

## Lot 7: Earthing Equipment

### 1 Spike Earthing

Spike earthing is used for 11 kV & 33 kV pole earthing. Spike Earthing consist of 25x6 mm, 1.5-meter GI Flat, 2.5 meter long spike earthing electrode with necessary holes as indicated on the drawing no BPC-DDCS-2022-21/1-2.

### 2 Pipe Earthing

Pipe earthing is used for the earthing of distribution substations. Pipe earthing consists of heavy gauge GI pipe of 40 mm diameter, 4mm thick, 2500 mm long with perforation and 25x6 mm , 6.5 meter long GI Flat. One end of the GI pipe shall be threaded with 50 mm length to fix the plate (250x250 mm) and other end to be pointed to drive into the ground. Details are given on drawing no. BPC-DDCS-2022-21/2-2

### 3 Stay Assembly

Stay assembly is installed at dead-end and angular locations to counter balance the load on the supports due to pulling of the conductors so that supports remain straight in vertical position without bending in any direction. They are also provided at mid-span support as a protection against the wind load. The stay set (Line Guy set) will consist of the following components:

**Table 1: Specification of Stay Set**

Description	33 kV & 11 kV
Anchor rod	2.5 metre long with 20 mm dia GI rod
Stay plate	300X300X6 mm with 22 mm hole at its centre
Turn buckle, eye bolt with nuts.	20 mm dia G.I rod, 460 mm long
Bow with welded channel (V Hanger) only for telescopic structure.	16 mm dia G.I rod. The apex or top of the bow shall be bent at an angle of 10R. The other end shall be welded with proper and good quality welding to a G.S. Channel 200 mm long having a dimension of 100x50x6 mm. The Channel shall have 2 holes of 18 mm dia at its centre.
Thimble 2 Nos.	1.5 mm thick GI sheet into a size of 75x22x40 mm and shaped as per standard.
Preform 4 nos.	Preform suitable for stay wire.

Details are given on drawing no. BPC-DDCS-2022-22

**4 Stay Wire**

Utilities grade galvanised steel strand shall be used for guy wire as shown in table 2.

**Table 2: Galvanised Steel Stay Wires**

Designation	No Strands	Strand SWG <sup>1</sup>	Strand Diameter (mm)	Overall dia	Appro. Wt. Per meter (kg)	Minimum breaking load (kN)
7/8	7	8	4.04	12	0.72	90

Galvanised steel wire is available in a range of steel grades and only utilities grade wire, manufactured using a high tensile steel, should be used.

**5 GI Shielding Wire**

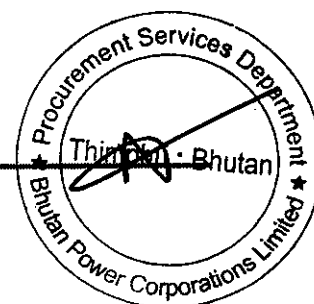
Shielding wire shall be made up of good quality material and all nuts, bolts, spring washers and flat washers and connectors shall also be hot dipped galvanized. The technical specification of earth shield wire shall be as below:

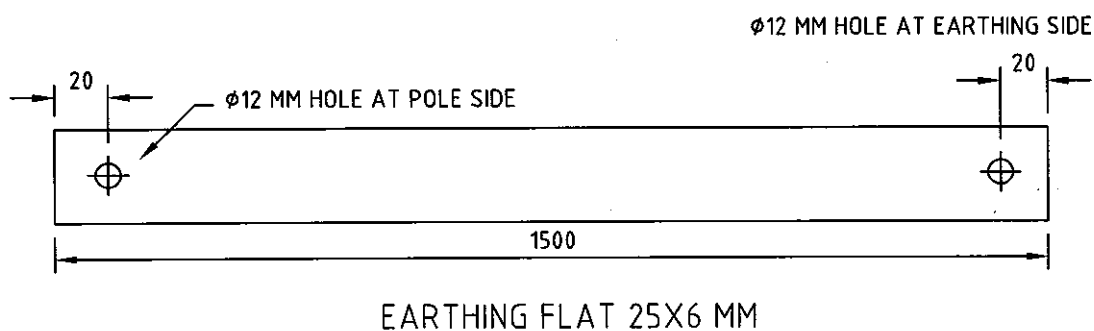
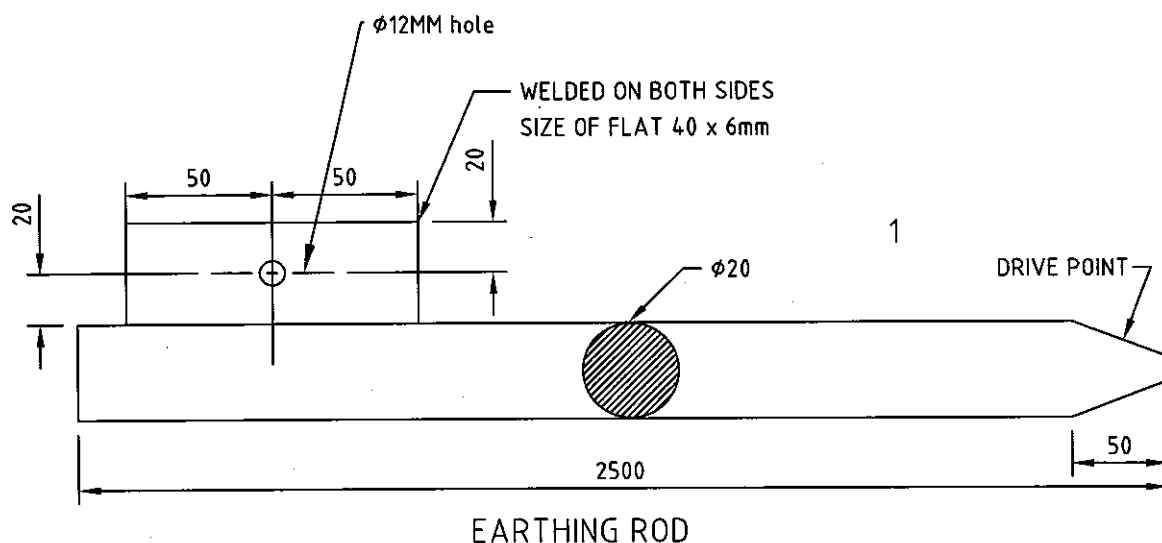
**Table 3: Specification of Shielding Wire**

Sl#	Parameters	
	Material	Galvanized stranded steel wire
	Strands	7/2.0 mm (SWG 7/14)
	Breaking Capacity	15.4 kN
	Tensile Strength	700 N/sq.mm
	Diameter of the wire	2 mm with +0.05 mm tolerance
	Standard length of shield wire /drum	2.5 km
	Approximate Weight	174.6 kg/km


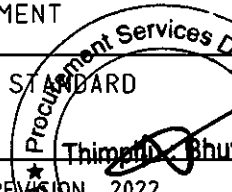
**6 Guard Wire**

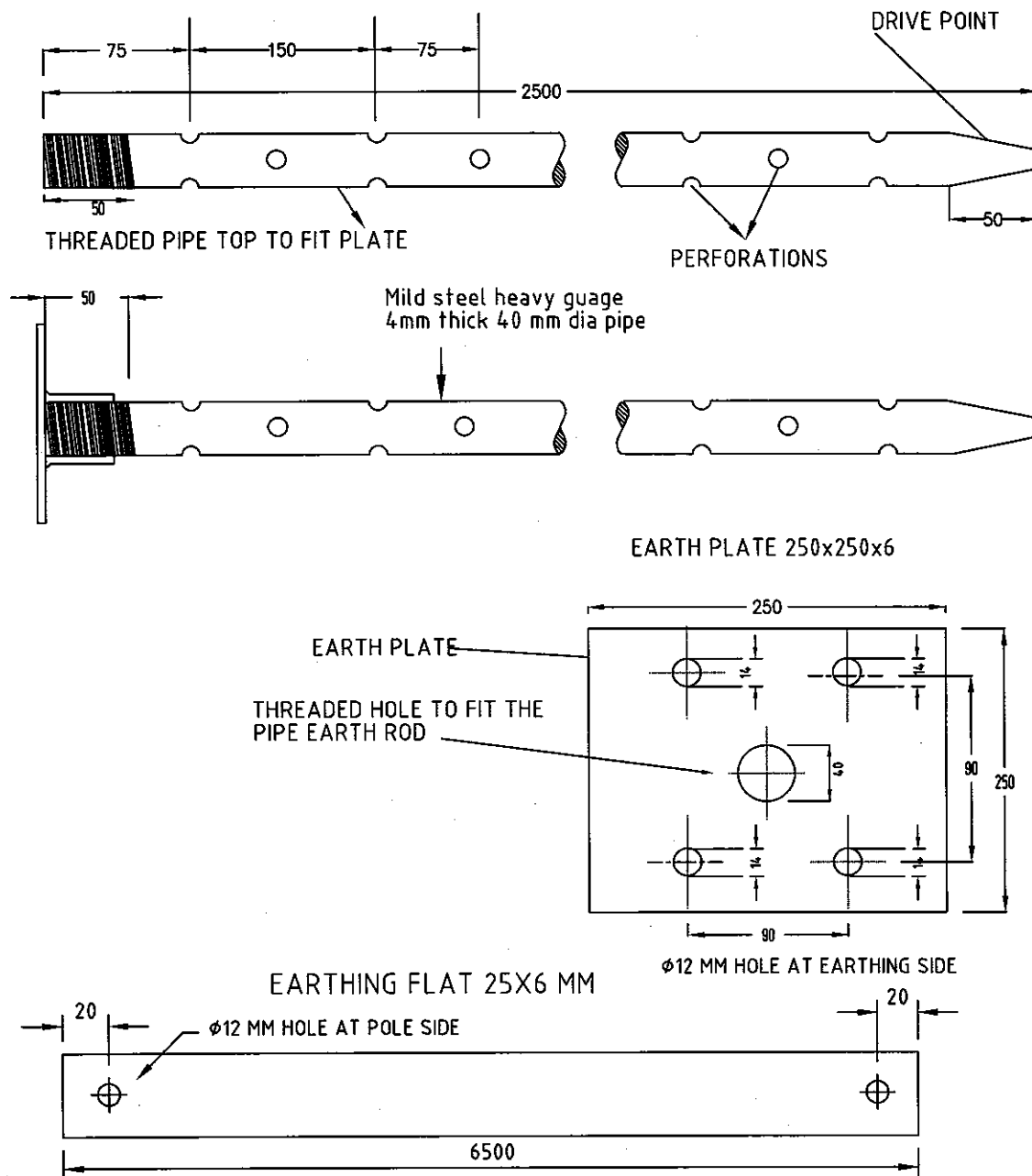
Guarding may be used for bare overhead conductor where power line crosses a street or road. Guard wires shall be of galvanized steel 8 SWG having breaking strength not less than 635.02 kg. Guard wires installed shall be earthed at all points.





GRADE OF STEEL: BS 4360 GRADE 43A OR EQUIVALENT  
 GALVANISED TO: BS 729 OR EQUIVALENT  
 PACKING: EARTING RODS, NUTS & BOLTS, FLATS  
 TO BE PACKED SEPARATELY

5	WASHER SPRING	4	HDG STEEL	M12
4	NUT HEX	4	HDG STEEL	M12
3	EARTHING FLAT 25X6MM	1	HDG STEEL	1.5Meter
2	BOLT HEX	4	HDG STEEL	M12 x 25 x FT
1	EARTHING ROD	1	HDG STEEL	M20 x 2500
ITEM	NAME OF ITEM	QTY	MATERIAL	SIZE
 BHUTAN POWER CORPORATION LIMITED	ENGINEERING AND RESEARCH DEPARTMENT			
	DISTRUBUTION DESIGN & CONSTRUCTION STANDARD			
	SPIKE EARTHING SET			
	DRAWING NO.BPC-DDCS-2022-21/1-2			
TITLE		NAME	DATE	
DESIGNED BY				
CHECKED BY				
APPROVED BY				
				REVISION 2022



GRADE OF STEEL: BS 1387 OR EQUIVALENT  
 GALVANISED TO: BS 729 OR EQUIVALENT  
 PACKING: EARTING ROD,LUGS, BOLTS & NUTS  
 PLATE PACKED SEPARATELY

EARTHING FLAT (6.5 METER)	11	H.D.G STEEL
FLANGED PLATE	1	H.D.G STEEL
SPRING WASHER	4	H.D.G STEEL
HEX NUT M06	4	H.D.G STEEL
HEX BOLT M06X25	4	H.D.G STEEL
EARTHING ROD	1	H.D.G STEEL
NAME OF THE ITEM	QTY	MATERIAL



BHUTAN POWER  
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ENGINEERING AND RESEARCH DEPARTMENT

DISTRIBUTION DESIGN & CONSTRUCTION STANDARD

PIPE EARTHING

TITLE	NAME	DATE
DESIGNED BY		
CHECKED BY		
APPROVED BY		

DRAWING NO. BPC-DDCS-2022-21/2-2

