Eskom	Standard	Technology

Title: **STANDARD FOR EARTHING OF SECONDARY PLANT EQUIPMENT IN SUBSTATIONS**

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Content

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1. Introduction

This document serves as a Standard detailing the Earthing Requirements for all Secondary Plant Equipment installed within the Eskom Substation environment.

2. Supporting clauses

2.1 Scope

This document covers and is limited to the Earthing requirements for Secondary Plant Equipment installed in Substations within Eskom Holdings Limited Divisions.

2.1.1 Purpose

This document ensures that safety and quality standards are met.

2.1.2 Applicability

This document shall apply throughout Engineering within Eskom Holdings Limited Divisions.

2.2 Normative/informative references

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] ISO 9001 Quality Management Systems.

[2] 32-9: Definition of Eskom documents.

[3] 32-644: Eskom documentation management standard.

2.2.2 Informative

None

2.3 Definitions

2.3.1 General

None

2.3.2 Disclosure classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Abbreviation	Description
ESD	Electrostatic Discharge Point
I/O	Input & Output Cards
IDF	Intermediate Distribution Frame
IED	Intelligent Electronic Device
IST	Integrators of System Technology

Abbreviation	Description
OEM	Original Equipment Manufacturer
PEC	Parallel Earthing Conductor
PSU	Power Supply Unit
RTU	Remote Terminal Unit

2.5 Roles and responsibilities

As the area of applicability is Engineering, it is the responsibility of all personnel falling under this division to enforce this standard.

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2.6 Process for monitoring

All equipment covered by this standard shall be inspected and tested before being installed. All equipment covered in this standard shall be designed and manufactured in accordance with the requirements stipulated in the ISO 9001 Quality Management System.

2.7 Related/supporting documents

Not applicable.

3. Earthing Requirements

3.1 Secondary Plant Earthing Practice in Substations

Equipment from the OEM is delivered on site with all modules bonded to the cabinet earth. It is very important to make sure the Protection Panel Equipment including manufacturer's cabinet(s) is earthed to the cable trench earth bar running in the cable trench inside the control building (refer to Substation design guide SLDG-13-3/0**).** The cable trench earth bar must also be connected to the substation station earth.

Earthing is required for reasons of personnel safety and therefore all electronic equipment (other than portable equipment with self-contained power sources) shall be earthed. The following rules shall apply:

- All metalwork associated with the structure shall be provided with adequate means for bonding to earth in accordance with the requirements of ESI Standard 50-18.
- Reliance shall not be placed upon the metalwork as an earth return. Earth conductors shall also be used.
- The size of the earthing conductors shall be such that with the maximum possible value of fault current, no damaging temperature rises occur before the protective device operates.
- Earthing conductors and structural metalwork shall not carry any currents other than fault or interference currents.
- Each panel shall be provided with a 40 mm x 3 mm copper earth bar and one earth connection terminal suitable for a 120 mm² stranded or a 12 mm diameter solid copper earth strap.
- All metal components of the panel, doors, control devices and all relay frames shall be effectively connected to this earth bar by means of green 2.5 mm² PVC insulated earthing conductors.
- Where specified, a separate earthing conductor shall be provided for static relays. All earth connections shall be as short as possible and shall not be coiled. Eskom will connect this earth bar to the station earth.
- The arrangement and detail of the above earth bar and connection terminal shall be to Eskom's approval.

3.2 Cabinet and Enclosure Earthing

There are two types of enclosures (also called cabinets) and these are Fixed Frame and Swing Frame enclosures. The enclosures come in different sizes, namely 600X600X2400mm or 800X600X2400mm.

Opening the Fixed or swing Frame, there are two pieces of gland plates at the bottom of the enclosure. Each gland plate piece has two screws. There are two doors, which are front and back doors. At each corner of the enclosure is the 19" rack mount for subracks. There are four of these 19" rack mounts inside the Fixed Frame enclosure. The following procedure regarding the earthing of the Fixed Frame enclosures applies to all different sizes of Fixed Frame enclosures.

3.2.1 Cabinet Gland Plate and Earth Bars

- Provide a Non-painted, conductive gland plate at the bottom of the cabinet connected at several points to the enclosure itself. Ensure a high quality, durable metal-to-metal contact with the cabinet (see figure 1).
- Provide an earth bar at the bottom of the cabinet. A DIN rail is recommended to accommodate most surge suppression devices. Provide an additional vertical running bar for cabinets taller than 1 metre (see figure 1).
- The arrangement highlighted in figure 1 below is mirrored for cables entering from the top of the enclosure.

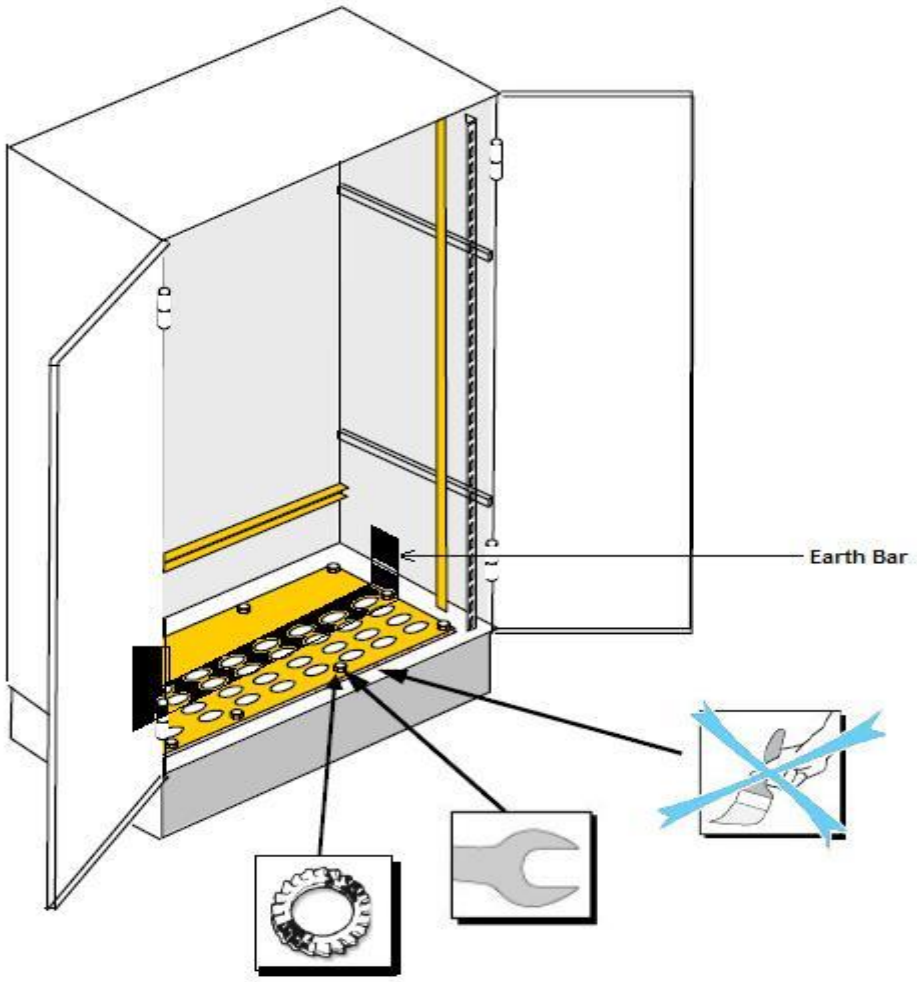


Figure 1: Represents the cable gland plate and Earthing bars

3.2.2 Cabinet Earthing Detail

Cabinets and enclosures provides an effective interference barrier for conducted and radiated interference. The following salient points are applicable to control room cabinets:

- Gland Plates must be provided at cable entry points for shield earthing purposes. Gland plates must not be painted – plated mild steel (yellow passivated, zinc chromated) is specified.
- 19 inch equipment mounting brackets must also be plated. These brackets and the earth bar needs to be connected to the gland plates using short braided copper straps.
- All cables entering the cabinet must have shields effectively earthed to the gland plate, in order to divert common mode currents away from the cabinet's interior.
- Cables entering the cabinet should remain in close proximity to the cabinets earthing conductor, to minimize the creation of induction loops.

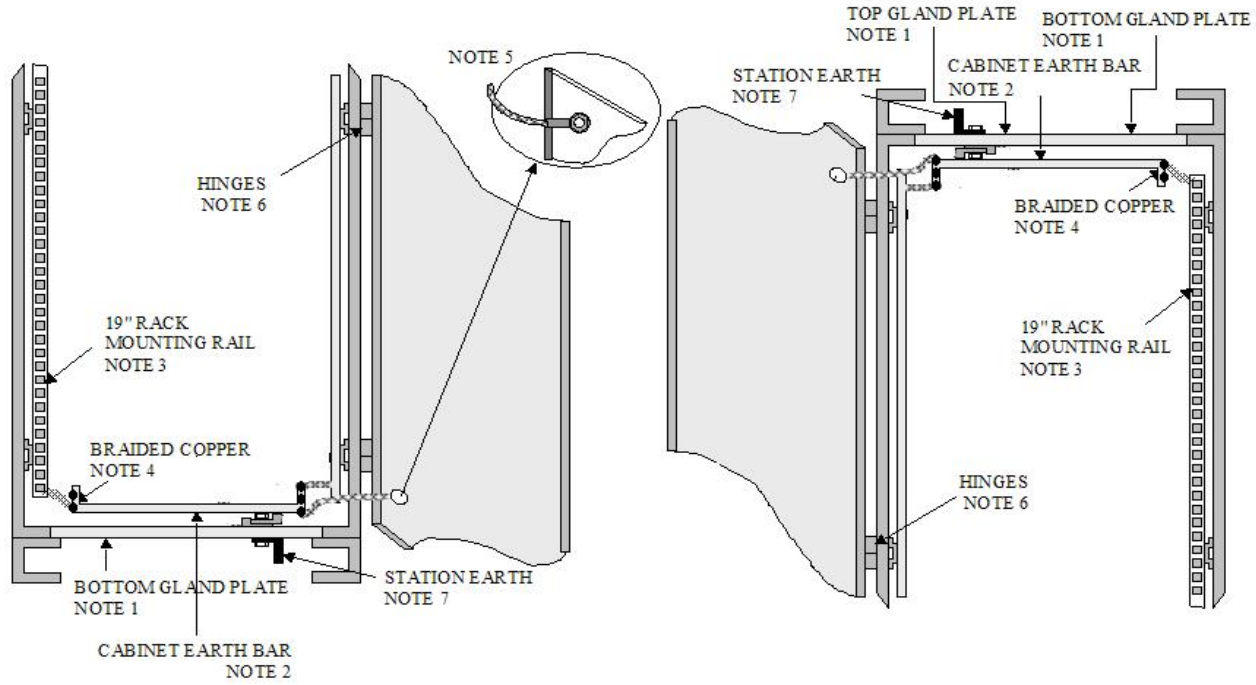


Figure 2: Represents the Earthing Detail of Equipment Cabinets

Note 1: The top and bottom gland plates are mild steel, yellow passivated, zinc chromated.

Note 2: The cabinet earth bar is bolted to the cabinet and is metallically bonded to the cabinet and is connected to the gland plate using copper braid (see note 5).

Note 3: The 19" rack mounting rail is also yellow passivated, zinc chromated and is earthed using copper braid (see note 5). Right hand rail not shown for clarity.

Note 4: The cabinet door is bonded to the gland plate (see note 5).

Note 5: The braided copper must be as short as possible.

Note 6: The doors are fitted with lift off door hinges to facilitate easy removal of the door whilst installing equipment in the cabinet.

Note 7: Station earth connection can be 25 mm x 3 mm flat copper bar or 10 mm diameter solid round conductor. A copper lug must be brazed

3.2.3 Bonding of Cabinets Metallic Components

- The cabinet must consist of metal doors with braided bonding straps for electrical connection of the doors to the cabinet.
- Hinged frames must be bonded to the cabinet in the same way as metal doors (see figure 2).

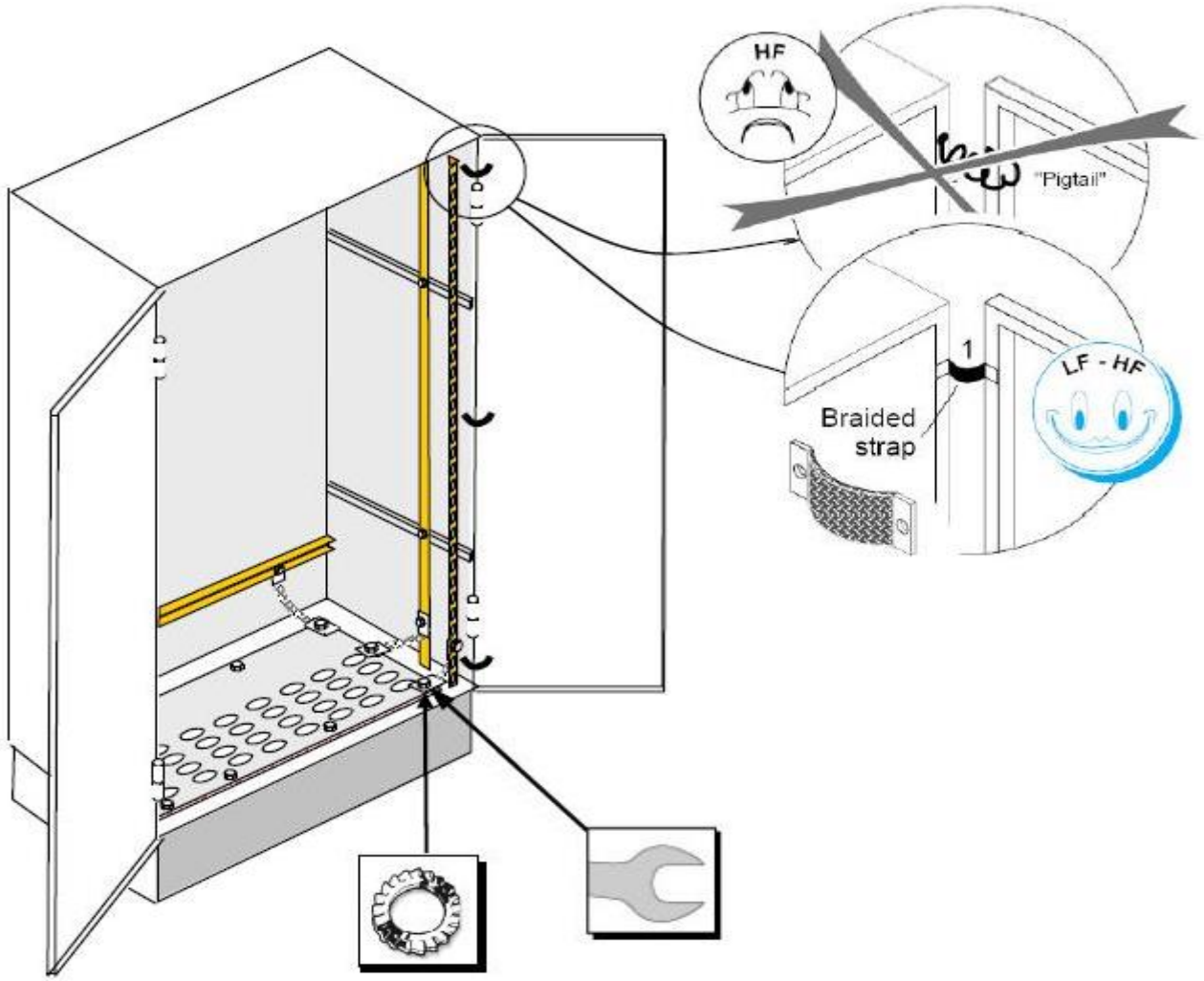


Figure 3: Represents the bonding of the Cabinets Metallic Components

3.2.4 Connections to the Trench and Tray Earth Conductor

- Each Cabinet's earth bar must be bonded (braised/welded) externally to the trench or tray earth conductor with a 25mm wide copper strap or braid or round bar with at least a 75mm2 cross sectional area. If the distance from the panel to the trench earth exceeds 5 meters then two parallel straps separated by the width of the cabinet must be used (figure 4).
- In existing installations employing separate earths, the earth bars have to remain isolated from the cabinet frame using stand-off isolators, and connected only to the electronic earth (EE).

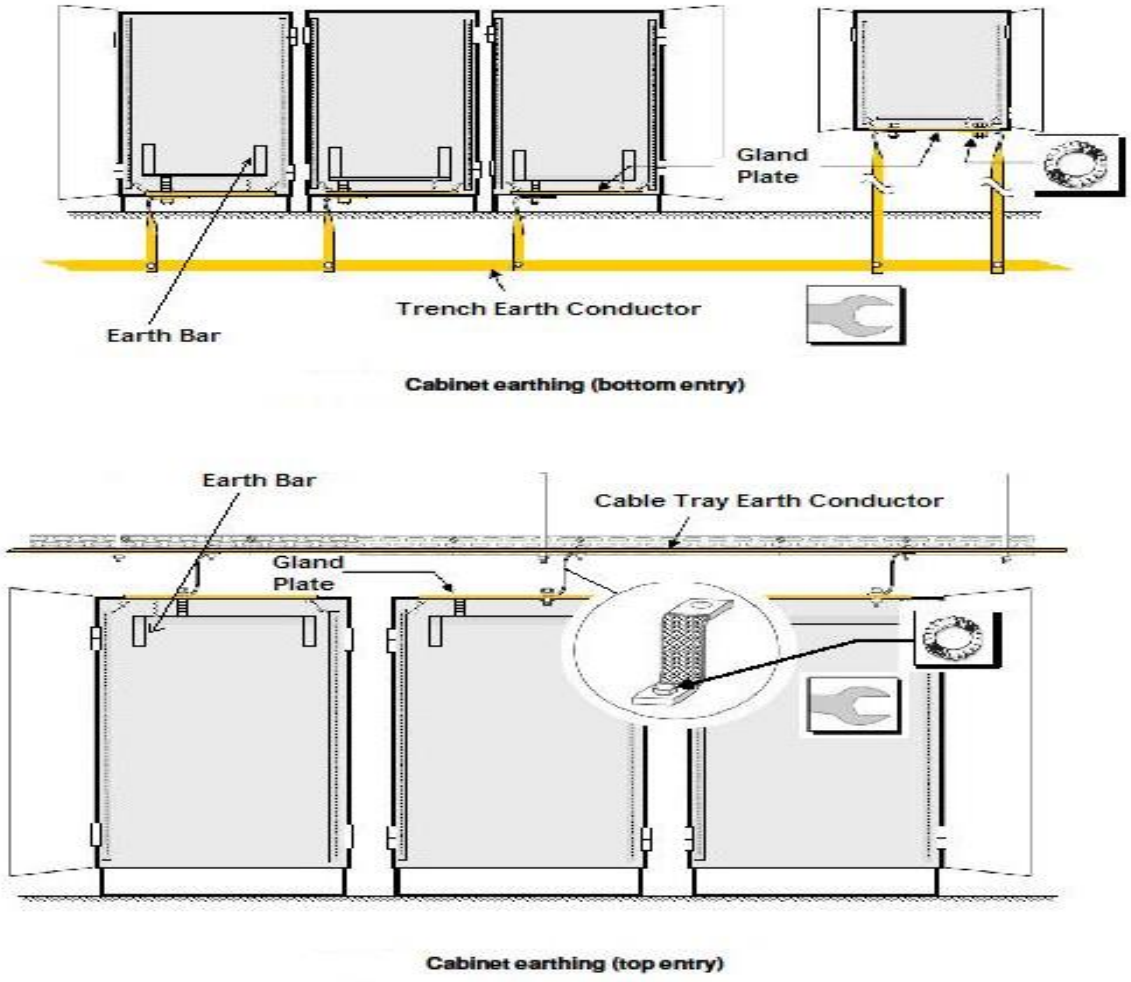


Figure 4: Represents the connection of the panel earth bar to the cable tray earth conductor and the trench earth conductor

3.2.5 Electrostatic Discharge Precautions

In a substation environment it is important to have measures in place to protect electronic equipment from static charges. Electronic equipment can be damaged by charges of less than 200V. This charge level is below the threshold of feeling, hence damage to EPROMS and MOSFET devices could be sustained unknowingly by personnel handling the equipment.

While working on electronic equipment in substation control rooms it is therefore mandatory for field personnel to wear static control wrist straps with Earthing cords – such wrist straps need to be in direct contact with the skin. Earthing sockets have to be available on all cabinets. Protection against ordinary electric shock is ensured by the inclusion of a 1MΩ resistor in the leads of the device.

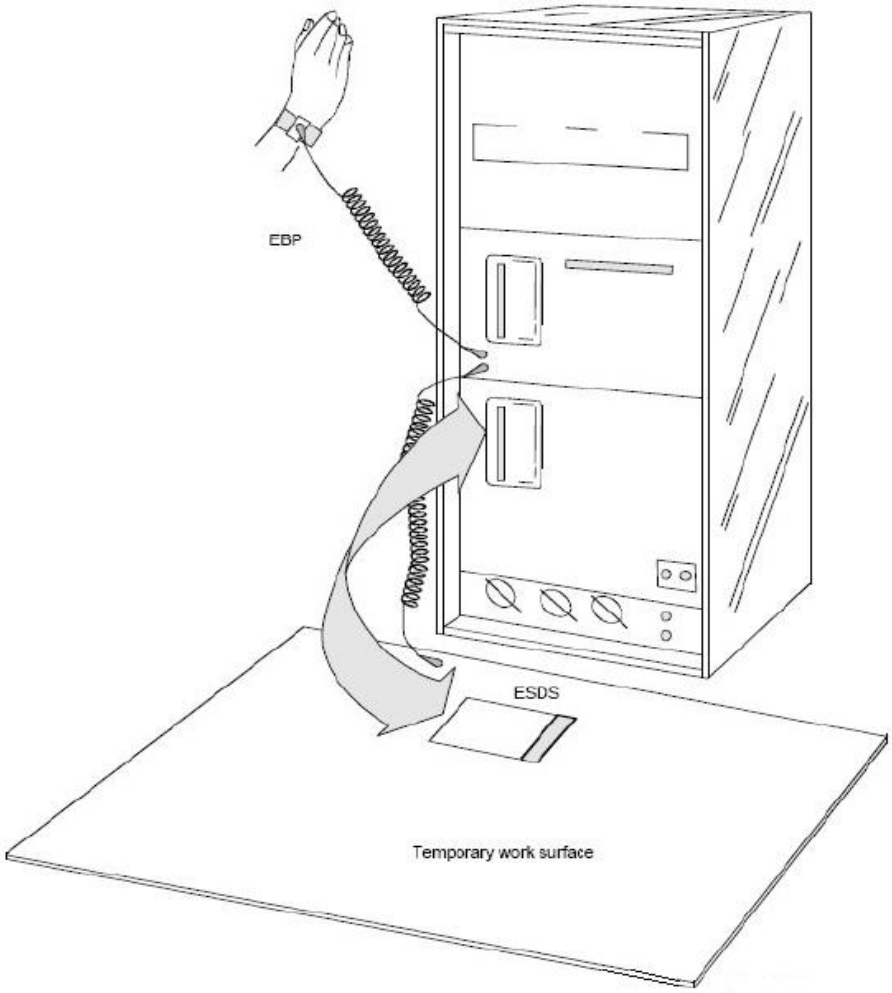


Figure 5: Represents the use of electrostatic discharge strap

3.2.6 Earthing of Intermediate Distance Frames

- The method for Earthing the Intermediate Distance Frame is shown in Figure 6
- The method for Earthing the IDF cables must be done according to Figure 7

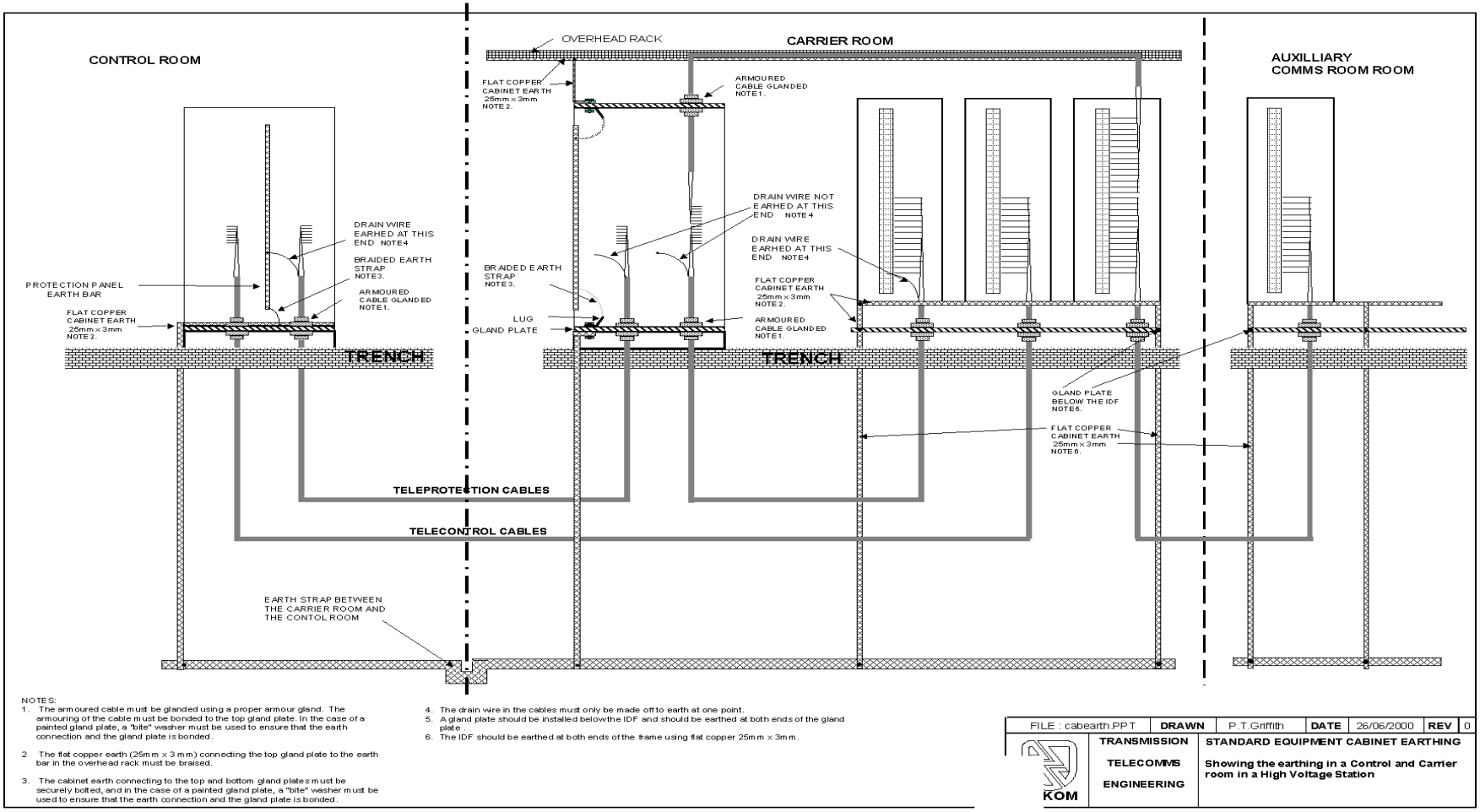
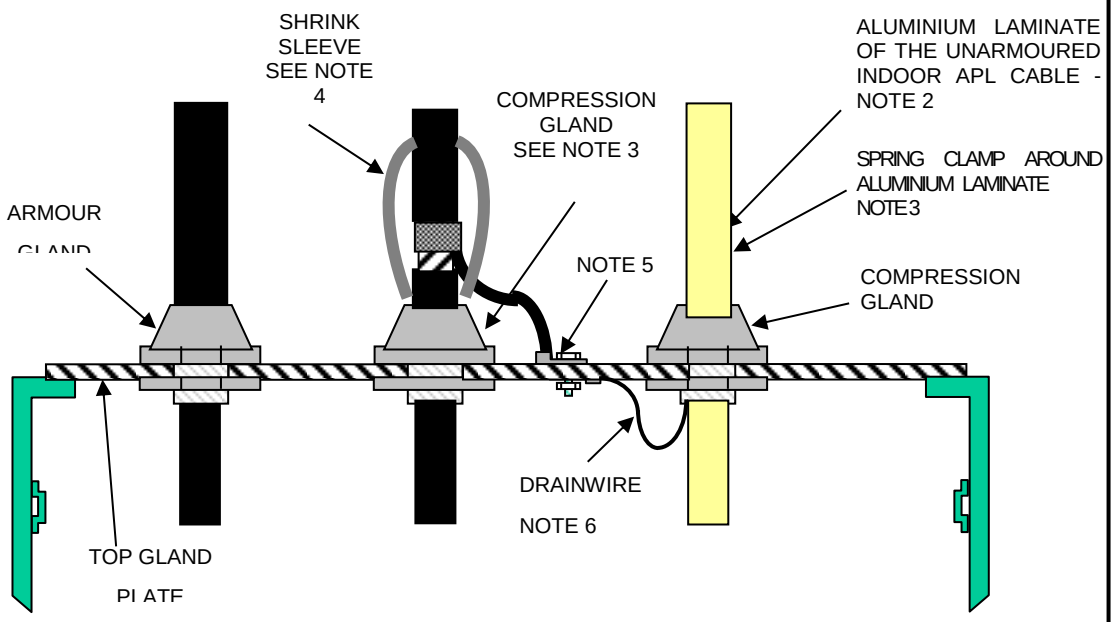


Figure 6: Showing the earthing method for the IDF



Notes:

1) Compression gland is installed on the unarmoured indoor cable and on the cabinet gland plate

2) The aluminium laminate of the unarmoured indoor cable is exposed and cleaned so that a spring loaded clamp of the correct size is to be fitted.

3) Where a compression gland is installed on an armoured cable, and earth kit must be installed as described in Note 2.

4) The spring loaded clamp is also fastened to a suitable length of braided copper so that it is galvanically connected at that point and a shrink sleeve covers the exposed Armouring or aluminium laminate and the spring loaded clamp.

5) The braided copper is terminated to the gland plate using a lug and a bolt and nut.

6) If the unarmoured indoor cable does not have an aluminium laminate, the drainwire in the cable is connected to the gland plate as shown.

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STANDARD EQUIPMENT CABINET CABLING
Showing the glanding and earthing of an armoured and unarmoured cable.

Figure 7: Showing the correct Glanding and Earthing of cables on an IDF

3.3 Bonding of Conductors and Wires

The layout inside cabinets should never mix power equipment with sensitive electronic equipment. A portioning panel must be included in the cabinet should there be a need for equipment to be mixed. Reducing interference by cable or conductor segregation is still highly effective inside cabinets, particularly when cables or conductors are run very close to the cabinet's side walls. Furthermore, it is important not to group together incoming field cables with unshielded ribbon and communication cables. Equipment installations must be done in such a way that all components chassis earths are bonded directly to the cabinet earth bar, either by direct electrical contact to the mounting rails or by very short earth straps. Bonding conductors must be as short and wide as possible in every case (see figure 8).

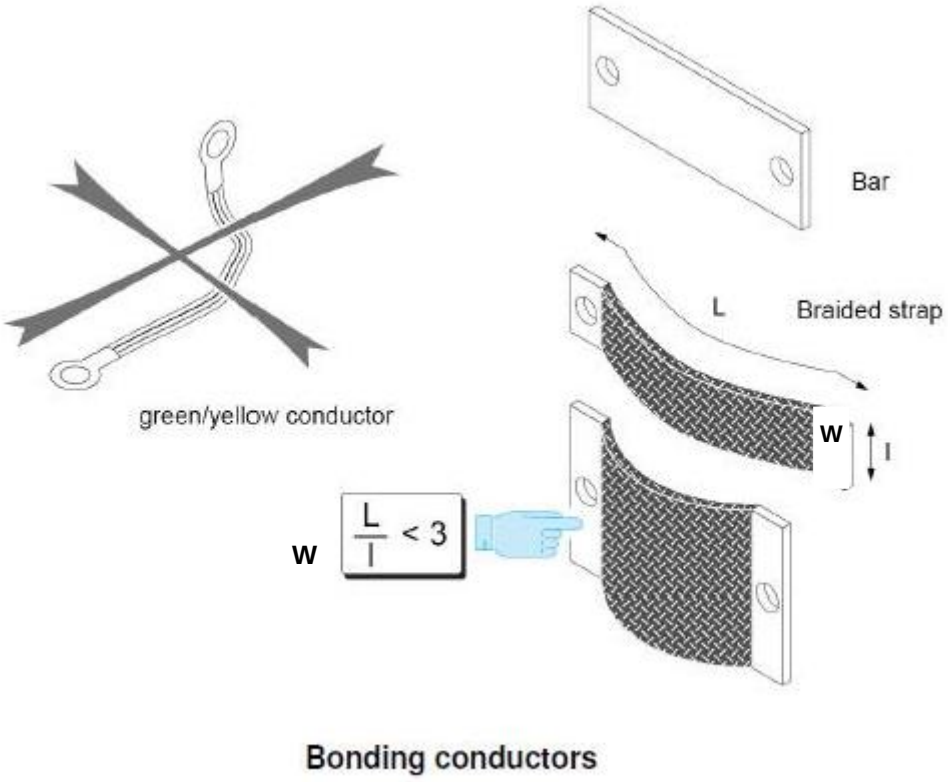

Figure 8: Represents the type of Bonding Conductors

It is crucially necessary to ensure metal-to-metal contact and a high contact pressure between conductive parts. In particular, the procedures for making connections are as follows:

- Painted sheet metal
- Removal of insulating coatings and paintwork between surfaces in contact
- Ensure adequate tightening by using a nut and bolt and good contact by using bite washers
- Apply paint or grease to ensure high quality contact is maintained over time

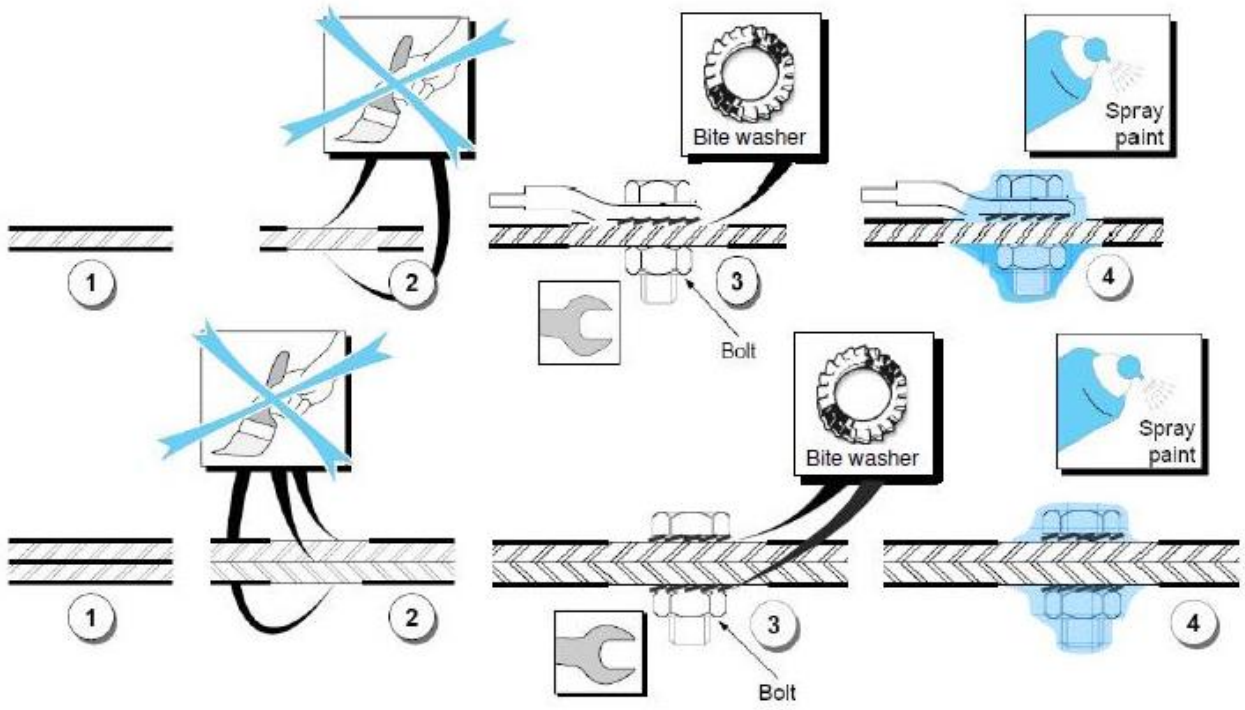

Figure 9: Represents the procedure for making bonding connections

In new installations with fully meshed earth systems, connect cable shields to earth at both ends of the cable. This method is very effective against external disturbances (magnetic and electric fields). In the event that, voltage differences exist in the earth system, this method may produce unacceptable buzz in sensitive cables due to current flowing in the shield. Intermediate connections of the shield to earth at 10-15m intervals are advisable for long cables to reduce buzz.

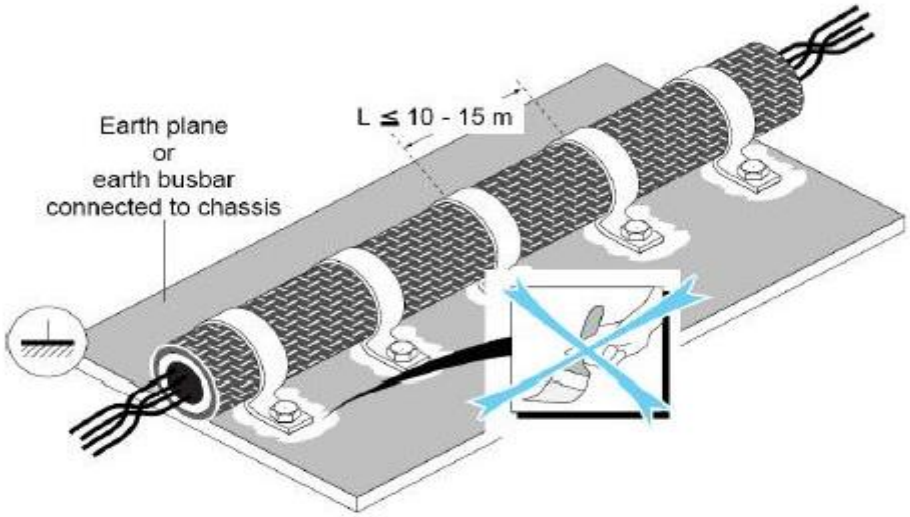

Figure 10: Represents earthing of cable shields at both ends

In existing installations with separate earth systems or without equipotential bonding, earth shield only at one end. This method is effective for electric fields but not for low frequency magnetic fields, it thus prevents buzz caused by 50Hz current flowing in the shield. This method is necessary in earth systems that are fully meshed. A large potential difference may exist at the end of the shielding that is not earthed.

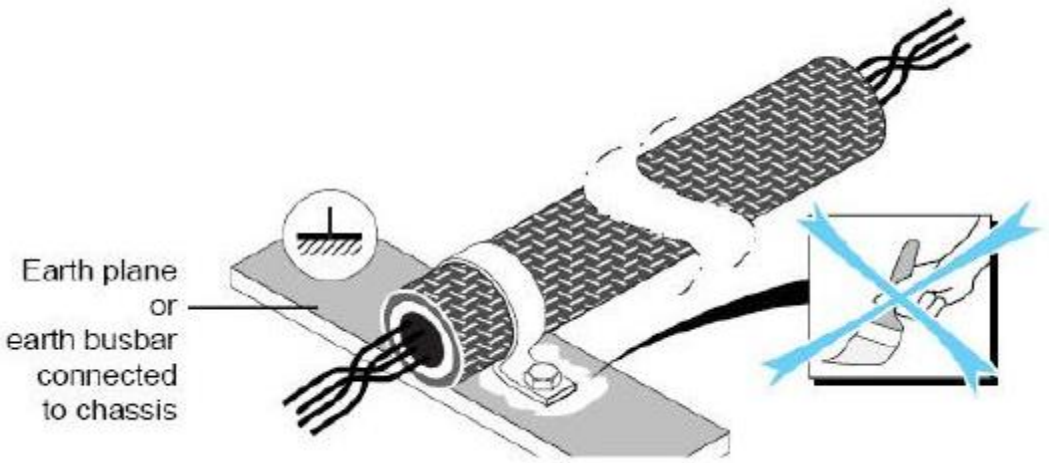

Figure 11: Represents earthing of cable shields at one end

Spare conductors need to be earthed at both ends via the chassis, cabinet or earth bar in order to enhance the screening of the cable shield. If the cable shield itself is earthed at one side, then the conductor must be earthed on one side only.

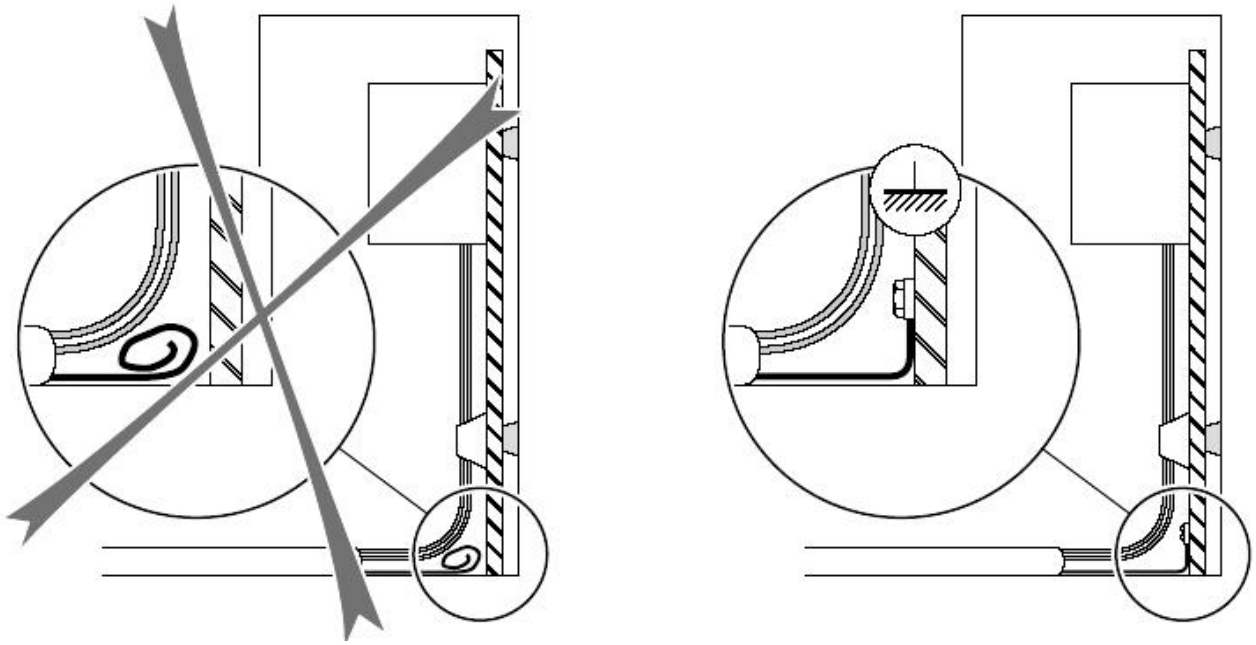

Figure 12: Represents earthing of unused conductors

Discrete electronic equipment needs to be earthed in the cabinet via the earth bar or the chassis bar, using separate conductors. Connections should be kept as short as possible and *daisy-chaining* of earth connections must be avoided. Daisy-chained earth connections have proven to be satisfactory for safety standards but not effective for high frequency electromagnetic interference control.

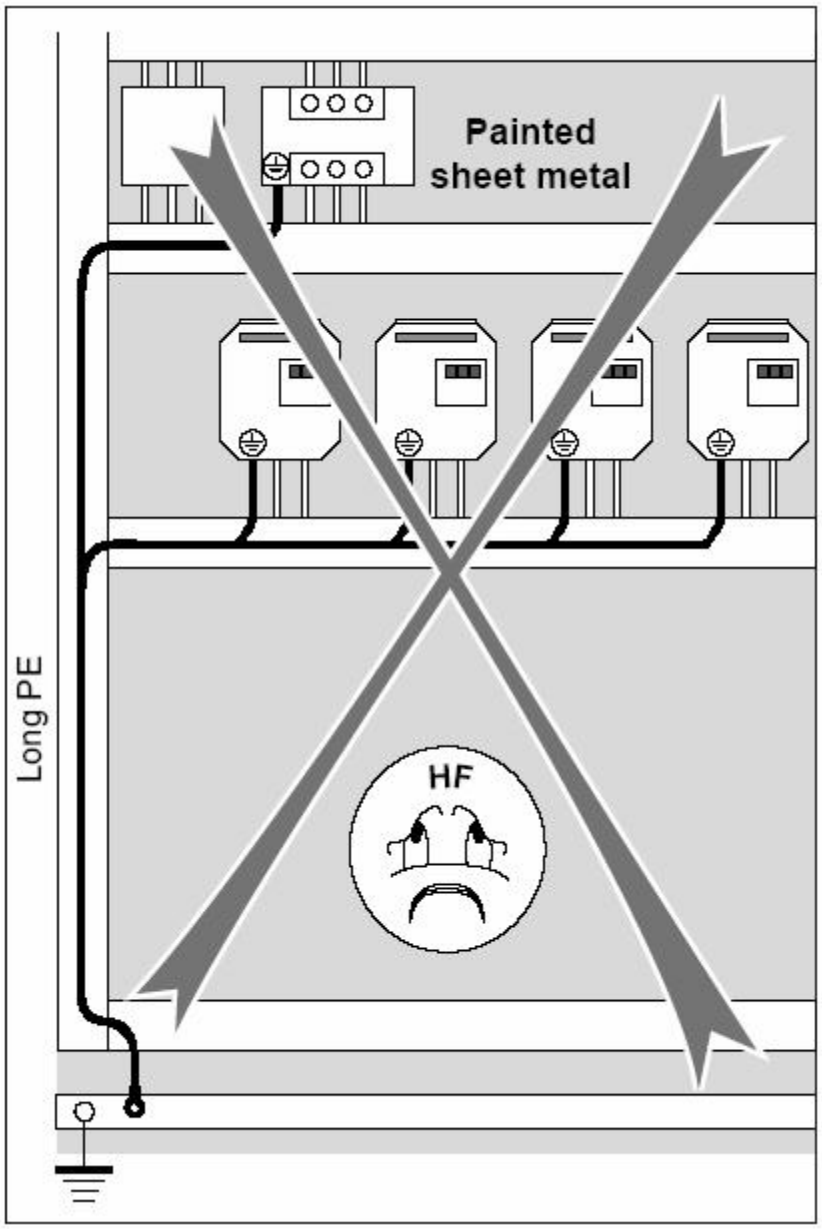

Figure 13: Represents an example of daisy-chaining conductors in a cabinet

Screened cables entering the cabinet from the high-voltage yard must have their screens and armouring connected to the gland plate with a suitable gland or earthing kit. An exception for this practice is when cable screens have to be earthed at one end only, and are already earthed at the opposite end.

3.4 External Junction Boxes and Enclosures

Durable, metallic equipment enclosures and junction boxes must be in used in switchyards. The raw materials of such equipment include stainless steel, hot dip galvanised steel or cast aluminium. PVC and other non-conducting types are not suitable due to their lack of electrostatic shielding. The enclosure or the junction box itself must make provision for earthing of cables at the entry point with earthing glands. The bonding area must be free of paint or coatings. If the structure is made-up of aluminium, suitable bimetallic washers have to be used to prevent corrosion to set in. The internal structure needs to be internally treated to prevent condensation. An earthing stud of a minimum size (M10) must be available nearest to the cable entry point from where the unit must be bonded directly to an earthed structure. Hinged doors and internal metallic frames must be bonded to the junction box or enclosure in the same way as indoor cabinets. Control cables connecting to the relay room to Current Transformers and Voltage Transformers are generally problematic due to their direct connection to high voltage equipment. The recommended earthing method is to earth both ends of the shield. The issue of large shield currents being generated during transients is addressed by using a copper parallel earthing conductor (PEC) of at least 50mm^2. Common practice for cabling between the relay room and equipment is to use a junction box at the central phase where the neutrals of the three phases are combined (the earthing arrangement is used in figure 15). The PEC must be continuous on each phase from the junction box to the transformer, as depicted in figure 15.

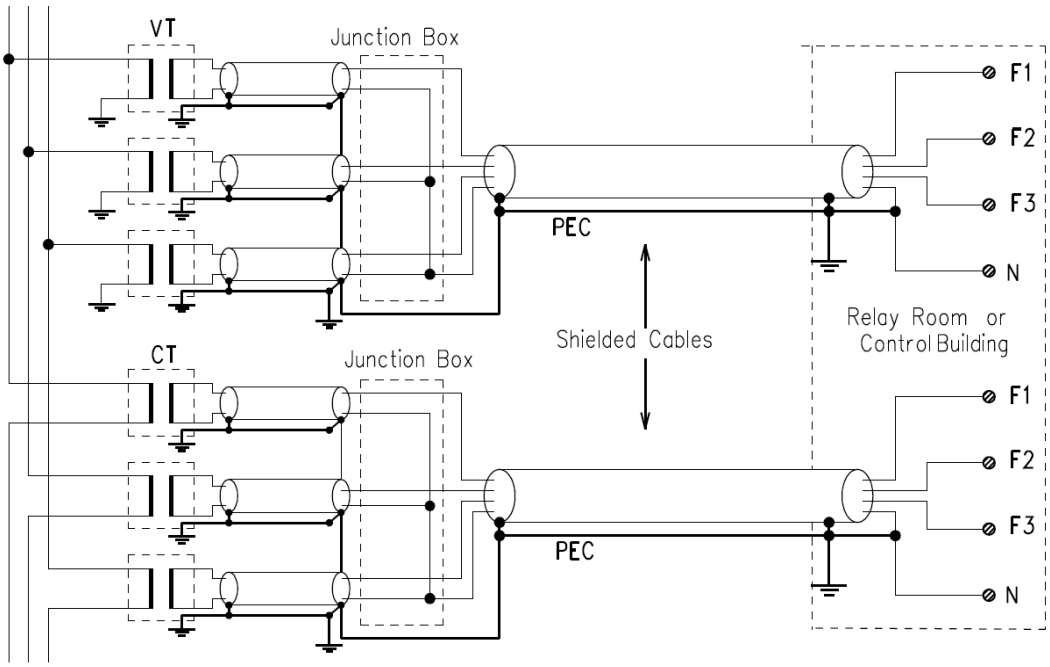

Figure 14: Represents the earthing arrangement of VT & CT cabling using the junction box and the PEC

Earthing of VT and CT cables at only one end of the shield is not recommended, as it reduces the shielding effect significantly and can result in the breakdown of the cables insulation. These cables must not be used cables must not be used for any other purposes. When spare cores in the cable exist, these cores must be earthed at both ends to complement the PEC.

In terms of the transformer, its neutrals must be earthed at one point only, either in the junction box or in the relay room. According to the IEEE, the recommended earthing point is the relay room which has the following advantages:

- voltage rise is minimised near the relay equipment;
- The shock or hazard to personnel in the building is reduced;
- and all circuit earths are at one location.

3.5 Relay and interface panel internal earthing Connections

All relay panel subracks must be earthed via the 19' rack mounting earthing point using 2.5mm2 PC single core Green/Yellow wire. All the different sizes of the subrack's front doors where applicable must be earthed directly to the panel earth bar using 2.5mm2 Green/Yellow wire.

3.5.1 Main Protection IED / Relay

- All main protection IED/relays must be earthed using 2.5mm^2 single Green/Yellow wire to the directly to earth bar. Wires must be properly terminated using correct size of lugs, washer and nut combination.
- Depending on OEM, if multiple I/O slots exist, then each connecter needs to be securely fastened to the base plate of the IED.
- The earth bar should make provision for at least 5 thread bolts protruding out of the base of the earth bar.
- No more than two 2.5mm^2 earth wires should be secured onto a specific thread bolt.

3.5.2 Auxiliary Relays

All auxiliary relays or protection relays with metal mechanisms or housings that provide an external input to the main protection relays shall be earthed at the base or chassis of that particular relay directly to the panel earth bar using 2.5mm^2 Green/Yellow wires.

3.5.3 Pushbuttons and Control Switches

All push buttons and control switches with metal mechanisms or housings shall be earthed via a single 2.5mm^2 copper green/yellow wire directly to the panel earth bar.

3.5.4 Electrostatic Discharge Point

Both the relay and interface panel shall have one electrostatic discharge point (per panel), which consists of a banana plug (marked in blue on the front face of the panel) which is connected via a 1MΩ resistor directly to the earth bar with a single 2.5mm^2 Yellow/Green insulated copper wire.

3.5.5 Test Plugs

All OEM test blocks shall be earthed using single 2.5mm^2 Yellow/Green copper wire secured to the test block using the appropriate size flat washer and nut arrangement. The test block shall be earthed directly to the earth bar.

3.5.6 Teleprotection and Auxiliary Protection Equipment

All teleprotection equipment applicable to Extra High Voltage (EHV) feeder schemes as well as any other specialised auxiliary equipment such as fault monitoring devices shall be earthed via single 2.5mm^2 copper-wire connected to the chassis or housing of the device directly to the panel earth bar.

3.5.7 Measurement Transducers

All measurement transducer racks containing transducer modules and displays shall be earthed at the ground terminal of the measurement rack terminal block with single 2.5mm^2 Yellow/Green copper-wire secured directly to the panel earth bar.

3.5.8 Miniature Circuit Breaker

All miniature circuit breaker (MCB) hinge doors must be earthed using 2.5mm^2 Yellow/Green wire connecting the stud of the MCB door to the panel earth bar.

3.6 Protection Equipment Check List

The following checks should be conducted on all protection related equipment, keeping in mind that a visual inspection of panel and equipment earthing should be considered merely an indication of earthing condition and under no circumstances should to be substituted for comprehensive earthing resistance tests. Nonetheless inspect and document the condition of:

- Presence of the panel earth bar (40mm X 3mm Copper)
- Confirmation that the earth bar is properly bonded to the Substation Earth mat (120mm stranded copper wire or 12mm diameter solid copper earth strap)
- Inspect if all metal panel doors earthed (2.5mm^2 copper wire or copper braiding)
- Check if all terminal rails are earthed (irrespective of size)
- Check if every rack, subrack or frame is earthed
- Check if every protection IED or relay is earthed by means of 2.5mm^2 copper wire
- Check if all control switches and push buttons with metal mechanisms or housings are earthed
- Check if all blanking plates earthed
- Check if all earth connections are:
    - Clean to the metal
    - Utilising correct lugs, bolts, and washers (where applicable) and are properly fastened
    - Corrosion free
    - Made-up with correct colour combination (Green/Yellow) insulated wire

3.7 Modification of OEM Cabinets and Wires Specifications

Before undertaking any modifications to the Secondary Plant Cabinets, it would be prudent to engage the respective OEM in order to discuss any possible impacts of the modifications and to mitigate against any future problems. Furthermore, all earthing kits are to be procured from the respective OEM only **-** the wire specification is listed in Table 1.

Table 1: Wiring Specifications

APPLICATION	CORE THICKNESS	TYPE	COLOUR
IST Cabinet to Gland plate	2.5mm^2 PC single core.	Flexible PVC Insulated 600/1000V 25 Amp	Green/Yellow
Earthing STC/RTU Subrack	2.5mm^2 PC single core.	Flexible PVC Insulated 600/1000V 25 Amp	Green/Yellow
Earthing Front Panel	3 mm	TCP Braid 3 mm	No Insulation
Push Buttons & Control Switches	2.5mm^2 PC single core	Flexible PVC Insulated 600/1000V 25 Amp	Green/Yellow
Teleprotection & Auxiliary Equipment	2.5mm^2 PC single core	Flexible PVC Insulated 600/1000V 25 Amp	Green/Yellow
Earthing Swing Frame Door	5 mm	TCP Braid 3 mm	No Insulation
Plant Card Power Cable	0.8 mm^2 or 18 AWG	MIL-W-16878E Type B 105C 600V 0.25mm PVC Insulation	Red, White, Black
Plant Card Earth Cable	2.5mm PC single core	Flexible PVC Insulated 600/1000V 25 Amp	Green/Yellow

APPLICATION	CORE THICKNESS	TYPE	COLOUR
Test Blocks	2.5mm^2 PC single core	Flexible PVC Insulated 600/1000V 25 Amp	Green/Yellow
Gland Plate to RTU Cabinet	2.5mm^2 PC single core.	Flexible PVC Insulated 600/1000V 25 Amp	Green/Yellow
Protection IED	2.5mm^2 PC single core	Flexible PVC Insulated 600/1000V 25 Amp	Green/Yellow
Auxiliary Relays	2.5mm^2 PC single core	Flexible PVC Insulated 600/1000V 25 Amp	Green/Yellow
Measurement Transducer	2.5mm^2 PC single core	Flexible PVC Insulated 600/1000V 25 Amp	Green/Yellow
Electrostatic Discharge	2.5mm^2 PC single core	Flexible PVC Insulated 600/1000V 25 Amp	Green/Yellow

4. Authorization

This document has been seen and accepted by:

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Khaya Sobuwa	Power Plant C & I Study Committee Chairperson
Ziyaad Gydien	Telecommunications Study Committee Chairperson
Marlini Sukhnandan	Telecontrol/SCADA Study Committee Chairperson
Lerato Mputle	Solar Study Committee Chairperson
Isaac Blou	Wind Study Committee Chairperson
Thinus Du Plessis	Metal Enclosed Switchgear and Cables System Study Committee Chairperson
Riaz Asmal	MV&LV Study Committee Chairperson
Riaz Vajeth	Overhead Lines Study Committee Chairperson
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Marubini Manyage	Rotating Electrical Machines Study Committee Chairperson
Phineas Tlhatlhetji	Senior Manager - Substation Eng, Substations Study Committee Chairperson

5. Revisions

Date	Rev	Compiler	Remarks
March 2017	2	C Hitchin	Area of applicability changed to Engineering and document “Seen and Accepted By” list updated.
Sept 2013	1	C Hitchin	First issue

6. Development team

The following people were involved in the development of this document:

A Ally, P Griffith and S Ndamase for the compiling the original documents that this Standard is based on.

7. Acknowledgements

Not applicable.

Annex A – Impact Assessment

(Normative)

Impact assessment form to be completed for all documents.

1) Guidelines

- All comments must be completed.
- Motivate why items are N/A (not applicable)
- Indicate actions to be taken, persons or organisations responsible for actions and deadline for action.
- Change control committees to discuss the impact assessment, and if necessary give feedback to the compiler of any omissions or errors.

2) Critical points

2.1 Importance of this document. E.g. is implementation required due to safety deficiencies, statutory requirements, technology changes, document revisions, improved service quality, improved service performance, optimised costs.

Comment: This document is required to ensure that all Secondary Plant Equipment that is supplied to Eskom Holdings LTD. has all the correct Earthing requirements and that when it is installed in Eskom Substations all Equipment is correctly Earthed.

2.2 If the document to be released impacts on statutory or legal compliance - this need to be very clearly stated and so highlighted.

Comment:

2.3 Impact on stock holding and depletion of existing stock prior to switch over.

Comment: Not Applicable

2.4 When will new stock be available?

Comment: Not Applicable

2.5 Has the interchangeability of the product or item been verified - i.e. when it fails is a straight swop possible with a competitor's product?

Comment: Not Applicable

2.6 Identify and provide details of other critical (items required for the successful implementation of this document) points to be considered in the implementation of this document.

Comment: None

2.7 Provide details of any comments made by the Regions regarding the implementation of this document.

Comment: Not Applicable

3) Implementation timeframe

3.1 Time period for implementation of requirements.

Comment: Immediate.

3.2 Deadline for changeover to new item and personnel to be informed of DX wide change-over.

Comment: Not Applicable

4) Buyers Guide and Power Office

4.1 Does the Buyers Guide or Buyers List need updating?

Comment: Not Applicable

4.2 What Buyer's Guides or items have been created?

Comment: Not Applicable

4.3 List all assembly drawing changes that have been revised in conjunction with this document.

Comment: not Applicable

4.4 If the implementation of this document requires assessment by CAP, provide details under 5

4.5 Which Power Office packages have been created, modified or removed?

Comment: Not Applicable

5) CAP / LAP Pre-Qualification Process related impacts

5.1 Is an ad-hoc re-evaluation of all currently accepted suppliers required as a result of implementation of this document?

Comment: No this document does not introduce any new requirements to suppliers. This document is just an amalgamation of the different existing Divisional documents.

5.2 If NO, provide motivation for issuing this specification before Acceptance Cycle Expiry date.

Comment: Not Applicable

5.3 Are ALL suppliers (currently accepted per LAP), aware of the nature of changes contained in this document?

Comment: Not Applicable as there are no changes in this document.

5.4 Is implementation of the provisions of this document required during the current supplier qualification period?

Comment: Not Applicable

5.5 If Yes to 5.4, what date has been set for all currently accepted suppliers to comply fully?

Comment: Not Applicable

5.6 If Yes to 5.4, have all currently accepted suppliers been sent a prior formal notification informing them of Eskom's expectations, including the implementation date deadline?

Comment: Not Applicable

5.7 Can the changes made, potentially impact upon the purchase price of the material/equipment?

Comment: Not Applicable

5.8 Material group(s) affected by specification: (Refer to Pre-Qualification invitation schedule for list of material groups)

Comment: Not Applicable

6) Training or communication

6.1 Is training required?

Comment: No

6.2 State the level of training required to implement this document. (E.g. awareness training, practical / on job, module, etc.)

Comment: Not Applicable

6.3 State designations of personnel that will require training.

Comment: Not Applicable

6.4 Is the training material available? Identify person responsible for the development of training material.

Comment: Not Applicable

6.5 If applicable, provide details of training that will take place. (E.G. sponsor, costs, trainer, schedule of training, course material availability, training in erection / use of new equipment, maintenance training, etc).

Comment: Not Applicable

6.6 Was Technical Training Section consulted w.r.t module development process?

Comment: Not Applicable

6.7 State communications channels to be used to inform target audience.

Comment: Not Applicable

7) Special tools, equipment, software

7.1 What special tools, equipment, software, etc will need to be purchased by the Region to effectively implement?

Comment: Not Applicable

7.2 Are there stock numbers available for the new equipment?

Comment: not Applicable

7.3 What will be the costs of these special tools, equipment, software?

8) Finances

8.1 What total costs would the Regions be required to incur in implementing this document? Identify all cost activities associated with implementation, e.g. labour, training, tooling, stock, obsolescence

Comment: Not Applicable

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Impact assessment completed by:

Name: Chris Hitchin

Designation: Chief Technologist