BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS ENGINEERING MANAGEMENT

NEW DELHI

DOCUMENT No.	TB-368-316-012	Rev	00		Prepared	Checked	Approved
CUSTOMER Doc. No.				NAME	SK	SKS	SKS
TYPE OF DOC.	TECHNICAL SPECIFICATION			SIGN			
TITLE	7/9 SWG GI EARTH WIRE			DATE	31.03.15		31/03/15
				GROUP	TBEM		
				W.O. No	83012		

CUSTOMER	**MADHYA PRADESH POWER TRANSMISSION LTD.**
PROJECT	**Construction of new 400 kV sub stations, transmission lines and Augmentation work/feeder bay work on total turnkey basis (Lot no. 1) Balaghat, Badnawar, Bhopal, Chhegaon and Nagda**

List of Contents

Rev.	Date	Altered	Checked	Approved	REVISION DETAILS

Distribution	CUSTOMER	TBMM	O/C	
	-			

SECTION – 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENT AND QUANTITIES

1. **SCOPE:-**

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of earth wire to site.

This section covers the scope and quantities of earth wire. The offered earth wire shall also comply with the General Technical Requirements for the project as detailed under section-3 of this specification. For environmental conditions, refer Section-3 carefully.

The specification comprise of following sections:

Section-1: Scope, specific technical requirements & Bill of Quantities.
Section-2: Equipment specifications
Section-3: General technical requirements for all equipments under the project.
Section-4: Guaranteed Technical Particulars

In case of any conflict between various sections, order of precedence shall be in the same order as listed above.

The equipment is required for the following projects:
Name of the Customer : Madhya Pradesh Power Transmission Company Ltd.
Name of the Project : Construction of new 400 kV sub stations, transmission lines and Augmentation work/feeder bay work on total turnkey basis (Lot no.- 1) - Balaghat, Badnawar, Bhopal, Chhegaon and Nagda

The term 'Owner' appearing in this specification shall refer to MPPTCL, the term 'Purchaser/Employer' shall refer to BHEL and the term 'Contractor' shall refer to the successful Bidder.

2. **SPECIFIC TECHNICAL REQUIREMENTS:-**As per Section-2.

3. **BILL OF QUANTITIES:-**

Sl. no.	Description	Unit	Quantity.					Total
			Balaghat	Badnawar	Bhopal	Chhegaon	Transmission store MPPTCL Itarsi	
1	7/9 SWG GI earth wire	Km	7.0	19.0	2.10	1.10	1.0	**30.20**

Note -1-Total quantity may vary upto ±25% at contract stage. However, individual project wise quantities may vary upto ±30%.

Note -2- *All applicable tests as per IS shall be conducted by the bidder.*

4. **TYPE TESTING:-**

The offered equipments should be fully type tested as per the relevant standards. In case the equipment of the type and design offered, has already been type tested, Bidder shall invariably furnish type test reports from the reputed and approved national/international laboratory/Government approved test houses to prove that specifications of equipments offered conform to the relevant standard.
Test certificates shall clearly indicate the type and model number etc., so that relevant details of offered equipments could be verified. While submitting bids the model and type etc., shall be clearly indicated.

Type test reports furnished with the offer should not pertain to the period earlier than five years from the **date of opening of Bid which is 20.11.13.**

In case the type tests were carried out earlier than five years, the manufacturer will have to conduct these tests, without any commercial & delivery implication to BHEL, before commencement of supply. In both the above cases type test certificate must be submitted with the bid. The Bidders have to submit one complete set of Type Test reports for the offered equipments.
All the tests as per relevant IS/IEC shall be carried out.

5. **INSPECTION & TESTING:-**

Before being fitted on the equipment, all components shall be subjected to routine tests at the Contractors factory, as per the relevant IEC/IS standards. A detailed test report proving the successful passing of such tests shall be provided.

Prior to dispatch, the routine & acceptance tests shall be carried out on equipment in accordance with the applicable IEC /IS and the material shall be offered for final inspection to BHEL and MPPTCL in accordance with agreed quality plan with 3 weeks advance information.

6. **QUALITY PLAN:-**

The contractor shall carry out contract works in accordance with sound quality management principles which shall include such as controls which are necessary to ensure full compliance to all requirements of the specification & applicable international standards. These quality management requirement shall apply to all activities during design, procurement, manufacturing, inspection, testing, packaging, shipping, inland transportation, storage, site erection & commissioning. Contractor shall submit detailed Quality Plan for BHEL / MPPTCL approval within 1 week of P.O. placement.

SECTION - 02

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SECTION-4

TECHNICAL SPECIFICATIONS FOR EARTH WIRE

4.01 STANDARDS:

The high Tensile Steel Galvanised Earth Wire shall conform to the following Indian Standards, which shall mean latest revisions, amendments/changes adopted and published, unless otherwise specified hereinbefore.

Sl. No.	Indian Standards or any Equivalent International Standard	Title
1	IS:209	Specification for Zinc
2	IS:2141	Specification for Earth wire for overhead Transmission purpose
3	IS:1778	Reels and drums for Bare wires
4	IS:1521	Method of Tensile Testing of Steel wire
5	IS:2629	Recommended practice for Hot Dip Galvanising Iron and Steel
6	IS:2633	Method of Testing Uniformity of Zinc coating of Zinc coated Articles.
7	IS:4826	Galvanised coating on Round Steel wire
8	IS:6745	Method of Determination of weight of Zinc coating of zinc coated Iron and Steel Articles
9	IS: 12776	Method of Testing of Ground wire

4.02 CLIMATIC CONDITIONS :

The Earth wire shall be suitable for being installed directly in air supported with suspension clamp or tension clamp at the cross arms of single circuit and double circuit transmission line towers. The earth wire shall be therefore suitable for satisfactory continuous operation under the following climatic conditions:

1	Location in the State of	MADHYA PRADESH
2	Maximum ambient air temperature (^{0}C)	50.
3	Minimum temperature in shade (^{0}C)	1.
4	Maximum relative humidity (%)	95(sometimes approaches saturation)
5	Average daily ambient air temperature (^{0}C)	40° Centigrade
6	ISOCERANIC Level (days/year) (Average number of thunder storm days)	50
7	Average rainfall (mm)	1250
8	Maximum wind pressure (kg/ square meters)	150
9	Max. Altitudes above mean sea level (meters)	1000
10	Seismic level (Horizontal acceleration) (g)	0.3

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NOTE: Moderately hot and humid tropical climate conducive to rust and fungus growth. The climatic conditions are also prone to wide variations in ambient conditions. Stroke is also present in the atmosphere. Heavy lightening also occurs during June to October.

4.03 PARAMETERS :

4.03.1 PRINCIPAL PARAMETERS OF EARTH WIRE:

The standard technical particulars of 7/3.66mm galvanized steel earth wire shall be as follows :-

(A) The details of Steel strand:

Sr. No.	Details of steel strands	Earth Wire
a)	Material	Steel
b)	Stranding	7
c)	Weight per Km	583 Kgs
d)	Dia. of wire	3.66 mm
e)	Tolerance	2%
f)	Minimum elongation in 100 mm length	5 mm
g)	Minimum breaking strength per strand	1000 Kg
h)	Minimum tensile strength	95 Kg./mm^2
i)	D.C. resistance at 20 Deg. C	17.15 Ohms/Km

(B) The details of Stranded Earth Wire :

Sr. No.	Details of Stranded Earth Wire	Earth Wire
i.	Maximum Length of Lay	198
ii.	Minimum Length of Lay	165
iii.	Minimum breaking load	6972 Kgs
iv.	Overall diameter	10.98mm
v	Modulus of elasticity	1.933 x 10^6 Kg./cm^2
vi	Co-efficient of linear expansion	11.50 x 10^{-6} per Deg.C
vii	Weight of zinc coating on wire	260 gms./ m^2 (Min.)
viii	No. of one minute dip and half minute dip respectively	3 one minute and 1 half minute
ix	Calculated d.c. Resistance at 20 Deg.C	2.5 Ohms per Km

4.04 GENERAL TECHNICAL PARTICULARS : MATERIAL AND WORKMANSHIP FOR EARTH WIRE:

4.04.1 The steel wire (strands) used in manufacture of galvanized steel earth wire shall be drawn from steel wire rod produced by either acid or basic open hearth process or by the electric furnace process or basic oxygen process. The steel wire shall not have sulphur and phosphorous contents exceeding 0.045% each. The carbon content shall not exceed 0.55%. The steel produced by bassemer process shall not be used for drawing of steel wire

strands. The finished earth wire shall have minimum brittleness as it will be subjected to continuous vibration while in use on line.

4.04.2 The steel wire shall be hot dip galvanized and shall have clause 'A' (heavy) zinc coating of minimum 260 gram per sq. meter of the uncoated wire surface. The zinc coating shall be smooth and continuous of uniform thickness, free from imperfections not consistent with good commercial practice and shall meet the test requirement. The zinc used in galvanizing of earth wire shall be as per IS: 209-1966.

4.04.3 All the steel wires shall be circular, smooth, uniform and free from imperfections, such as spills and splits, die marks scratches, abrasions, cuts and kinks etc. drawing and after stranding.

4.04.4 The steel wires, after galvanizing shall be bright in appearance, smooth and free from all defects like flux, ash, cross inclusions, bare and black spots, pimples, lumpiness in runs, rust, stains, bulky white deposits and blisters.

4.04.5 To avoid susceptibility towards wet storage stains (white rust) the stranded earth wire shall be provided with a protective coating of boiled linseed oil.

4.04.6 The finished earth wire shall have a smooth surface without any surface cuts, abrasions, scuff marks and shall be free from dirt, grit etc.

4.04.7 Failure of any sample to meet the above requirements shall be sufficient cause for rejection of the lot of earth wire represented by the sample, particular care shall therefore be taken during manufacture, handling, packing and transportation of the earth wire so that it is not dented, cut or damaged in any way.

4.05 Size and Properties:

4.05.1 The earth wire size, physical properties, tolerance in diameter of individual strands and length of lay of the strand shall be as given above.

4.05.2 The wires shall be so stranded together that when an evenly distributed pulls is applied at the end of completed strands, each wire will take an equal share of the pull.

4.05.3 The earth wire shall be supplied in the standard lengths which shall not be less than 3 Km. and such lengths will be specifically indicated in the tender. Not less than 95% of the total quantity of the earth wire shall be supplied in standard lengths. The quantity of earth wire in length shorter than standard one shall not exceeds 5% of the total quantity to be supplied. Further, no single earth wire length in respect of such 5% (maximum) supply in random lengths shall be shorter than 50% of the standard length.

4.05.4 The length of the stranded wire shall be supplied without joints in the individual wires comprising it, excluding welds made in base rod before it is drawn.

4.05.5 Each coil be warranted to contain no welds, joints or splice other than in the base rod before it is drawn.

4.06 GALVANISING AND OILING:

4.06.1 All the wires of the strand shall be galvanized in accordance with IS-2629-1966. Recommended practice for Hot dip galvanizing of Iron and Steel of some other authoritative equivalent standard.

4.06.2 The galvanized earthwire after stranding operation shall have dipped in boiled linseed oil before winding it on drums.

4.07 TEST FOR EARTH WIRE :

4.07.1 Earth wire shall be subjected, before despatch from the works to tests as specified in the IS-2141, IS 1521, IS 1755 & IS 4826 or any other authoritative equivalent standard.

4.07.2 All the drums of galvanized steel stranded earth wire of the same grade, diameter and construction, manufactured under similar condition shall be grouped to constitute one lot.

4.07.3 Samples from each lot shall be tested for ascertaining the conformity to the requirements of the earth wire specified herein. The drums selected shall be tested for length of the lay and diameter of individual strands etc. The lot shall be declared conforming to the requirement of these characteristics if all the samples are found satisfactory. One test specimen from each wire of the strand shall now be drawn from every selected drum and subjected to chemical analysis, tensile tests, ductility test, elongation test and coating test. One test specimen, of the completed strand from each drum shall be subjected to tensile strength. The lot shall be declared conforming to the requirements of these characteristics, if the entire test specimen satisfies the relevant requirement.

4.08 INSPECTION :

4.08.1 The purchaser's representative shall at all times be entitled to have access to the works and all places of manufacture where earth wire shall be manufactured and the representative shall have full facilities for unrestricted inspection of the Supplier's works, raw materials and process of manufacture for conducting necessary tests as detailed herein.

4.08.2 The Supplier shall keep the Purchaser informed in advance of the time of starting and of the progress of manufacture of earth wire in its various stages so that arrangements can be made for inspection.

4.08.3 No material shall be despatched from its point of manufacture before it has been satisfactorily inspected and tested, unless the purchaser in writing waives off the inspection. In the later case also, the earth wire shall be despatched only after satisfactory testing for all tests specified herein has been completed.

4.08.4 The acceptance of any quantity of material shall in no way relieve the Supplier of any of his responsibilities for meeting all requirements of the specification, and shall not prevent subsequent rejection if such material is later found to be defective.

4.08.5 At least 5% of the total number of drums subject to minimum of two in any lot put up for inspection, shall be selected at random to ascertain the length of earth wire by following method:

"At the works of the manufacturer of the earth wire, the earth wire shall be transferred from one drum to another at the same time measuring its length with the help of graduated pulley and Cyclometer. The difference in the average length thus obtained and as declared by the supplier in the packing list shall be applied to all the drums if the conductor/earth wire is found short during checking"

4.09 DOCUMENTATION:

4.09.1 Six sets of type test reports, duly approved by the Purchaser shall be submitted by the supplier for distribution, before commencement of supply.

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Adequate copies of acceptance and routine test certificates, duly approved by the Purchaser shall accompany with despatched consignments.

4.09.2 The manufacturing of the material shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the Purchaser. All manufacturing and fabrication work in connection with the material prior to the approval of the drawing shall be at Supplier's risk.

4.09.3 Approval of drawing/work by Purchaser shall not relieve the Supplier of his responsibility and liability for ensuring correctness and correct interpretation of the latest revision of applicable standards, rules and codes of practices. The equipment shall conform in all respect to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering. Purchaser shall have the power to reject any work or material, which in his judgment is not in full accordance therewith.

4.10 PACKING AND FORWARDING:

4.10.1 The earth wire shall be supplied in strong wooden drums provided with lagging of adequate strength, to protect the conductor/earth wire against all damage and displacement during transit, storage and subsequent handling and stringing operations in the field. The drums shall generally conform to IS: 1778 except otherwise specified hereinafter.

4.10.2 The drums shall be suitable for wheel mounting and for jetting off the conductor/earth wire under a minimum controlled tension of the order of 5kN.

4.10.3 After placement of the letter of Award, the supplier shall submit four copies of fully dimensioned drawing of the drum he wishes to supply, for Purchaser's approval, before taking up manufacturing of earth wire. After getting approval from the Purchaser, Supplier shall submit 30 more copies of the approved drawing to Purchaser for further distribution and field use at Purchaser's end.

4.10.4 All wooden components shall be manufactured out of seasoned soft wood free from such defects that may materially weaken the component part of the drums. Preservative treatment for anti-termite /anti-fungus (Aldrine/Aldruse) shall be applied to the entire drum with preservatives of a quality which is not harmful to the earth wire.

4.10.5 The flanges shall be of two/three ply construction with each ply at right angles to the other and nailed together. Further the outer face of the flange shall be reinforced with the circumferential battens, fixing in octagonal shape. The nails shall be driven from the inside face of flange, punched and then clenched on the outer face. The tolerance in thickness of each ply shall be +/- 3 mm only. There shall be at least 3 nails per plank of ply with maximum nail spacing of 75 mm. Where a slot is cut in the flange to receive the inner end of the conductor/earth wire, the entrance shall be in line with the periphery of the barrel. Spindle hole shall be provided at the centers of the planks of the plies and spindle plates with 102 mm dia. Holes shall be fitted on either side of both the flanges.

4.10.6 The wooden battens used for making the barrel of the earth wire shall be of segmental type. These shall be nailed to the barrel supports with at least two nails. The battens shall be closely butted and shall provide a round barrel with smooth external surface. The edges of the battens shall be rounded or chamfered to avoid damage to the earth wire.

4.10.7 Barrel studs shall be used for construction of drums. The flanges shall be holed and the barrel supports slotted to receive them. The barrel studs shall be threaded over a length on either end, sufficient to accommodate

washers, spindle plates and nuts for fixing flanges at the required spacing. Barrel studs should be tack welded with the nuts after tightening.

4.10.8 Normally, the nuts on the studs shall stand protrude of the flanges. All the nails used on the inner surface of the flanges and the drum barrel shall be counter sunk. The ends of barrel shall generally be flushed with the top of the nuts.

4.10.9 The inner cheek of the flanges and drum barrel surface shall be painted with bitumen-based paint.

4.10.10 Before reeling, cardboard or double corrugated or thick bituminised waterproof bamboo paper shall be secured to the drum barrel and inside of flanges or the drum by means of a suitable commercial adhesive material. The paper should be dried before use. Medium grade craft paper shall be used in between the layer of the conductor/earth wire. After reeling the conductor/earth wire the exposed surface of the outer layer of conductor/earth wire shall be wrapped with thin polythene sheet across the flanges to preserve the conductor/earth wire from dirt, grit and damage during transportation and handling and also to prevent ingress of rain water during storage/transport.

4.10.11 Minimum space of 125 mm shall be provided between the inner surface of the external protective layer and outer layer of the conductor/earth wire.

4.10.12 Each batten shall be securely nailed across grains as far as possible to the flange edges with at least 2 nails per end. The length of the nails shall not be less than twice the thickness of the battens. The nail shall not protrude above the general surface and shall not have exposed sharp edges or allow the battens to be released due to corrosion.

4.10.13 Outside the protective layer, there shall be minimum of two binders consisting of hoop iron/galvanized steel wire. Each protective layer shall have two recesses to accommodate the binders.

4.10.14 The earth wire ends shall be properly sealed and secured with the help of U-nails on one side of the flanges. The end securing shall be done by taking out at least 500 mm of steel wire on either end by U-nails. The earth wire shall be binded by use of galvanized steel wire/aluminum wire at three locations at least 75 mm apart or more covered with PVC adhesive tape so as to avoid loosening of earth wire layers in transit and handling.

4.10.15 Only one length of earth wire shall be wound on each drum.

4.11 MARKING :

Each drum shall have the following information stenciled on it in indelible ink along with other essential data:

x. Order Number and date.

xi. Name and address of consignee

xii. Manufacturer's name and address

xiii. Drum number

xiv. Size of earth wire (7/3.66mm)

xv. Length of earth wire in meters

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xvi. Gross weight of drum with earth wire

xvii. Weight of empty drum with protective lagging

xviii. Arrow marking for unwinding

4.12 END SEALING :

Both the ends of each length of earth wire should be provided with non-destructive type metal crimped or epoxy capped seals with punching embossing/ engraving of manufacturer's monogram and drum number.

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SECTION-3

3.0 GENERAL

This section stipulates the General Technical Requirements under the Contract and will form an integral part of the Technical Specification.
The provisions under this section are intended to supplement general requirements for the materials, equipments and services covered under other respective sections and are not exclusive. However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall hold good.

3.1 PROJECT INFORMATION AND SYSTEM PARAMETERS

a)	Customer/ Purchaser/ Owner	Madhya Pradesh power Transmission company Ltd.				
b)	Project Title	Construction of new 400 kV sub stations, transmission lines and Augmentation work/feeder bay work on total turn key basis (Lot no. 1) – Balaghat , Badnawar, Bhopal, Chhegaon and Nagda substation				
c)	Location	Balaghat	Badnawar	Bhopal	Chhegaon	Nagada
		Balaghat is Located in district of Balaghat of Madhya Pradesh. Distance between Jabalpur to Balaghat is 232 km by Road and 130 km by Rails.	Badnawar is Located in district of Dhar of Madhya Pradesh. Distance between Badnawar to Ujain is 70 km by Road .	Bhopal site is located 20 kM away from Bhopal city.	Chhegaon is located in Khandwa district of Madhya Pradesh . Distance between Chhegaon to Khandwa is 15 km by Road.	Nagda is located in Ujjain district of Madhya Pradesh. The road distance between Nagda to Ujjain is 47 km
d)	Transport Facilities	Road/Rail				
e)	Postal Address	To follow				
SITE CONDITIONS						
a)	Maximum ambient air temperature	50°C				
b)	Minimum ambient air temperature	1°C				
c)	Average daily ambient temperature	40°C				

d)	Maximum Relative humidity	95 %(sometimes approach saturation)
e)	Pollution Severity	Heavily Polluted
f)	Seismic level (horizontal acceleration)	0.3g
g)	Wind zone as per IS 802 (PART 1) -1995	4
h)	maximum wind pressure	150kg/sq.mts
i)	Average annual rainfall	1250 mm
j)	Maximum altitude above mean see level	1000m
k)	Isolceraunic level	50 days per year
l)	Climate	Moderately hot & humid tropical climate , conducive to rust & fungus growth

3.2 MATERIAL/WORKMANSHIP

3.2.1 General Requirement

Where the specification does not contain characteristics with reference to workmanship, equipment, materials and components of the covered Equipment it is understood that the same must be new, of highest grade of the best quality of their kind conforming to best engineering practice and suitable for the purpose for which they are intended.

The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements and shall be used throughout the design. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall be interchangeable with, and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modem practices will be accepted. Installation shall be constructed as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances

initial operation, testing and commissioning in accordance with the manufacturer's tolerances and instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacture's limits suitable guards shall be provided for the protection of personal on all exposed rotating and / or moving machine parts and shall be designed for easy installation and removal for maintenance purpose. The spare equipment(s) shall be installed at designated locations and tested for healthiness.

The Contractor shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Contractor shall apply all operational lubricants to the equipment installed by him.

All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Contractor has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease is available. He shall help purchaser in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

3.3 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be throughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible, shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for paintaing shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitabley wrapped or other wise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling. All external painting shall be as per shade no. 697 of IS:5.

3.4 PACKING

The following details are to be clearly indicated in the material forwarding documents:

a) Name and address of the consignee.
b) Purchase order number.
c) Name of supplier/s.
d) Description of equipment / material.
e) Net weight.
f) Gross weight.

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the purchaser, the Contractor shall also submit packing details/associated drawing for any equipment material under his scope of supply, to facilitate the purchaser to repack any equipment/ material at a later date, in case the need arises. Any material found short inside the

packing cases shall be supplied by the supplier without any extra cost.The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbol i.e. fragile, handle with care, use no Hooks etc.

3.5 QUALITY

BHEL quality plan to be followed subject to TBEM / customer's approval.

3.6 DOCUMENTATION

3.6.1 LIST OF DOCUMENTS

The bidder shall submit a detailed list of drawings / documents along with the bid proposal which he intends to submit to the Employer after award of the contract.

The supplier shall necessarily submit all the drawings / documents unless any thing is waived.

All engineering data submitted by the Contractor after final process including review and approval by the Employer shall form part of the Contract Document and the entire works performed under this specification shall be performed in strict conformity, unless otherwise expressly requested by the Employer in Writing.

3.6.2 DRAWINGS

All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, the external connections, fixing arrangement required, the dimensions required for installation and interconnections with other equipments and materials, clearances and spaces required for installation and interconnection between various portions of equipments and any other information specifically requested in the specifications.

Each drawing submitted by the Contractor shall be clearly marked with the name of the Employer, name of consultant ,the unit designation, contract no. , and the name of the Project .If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

Further work by the Contractor shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Employer if so required.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawing shall be at the Contractor's risk. The Contractor may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Employer. Approval of Contractor's drawing or work by the Employer shall not relieve the contractor of any of his responsibilities and liabilities under the Contract.

3.6.3 APPROVAL PROCEDURE

The scheduled dates for the submission of these as well as for, any data/information to be furnished by the Employer would be discussed and finalised at the time of award. The supplier

shall also submit required no. of copies as mentioned in this specification of all drawings/design documents/test reports for approval by the Employer. The following schedule shall be followed generally for approval.

i.	Approval/comments/by employer on Initial submission	Within 2 weeks of receipt
ii.	Resubmission	Within 2 (two) weeks (whenever from date of comments required) Including both ways postal time.
iii.	Approval or comments	Within 2 weeks of receipt of resubmission
iv.	Furnishing of distribution copies	2 weeks from the date of last approval.

Note: The contractor may please note that all resubmissions must incorporate, all comments given in the submission by the Employer failing which the submission of documents is likely to be returned. Every revision shall be a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.

The title block of drawings shall contain the following information incorporated in all contract drawings. Please refer enclosed sheet for details of Title block.

3.6.4 DOCUMENTS TO BE SUBMITTED ALONGWITH OFFER

1) Drawings
2) Guaranteed Technical Particulars
3) Type Test Reports
4) Manufacturing Quality Plan

3.6.5 DOCUMENTATION SCHEDULE

S. No.	DESCRIPTION	TENDER STAGE	CONTRACT STAGE FOR APPROVAL	FINAL DOCUMENTATION	
			Prints	Prints	CDs
1.	Drawings and Data Sheets	1	6	21	7 nos of all drawings/documents
2.	Drawings "As Built "	-	-	21	
3.	Type Test Reports	1	6	21	
4.	Erection Manuals	-	6	21	
5.	Operation and Maintenance Manuals	-	6	21	
6.	Manufacturing Quality Plan	1	6	21	
7.	Field Quality Plan	1	6	21	
8.	Inspection Test Reports	-	-	21	

Soft copies of drawings at contract stage shall also be submitted in **PDF format**.

Drawings will also be submitted in mini cartridges in AUTOCAD Release -14 package or any other CAD package along with conversion files for all major items.Final Documentation shall be submitted in bound volumes with Customer & Project etc. written on top.

REV.	DATE					

OWNER

MADHYA PRADESH POWER TRANSMISSION COMPANY LIMITED

PROJECT

CONSTRUCTION OF NEW 400KV SUB STATION, TRANSMISSION LINES AND AUGMENTATION WORKS/FEEDER BAY WORK ON TOTAL TURN KEY BASIS (LOT NO. -I) -BALAGHAT, BARNAWAR, BHOPAL, [illegible] AND NAGDA

EPC PURCHASER

BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP

	NAME	SIGN.	DATE

TITLE

BHEL/SUB VENDOR DRG NO.

SHT. No | REV.

GUARANTEED AND TECHNICAL PARTICULARS OF STRANDED G. I EARTH S.WIRE

S. No.	Description	Unit	Particulars
1.	**Name & Address of manufacturer**		
2.	**Particulars of raw materials**		
2.1	Aluminium		
	a) Minimum Purity of Aluminium	%	
	b) Maximum Copper Content	%	
2.2	Steel wires/Rods		
	a) Carbon	%	
	b) Manganese	%	
	c) Phosphorous	%	
	d) Sulphur	%	
	e) Silicon	%	
2.3	Zinc		
	a) Minimum purity of Zinc	%	
3.	**STEEL STRANDS BEFORE STRANDING**		
3.1	Diameter		
	a) Nominal	mm	
	b) Maximum	mm	
	c) Minimum	mm	
3.2	Minimum breaking load of strand	kN	
3.3	Maximum Resistance of 1 M Length of strand of 20°C	Ohm	
4.0	**STEEL STRANDS AFTER STRANDING**		
4.1	a) Nominal Diameter	mm	
	b) Maximum Diameter	mm	
	c) Minimum Diameter	mm	
4.2	Minimum breaking load of strand	kN	
4.3	Galvanising		
	a) Min. weight of zinc coating of uncoated wire surface	g/ m^2	
	b) Min. number of one minute dips that the galvanised strand can withstand in the standard Preece test	Nos.	
	c) Min. No. of twists in gauge length equal to 100 times the dia of wire which the strand can withstand in the torsion test	Nos.	
5.	**COMPLETED STRANDED WIRE**		
5.1	UTS of stranded wire	kN	
5.2	Lay length of outer steel layer	mm	
5.3	DC resistance of stranded wire at 20°C	Ω/km	
5.4	Direction of lay of outer layer	-	
5.5	Linear mass of earth wire		
	a) Nominal	Kg/km	
	b) Maximum	Kg/km	
	c) Minimum	Kg/km	
6.0	Is drum as per I.S	Yes/No	
5.6	Standard length of stranded wire in the drum	m	

CHECK LIST FOR GI EARTH WIRE

Put a tick mark on 'YES' if the specified requirement is met, or put a tick mark on 'NO' if the specified requirement is not met and give comments in the remark column.

1. TECHNICAL REQUIREMENTS

Sl. No.	PARAMETERS	DETAILS	YES/NO	REMARKS
1.	Stranding and wire diameter	7/3.66 mm steel	YES/NO	
2.	Strand Arrangement			
	a) Steel core	1	YES/NO	
	b) Outer Steel Layer	6	YES/NO	
3.	Overall diameter	10.98mm	YES/NO	
4.	Approximate weight	583 kg/km	YES/NO	
5.	Calculated d.c. resistance at 20°C	2.5 ohms/km	YES/NO	
6.	Minimum breaking load	6972Kgs	YES/NO	
7.	Direction of lay of outer layer	Right hand	YES/NO	
8.	Applicable standard	IS:398 (part-II): 1976	YES/NO	
9.	Minimum Zinc coating on hot dip galvanized steel strands	260 g/m^2	YES/NO	
10.	Nos. of one minute and half minute dip respectively	3 one minute and 1 half minute	YES/NO	
11.	Standard length	As per cl. No. 4.05 of section -2	YES/NO	
12.	Tolerance	As per section -2	YES/NO	
13.	Material composition	As per section -2	YES/NO	
14.	Packing	As per cl. No. 4.10 of section -2	YES/NO	
15.	All valid Type test reports as per Clause No. 4 of section-1, of this specifications , are available	Yes, available	YES/NO	