

Distribution Earthing Manual FAQ

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1 What is this manual about?

The Distribution Earthing Manual sets out earthing philosophy and general guidelines for Energex's distribution network.

Note: It is not intended to be used as a replacement for the various construction manuals for earthing.

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2 Why is the manual created?

Previously Energex's earthing requirements were detailed in the Energex Supply and Planning Manual RED 00295. While RED 00295 is now available on the Energex web site, it was decided that the earthing information warranted a separate document and so the information was expanded, clarified and summarized, and is issued as a separate document.

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3 Have there been any changes to the way we do earthing?

Generally, the requirements of distribution earthing are largely the same.

A brief summary:

CMEN – The preferred option. Bonding of earths to CMEN where ever possible. The Minimum requirements for CMEN are as follows:

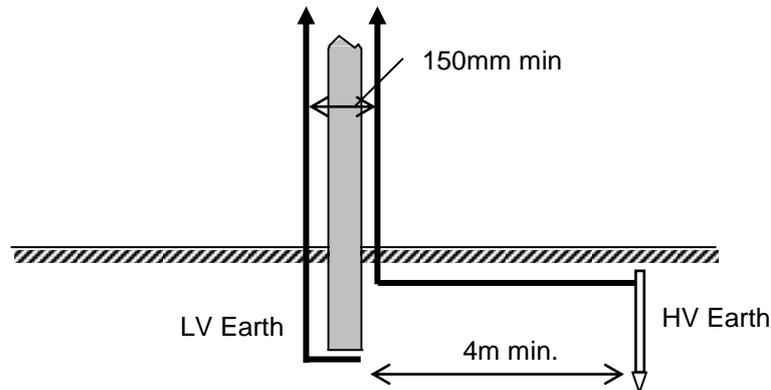
- A minimum of 3 transformers with LV neutral interconnected.
- Resistance from neutral to earth should be $< 1 \Omega$ connected.
- Local earth $< 30 \Omega$ disconnected for pole mounted plant.
- Local earth $< 10 \Omega$ disconnected for ground mounted plant.

Separately Earthed – Where CMEN is not possible, the HV and LV must be separately earthed. The general requirements are:

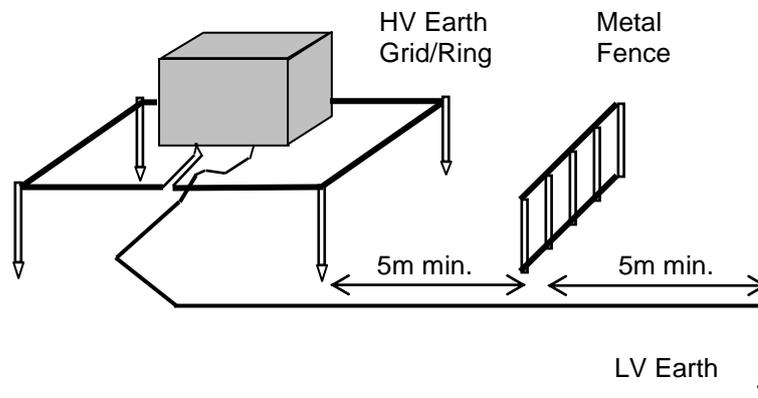
- LV $< 10 \Omega$ to area MEN (except for special cases).
- HV $< 30 \Omega$ for pole mounted plant.
- HV $< 10 \Omega$ for ground mounted plant.
- LV downloads must be PVC insulated and installed in conduit (double insulated).
- Metallic cable guards connected to LV earth.

In addition, the following clearances must be observed:

- 150mm minimum separation between HV & LV downleads
- 4m minimum horizontal separation between LV earth and HV earth electrodes for pole mounted plant.



- 5m minimum horizontal clearance (measured from the edge of the plinth) to be maintained free from metallic objects, buildings, and structures – including foundations, for ground mounted plant.



A few notable additions to the manual are:

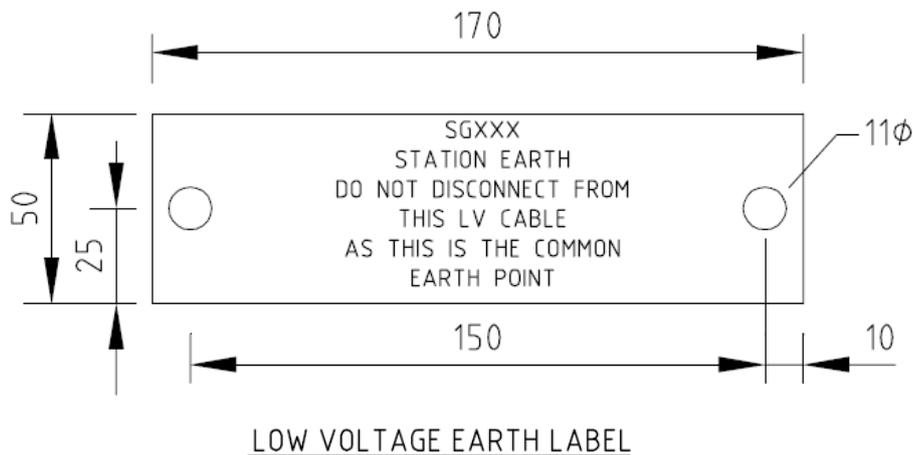
- Requirements for upgrading CMEN on existing substation without neutral or earth tie to other substations (see clause 7.4).
- Increased the lead size for indoor substations with remote earths to 120mm² (clause 7.7)
- Expanded on special locations and situations where a risk assessment in accordance with AS/NZS 7000 / EGO is required (clause 3.5).
- Added Appendices summary for earthing installation target values and telecommunications clearances.

A full list of updates is provided in Appendix 3 of the Manual.

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- 4 A new padmount transformer has been installed with the CMEN earthing arrangement, but without an earth tie interconnection to another transformer in the area. The conduits and the pits in between the two transformers have already been installed. Would it be acceptable to install an earth cable through the existing conduits?**

Yes it is acceptable. A 70mm² bare earth cable earthed at 100m intervals (if permissible) is required to connect back to other transformers in the area where the CMEN system of earthing is used. Where earthing at 100m interval is not possible, longer runs are permissible so long as the standard CMEN requirement can be met: i.e. the connected earth resistance is not to exceed 1 ohm and disconnected local earths are not to exceed 10 ohms. LV earth label should also be installed at bond ends as according to Network Labelling & Signage Manual RED 00297, drawing 7784-A4 B (shown below).



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- 5 A 500kVA padmount transformer is to be installed. To meet the common earthing requirement, a 70mm earth wire approximately 400m to the nearest LV network is to be installed. In the earthing manual, the direction is to install earth rods every 100m. There is a 200m section which is to be directionally drilled, with no possibility to install an earth rod in this section. Is there an issue with this? Do we need to install more earth rods in the trenched section to compensate?**

Where it is not possible for earth rods to be installed, and additional earth rods are required to lower earth resistances to prescribed levels, earth rods are to be installed where possible after the exit of the underbore.

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6 How are the steel crossarms bonded to earth?

For new constructions on wooden poles, steel crossarms should not be bonded to earth. The primary reason for this configuration is to prevent outages caused by wildlife bridging phase conductors to the earthed steelwork.

On conductive concrete poles, steel crossarms will be bonded or inherently earthed to the reinforcement of the pole. No further bonding of the crossarm to the pole is necessary.

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7 What should we do when a timber pole has OPGW / OHEW with 33kV and 11kV terminations on the same pole, and there is no LV or CMEN in the area?

33kV OHEW/OPGW downleads should not be connected to earth at this pole and instead bonded at the next available pole.

The 11KV and 33kV earth down-leads shall be PVC insulated (or similar) and separated by a minimum of 150mm on the pole. Earth electrodes between the HV and shall be separated by a minimum of 4m.

Metallic cable guards over HV cables shall be separately earthed from any other HV earthing with a disconnect resistance of $< 30 \Omega$ ($< 10 \Omega$ if permissible). The HV earth downleads must be kept well separated from the metallic cable guard (i.e. not pinched under the guard).

HV cables under metallic cable guard shall be insulated to prevent the cable guard from becoming live:

- For XLPE, the polyethylene outer sheath provides the insulation.
- For old jute covered cables, split PVC conduit shall be installed around the cable to provide the insulation.

Note: HV surge arrester and HV cable sheath **MUST NOT** be connected to metallic cable guard at separately earthed sites.

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8 What is the earthing policy when supplying Queensland Rail with LV?

In general, no interconnection between the two earthing systems is permitted. Energex's MEN must be isolated from QR HV track rail earthing system with the use of a suitable isolation transformer. Queensland Rail is responsible for ensuring that such interconnection is not made (either directly, or indirectly, e.g. electrical bonds, fences, water pipes or metal works, etc.).

In special situation where two earthing systems cannot be separated, QR **MUST** consult Energex on a site-by-site basis – contact the [Engineering Standards and Grid Modernisation](#) Group with any non-standard earthing arrangements.

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9 What is the earthing policy when supplying Powerlink with LV?

In general, no interconnection between the two earthing systems is permitted. Energex's MEN must be isolated from all Powerlink transmission earthing systems. It is especially important that no neutral interconnection is made to transformers within Powerlink transmission substations.

In special situation where two earthing systems cannot be separated, Powerlink **MUST** consult Energex on a site-by-site basis – contact the [Engineering Standards and Grid Modernisation](#) Group with any non-standard earthing arrangements.

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10 Requirements for a customer's main earthing conductor to be connected from customer's main switchboard to Energex's substation earth?

In general, customers' earth conductors are not connected back to Energex's substation earth, as customers are responsible for the earthing of their premises to AS/NZS 3000.

However, in certain situations, customers may, at the discretion of Energex, request to have their main switchboard connected back to the Energex's Substation earth. This may be acceptable where it is impossible for the customers to achieve effective earthing with other means, and when the two earthing system cannot be effectively isolated. e.g. in a Chamber substation where the substation earth is at the basement of a high rise building, and where customer switchboard shares the same reinforced concrete slab as the substation.

The earthing conductor is to be chosen according to the requirements in Section 5 of AS3000, and tagged at both ends with "Consumer Earth" Tags (SC6424), with a MEN connection at the customer main switchboard.



Where approved the Customers Main Earthing conductor must be:

- Sized in accordance with AS/NZS 3000 and
- Tagged where it connects to the Energex earthing system and at the customers main switch board with "Consumer Earth" Tags (SC6424)

Permission shall be granted on a case by case situation and the contractor must apply early to their local hub contacts to ensure the connection can be made in a safe and economical manner.

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