF QUANTITIES:

2.1 Quantity requirements shall be as per **Annexure-I (Bill of Quantities (BOQ))** enclosed.

3.0 SPECIFIC REQUIREMENTS:

3.1 Technical:

S .No.	*Reference Clause No. of Section D (if any)*	*Specific Requirement/ Change*
1		

3.2 Quality/ Inspection:

S .No.	*Reference Clause No. of Section D (if any)*	*Specific Requirement/ Change*

3.3 NTPC Quality Assurance Plan has been attached as annexure-IV. Bidder to furnish quality Plan accordingly.

3.4 Pl refer annexure-V for lightning protection downcomer test link detail.

ANNEXURE-I
BOQ-CUM-PRICE SCHEDULE

S. No.	ITEM CODE	DESCRIPTION	UNIT	ORDER QTY.	LOT-1 QTY.	UNIT PRICE Rs
1	507-23008-A	FLEXIBLE COPPER BRAID FOR GATE EARTHING.	NOS.	20	14	
2	507-23013-A	GI WIRE 8 SWG	MTR	16000	11500	
3	507-23014-A	GS FLAT 25 X 3 MM	MT	11	8	
4	507-23015-A	GS FLAT 25 X 6 MM	MT	60	42	
5	507-23017-A	GS FLAT 50 X 6 MM	MT	130	91	
6	507-23020-A	GS FLAT 65 X 8 MM	MT	300	210	
7	507-23023-A	GS ROD 20 MM DIA.1000MM LONG	NOS	150	105	
8	507-23030-A	TEST LINK 150X25X6 MM GS FLAT WITH BOX	NOS	350	245	
9	507-23051-A	50NB GALV MS HEAVY DUTY PIPE (PERFORATED) 3M LONG	NOS	240	186	

NOTES:

1. The quantities will be released for manufacture in more than one lot. Lot-I quantities, which are indicated above, shall be released for manufacture along with LOI.

2. Manufacturing of Lot-I quantities shall be done after the approval of technical and quality documentation, and supply of same shall be completed within two months of date of approval of documents.

3. Subsequent lots shall be cleared for manufacture based on progress of engineering and site requirements. A lead-time of two months shall be given for completion of supply of each lot from the date of clearance of the quantities.

4. The total quantity variation shall be limited from *- 30 % to + 30%* of the total contract value derived on the basis of the Order Quantities.

ANNEXURE – II

LIST OF DRAWINGS / DOCUMENTS TO BE FURNISHED BY SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT

Sl. No.	Drawings/Document Description	Drawings / Document Number	Submission Schedule
1.	Technical Data Sheet for Above Ground Earthing & Lightning Protection Materials	PE-V0-405-507-E021	Within one week of award of contract
2.	GA drawings for Above Ground Earthing & Lightning Protection Materials	PE-V0-405-507-E022	Within one week of award of contract
3.	Quality Plan for Above Ground Earthing & Lightning Protection Materials	PE-V0-405-507-E903	Within one week of award of contract

It may please be noted that successful bidder is not to make any fresh submittals at contract stage w.r.t. above mentioned drawings/documents. Technical datasheet, GA drawings & Quality Plan as enclosed in the technical specification is to be appended with cover sheet bearing drawing/document number & description as stated above.

The signed & stamped copy for the same shall be submitted by successful bidder to BHEL within one week of award of contract without making any changes in the contents of the drawing/document.

S.No	Description of Drgs/Docs	No of Prints	No of CD ROMs/DVDs/Portable Hard Disk .
1	Drawings, Data sheets, Design calculations, Purchase specifications and other documents		
	First submission and submission with major changes		
	▪ Layout (A0&A1 sizes)	4	-
	▪ Other Drawings/Documents (A0&A1 sizes)	2	-
	▪ P&ID (All sizes)	4	-
	a) Final drawings/documents (Directly to site)	6	2
	b) "As Built" Drawing/Documents (Directly to site)	6	2
	c) Analysis reports of Equipments / piping /structures components/system employing software packages as detailed in the specifications.	2	2
2	Erection Manual (Directly to site)	4 sets	2
3	Operation & Maintenance manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2
4	Plant Hand Book i) First Submission	1	1
5	Commissioning and Performance Test Procedure manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2

CLAUSE NO.	QUALITY ASSURANCE

CABLING, EARTHING, LIGHTNING PROTECTION

ATTRIBUTES / CHARACTERISTICS / ITEMS/COMPONENTS / SUB SYSTEMS	Dimension	Paint shade, paint thickness, adhesion	Pre-treatment of sheet	IP protection	Proof load*	Surface finish	Deflection test*	HV & IR	Galvanise Test (If Applicable)	Functional	Bought out items/Bill of material	Routine tests as per relevant standard & specification	Acceptance tests as per relevant standard & specification	Constructional feature as per NTPC
Wall Mounted-Lighting Panel (IS-513, IS:5, IS:2629, 2633, 6745)	Y	Y	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y
Switch box/junction box/ Receptacles Panel (IS-513, IS:5, IS:2629, 2633, 6745)	Y	Y	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y
Cable glands(BS-6121)	Y											Y		
Cable lug(IS-8309)	Y											Y		
Lighting wire(IS-694)	Y											Y		
Flexible conduits	Y											Y		Y
Conduits(Galvanise & Epoxy) IS-9537 & IS-2629,2633 ,6745	Y		Y								Y	Y		Y
RCC Hume Pipe (IS-458)												Y		
Cable termination & straight through joint (VDE-0278)	Y											Y		Y
Cable Trays, Flexible supports system & accessories IS-513, 2629,2633,6745	Y		Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
Trefoil clamp	Y													Y
GI flats for earthing & lighting protection (IS 2062, 2629, 6745,2633)	Y		Y						Y			Y		Y
GI wire (IS-280)	Y											Y		
Fire Sealing System (BS –476)												Y	Y	Y

.Note:1.This is an indicative list of tests /checks. The manufacturer is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.
2.* Deflection Test on cable trays and Proof Load test on cable trays support system will be as per details given in the NTPC technical specification & approved MQP. The above acceptance tests shall be done only on one sample from each size of offered lot.
3. Make of all items will be subject to NTPC approval.

SECTION 'D'
STANDARD TECHNICAL SPECIFICATIONS

1.0 SCOPE OF ENQUIRY

1.1 This specification covers the Design, Manufacture, Assembly, Testing and Inspection at vendor's/sub vendor's works, Packing and despatch to site of ABOVE GROUND EARTHING & LIGHTNING PROTECTION MATERIALS as described in various sections of this specification.

2.0 CODES & STANDARDS

2.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.

2.2 The design, material, construction, manufacture, inspection, testing and performance of "Above ground earthing & Lightning Protection material" shall conform to the latest revision of relevant standards and codes of practices as per Technical datasheet-A.

2.3 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

3.0 DESIGN REQUIREMENTS AND CONSTRUCTIONAL FEATURES

3.1 All items listed in the BOQ-Cum-Price Schedule for Above Ground Earthing & Lightning Protection Material (Annexure - I of the specification) shall be manufactured as per Technical Datasheet-A and Project drawings enclosed with this specification.

3.2 Straight lengths of hot dip galvanised MS materials as per project specific requirement shall be supplied in the standard lengths as below:

a)	MS Flats of all sizes	:	4-7 metres
b)	SWG wires of different sizes	:	100 metres (minimum)

3.3 All finished materials (after galvanization) shall be free from sharp edges, corners, burs & unevenness.

3.4 Flexible braided Copper Conductor of 600 mm length (cross section equivalent to 300 sq.mm) with tinned copper clamp connected by U-bolt for fence gate earthing as per enclosed drawing no. PE-DG-999-509-E003, Sheet 3 of 4

3.5 Shielding Mast shall be as per enclosed drawing no. PE-DG-999-509-E003, Sheet 4 of 4

4.0 QUALITY / INSPECTION

4.1 The supplier shall perform all tests necessary to ensure that the material and workmanship conform to the relevant standards and comply with the requirements of this specification. Charges for all these tests for all the equipments & components shall be deemed to be included in the bid price.

4.2 BHEL's Standard QPs (PED-509-00-Q-001/03) & (PED-507-00-Q-006/02) are enclosed for reference. However, at contract stage, the successful bidder shall submit the QP for BHEL/ ultimate customer's approval. In case bidder has reference QP agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ ultimate customer's approval. There shall be no commercial implication to BHEL on account of QP approval.

4.3 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved quality plan.

4.4 At the time of final inspection,1 sample / lot /size shall be randomly selected by inspector for testing chemical & physical properties at NABL / govt. Approved laboratories. Further, the test certificates shall be submitted to BHEL for review / approval before dispatch of material.

5.0 PACKING

The material shall be packed to ensure protection against damage during transit, storage for prolonged periods and handling.

Test links with Protective boxes & fixing hardware shall be packed separately to avoid damage.

6.0 DELIVERY

The delivery shall be as per NIT (Notice Inviting Tender).

7.0 DOCUMENTATION

7.1 Documents to be submitted by the bidder along with the bid.

a) A copy of sheet " List of Contents" with bidder's signature & company stamp
b) A copy of sheet "Instructions to bidders for preparing Technical offer" with bidder's signature & company stamp.
c) Unpriced copy of "Annexure-I (Bill of Quantities Cum Price Schedule)" with bidder's signature & company stamp.

No other documentation is required to be submitted as technical offer. Any information contained in other parts of the offer (e.g. covering letter, annexures, etc.) which is deviating from specification requirements in any way shall not be considered by BHEL as part of offer.

7.2 Documents to be submitted by successful bidder after award of contract shall be as per Annexure-II.

7.3 Document distribution schedule for the project shall be as per Annexure-III.

TECHNICAL DATASHEET-A

1.0 APPLICABLE STANDARDS:

a)	For Hot rolled carbon sheets & strips.	IS: 2062
b)	For Mild Steel Wire	IS: 280
c)	For Surface Pre-treatment	IS: 2629
d)	For Hot dip galvanising of steel	IS: 2629
e)	For Hot dipped galvanised coating on round steel wires	IS: 4826
f)	For Testing of zinc coating	IS: 2633
g)	For Determining of mass of zinc coating	IS: 6745
h)	For Rolling & cutting tolerances of hot rolled steel products	IS: 1852
i)	For Hot dip zinc coating on structural steel & other allied products	IS: 4759
j)	For Tubes, Tubulars and other Wrought Steel Fittings	IS: 1239

2.0 GALVANIZED MS MATERIALS FOR ABOVE GROUND EARTHING AND LIGHTNING PROTECTION SYSTEMS

a)	Material:	Hot / cold Rolled Mild Steel
b)	Type:	Hot-dip galvanized

3.0 SURFACE TREATMENT

Galvanising:

a)	Pre-treatment	As per IS 2629 prior to galvanization
b)	Type	Hot dip galvanization.
c)	Applicable Standard	IS 2629
d)	Minimum thickness:	
	i) MS flats 5mm thick & over	75 microns (minimum)
	ii) MS flats under 5mm thickness	60 microns (minimum)

	iii) Pipes/ conduits with thickness 5 mm & over.	75 microns (minimum)
	iv) Pipes/ conduits with thickness under 5mm	60 microns (minimum)
	v) GI Wire	20 Microns (Medium coated)
e)	Min. weight :	
	i) MS flats 5mm thick & over	610 gms. / sq. mtr.
	ii) MS flats under 5mm thickness	460 gms. / sq. mtr.
	iii) Pipes/ conduits with thickness 5 mm & over.	610 gms. / sq. mtr
	iv) Pipes/ conduits with thickness under 5mm.	460 gms. / sq. mtr
	v) GI Wire	150 gms. / sq. mtr

	QUALITY PLAN	CUSTOMER :	PROJECT: NORTH KARANPURA STPP (3 X 660MW	SPECIFICATION : PE-TS-405-509-E003
			TITLE :	NUMBER :
		BIDDER/ :	QUALITY PLAN	SPECIFICATION : TECHNICAL SPECIFICATION FOR ABOVE GROUND EARTHING & LIGHTNING PROTECTION MATERIALS
		VENDOR	NUMBER PED-507-00-Q-006, REV-02	
	SHEET 1 OF 1	SYSTEM : GROUNDING	ITEM : GALVANISED RIGID STEEL CONDUITS & PIPES	SECTION VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	CONDUITS	1. MATERIAL	MA	VISUAL,MECH, & CHEMICAL	IS - 9537	IS:9537	IS:9537	INSP. REPORT	3	2	1	
		2. DIMENSIONS	MA	MEASUREMENT	IS - 9537	IS - 9537	IS - 9537	INSP. REPORT	3	2	1	
		3. MECH PROPERTIES										
		A) BENDING TEST	CR	TESTING	IS - 9537	IS - 9537	IS - 9537	INSP. REPORT	3	2	1	
		B) COMPRESSION TEST	CR	TESTING	IS - 9537	IS - 9537	IS - 9537	INSP. REPORT	3	2	1	
		4. GALVANISATION TEST										
		A) WEIGHT OF ZINC COATING	MA	CHEM. TEST	IS-4759	IS-6745	BHEL SPEC.	INSP. REPORT	2	1	-	
		B) UNIFORMITY OF ZINC COATING	MA	CHEM. TEST	IS-4759	IS-2633	IS-2633	INSP. REPORT	2	1	-	
		C) THICKNESS OF ZINC COATING	MA	ELCOMETER	IS-4759	BHEL SPEC.	BHEL SPEC.	INSP. REPORT	2	1	-	
2.0	PIPES	1. MATERIAL	MA	VISUAL,MECH, & CHEMICAL	IS - 1239	IS - 1239	IS - 1239	INSP. REPORT	3	2	1	
		2. DIMENSIONS	MA	MEASUREMENT	IS - 1239	IS - 1239	IS - 1239	INSP. REPORT	3	2	1	
		3. MECH PROPERTIES										
		A) BENDING TEST	CR	TESTING	IS - 1239	IS - 1239	IS - 1239	INSP. REPORT	3	2	1	
		B) COMPRESSION TEST	CR	TESTING	IS - 1239	IS - 1239	IS - 1239	INSP. REPORT	3	2	1	
		4. GALVANISATION TEST										
		A) WEIGHT OF ZINC COATING	MA	CHEM. TEST	IS-4759	IS-6745/ BHEL SPEC.	BHEL SPEC.	INSP. REPORT	2	1	-	
		B) UNIFORMITY OF ZINC COATING	MA	CHEM. TEST	IS-4759	IS-2633	IS-2633	INSP. REPORT	2	1	-	
		C) THICKNESS OF ZINC COATING	MA	ELCOMETER	IS-4759	BHEL SPEC.	BHEL SPEC.	INSP. REPORT	2	1	-	

NOTE : INSTRUCTIONS FOR QUALITY PLAN IS ATTACHED AS ANNEXURE - 1.

BHEL	PARTICULARS	BIDDER/VENDOR	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	QUALITY PLAN	CUSTOMER :			PROJECT NORTH KARANPURA STPP (3 X 660MW) TITLE			SPECIFICATION : PE-TS-405-509-E003 NUMBER :			
		BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-509-00-Q-001, REV-03			SPECIFICATION : TECHNICAL SPECIFICATION FOR ABOVE GROUND EARTHING & LIGHTNING PROTECTION MATERIALS			
	SHEET 1 OF 2	SYSTEM : GROUNDING			ITEM : EARTHING & LIGHTNING PROTECTION MATERIALS			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	**RAW MATERIAL**											
1.1	MILD STEEL (FLATS & RODS) AS PER SPECIFICATION	1.CHEMICAL & PHYSICAL PROPERTIES	MA	VERIFICATION, OF TC'S	100%	IS:2062	IS:2062	MILL TC	3	-	2	REFER NOTE IN REMARK AT SL. NO.3
		2.DIMENSIONS	MA	MEASUREMENT	100%	IS - 1730	IS - 1730	QC RECORD	3/2	-	-	
		3.SURFACE FINISH	MA	VISUAL	100%	IS : 1079	IS : 1079	QC RECORD	3/2	-	-	
1.2	ZINC	1.CHEM.COMP.	MA	CHEM.TEST	SAMPLE	IS - 209	IS - 209	QC RECORD	3/2	-	1/2	
2.0	**IN-PROCESS**											
2.1	CUTTING, DRILLING	1.DIMENSIONS	MA	MEASUREMENT	100%	BHEL SPEC	BHEL SPEC	QC RECORD	2	-	1	
		2.SURFACE FINISH	MA	VISUAL	100%	BHEL SPEC	BHEL SPEC	QC RECORD	2	-	1	
2.2	SURFACE PREPARATION	1.CLEANING PICKLING, RINSING, & FLUXING	MA	MEASUREMENT	PERIODIC IN EACH SHIFT	IS:2629	IS:2629	QC RECORD	2	-	-	
		2.SURFACE QUALITY	MA	VISUAL	100%	IS:2629	IS:2629	QC RECORD	2	-	-	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	QUALITY PLAN		CUSTOMER :			PROJECT TITLE NORTH KARANPURA STPP (3 X 660MW)			SPECIFICATION : PE-TS-405-509-E003 NUMBER :				
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-509-00-Q-001, REV-03			SPECIFICATION : TECHNICAL SPECIFICATION FOR ABOVE GROUND EARTHING & LIGHTNING				
	SHEET 2 OF 2		SYSTEM : GROUNDING			ITEM : EARTHING & LIGHTNING PROTECTION MATERIALS			SECTION		VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC 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
2.3	GALVANISING	1.TEMPERATURE OF BATH	MA	TEMPERATURE INDICATOR	CONTINUOUS	IS - 2629	IS - 2629	QC RECORD	3/2	-	-	galvanizing shall be carried out at NTPC acceptable galvanizers as per Annexure-2.
		2. DROSS	MA	VISUAL	PERIODIC	IS - 2629	IS - 2629	QC RECORD	3/2	-	-	
		3. RATE OF IMMERSION	MA	VISUAL/ MEASUREMENT	100%	IS - 2629/ MFRS PRACTICE	IS - 2629/ MFRS PRACTICE	QC RECORD	3/2	-	2	
		4.SURFACE QUALITY	MA	VISUAL	100%	IS - 2629	FREE FROM BURRS, ROUGHNESS, SLAG, FLUX, STAIN ETC.	QC RECORD	3/2	-	-	
3.0	**FINISHED ITEMS**	1. CHEMICAL	MA	CHEMICAL	1 No./LOT/SIZE	IS-2062	IS-2062	LAB TC	2	-	1	
		2.DIMENSIONS	MA	MEASUREMENT	IS 2500 (PART 1 LEVEL S-4	BHEL SPEC	BHEL SPEC	INSP. REPORT	2	1	-	
		3.SURFACE FINISH	MA	VISUAL	IS 2500 (PART 1 LEVEL S-4	BHEL SPEC	FREE FROM BURRS, SLAG, ROUGHNESS, FLUX, STAIN, ETC.	INSP. REPORT	2	1	-	
		4.MASS OF ZINC COATING	MA	CHEM. TEST	IS - 4759	IS-6745 / BHEL SPEC	BHEL SPEC	INSP. REPORT	2	1	-	
		5.UNIFORMITY OF ZINC COATING	MA	CHEM. TEST	IS - 4759	IS-2633	IS-2633	INSP. REPORT	2	1	-	
		6.THICKNESS OF ZINC COATING	MA	ELCOMETER	IS - 4759	BHEL SPEC	BHEL SPEC	INSP. REPORT	2	1	-	
		6.ADHESION	MA	MECH.TEST	IS-4759	IS-2629	IS-2629	INSP. REPORT	2	1	-	

NOTE: INSTRUCTIONS FOR QUALITY PLAN IS ATTACHED AS ANNEXURE-1.

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

ANNEXURE – 1

INSTRUCTIONS FOR FILLING QUALITY PLAN

The Quality Plan shall include all the Quality Control Measures and Checks adopted by the Vendor to ensure that the material/component/assembly/services supplied by him meet/will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, processes, manufacture, assembly, packing and despatch. The following guide lines may be noted:

Column 1- Serial Number

Column 2- Component/Operation- The component and/or operation being checked shall be given here.

Column 3- Characteristics check- The characteristics being checked shall be given here, e.g., chemical composition, mechanical properties, leak tightness, surface defects etc..

Column 4- Category -'CR' stands for critical characteristic - affecting safety of equipment and personnel

'MA' stands for major Characteristic - affecting safety of equipment and personnel

'MI' stands for minor characteristic - affecting appearance etc.

Column 5- Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc.

Column 6- Extent of check, such as, 100, 10, 1 percent etc.

Column 7- Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC.) procedure, etc. according to which check is done.

Column 8- Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided.

Column 9- Format of Record - Formats, log shets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here.

Column 10- Agency - The agency which performs the test/instruction shall be written in sub-column 'W'
The agency which verifies test certificates/inspection records and carries out audit check of the components/operation shall be written in sub-column 'V'

The agencies are codified as 1,2 & 3

'1' stands for (BHEL)

'1' * means the operation shall be cleared by BHEL before the start of the next operation.

'2' Stands for Vendor

'3' stands for sub-Vendor of the Vendor and so on.

Example :

Entry '3' in column 'P' means test./inspection to be performed by sub-Vendor's QC

Entry '2' in column 'W' means test./inspection to be witnessed by Vendor's QC

Entry '1' in column 'V' means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL

Column11I- Remarks - Any special remarks shall be given here.

NOTES :

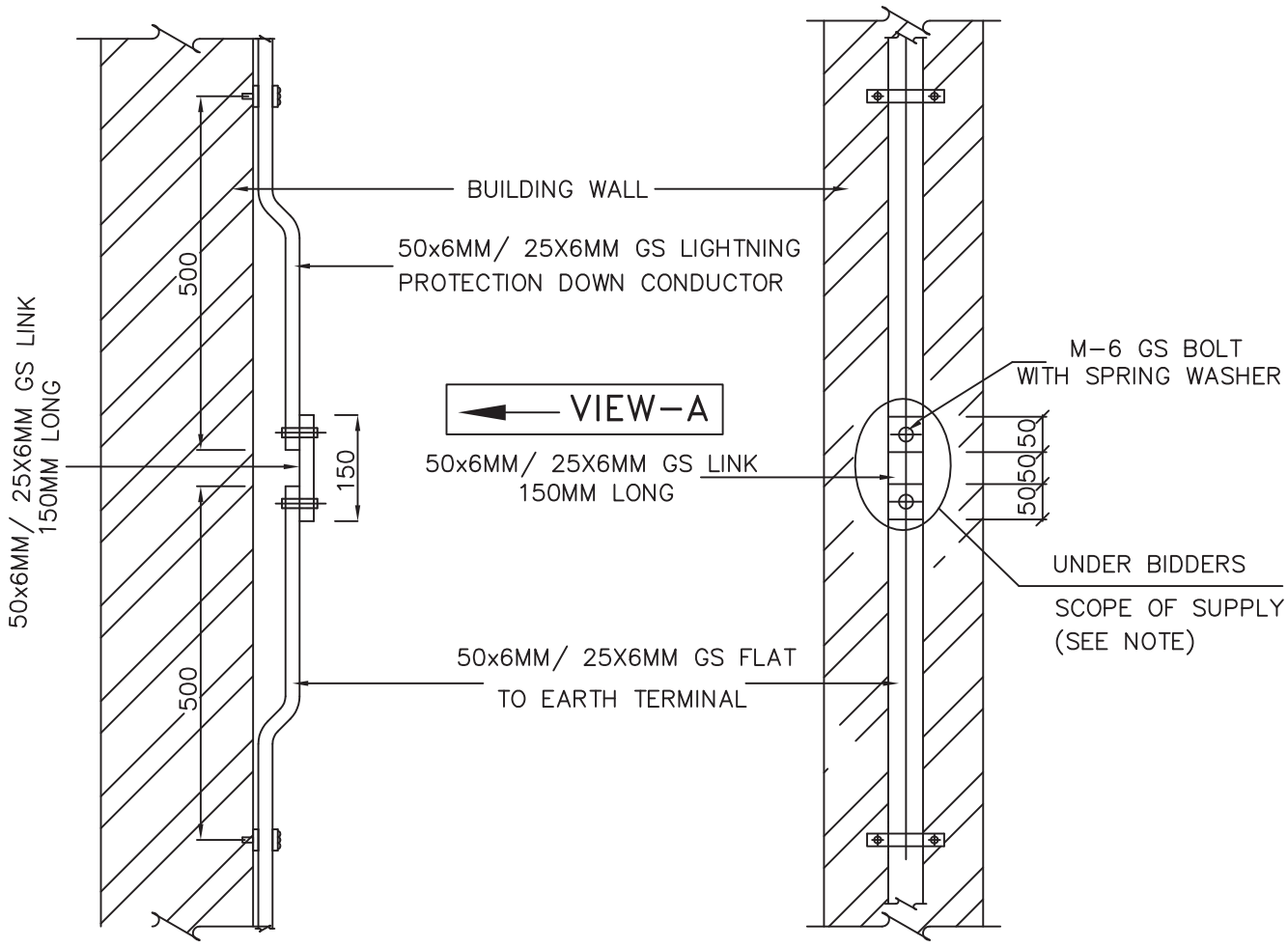
1. In absence of correlation with the test certificate(s) (e.g. material identification) samples shall be drawn bgy BHEL and all tests as per relevent specifications shall be carried out in their presence or in recognized Government Laboratory.
2. When materials and components are initially identified and stamped by BHEL QS engineer, the identification marks shall be presserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless other wise agreed.
3. For castings and forgings integral test specimens shall be provided, When this is not possible for casting, they shall be poured in the presence of BHEL QS Engineer unless otherwise, if witnessing of test by BHEL is called for.
4. When welders qualified by reputed inspection agencies or statutory bodies are not available, qualification tests shall be conducted in the presence of BHEL QS Engineer.
5. This Quality Plan is liable to be modified as per the requirements of approved drawings and changes in technical specifications/drawings. If there are contradictions in respect of column 7 & 8 between this Quality Plan and the approved drawings specifications, the latter shall prevail.
6. Wherever inspection by BHELs Purchaser/Third Party/Statutory authorities are mandatory, this shall be compiled with.
7. Inspection reports, log sheets, test reports/certificate. etc. shall be furnished to BHEL at the approproate stages or at the time of final inspection, as required.
8. This Quality Plan is also applicable to spares, if any, under scope of supply of Vendor.
9. The quality plan shall be submitted in minimum 4 copies with a soft copy of the same or in line with contract requirements.

ANNEXURE -2 of Quality Plan

List of NTPC acceptable galvanizers

1. M/s M J Engg, Delhi
2. M/s Jamna Metal, Delhi
3.M/s A.V. Engg, Kolkata
4. M/s Inar Profiles, Vishakapatnam
5. M/s Anand Udyog, Mumbai
6. M/s Techno Engg, Chandigarh
7. M/s Steelite Engg, Mumbai
8. M/s National Galvanizer Kolkata
9. M/s Unistar Galvanizer, Kolkata
10. M/s B.P. Project, Kolkata
11. M/s Bajaj Pune
12. M/s Electrocare Industries, Mumbai
13. M/s B.G. Shirke, Pune
14. M/s Gurpreet Galvanizer, Hyderabad
15. M/s Sigma, Mumbai
16. M/s Radhakrishnan Shetty, Chennai
17. M/s Karamtara Mumbai
18. M/s Poona Galvanizers Pune
19. M/s Neha Galvanizer, Kolkata
20. M/s Unitech galvanizers-Hoogly
21. M/s Gurpreet Galvanizers, Hyderabad

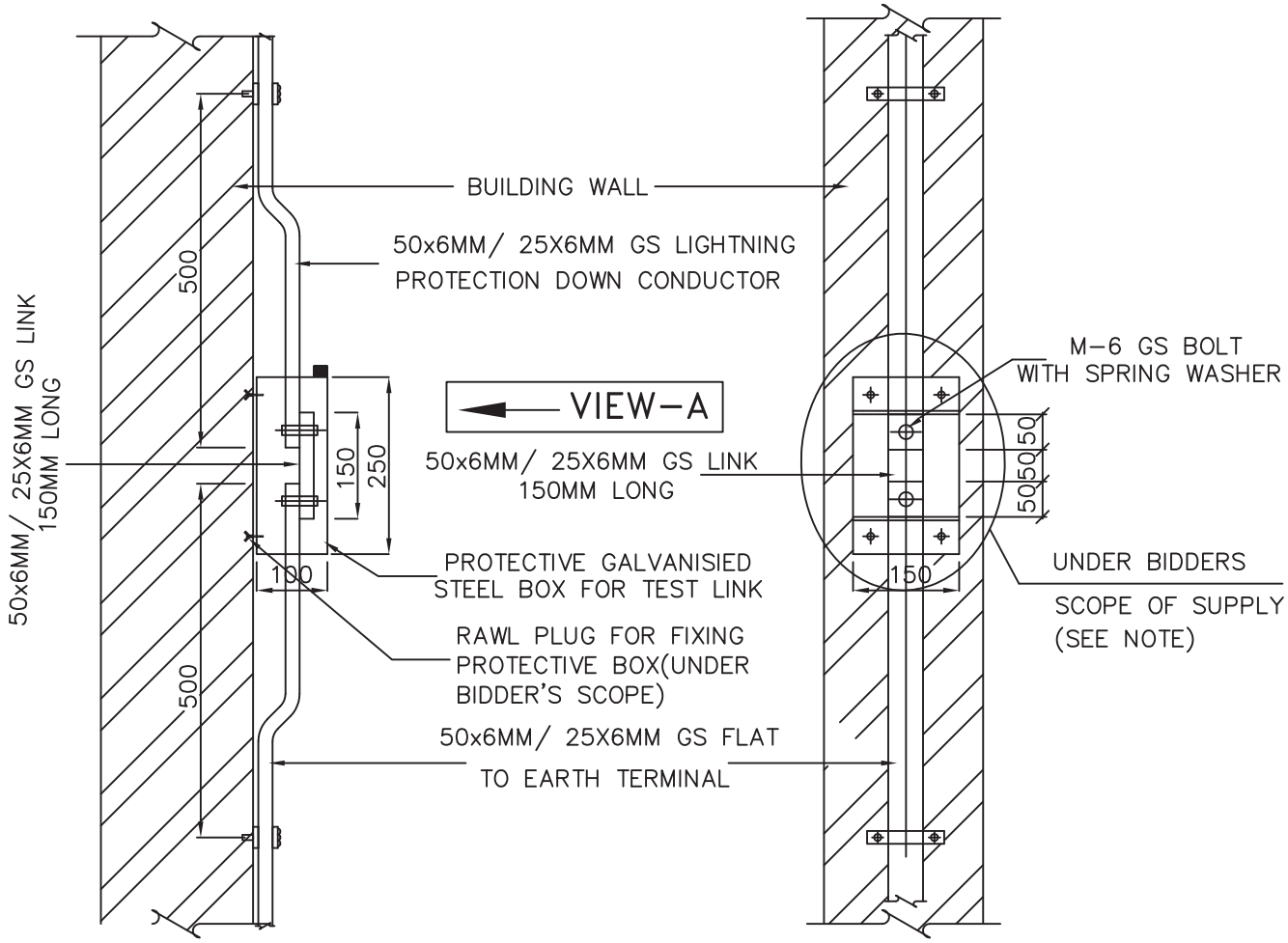
NOTE: Vendor can propose additional source of galvanizers with complete credentials along with bid which shall be reviewed and assessed by NTPC. Non-acceptance of additional galvanizers by NTPC shall have no commercial implication to BHEL. In case of non-acceptance of additional galvanizers by NTPC, above list shall be applicable. In case of non-compliance to this requirement, bid is likely to be rejected.



TEST LINK DETAILS

NOTE: BIDDER'S SCOPE INCLUDES THE 150 MM LONG 50X6MM/ 25X6MM GS LINK ALONG WITH HARDWARES (2 NOS. M–6 GS NUTS & BOLTS & 4 NOS. SPRING WASHERS)

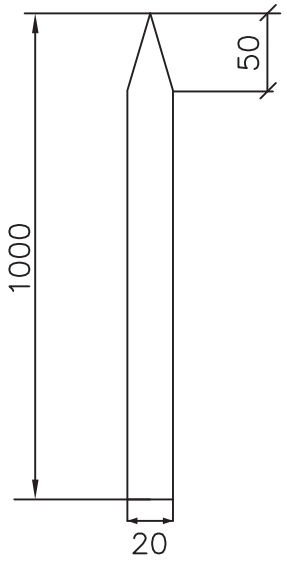
बीएचईएल BHEL	TITLE TYPICAL DETAILS OF TEST LINK	PE–DG–999–509–E003 SH 1 OF 4 | REV 0



TEST LINK DETAILS

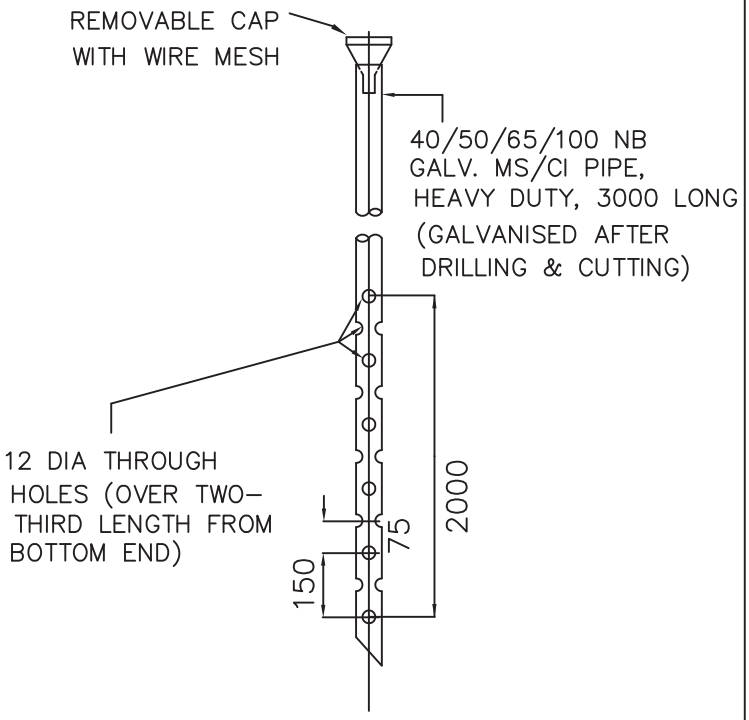
NOTE: BIDDER'S SCOPE INCLUDES THE 150 MM LONG 50X6MM/ 25X6MM GS LINK ALONG WITH HARDWARES (2 NOS. OF M–6 GS NUTS & BOLTS & 4 NOS. SPRING WASHERS) & 250X150X100 MM GALVANISED MS COVERING BOX (1.6 MM THICK) WITH 4 NOS. M12 SCREWS & RAWL PLUGS FOR FIXING OF THE SAME.

BHEL	TITLE TYPICAL DETAILS OF TEST LINK WITH PROTECTIVE BOX	PE–DG–999–509–E003 SH 2 OF 4 | REV 0

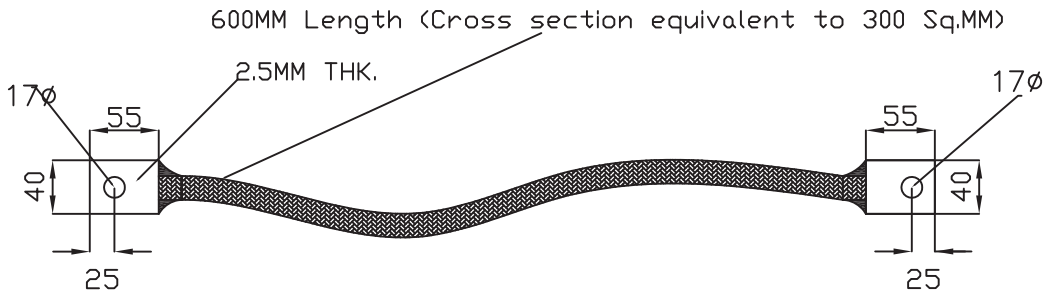


20MM DIA GS ROD

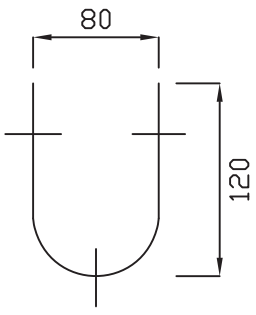
FOR LIGHTNING PROTECTION



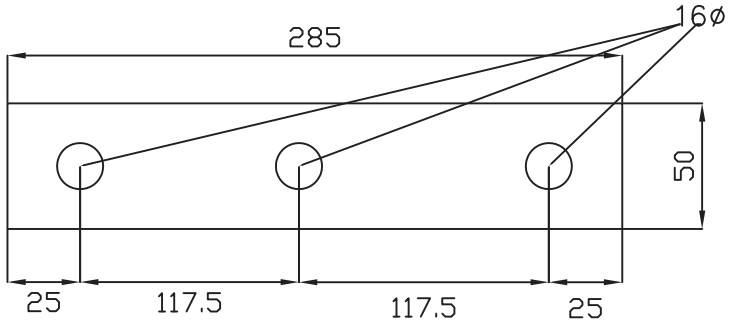
PERFORATED PIPE



FLEXIBLE BRAIDED COPPER CONDUCTOR



PLAN



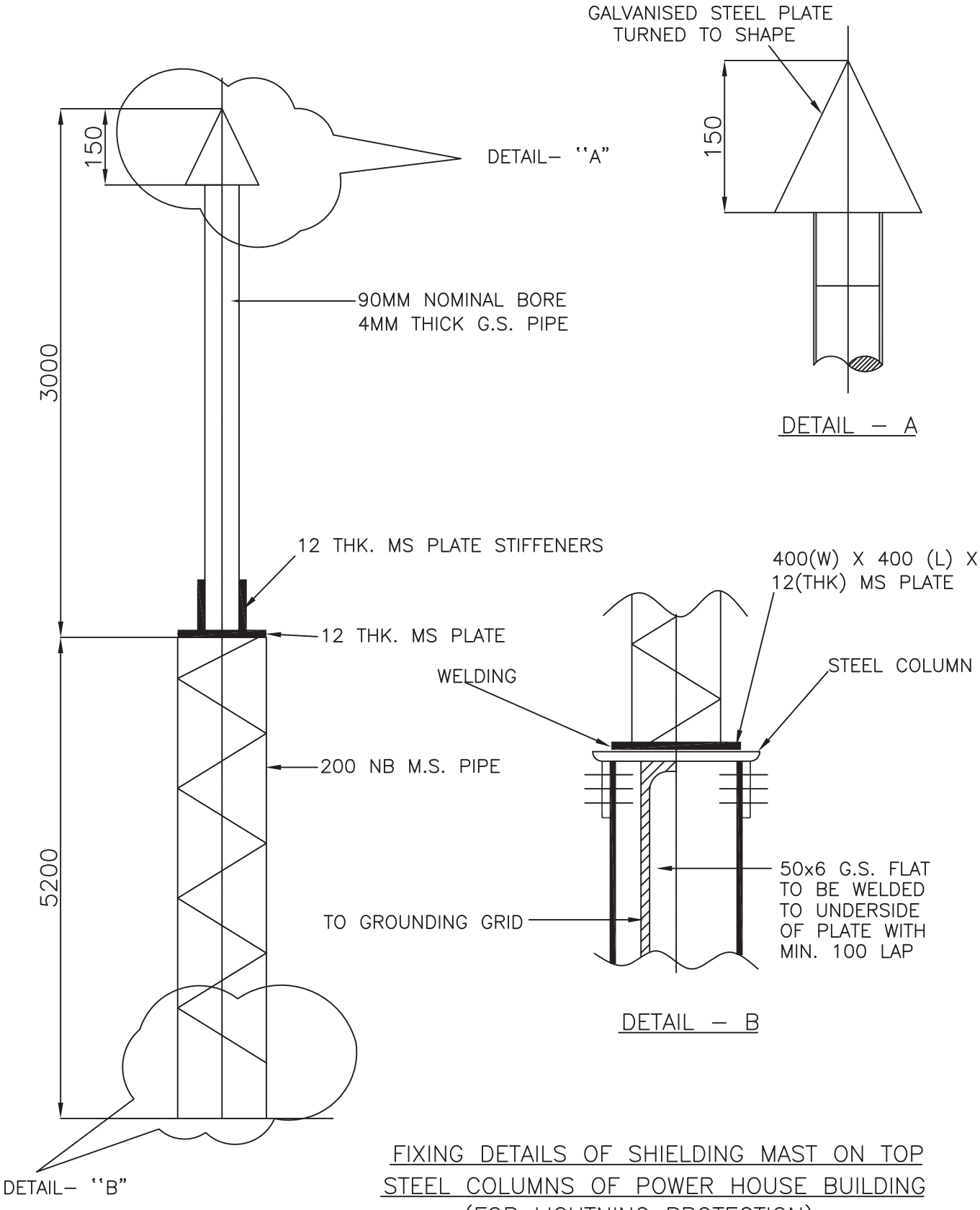
TINNED COPPER 'U' CLAMP (2.5 MM THICK)

TITLE

TYPICAL DETAILS OF FLEXIBLE BRAIDED COPPER CONDUCTOR & 20MM DIA. GS ROD

PE–DG–999–509–E003

SH 3 OF 4 | REV 0

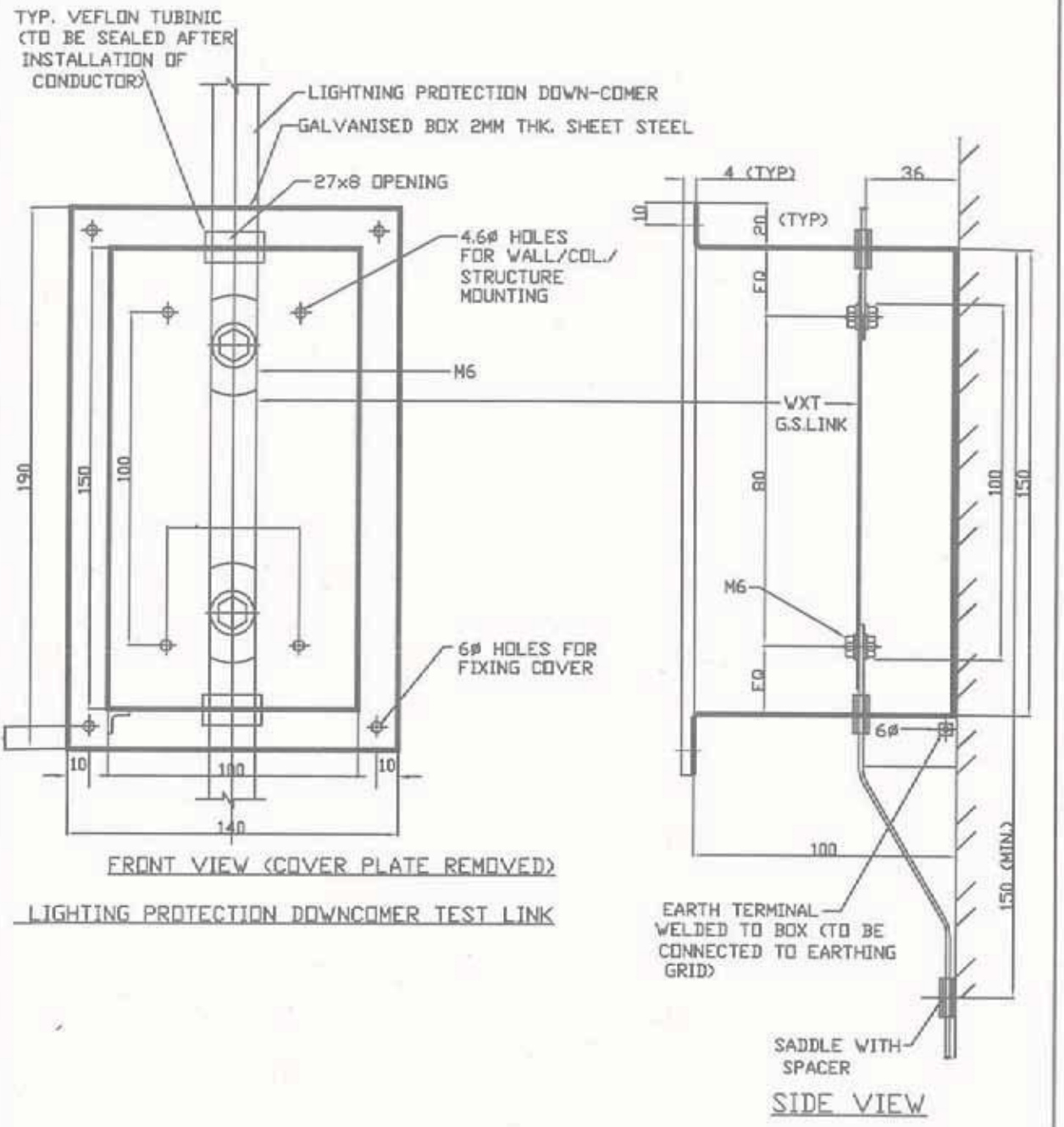


FIXING DETAILS OF SHIELDING MAST ON TOP STEEL COLUMNS OF POWER HOUSE BUILDING (FOR LIGHTNING PROTECTION)

NOTES:

1. THE ABOVE SHIELDING MAST SHALL BE PROVIDED ON TOP OF "A" ROW STEEL COLUMNS OF POWER HOUSE BUILDING
2. ALL DIMENSIONS ARE IN MM.

TITLE: TYPICAL DETAILS OF SHIELDING MAST		PE–DG–999–509–E003
	SH 4 OF 4	REV 0



FRONT VIEW (COVER PLATE REMOVED)

LIGHTING PROTECTION DOWNCOMER TEST LINK

SIDE VIEW

NOTE.
1. ALL DIMENSIONS ARE IN mm.
2. THE TEST LINK SHALL BE OF SAME WIDTH AND THICKNESS AS THE DOWNCOMER. NUTS BOLTS AND WASHER TO BE OF GS.
3. THE DOWN COMER ENTRY AND EXIT POINTS IN TO BOX BE MADE WATER-TIGHT AFTER LAYING OF CONDUCTOR.

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD	M	E	C	C&I	ARCH	APPD	DATE
					CLEARED BY						
RC	FOR TENDER PURPOSE				–		–	–	–		05.07.10
RB	FOR TENDER PURPOSE	RKG	RKG	VKM	–	SS	–	–	–	AS	
RA	FOR TENDER PURPOSE	–	–	–	–	–	–	–	–	–	

एन टी पी सी NTPC

NTPC LTD.
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: STANDARD

TITLE: LIGHTNING PROTECTION DETAILS.

SIZE	SCALE	DRG. NO.	REV. NO.
A4	NTS	0000-211-POE-A-047	RC