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## Improving Life and Reliability of **DISTRIBUTION TRANSFORMERS**

### Interview

"The quality of transformers being manufactured in India has improved, resulting into less failures"

- Mr Alok Agrawal, Vice Chairman,  
IEEMA DT Division

### Policy Matters

Energy conservation through  
new BEE Star Rating  
Distribution Transformers

### Innovations & Trends

Emerging trends in Transformer  
technology

### In Depth

Relationship between ATC losses  
and Transformer failures

### Special Report

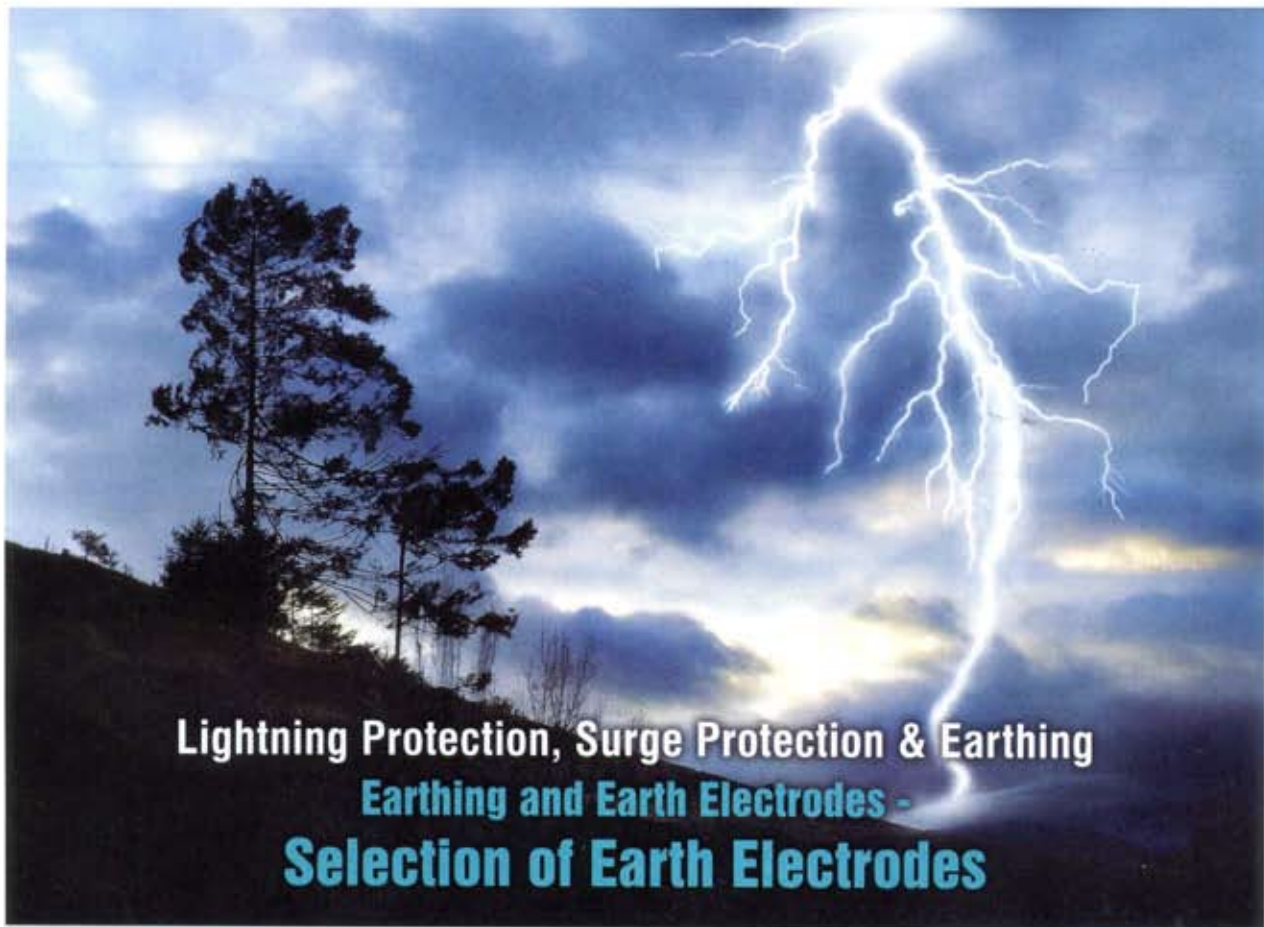
Discoms positive on steady  
progress of UDAY scheme

ANNOUNCING ELECRAMA-2018, 10-14 **MARCH 2018**



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## Lightning Protection, Surge Protection & Earthing Earthing and Earth Electrodes - Selection of Earth Electrodes

In electrical system earthing used is for protective and functional purpose. The earthing system of an electrical installation consist of an earth electrode, an earth conductor, an earth bar etc. Conductors and earth electrodes are designed and made in a way that in normal use, their performance is reliable, suitable for the protective requirements of the installation. It has to carry earth fault currents and protective conductor currents to earth without danger from thermal, thermo-mechanical and electromechanical stresses and electric shock arising from these currents. If relevant, is also suitable for functional requirements and the foreseeable external influences such as mechanical stresses and corrosion.

Earth Electrode plays a major role in an earthing system. In recent years, Indian market is crowded with earth electrode suppliers who claim to offer maintenance free very low earth resistance value irrespective of soil resistivity. They call these electrodes in different names such as Pipe-in Pipe, Rod-in-Pipe, Digital earth electrode, chemical earth electrode, gel earth electrode and several other attractive names. Most of these electrodes are made of a commercially available GI pipe filled

with so called magic substances inside the pipe. The claimed feature being an earth resistance value of about 1 ohm with the help of a magic compound filled inside the augured hole along with this special earth electrode. However there is no scientific or practical evidence for this baseless claim. In order to get confidence of user the common practice of these suppliers is to provide a short circuit current test report from a laboratory such as CPRI. Unfortunately this certificate does not mean anything about the reliability and performance of the electrode.

IEC 62561-2 as well as UL 467 are the only available international

standards which call for the quality and reliability of an earth electrode. Both these standards allow using different kind of electrodes which meet the mechanical, electrical and corrosion resistant behavior, tested to satisfy various requirements of these standards.

Copper, hot dip galvanized steel, copper coated steel and stainless steel materials are allowed with a condition that they shall be mechanically robust without cracks even during installation. Materials in the shape of solid round and solid flat, stranded, solid plate, lattice plate etc. can be used, with specific cross sectional area, each tested for its tensile strength and electrical



resistivity as per the standard. Steel rods coated with zinc / copper shall meet the requirements such as coating thickness, adhesiveness of the coating to ensure that coating do not peel off during installation and additional bending test for copper coated rods. The electrodes also shall carry proper marking about the specific requirements of the standard.

In order to ensure that the electrode does not corrode after installation in soil, the electrodes are tested for different environmental tests such as salt mist, humid sulphur atmosphere and ammonia atmosphere tests.

All the above complete tests only ensure that the electrode is able to provide its required performance. The complete tests need several weeks to complete.

UL 467 also specifies stringent quality checks for the earth electrode as well as the complete assemblies including clamps. Apart from mechanical, electrical and environmental tests, UL 467 also insists for short circuit current tests for the complete assembly of electrode and clamps. This is to ensure that the connecting parts are able to withstand the energy of the short circuit current. By listing the tested and approved rods, UL ensures the quality of the electrode by frequent inspection of UL engineers in the factory of the manufacturer.

These tested rods shall provide maximum life for a given installation. It does not ensure about the earth resistance value as the value depends mainly on soil resistivity at the place of installation. For getting a low constant resistance value, for a long period without the influence of climatic and moisture contents, several interconnected electrodes may be required depending upon the soil resistivity.

Solid Steel rods are generally used as earth electrodes which offer high tensile strength, due to which it can be driven directly in soil. Steel rods with electro deposited copper

coating offers maximum life too, almost equal to the life of copper. These cost effective rods offer good performance for a given installation over a long period.

### Conclusion

There is no science behind special earth electrodes offering resistance of 1 ohm irrespective of soil

resistivity. Earth resistance mainly depends upon the soil resistance. A good quality earth electrode shall offer maximum life with minimum corrosion. UL listed copper coated rods offers good quality & reliability over a long period. ■

**Mr S Gopa Kumar,**  
Managing Director of Cape Electric Pvt Ltd, Chennai.

