



BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP
ENGINEERING MANAGEMENT, NEW DELHI

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Title	GS FLAT & EARTH ELECTRODE FOR EARTHING SYSTEM	Date	17.08.07	17.08.07	17.08.07
		Group	TBEM		
		W.O. No			
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Tender					

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05. 18.05.15 MS Flat of size 75x12 mm & 50x8 mm added.
Note 4 added in sketch 2.

04	26.11.12	Sd/-	Sd/-	Sd/-	Sd QP included.
03	09.11.12	Sd/-	Sd/-	Sd/-	POWERGRID requirement & Cut Lengths included.
02	10.06.09	Sd/-	Sd/-	Sd/-	Documents updated
01	14.08.07	Sd/-	Sd/-	Sd/-	Revised as per TBMM requirement.

Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS					
Distribution				To						
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SECTION 1

SCOPE AND SPECIAL TECHNICAL REQUIREMENT

1.0 SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of Earthing Strips & Earthing Electrodes, complete with accessories.

This section covers the general technical requirements of Earthing Strips & Earthing Electrodes. In case of any discrepancies between the requirements mentioned in this section and those specified in the following sections of this specification, the specifications given herein shall prevail and shall be treated as binding requirements.

1.1 TECHNICAL REQUIREMENTS:

1.1.1 GALVANIZED MILD STEEL FLAT (Power grid Requirement)

- i) Chemical composition & mechanical properties: Grade –A (Item Designation – Fe410W) of IS: 2062.
- ii) Mass of protective zinc coating: 618 gm/sq.m and minimum thickness of coating shall be 85 microns for items thicker than 6 mm. For less than 6 mm, the thickness shall be as per clause 4.0 of IS 4759, 1984.
- iii) Sizes:

Sl. No.	Description	Approx. Weight (kg)
1	Galvanised Steel Flat 75 x 12 mm	7.0663 kg/meter
2	Galvanised Steel Flat 75 x 10 mm	5.8893 kg/meter
3	Galvanised Steel Flat 50 x 6 mm	2.4008 kg/meter
4	Galvanised Steel Flat 25 x 3 mm	0.5894 kg/meter
5	Mild Steel Flat 50 x 6 mm	2.3316 kg/meter

- iv) Length: 4 m to 6 m
- v) Raw Material: Vendor to procure the raw material from Power Grid approved Sources with PG stamp.

1.1.2 GALVANIZED MILD STEEL FLAT (Other then Power grid Requirement)

- i) Chemical composition & mechanical properties: Grade –A (Item Designation – Fe410W) of IS: 2062.
- i) Mass of protective zinc coating: 1) 610 gm/sq.m and minimum thickness of coating shall be 85 microns for items thicker than 6 mm. For

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less than 6 mm, the thickness shall be as per clause 4.0 of IS 4759, 1984.

ii) Sizes:

Sl. No.	Description	Weight (kg)
1	Galvanised Iron Flat 75 x 12 mm	7.065 kg/meter
2	Galvanised Iron Flat 75 x 10 mm	5.888 kg/meter
3	Galvanised Iron Flat 75 x 8 mm	4.710 kg/meter
4	Galvanised Iron Flat 65 x 10 mm	5.10 kg/meter
5	Galvanised Iron Flat 65 x 8 mm	4.082 kg/meter
6	Galvanised Iron Flat 50 x 8 mm	3.140 kg/meter
7	Galvanised Iron Flat 50 x 6 mm	2.4 kg/meter
8	Galvanised Iron Flat 25 x 3 mm	0.589 kg/meter
9	Mild Steel Flat 75 x 10 mm	5.7843 kg/meter
10	Mild Steel Flat 50 x 6 mm	2.3316 kg/meter
11	Mild Steel Flat 75 x 12 mm	7.065 kg/meter
12	Mild Steel Flat 50 x 8 mm	3.140 ka/meter

iii) Length: 4 m to 6 m.

1.1.3 EARTH ELECTRODE (Mild Steel iron)

i)	Applicable Standard	IS:1239
ii)	Sizes of Pipe	40 NB
iii)	Grade	Medium
iv)	Thickness of zinc –coating	460 gm/sq.m
v)	Reference Drg.	SKETCH SK-1 (Typical)

1.1.4 EARTH ELECTRODE (Cast Iron)

i)	Cast Iron pipe ID (mm)	100/150 mm
ii)	Thickness (mm)	12/10/13 mm
iii)	Reference Drg.	SKETCH SK-2 (Typical)

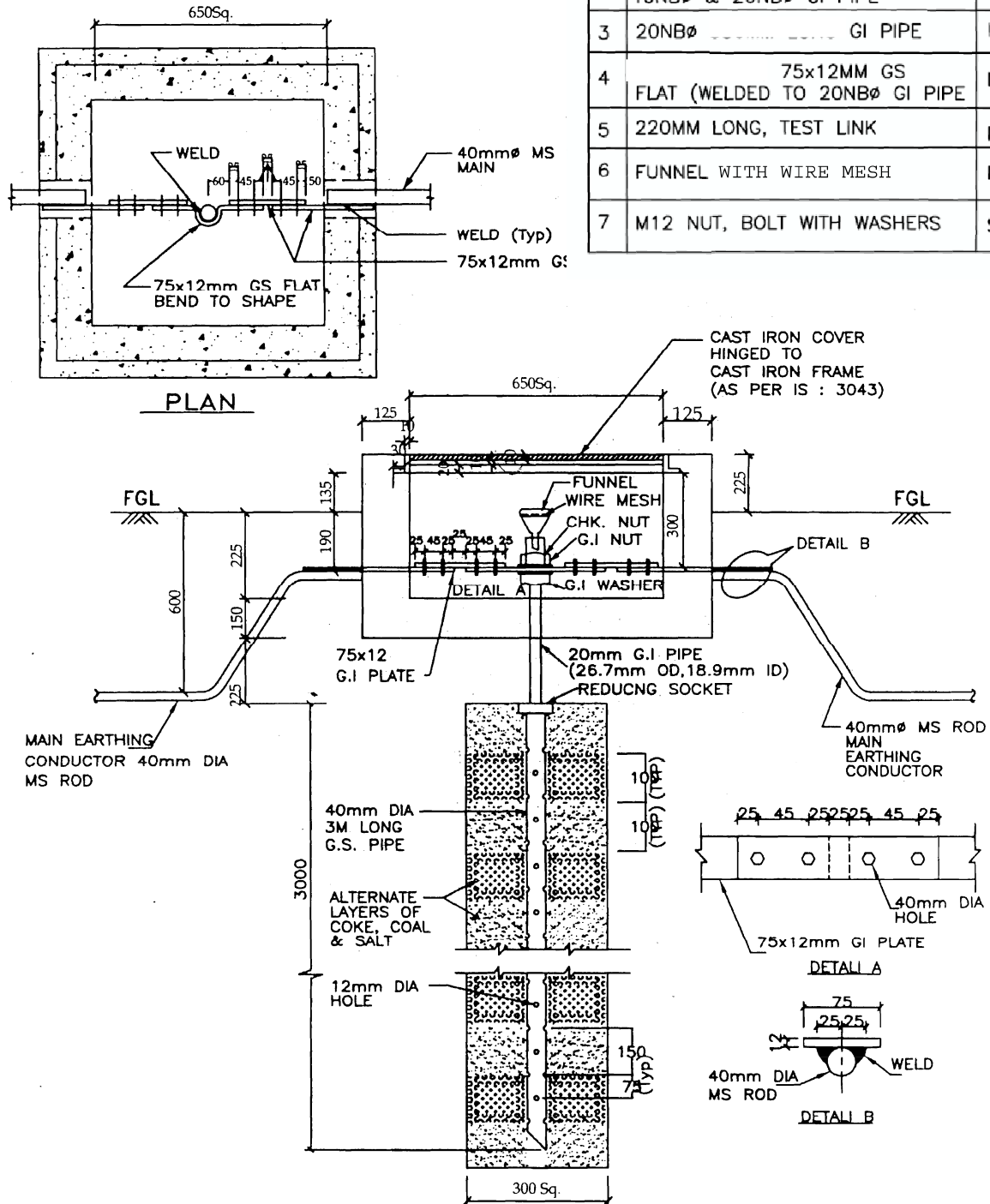
1.2 Manufacturing quality plan:

- i) Quality plan of GS flat is not required for power grid projects. Therefore, the inspection of GS flat & electrodes for power grid projects will be carried out as per relevant Indian Standards (latest version).
- ii) The QP enclosed with standard specification is to be followed for Non Power Grid projects.

SKETCH SK-1

BILL OF MATERIAL:-

SN	ITEM	UNIT	QTY.
1	40 NBØ 3MTR. LONG GI PIPE	NOS.	01
2	REDUCING SOCKET BETWEEN 40NBØ & 20NBØ GI PIPE	NOS.	01
3	20NBØ GI PIPE	NOS.	01
4	75x12MM GS FLAT (WELDED TO 20NBØ GI PIPE)	NOS.	01
5	220MM LONG, TEST LINK	NOS.	02
6	FUNNEL WITH WIRE MESH	NOS.	01
7	M12 NUT, BOLT WITH WASHERS	SETS	08



RELEASED FOR CONSTRUCTION

POWER GRID CORPORATION
OF INDIA LIMITED
(A Government of India Enterprise)



PROJECT :- STANDARD

TITLE:- STANDARD EARTHING DETAILS

CKD BY	PRPD BY	12/11/2007	Drawing No. C/ENG/STD/EARTHINGS SHEET # 5	Rev. (00)
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SECTION - 2

STANDARD SPECIFICATION

2.1 APPLICABLE STANDARDS

The materials shall strictly conform to the following Indian Standards, as appropriate:

The materials shall confirm to the latest editions of the following Indian Standards:

IS 2062: 2011 Steel for general structural purposes

IS 1730: 1998 Dimensions for steel plate, sheets, strips and flats for general engineering Purposes.

IS 1731: 1971 Dimensions for steel flats for structural and general engineering purposes.

IS 2629: 1985 Recommended practices for Hot-dip galvanizing on iron & Steel

IS 2633: 1986 Methods for testing uniformity of coating of zinc- coated articles.

IS 1852: 1985 Rolling & Cutting Tolerance for hot rolled steel products.

IS 1239 (Part 1): 1990 Specification for mild steel tubes, tubular and other wrought steel fittings (Mild Steel tubes)

IS 1239 (Part 2): 1992 Specification for Mild steel tubes, tubular and other wrought steel fittings (Mild Steel Sockets)

IS 4826 – 1979 Hot-dipped zinc coatings on mild steel tubes

IS 4759: 1984 Hot Dip Coatings on Structural Steel and other allied Products

IS 6745: 1972 Determination of mass of Zinc Coating on Zinc Coated Iron and Steel Articles

IS 1536: 1993 Cast Iron Pressure Pipe -Specification

2.2 CONSTRUCTIONAL FEATURES

2.2.1 MILD STEEL FLATS

All steel required for earthing material shall confirm to Grade –A (Item Designation – Fe410W) of IS:2062: 2011.

2.2.2 EARTH ELECTRODES

- (1) The earth electrodes (Galvanised Iron) shall be perforated and fabricated out mild steel pipes and shall conform strictly to IS 1239 – 2004.
- (2) The earth electrodes (Cast Iron) shall be perforated and fabricated out cast iron pipes and shall conform strictly relevant IS: 3043-2006.

Note: Latest revisions shall be followed for all mentioned standard.

SECTION - 3

GENERAL SPECIFICATIONS

3.1 INSPECTION AND TESTING

All tests and inspection of the equipment specified shall be performed to the extent and in the manner as stipulated in the relevant standards and in this specification. All type test/routine tests/acceptance tests as specified shall be conducted as per the details mentioned in the Purchase order for this equipment.

3.2 DOCUMENTATION SCHEDULE AT CONTRACT STAGE: (DOCUMENTATION REQUIREMENT SHALL BE SPECIFIED BY PROJECT PPE AT CONTRACT STAGE AND SHALL VARY FROM PROJECT TO PROJECT).

A (No. of Copies)	For Approval
	Copies of GA drawings with projects details, dimension, equipment weight, fixing details, tolerances and terminal details etc.
	Copies of GTP
	Copies of type test reports
	Copies of manufacturing quality plan.
B (No. of Copies)	After Approval and For Information/Distribution.
	Copies of GA drawings
	Copies of GTP
	Copies of type, Routine & Acceptances tests.
	Copies of manufacturing quality plan.
	Copies of shipping list detailing the description & quantities of all items being dispatched separately, with shipping weights, number of cases and dimensions.

3.3 Material shall not be dispatched without the approval of test certificates by purchasers.

3.4 MATERIALS AND WORKMANSHIP

Equipment materials and components shall be new, of high grade and good quality and be to the latest engineering practice. The material and workmanship throughout shall be in accordance with the purpose for which they are intended. Each component shall be designed to be consistent with its duty.

In general, screw threads shall be standard metric threads. The use of other thread from will be used only after prior approval. The supplier shall furnish locking devices for threaded fasteners, which will lock them in such a manner so as to prevent them from coming loose in transport and in service.

All joints and fastening shall be so designed, constructed and registered that the component part may be accurately positioned and restrained to fulfill their required function. The heads of all bolts shall register flush on the surface, which they fasten.

All the information concerning materials or components to be used in manufacturing, machinery, equipment, materials and components supplied, installed or used shall be submitted for approval. Without such approval the supplier shall run risk of subsequent rejection. The cost as well as time delay associated with such rejection shall be borne by the supplier.

Whenever possible, all similar parts 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.

The supplier shall apply all lubricants used for installation and operation of the equipment. All consumable required for one-year operation shall be in the scope of supplier.

All components exposed to rain shall be designed with sloped upper surface to avoid water pools.

3.5 SURFACE TREATMENT

- 3.5.1** All metal surfaces shall be treated to provide anti-corrosion protection. All ferrous surfaces for external use shall be hot-dip galvanized after fabrication. High Tensile steel nuts and bolts and spring washers shall be electro-galvanized to service condition .

36 WELDING

All welding shall be done by a qualified welder.

3.7 PACKING AND MARKING

3.7.1 PACKING

GI Flat may be supplied in open condition. However, while stacking the materials for transportation it should be ensured that, similar items are grouped and tied with steel wires /

strips for convenient handling and shall be done in such away to avoid damage during transits.

3.7.2 MARKINGS

The following details shall be marked on the packing:

- i) Name and address of the consignee
- ii) Purchase Order No:
- iii) Name of supplier
- iv) Description of material
- v) Tare weight
- vi) Gross weight

4.1 General

The Works covered by the Specification shall be designed, manufactured, built, and tested in accordance with the Acts, Rules, Laws and Regulations of India. The Equipment(s) shall also conform to the general requirements detailed in the following standards, which shall form an integral part of the Specification, in addition to meeting the specific requirements called for elsewhere in the Specification.

In case of conflicting requirements between this document (General Technical Requirements -Section 3) and equipment specification (Section 1 & Section 2), equipment specification shall prevail.

Unless specifically agreed to by the Purchaser prior to Award of Contract, the Work shall be in accordance with the standards indicated and the requirements of the Specification. The Supplier shall be held responsible for any deviation.

4.2 Definitions

The following words and expressions shall have the meanings hereby assigned to them throughout this document

"Employer/Owner" means Power Grid Corporation of India Ltd.

"Purchaser" means Bharat Heavy Electricals Limited

"Supplier/Manufacturer" means the person or persons, firm or company assigned to execute the works as defined by the scope of supply, described here.

"Specification" refers to this document.

4.3 Instructions to supplier

The supplier should be approved by Power Grid. If not, it is the responsibility of the vendor to be assessed and approved by Power Grid, before placement of order by BHEL. Any cost involved in vendor assessment/approval must be borne by the vendor himself.

The supplier shall submit the technical requirements, data and information as per the technical data sheets provided in the appropriate clause of bid document.

4.4 Site information

	Particular	Raigarh	Pugalur
a)	Employer/Owner	<i>Power Grid Corporation of India Ltd (POWERGRID)</i>	
b)	Project Title	<i>±800 kV, 6000 MW HVDC Raigarh – Pugalur Terminals</i>	
c)	Location	<i>11 km from Raigarh in State of Chattisgarh. Raigarh is the nearest railway station from Raigarh Site. The nearest Airport is Raigarh. The nearest port to Raigarh site is Paradip, Odisha.</i>	<i>Pugalur site is located about 32 Km from Pugalur in the state of Tamilnadu. The nearest Rail head is Pugalur. The nearest Airport is Coimbatore/ Trichi. The nearest port to Pugalur is Cohin.</i>
d)	Nearest Rail Head	<i>Raigarh</i>	<i>Pugalur</i>
e)	Postal Address	<i>To follow</i>	<i>To follow</i>
f)	Design ambient temp.	<i>50 °C</i>	<i>50 °C</i>

	Particular	Raigarh	Pugalur
g)	SEISMIC COEFFICIENT	Zone II Importance factor for the stations is 1.5 as per table no. 6 of IS-1893.	Zone II Importance factor for the stations is 1.5 as per table no. 6 of IS-1893.
h)	Site Wind Pressure	Zone II with basic wind speed of 44 m/s at 10 m height above mean ground level. The risk level coefficient/factor shall be taken as 1.07.	Zone V with basic wind speed of 44 m/s at 10 m height above mean ground level. The risk level coefficient/factor shall be taken as 1.07.
i)	Isokeraunic Level	50 days per year	50 days per year
j)	Relative Humidity	Max. 100%	
k)	Rain fall Intensity	In 24 hours: 200cm 80mm/hr (for drainage system Design)	In 24 hours: 1250mm, 50mm/hr (for drainage system Design)
l)	Solar Radiation	83 Cal/cm ² per hour	
m)	Air Pollution	Heavily polluted for Raigarh and Pugalur terminals as per IEC 60815(1986). However leakage distance for AC equipment connected to 400 kV AC bus shall not be less than 10500 mm.	

4.5 Site temperatures for design purposes

The Supplier shall assume the temperatures given below for the design of the works at the converter stations.

Description	Temperature in deg C	
	Raigarh	Pugalur
<i>Maximum dry bulb one hour average</i>	50	50
<i>Maximum dry bulb 24 hour average</i>	40	40
<i>Annual mean dry bulb temperature</i>	30	30
<i>Minimum dry bulb one hour average</i>	0	0
<i>Maximum wet bulb one hour average</i>	33	33
<i>Dry bulb temperature for low ambient condition</i>	33	33
<i>Wet bulb temperature for low ambient condition</i>	23	23

SECTION - 4

GUARANTEED TECHNICAL PARTICULARS for ELECTRODES

1.0 EARTH ELECTRODE (Galvanized iron)

- 2.1 Mild Steel pipe OD (mm)
- 2.2 Mild Steel ID (mm)
- 2.3 Thickness of zinc –coating
- 2.4 Weight of zinc coating
- 2.5 Applicable standards

2.0 EARTH ELECTRODE (Cast Iron)

- 3.1 Cast Iron Pipe OD (mm)
- 3.2 Cast Iron Pipe ID (mm)
- 3.3 Applicable standards

CHECK LIST FOR INFORMATION TO BE FURNISHED WITH OFFER
RETURN THIS CHECKLIST AS PART OF THE OFFER DULY SIGNED

The offer may not be considered if the following information and this Checklist are not enclosed with the Offer.

BHEL ENQUIRY. NO:
BIDDER OFFER REFERENCE:

(1) S.No.	(2) Parameter	(3) Requirement	(4) Yes / No	(5) Remarks in case reply in Col (4) is NO
1.0	Weight of Zinc coating	Weight of zinc coating shall be as per clause 2.4 of Section-2		
2.0	Tolerance in the flat size	Tolerance in the flat size shall be as per IS:1852-1985		
3.0	Chemical composition of flat/CI Pipe/GI Pipe	Certified copy of the chemical composition of the material as per the relevant standards shall be supplied before the dispatch of the material.		
4.0	Earth electrode	Electrode arrangement shall be provided as per sketch no. SKTECH SK-1 / SKETCH SK-2		
5.0	PG stamp	Raw material shall be inspected at source by Powergrid/BHEL.		
6.0	Length	4 to 6 mtrs		
7.0	Conformance	With enclosed QP		

Date:

Signature of the authorized representative of Bidder

Company Seal