

1. SCOPE

This Safety Instruction applies the principles established by the ScottishPower Safety Rules (Electrical and Mechanical) to achieve **Safety from the System** for personnel working on or testing pole mounted **HV** substations supplying mobile phone base stations or other electrical equipment installed on transmission or distribution steel towers or other steel structures.

These substations are normally constructed in accordance with ENA Engineering Recommendation G78 'Recommendations for low voltage supplies to mobile phone base stations with antennae on high voltage structures', with the aim of dealing with the risk of rise of potential. For guidance on the appropriate construction standard, refer to EPS-01-005 and OHL-02-015.

At the pole mounted substation, the **HV** steelwork earth and **LV** neutral earth are connected together on the transformer tank and are not connected directly to earth at the foot of the pole. This combined **HV** and **LV** earth is pulled through a continuous run of insulated ducting from the transformer pole to the *Tower* and connected to the *Tower* steelwork earthing facility. Refer to diagram 1.

This feature of the construction may present a **Danger** to personnel working on the substations, when **Earthing Devices** are applied to achieve **Safety from the System**.

Although this Safety Instruction assumes the pole mounted substation has been constructed as described above, instructions are also given for applying the same principles where the substation is constructed to a different standard.

2. ISSUE RECORD

This is a [Reference](#) document. The current version is held on the EN Document Library.

It is your responsibility to ensure you work to the current version.

Issue Date	Issue No.	Author	Amendment Details
August 2004	1		Initial Issue.
September 2015	2	Phil Currie	Document now includes testing on these substations. Title Change. 1: Scope redefined and clarified. 5: Definition of <i>Tower</i> clarified. 8: Apparatus identification added. 9: Related documents added. 11: More detail in the 'Avoiding Dangers ' section. 11.1: New requirement. 11.5: Situations where earth connections or steelwork bonding are being interfered with. 11.6: Requirement at non-standard sites to replicate expected standards. 11.7: Requirement to highlight known Locations on control centre diagram. Diagrams added for clarity.

3. ISSUE AUTHORITY

Author	Owner	Issue Authority
Name: Phil Currie Title: Operational Compliance Manager	Name: Phil Currie Title: Operational Compliance Manager	Name: Colin Taylor Title: Director, Engineering Services

4. REVIEW

This is a **Reference** document which has a 5 year retention period after which a reminder will be issued to review and extend retention or archive.

5. DISTRIBUTION

This Energy Networks' Safety Instruction is maintained by EN Document Control and is part of the ScottishPower Safety Rules which is published to the SP Energy Networks Internet site.

6. CONTENTS

1. SCOPE	1
2. ISSUE RECORD	1
3. ISSUE AUTHORITY	1
4. REVIEW	2
5. DISTRIBUTION	2
6. CONTENTS	2
7. DEFINITIONS	3
8. APPARATUS IDENTIFICATION	3
9. RELATED DOCUMENTS	3
10. DANGERS	3
11. AVOIDING DANGERS	3

7. DEFINITIONS

Terms printed in bold type are as defined in the ScottishPower Safety Rules (Electrical and Mechanical).

For the purpose of this Safety Instruction the following definition applies.

Tower – This means **HV** overhead line steel tower or other steel structure (whether denoted as either ‘transmission’ or ‘distribution’), which has mobile phone base station(s), microwave or radiowave aerial installation(s), or other electrical equipment attached to it.

8. APPARATUS IDENTIFICATION

Apparatus on which work or testing is to be carried out shall be readily identifiable or have fixed to it a means of identification which shall remain effective throughout the course of the work or testing.

9. RELATED DOCUMENTS

ENA Engineering Recommendation G78 ‘Recommendations for low voltage supplies to mobile phone base stations with antennae on high voltage structures’

EPS-01-005 Policy for Supplies to Mobile Phone Base Station Sites

OHL-02-015 Code of Practice for the Provision of LV Supplies to Equipment Associated with Transmission Towers

10. DANGERS

The main **Dangers** to personnel working on or testing either pole mounted transformers supplying mobile phone base stations or adjacent **System Apparatus** are from different earth potentials:

- (i) For work on or testing of the **HV Apparatus** at the pole mounted substation, following isolation and earthing, a difference of potential is possible between the **Earthed HV** overhead conductors and any exposed steelwork and neutral connections on the transformer pole, which are remotely connected to earth at the *Tower*. Any rise of earth potential at the pole or *Tower* will create a difference in earth potential that could be a significant hazard to **Persons** working or testing under a **Safety Document** on the **HV Apparatus**. Refer to diagram 2.
- (ii) When precautions are implemented to control the **Danger** identified in (i) above, for adjacent **System Apparatus** with earth electrodes, e.g. pole box earth, any rise of earth potential at the *Tower* could be transferred to the ground from adjacent **Primary Earths** or **Drain Earths** if the cluster or spike of these are in close vicinity to adjacent earth electrodes. As a result, this rise of earth potential could be transferred and could be a significant hazard to **Persons** working or testing on the **Apparatus**, e.g. **HV** cable. Refer to diagram 4.

11. AVOIDING DANGERS

- 11.1 A pole mounted substation supplying electrical equipment installed on a *Tower* shall not be used to provide any other supply.
- 11.2 Normal operational procedures to isolate the **HV** pole mounted **Apparatus** and for the application of **Primary Earths** shall be completed.
- 11.3 The earth cluster or spike of any **Portable Primary Earth** or a **Portable Drain Earth** shall be installed at least 10 metres from any **HV** or **LV** earth associated with the remainder of the **System** i.e. greater than 10 metres from, for example, the **HV** or **LV** earth of any nearby pole mounted transformer or **HV** cable termination. Refer to diagram 4.

- 11.4 In addition to any **Portable Drain Earths** which may be required to protect from induced voltage, impressed voltage or inadvertent backfeed, the **Danger** from the different earth potentials at the pole mounted **Apparatus** will be removed by bonding together the **Earthed HV** overhead line conductors and the steelwork using a separate **Portable Drain Earth**. This **Portable Drain Earth** shall be fitted between the **HV** overhead line conductors and either a suitable steelwork connection, or the **LV** neutral cable connector, and shall remain in place until completion of the work or testing and shall be removed prior to the clearance of the **Safety Document**. The **Senior Authorised Person** shall record in the appropriate section of the **Safety Document** the requirement for this separate **Portable Drain Earth**. Refer to diagram 3.
- 11.5 If the work or testing involves interfering with earth connections or transformer/steelwork bonding, the **Senior Authorised Person** shall determine the precautions necessary to reduce the risk of different earth potentials arising during the course of work or testing.
- 11.6 Where the construction of the pole mounted transformer is not as described in the Scope section above, or there is doubt about the integrity of the transformer earth connection to the *Tower* steelwork earthing facility, then before starting work or testing, arrangements shall, where reasonably practicable, be made to reduce the risk of different earth potentials by replicating the conditions described in the Scope section above (or make changes to convert to required permanent standard construction). This may include, for example, connecting the **HV** steelwork earth and **LV** neutral earth on the transformer tank and/or connecting the transformer earth to the *Tower* steelwork earthing facility using a **Portable Drain Earth**. Any temporary modifications shall be removed before clearance of the **Safety Document**.
- 11.7 When a new substation is constructed supplying equipment on a *Tower*, or when work or testing is carried out at an existing such **Location**, it shall be confirmed that an information symbol is placed on the appropriate control centre operational diagram indicating that compliance with this Safety Instruction is required at the **Location**.

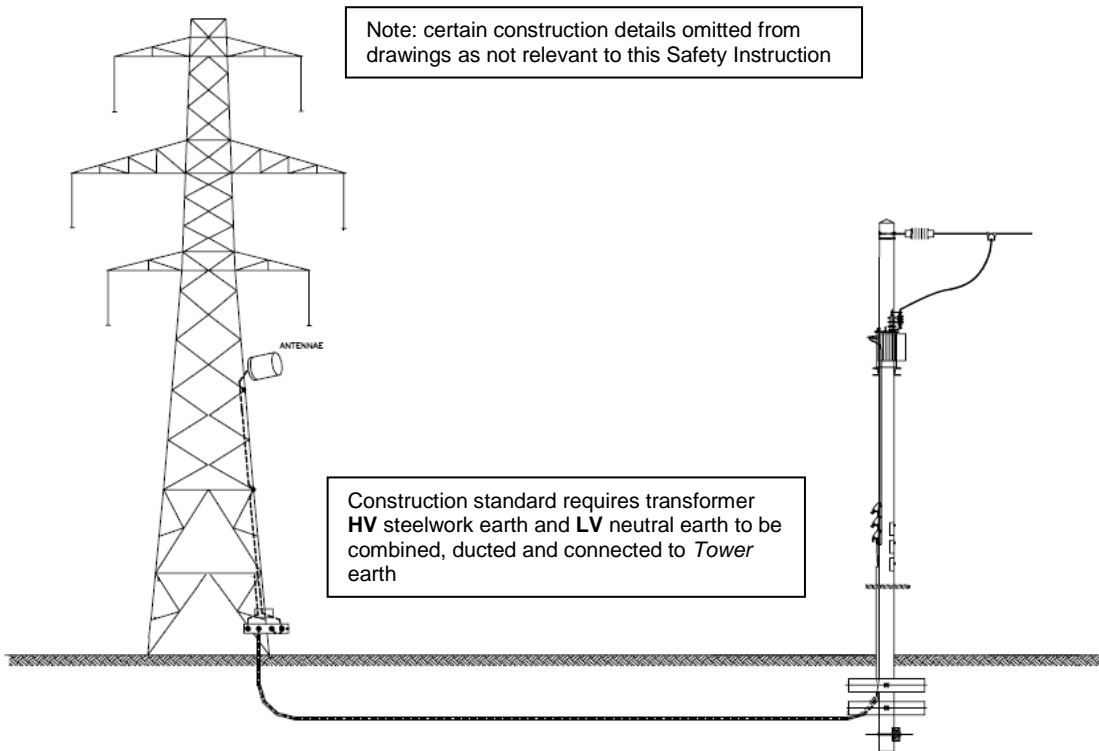


Diagram 1: Explanation of standard HV and LV earth connection arrangement.

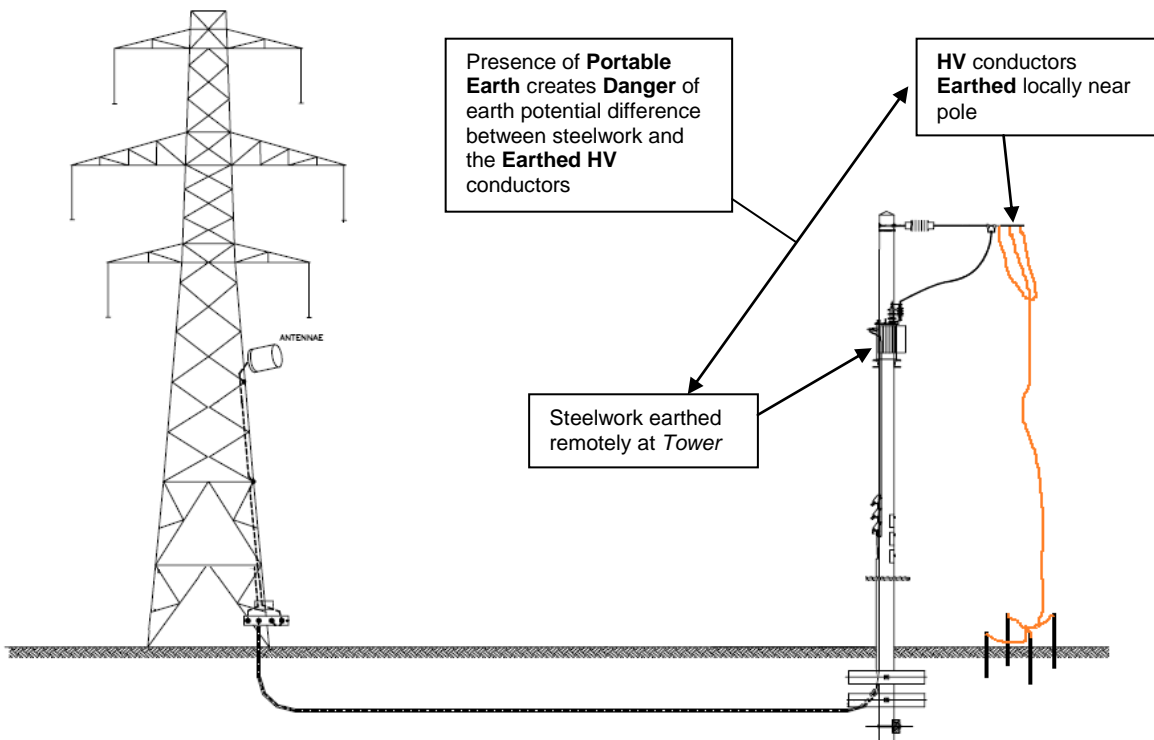


Diagram 2: Explanation of **Danger 10 (i)**

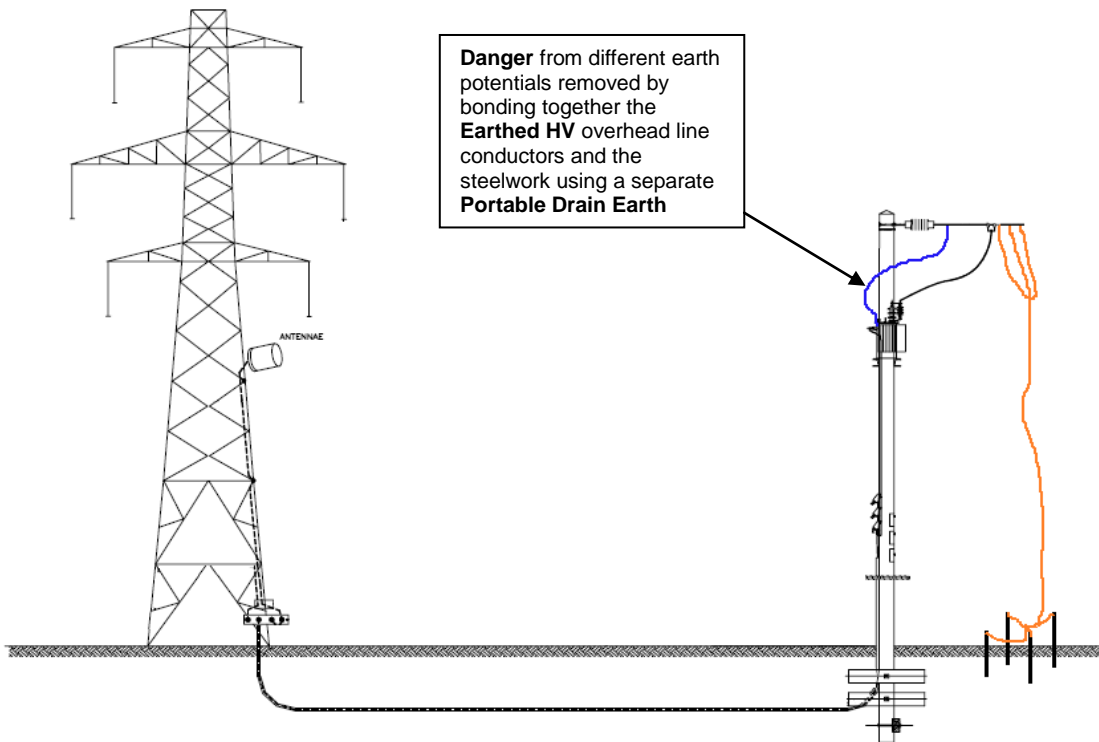


Diagram 3: Explanation of precaution required in section 11.4.

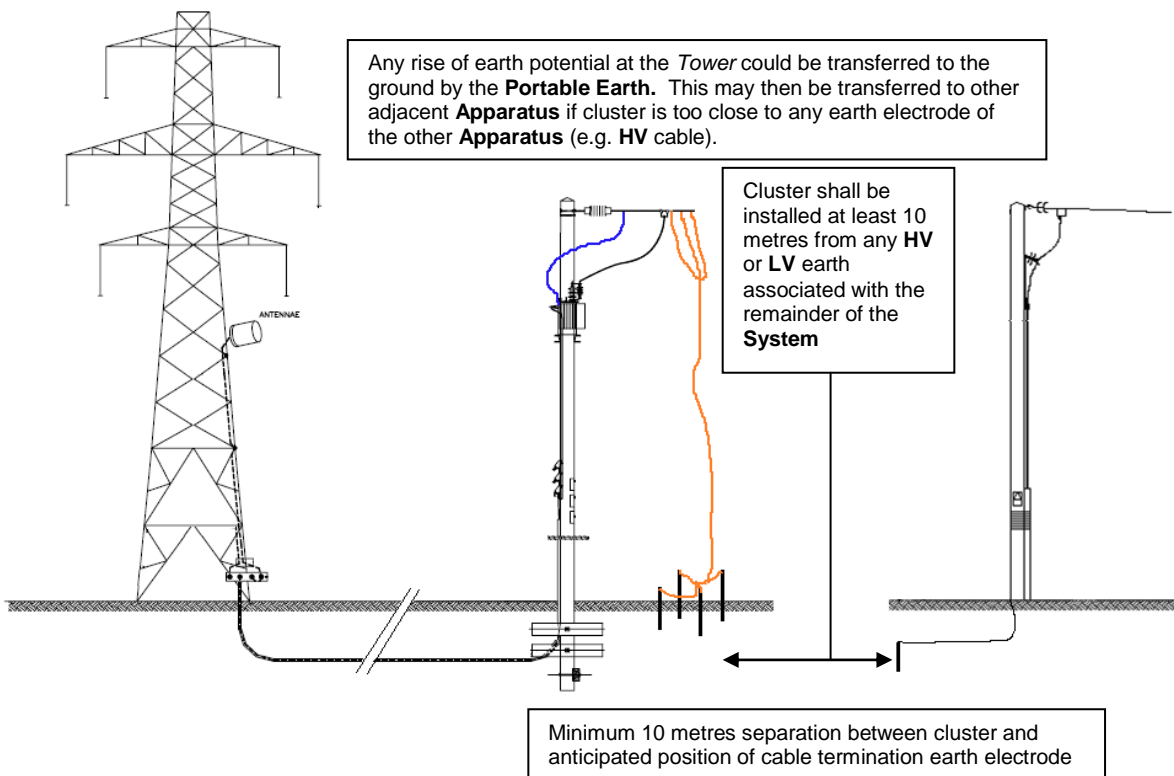


Diagram 4: Explanation of **Danger 10 (ii)** and precaution required in section 11.3.