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ELECTRICITE DU CAMBODGE

TECHNICAL RULE

EDC-TR-005

EARTHING CONNECTION of UGC and ABC MV CABLE'S METALLIC SCREEN

July 2021

ELECTRICITE DU CAMBODGE

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1.0	January, 2022	Earthing Connection of UGC and ABC MV Cable's Metallic Screen	Dr. Praing Chulasa

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Content

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1 Scope of application

This technical rule defines and clarify the location of earthing of MV distribution cables metallic screens either for underground cables and aerial bundled cables as well as any underwater cable. It does not concern MV cable link between power transformer and MV switchboard of HV/MV substations.

2 Length of cables

In order to limit the inductive currents in the cable screen to acceptable values, the length of one section of cable (UGC and ABC) is **strictly limited to 3 km maximum**. In case of longer cable section and in order to split this long section in 2 (or more) sections of less than 3km and it will be installed as follow:

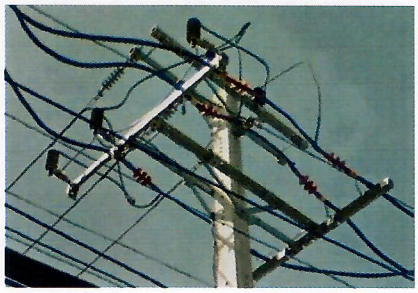
2.1 ABC

One pole mounted load break switch (LBS fitted with specific bushings for separable connectors are available on the world market as option) or one span of bare/covered conductors with a set of cable terminations at both ends.

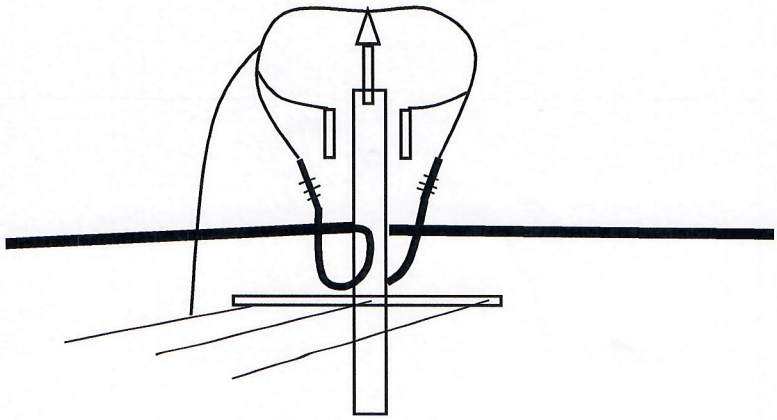
It is requested that the **outdoor terminations on ABC/UGC must be installed in approximately vertical** position as far as possible, keeping some "spare" cable in case one termination flashover and need to be replaced.

Nearly **horizontal position of outdoor termination is strictly forbidden** because during dry season dust can stay on the termination and drastically reduce the creepage distance between live parts and cable screen.

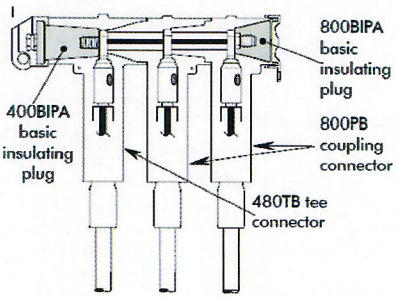
Such installations bellow is **strictly forbidden**:

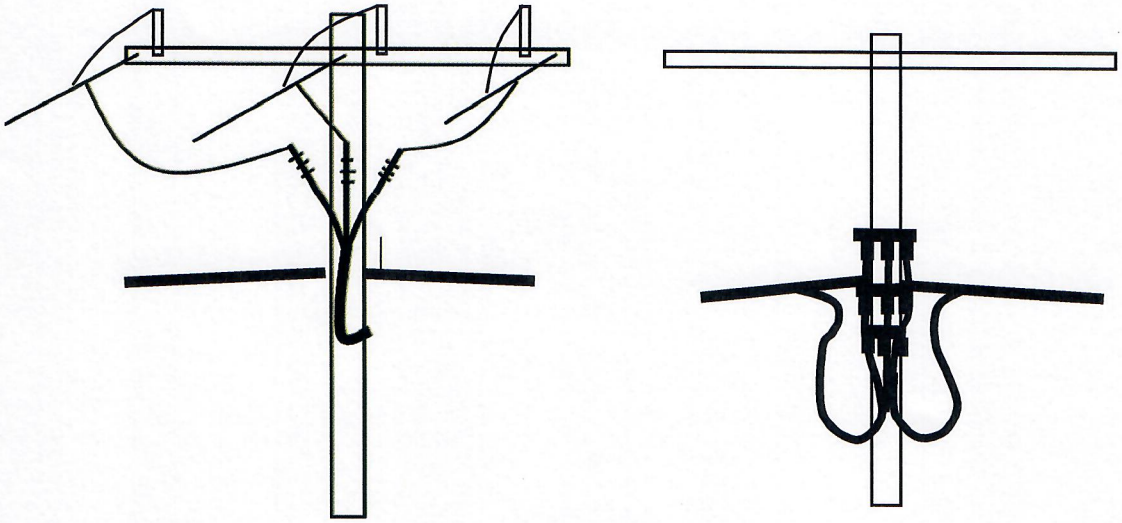


Such installation is the location of future faults. It is largely better to do as follow:



Other solution is to use 3-way connection using separable connectors.





or better: install a 1, 2 or 3 way compact RMU inside a cabinet at the base of the pole. That solution allows switching of tap only or tap and main cable in case of fault.
Other technical solutions and designs should be studied.

2.2 UGC

One RMU (Switch function) inside a RMU cabinet or a MV/LV substation including one RMU.

It is to be mentioned that this maximum length of 3 km is largely enough to solve the problem of too many OHL feeders around a HV/MV substation: it is strongly recommended to install UGC at the origin of all MV feeders around HV/MV substation in order to avoid the overcrowding of OHL along road near those power stations. In that case, the section of UGC will be connected to the substation circuit breaker on one end and to OHL using outdoor terminations in the other end.

2.3 Under water cables

For under water cables (under river and undersea), the length is not limited due the way of cable under water installation and the big cross section of screens + armour and because the three screens are connected together as the cable is a 3 core cable under a same envelop.

3 Rules for cable screen connection to the earth

The general rule is to connect the cable screens at EACH end of the cable.

This connection to the earth is to be done at each separable connector or indoor/outdoor cable termination.

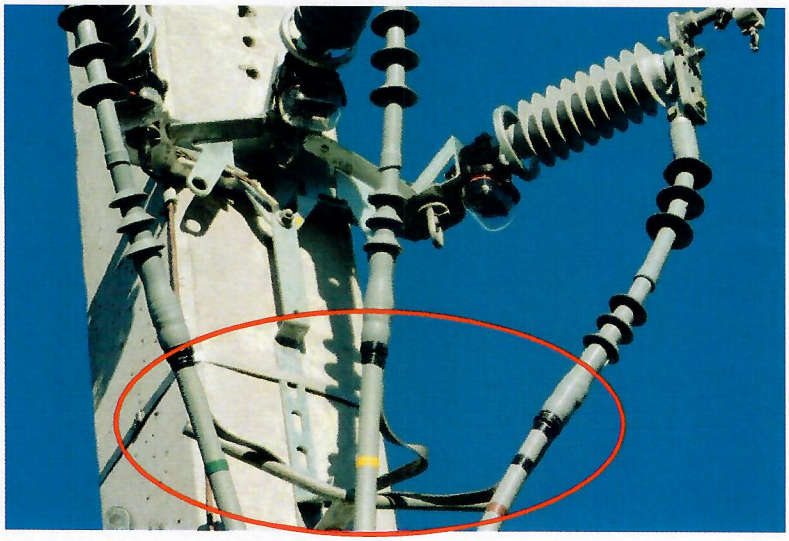
For cable section of less than 10 meter length: Case of cable ling between RMU and transformer inside a MV/LV substation the screens must be connected to mass circuit on both sides. connection on both side is **recommended** as well as the respect MV/LV substation circuit defined by the chapter 2.3 of policy: EDC-TP-002 EARTHINGS for MV and LV distribution networks.

Concerning One Pillar Substation (OPS) that are often powered from a RMU installed inside a RMU cabinet connected to an existing UGC, the screens of the cable shall be connected to earth on the both side and taking care of the mass earthing values of RMU cabinet and OPS that must be in accordance with the requirements of EDC-TP-002 EARTHINGS for MV and LV distribution networks that is 10Ω.

3.1 Outdoor terminations

The earthing of screens is done using the earthing tinned copper braid that is connected to the metallic screen (often with constant force spring).

This connection is done on the cross arm or the support supporting the termination. This cross arm is also connected to the earthing circuit.



Use of outdoor terminations without earthing braid or without connecting this braid to the earth is strictly forbidden.

3.2 Indoor terminations

Similarly, to outdoor terminations, the earthing of screens is done using the earthing tinned copper braid that is connected to the metallic screen. The opposite end of the earthing braid is connected to the bolt (s) foreseen for this inside the cubicle.

Use of indoor terminations without earthing braid or without connecting this braid to the earth is strictly forbidden.

3.3 Separable connectors

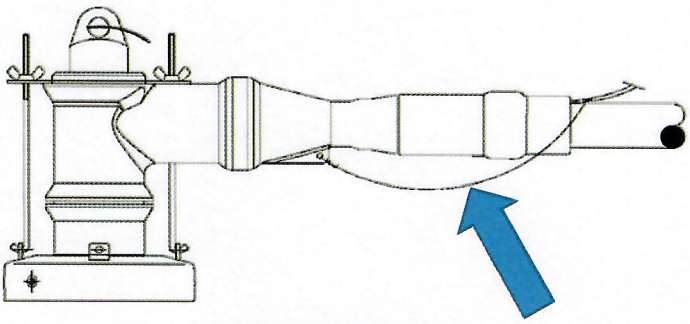
As for terminations, separable connectors include an earthing braid connected to the screen of the cable.

This braid is connected to the specific bolt or terminal on the RMU.

In case of separable connector used for powering a transformer, the braid is to be connected on the

Earthing circuit of the substation by installing a 35mm² copper conductor on the transformer tank.

It is also of the upmost importance to connect the outer layer of the separable connector to the earthing braid thanks the small wire supplied.



Example on transformer

Use of separable connectors without earthing braid or without connecting this braid to the earth is strictly forbidden.

3.4 Straight joints

The cable metallic screens at straight joint location are not cross bounded and not connected to the earth. **Only the metallic screens continuity is ensured by straight joint design** and proper implementation.