

GUJARAT POWER RESEARCH & DEVELOPMENT CELL

GUJARAT URJA VIKAS NIGAM LTD

ABOUT US

Gujarat Power Research and 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 PGVCL

GPRD Cell is working under Gujarat Urja Vikas Nigam Limited and funded by the Government of Gujarat through GUVNL. GUVNL is a parent Company of GSECL, GETCO, DGVCL, MGVL, UGVCL and PGVCL. GSECL is looking after electricity generation, GETCO is looking after transmission of electricity and DGVCL, MGVL, UGVCL and PGVCL 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 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.

**MAINTENANCE FREE,
ECO-FRIENDLY,
READY CAPSULE,
PIPE-IN-CAGE
TYPE EARTHING**

**REGISTERED
APPLICATION FOR
THE PATENT**

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 non-current carrying part of the equipment or neutral of the supply system to the ground by providing a very low ohmic value of earth resistance path.



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.
- Proper salt- charcoal laying methodology is not followed correctly.
- 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.

CURRENT SCENARIO

There are many practices followed by DISCOMs in earthing. 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 roads or GI roads. 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.



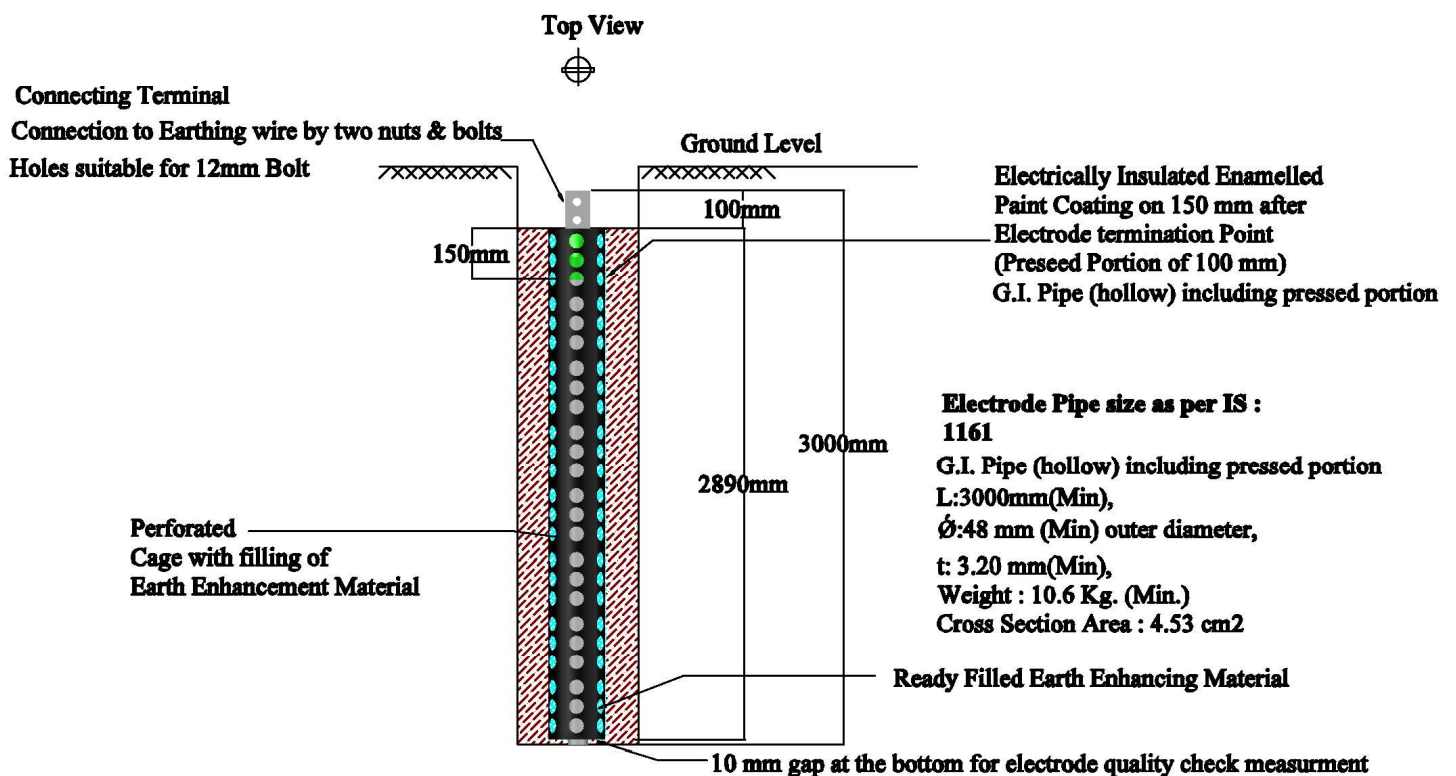
MAINTENANCE FREE CHEMICAL TYPE EARTHING AND ITS LIMITATIONS

- In the DISCOMs, there is a rare practice to inspect the material.
- Sometimes they use earthing electrode of less length.
- Theft of labor work in the absence of proper testing and supervision practice, resulting in the poor quality of earthing. The contractor uses less EEM to save the cost.

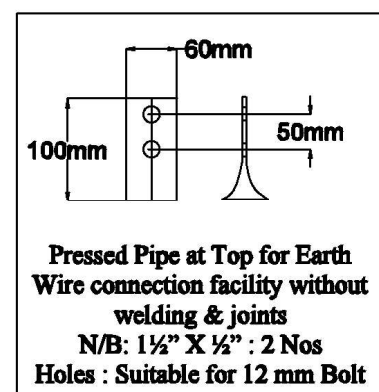
DELIVERING TOWARDS THE SITUATION BY EARTHING: MAINTENANCE FREE, READY CAPSULE PIPE IN CAGE (PIC)

GPRD Research team has worked out to enhance the soil conductivity by preparing different combinations of material by procuring and mixing the material under the guidance of IIT material lab persons. The characteristics of different combinations of Earth Enhancement Material (EEM) were studied in detail and accordingly developed cost effective superior conductive Earth Enhancement Material.

In PiC type Earthing, the pipe is as a primary electrode Bonded with earth enhancing material (EEM) is placed inside the perforated hollow cage i.e. single unit and ready to use form.



	MAIN ELECTRODE	PERFORATED Cage with Backfilling
DIA.	48mm	150mm
LENGTH	3000mm	2890mm



STRATEGIC ABILITY

MAINTENANCE FREE

- Sodium Montmorillonite / Sodium Bentonite added as a chemical absorbs water and retains moisture around the earth pit. No need to pour water at regular intervals.
- The greatest advantage of this maintenance-free earthing is that the ohmic value remains almost constant despite seasonal changes and water conditions.
- The corrosive effect and porosity effect occurs in the conventional earthing system is eliminated in this maintenance-free earthing.

READY CAPSULE

- Due to pre-fabricated, ready to use design, on-field wastage of Earth enhancement material 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



CONCLUSION

As per current practice followed by various utilities, Earthing in most of the DISCOMs are found inefficient. For safety concerns, DISCOMs are regularly giving 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 with specification as shown in the drawing 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 in this maintenance-free, ready capsule, Pipe-in-Cage type (PiC) type of earthing, 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.

soil refilling, watering at the site, can be overcome. 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.
- Quality check of material and whole design parameters according to standard is much easy. Here backfill compound filled between perforated cage & main electrode, so one can easily check the quality of Backfill compound in factory inspection test with soil box.
- Perforated Cage with small holes allowed ingress of moisture from mother soil to make the material wet some. All quality check related parameters can be checked at one go – Factory inspection. So, there is less need for on-field inspection for the utility.

FIELD STUDY REPORT

A total of 80 different places of DISCOMs have been already installed, commissioned and successfully being monitored through a responsive platform. All the PiCs having found working satisfactorily since more than two years.

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.



PATENT DETAIL

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

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



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