CHAPTER – 7
EARTHING

1.0 GENERAL:
1.1 Earthing of each tower is to be done after the foundation has been casted.

1.2 The earthing connection which was fixed to the stub during concreting of the chimney and taken out horizontally below the ground level is used for earthing.

1.3 As given at para 8.6.1 of Chapter – 4 of this section, this earthing connection is generally provided on Leg 1 and additional earthing, if required, is provided on Leg 3 for pipe type earthing. For counterpoise earthing, the earthing connection is provided on all the four legs.

1.4 The installation of the earthing shall be done in accordance with IS : 5613 – 1989 (Part 3 / Section 2) for 400 kV lines or IS : 5613 – 1985 (Part 2 / Section 2) for 220 kV and 132 kV lines.

2.0 PIPE TYPE EARTHING:
2.1 The pipe type earthing is generally provided outside the base of the tower.

2.2 A typical example of pipe type of earthing is given in Appendix – A.

2.3 A hole of the required diameter and depth is augured in the earth for the earthing pipe.

2.4 The earthing pipe is then put inside the hole.

2.5 A mixture of coke and salt is filled in the hole in which the earthing pipe is provided.

2.6 The earthing strip which was fitted to the stub of the tower leg is then connected to the earthing pipe.

2.7 The Railway authorities specify that the size of the pipe used for earthing should be of 38 mm diameter. Therefore, for towers on both sides of the Railway crossing, 2 pipes connected together are to be used for earthing.

2.8 In case of difficult locations, the pipe may be laid horizontally or slanting and within the tower base or foundation pit.

3.0 COUNTERPOISE EARTHING:
3.1 Counterpoise earthing consists of four lengths of galvanized steel stranded wires, each fitted with a lug for connection to the tower leg at one end. Galvanized steel stranded wire of the size given below is used for this purpose.

a) For 400 kV lines : 7 / 3.66 mm
b) For 220 kV and 132 kV lines : 7 / 3.15 mm

3.2 The wires are connected to each of the legs and taken radially away from the tower and embedded horizontally below ground level. The depth of burial below ground level and the length of each wire are normally kept according to the values given in the table below. However, the length of each wire may be increased if the resistance requirements are not met.

<table>
<thead>
<tr>
<th>No.</th>
<th>Voltage Level of Line</th>
<th>Depth of Burial</th>
<th>Length of Each Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>400 kV</td>
<td>1000 mm</td>
<td>25 metres</td>
</tr>
<tr>
<td>2.</td>
<td>220 kV &amp; 132 kV</td>
<td>450 mm</td>
<td>15 metres</td>
</tr>
</tbody>
</table>
3.3 A typical example of counterpoise type earthing of tower is given in Appendix – B.

4.0 TOWER FOOTING RESISTANCE:

4.1 The tower footing resistance of all towers shall be measured in dry weather after their erection and before the stringing of earthwire. In no case the tower footing resistance shall exceed 10 ohms. In case the resistance exceeds this value, multiple pipe earthing or counterpoise earthing shall be adopted in accordance with the relevant procedure given above.

4.2 The additional earthing shall be done without interfering with the foundation concrete even though the earth strip / counterpoise lead remains exposed at the tower end.

4.3 The connections in such cases shall be made with the existing lattice member holes on the leg just above the chimney top.
TYPICAL EXAMPLE OF PIPE TYPE EARTHING

All dimensions in millimeters.
APPENDIX – B

7/3.15 mm or 7/3.66 mm GSS Earth wire

TERMINALS 6 mm THICK

COMPRESSED JOINT

7/3.15 mm or 7/3.66 mm GSS Earth wire

All dimensions in millimetres.

Typical example of counterpoise type of earthing of tower