

Gujarat Power Research & Development Cell

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Research project to design and develop of ideal earthing system of distribution transformer center for DISCOMs

Subject of the Research: Research project to design and develop of ideal earthing system of distribution transformer center for DISCOMs

Present System: For the DISCOM, transformer structure is a key inventory. The safety of the distribution system cannot be ensured without having proper transformer structure with good quality of earthing. Presently, there exists a difference of workmanship due to non-effective earthing practice in field. The existing earthing done on the transformer center is mostly having charcoal, salt type earthing which has limited effective life. The earthing connection to various metallic parts of the transformer center is given mostly through GI wire. These non-effective practice make the transformer center of DISCOMs the weakest link, where the safety hazards are more prone to take place. Presently GI wire of 10 SWG is used for earthing the neutral and transformer structure with a common earth pit. Most probably earthing to the LA is avoided. Also the connections from earth pit to the components of T/C are given without using Nut bolts which makes loose connections and causing poor earthing.

Limitations of present system: Presently, the earthing on the transformer is done by the conventional charcoal salt type earthing. The salt will cause erosion of the coil and in turn increase the resistance of the pit over the period of time. Also, the conventional earthing needs frequent watering at regular interval. Also, the theft of material utilization and workmanship while erecting the earth pit is the greatest concern. This issues will make the earthing of the system more worse. It in-turn imposes the challenges related to the safety of the livelihood.

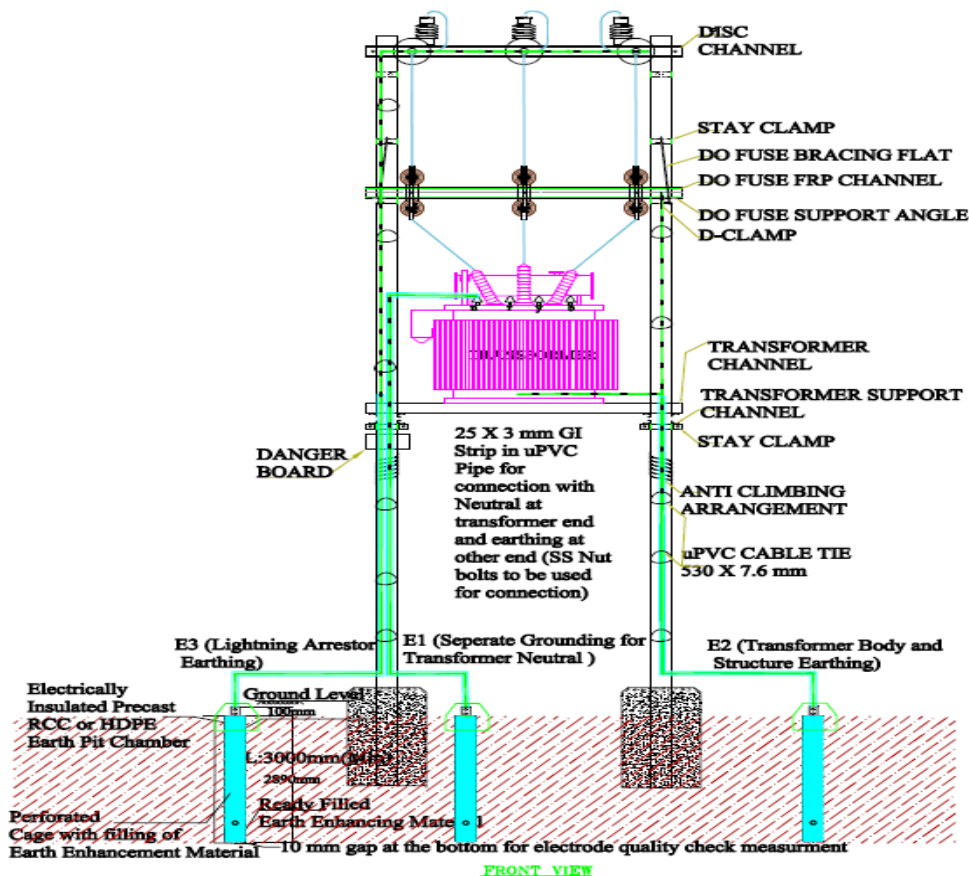
Detail report of Innovation: GPRD cell has designed an innovative Maintenance free, Ready capsule, Pipe-in-cage type earthing system which have following benefits compared to the conventional salt-charcoal type earthing system.

- In this type of Earthing Electrode, the electrode, the surrounding enhancing material bonding with electrode, and the cage are in pre-fabricated, ready to use form so that on-field mal-practice in form of less digging of earth pit, less Earth enhancement filling, improper watering at site, can be overcome. This makes the quality check very convenient;
- Due to pre-fabricated, ready to use methodology, no on-field wastage of Earth enhancement material is done;
- Installation procedure is effective, convenient, less time consuming and cheaper;
- Transportation and storing of material, compare to separate component (i.e. electrode, Earth Enhancement compound, etc.) on field is convenient, cheaper and too easy to do;
- We can check the continuity of electrode from both the end;

- Here back fill compound filled between perforated cage & Main electrode, so one can easily check quality of Back fill compound.

The key points for the ideal earthing system of distribution transformer center for DISCOMs are:

- Three separate Maintenance free, Ready capsule, Pipe-in-cage type earthings (earth pits) having 3 meter electrode are to be done near to the transformer center as shown in the sketch.
- These three separate earthings are for
 - (1) Neutral of the transformer;
 - (2) Earthing to the MS structures of the transformer center and
 - (3) Earthing to the Lightning Arresters of Transformer center.
- The connections from earth pit to the above component is very important. For long life and effective low resistance value, 25 mm x 3mm size GI strip covered with UPVC pipe is proposed with joints using GI nut bolts.
- The earth pits shall be covered with earthing chambers.



How this innovation does helps to overcome existing problem: Due to this type of earthing system, the reliability of the earthing system will greatly increase. Also, as the design is maintenance free, there will be no need to recharge the earthing at regular interval. Due to standardize inventory and good quality material, the safety of the installation can be improved and in turn the accidents can be reduced.