Procedure for installation of GEE slabs (transformer station)

1. Determine the area available and soil resistivity (at 1 m depth) along the planned trench route. *[If the soil resistivity is less than 150 Ohm.m, 10 GEE slabs will provide an earthing resistance less than 10 ohms. Similarly, if the soil resistivities are in to order of 200 Ohm.m and 250 Ohm.m, 15 GEE slabs and 20 GEE slabs respectively will be required to achieve earthing resistances less than 10 Ohms.* ***Refer to Soil Resistivity measurement note at the end****.]*

2. Dig trench (0.70m - 0.75m deep and 0.5 m wide) along the planned route.

3. If the earthing site is too rocky/sandy or the area is too small to fit in the required quantity of GEE slabs (i.e. according to the site soil resistivity), spread a layer of salt (about 50 kgs) at the trench bottom to lower the soil resistivity.

4. Spread soft soil (7 to 8 inches thick) on top of the salt layer if salt is used. Otherwise spread the soft soil directly at the bottom of the trench. This soft soil (i.e. organic soil is preferred) should preferably be sieved to filter out rocks for best results.

5. Soak/wet the GEE slabs in water and lay the GEE slabs on top of the soft soil and bolt tightly the GEE slabs end to end. The two GI strip ends should be cleaned properly before bolting. In addition, it is recommended that all the joints are permanently welded.

6. All the GEE slab joint sections should be properly enclosed within cement mortar (this is to ensure that the joints do not deteriorate over time). Likewise, all bare conductors connecting to the GEE slabs should also be encased in cement mortar (Cement : Sand = 1 : 3).

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7. Now cover the GEE slabs with 7-8 inches of good soft soil (Organic soil preferred) and tamp down gently with feet (the soil should preferably be sieved to filter out rocks). Care should be taken to not damage the fresh cement mortar coverings.

8. Backfill the remaining space in the trench with the excavated soil (or with good soft soil if available).

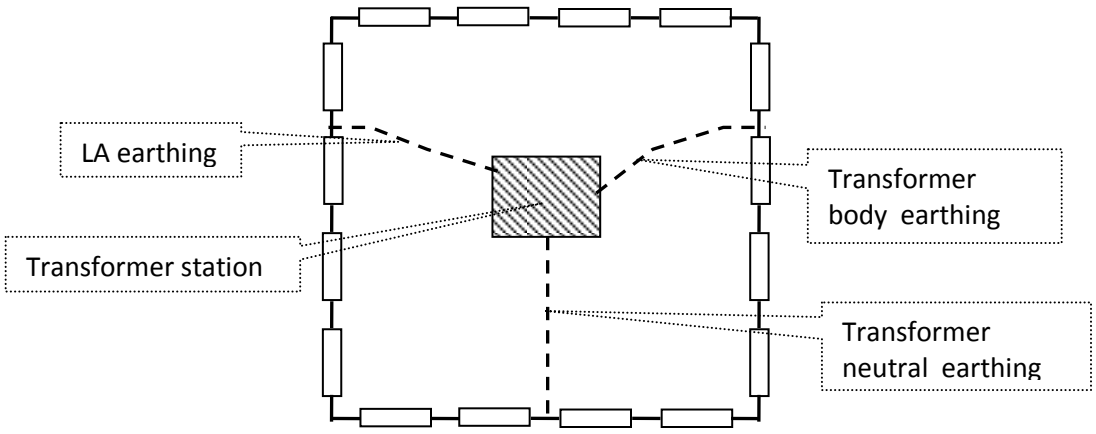
9. Pour water over the backfilled trench to expedite the soil compaction (this should be done the next day to avoid damage of the fresh cement mortar coverings).

Notes

(i) The earthing resistance will continue to drop as the soil slowly compacts firmly around the GEE slabs (this may take a few weeks).

(ii) The layout or orientation of GEE trench may be done in accordance to the shape of the installation plot and space availability. However, the GEE trench layout should cover the widest possible area for best results. GEE slabs installed in a straight line (where space is available) will provide best results.

(iii) For transformer station earthing, the three earthing conductors namely; (i) LA earthing conductor, (ii) transformer neutral (star point) earthing conductor, and (iii) transformer body/LV box earthing conductor, should be connected at different points on the chain of GEE slabs. Refer to illustrations below.



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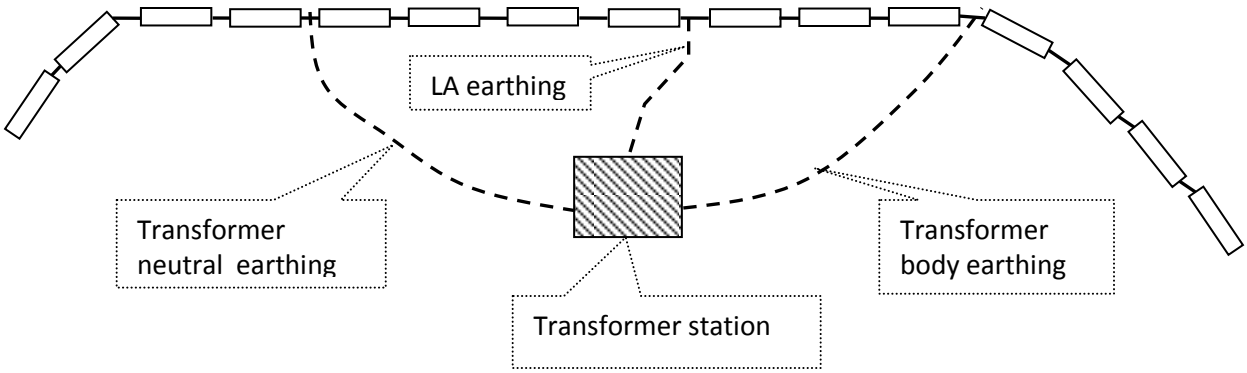

Important notes:

(1) With any earthing system, the earthing resistance mainly depends on the soil resistivity. The number of GEE slabs required to achieve a given earthing resistance primarily depends on the soil resistivity.

(2) Measuring the site soil resistivity takes some experience and knowledge since the soil is not homogenous. The measurement should be done along the planned route of GEE trench and the stake/spike spacing using Wenner method should not exceed 1m since we want to determine the soil resistivity at the buried depth of the GEE slabs. An example of soil resistivity measurement is shown below.

***Example**:*

Spike positions (spacing = D = 1m)	*1,2,3,4*	*2,3,4,5*	*3,4,5,6*	*4,5,6,7*	*5,6,7,8*	*6,7,8,9*	*7,8,9,10*	*8,9,10,11*	*9,10,11,12*
Measured resistance (R)	*30.1*	*28.3*	*31.0*	*26.4*	*23.8*	*32.5*	*25.1*	*21.8*	*23.2*
Average resistance (R) = ***26.9***									

Soil Resistivity (ρ) is calculated (Ω-m) = 2 x π x R x D

= 2 x 3.143 x 26.9 x 1

= 169 Ohm-m

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