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## Maintenance Free, Eco-Friendly, Ready Capsule, Pipe-in-Cage Type Earthing



WE, THE GPRD CELL Gujarat Power Research & Development (GPRD) Cell is a research center established by the Government of Gujarat for Gujarat Urja Vikas Nigam Limited (GUVNL) and its subsidiary companies namely, GSECL, GETCO, DGVCL, MGVL, UGVCL and PGVL. GPRD Cell is working under Gujarat Urja Vikas Nigam Limited and is funded by the Government of Gujarat through GUVNL. GUVNL is a parent Company of GSECL, GETCO, DGVCL, MGVL, UGVCL, and PGVL. GSECL is looking after electricity generation, GETCO is looking after transmission of electricity, and DGVCL, MGVL, UGVCL and PGVL are electricity distribution companies looking after the distribution, operation and maintenance of electricity up to consumer level in Gujarat.

The success of the leading Companies depends on the strength of their efforts employed towards R&D. Such Companies spare and spent a huge amount of funds for R&D activities.



With this concept and considering the future requirement of the power, an independent R&D Cell, called the GPRD Cell has been established.

Looking to the requirement of quality earthing for the power distribution sector, the GPRD team has taken up the research project to develop the Technical Specifications for “Maintenance Free Pipe-In-Cage (PiC) Type, Ready Capsule Type Earthing System” for the distribution system.

### ABOUT ELECTRICAL EARTHING

There are so many definitions of Earthing. In most simple words, we may define Earthing as: The process of transferring the immediate discharge of the electrical energy directly to the earth by providing the low resistance path. The electrical earthing is done by connecting the noncurrent carrying part of the equipment or neutral of the supply system to the ground by providing a very low ohmic value of the earth resistance path.



### CURRENT SCENARIO

There are many practices followed by DISCOMs in earthing. The earthing is the most important and yet most underrated subject for DISCOMs. Most of them are following conventional salt-charcoal type earthing as an earth enhancement material. Some utilities have started using a maintenance-free or chemical type earthing system with either copper bonded rods or GI rods. The effectiveness of quality earthing is highly dependent on the quality of electrode and workmanship which varies too much. The earthing is needed in almost every asset of utility such as poles, transformers, cables, switchgears etc. The quantity of these earthings are so huge that, to monitor each and every earthing by utility staff is a great challenge to the utilities. Also, practically for the utility, it is very difficult to measure the resistance value of all the earthings at the regular interval of every year or so and take corrective action.

### LIMITATION OF PREVAILING PRACTISE FOLLOWED BY DISCOM IN EARTHING SALT-CHARCOAL TYPE EARTHING AND ITS LIMITATIONS

- CI Plate or GI Coil is used as a primary electrode and salt-charcoal mixture as an earth enhancement substance.
- During the installation, electrode, salt and charcoal are used separately, there may be a chance of theft of material and labor.
- Proper salt-charcoal laying methodology is not followed correctly. The alternate laying of sand, coal and salt deposition around the electrode is not followed correctly in the field.
- Insufficient watering at the time of installation due to non-availability of water at the site.
- The presence of salt creates a corrosive effect on GI wire and earthing plate.
- Salt dissolved in the land after few months and creates porosity.
- The quality of coal is not verified, burnt coal powder increases resistivity.
- Maintenance of low ohmic value in the dry season is not possible.

### MAINTENANCE-FREE CHEMICAL TYPE EARTHING AND ITS LIMITATIONS

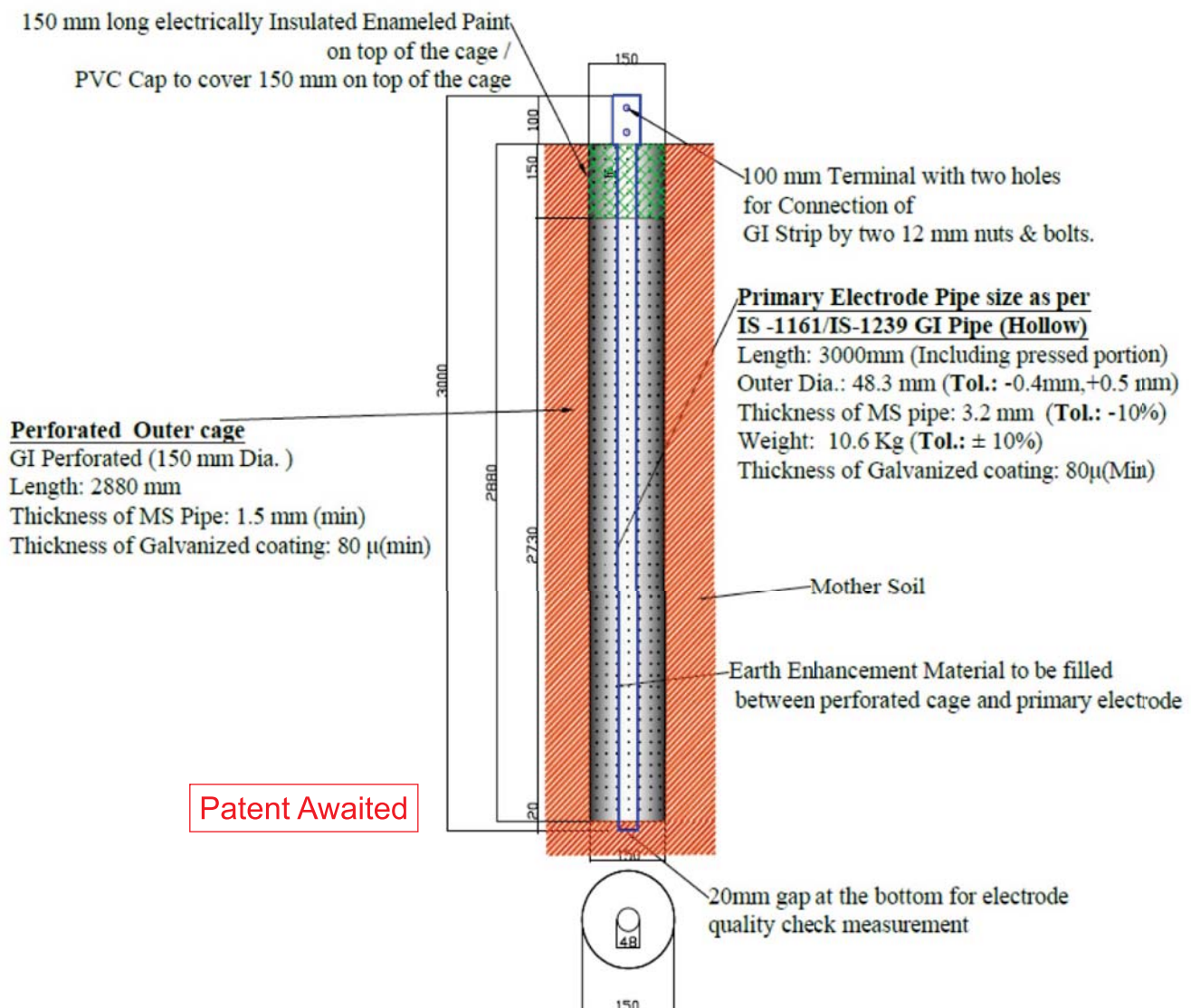
- Contractors generally provide the Earth Electrode and Earth Enhancement Material (EEM) separately for installation.

- The manufacturer does not specify the composition of their chemical and also the Earth Enhancement Material (EMM) is not inspected.
- In the DISCOMs, due to the difficulty of digging an earth pit of the required depth of 2 to 3 meters, they use Earthing Electrode of less length. Also use of poor quality and cheaper electrode and EEM, less use of EEM, and theft of labor work in absence of proper testing and supervision practice, resulting in poor quality of earthing and compromise with safety.
- To save material cost, transportation cost and labor cost, The contractor may carry less material especially less EEM and do insufficient watering and dumping during refilling of earthing pit.

### DELIVERING TOWARDS THE SITUATION BY INNOVATIVE EARTHING SYSTEM: MAINTENANCE FREE, READY CAPSULE PIPE IN CAGE (PIC)

GPRD Research team has worked out to enhance the soil conductivity by preparing different combinations of material by procuring and mixing the material in the IIT material lab. The characteristics of different combinations of Earth Enhancement Material (EEM) were studied in detail. After due research study and lab experiment, the GPRD Cell has developed the cost-effective superior conductive EEM.

In PiC type Earthing, the GI pipe is used as a primary electrode. The earth enhancement material is placed between the main electrode and the perforated hollow cage i.e. single unit and ready to use form.





## ESSENCE OF INNOVATIVE MAINTENANCE-FREE, READY CAPSULE PIPE IN CAGE (PIC)

### (1) MAINTENANCE-FREE

- Sodium Montmorillonite / Sodium Bentonite is added to absorb water and retains moisture of EEM. Because of the same, the design becomes maintenance free and there is no need to pour water at regular intervals.
- The greatest advantage of this maintenance-free earthing is that it maintains a fairly constant ohmic value despite seasonal changes and water conditions.
- As there is no presence of salt in the chemical composition of EEM, the corrosive effect and porosity effect occurs in the conventional earthing system is eliminated in this maintenance-free earthing.

### (2) READY CAPSULE

- Due to pre-fabricated, ready to use design, on-field wastage of Earth Enhancement Material (EEM) can be saved.
- Because of ready to use type, On-field mal-practice in form of less digging of earth pit, less earth enhancement filling, improper soil refilling, watering at the site, can be overcome.
- Due to the ready capsule design, the on-field inspection of the earthing erection can be minimized as all the quality check-related parameters can be verified at one go only. This makes the quality check very convenient.

### SOUNDLESS NATURES

- The installation procedure is effective, convenient, less time-consuming and cheaper.
- Transportation and storing of the single unit Electrode, compared to a separate component (i.e. Electrode, Earth Enhancement Compound, etc.) on the field is convenient, cheaper, and too easy to do.
- Perforated Cage with tiny holes allowed ingress of moisture from mother soil to make

the Earth Enhancement Material (EEM) wet and at the same time design also ensures that the material does not leach out of the PiC.

### CONCLUSION

As per current practice followed by various utilities, Earthing in most of the DISCOMs are found inefficient. The quantum of the earthing done in the subdivision is so large that, it is not possible to verify and correct earthing at each and every location. For safety concerns, DISCOMs are regularly giving turnkey based orders for the installation of Earthing. But many times, due to one or other reasons like the lack of supervision in regular practice, theft in material and labour, no measurement of earth resistance value etc., the effective earthing for long life, maintenance-free quality earthing is not achieved. This reflects in more nos of accident cases. Here, PiC type earthing is designed to overcome these limitations and it may serve the purpose of quality earthing and safety issues for DISCOMs. Being ready to use type PiC, theft of material, transportation and labour etc. can be almost avoided. Thus, it is very effective in resolving various on-going issues faced by utilities for providing effective earthing and yet be proved as cost-effective for long term.

### FIELD STUDY REPORT

More than 1000 different places of DISCOMs have been already installed, commissioned. All the installed PiCs are found working satisfactorily since long.

### PATENT & ADJUDGE

For the Maintenance Free, Eco-Friendly, Ready Capsule, Pipe-In-Cage (Pic) Type Earthing, this Cell has already registered an application for the Patent Right under IPA no. 201821047536.

The Research Paper regarding this newly developed "Maintenance Free, Eco-Friendly, Ready Capsule, Pipe-In-Cage (Pic) Type Earthing" was presented and published during the 12th National Conference of Earthing Systems at New Delhi during October 2019. ●●●

FOR MORE DETAILS, PLEASE CONTACT US WITHOUT HESITATION,  
WE ARE READY TO HEAR AND SERVE YOU AT:

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