



1. SCOPE

This document defines the procedures to be implemented by the **Senior Authorised Person** to manage **Drain Earths** on steel tower Overhead Lines.

This document introduces a **Drain Earth**, that shall be regarded as a *Fixed Drain Earth*, the application and removal of **Drain Earths** or where the *Working Party* have no **Drain Earth** authorisation.

This document considers the roles and responsibilities of the *Earthing Party* and the *Working Party* when managing the application, utilisation and removal of *Fixed Drain Earths*. This document also provides guidance on how to manage *Fixed Drain Earths* through the use of an **Earthing Schedule**.

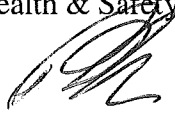
2. ISSUE RECORD

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Issue Date	Issue No	Author	Amendment Details
Nov 2005	1	S C Kelly	Initial Issue :12 Page Document

3. ISSUE AUTHORITY

Author	Owner	Issue Authority
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4. REVIEW

This document shall be subject to review when a new issue of the Electrical and Mechanical Safety Rules are issued or, if none, no later than five years from the issue date of this document.



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6. DEFINITIONS

The terms printed in bold type are as defined in the ScottishPower Safety Rules (Electrical and Mechanical) 4th Edition.

Terms printed in italics are as defined below.

Earthing Party – A party consisting of an **Authorised Person** in charge, accompanied by one or more **Authorised Persons** whose duty it is to apply, and remove, **Portable Drain Earths** on overhead line conductors and red pennants on towers, poles and high structures.

Working Party – The Persons under the **Immediate Supervision** of an **Authorised Person** and includes an **Authorised Person** when working by himself.

Earthing Schedule – A schedule indicating the **Drain Earth** requirements for each stage of the work or testing.

Drain Earth – A fixed or Portable **Earthing Device** applied for the purpose of protection against induced voltages, impressed voltages or inadvertent backfeed.

Fixed Drain Earth – A **Drain Earth** that will remain in place for use of a *Working Party* or by staff who have no **Drain Earth** authorisation. The *Fixed Drain Earth* will be clearly identifiable from a portable **Drain Earth** by the application of a *Fixed Drain Earth Notice*.

Fixed Drain Earth Notice – A notice in **Approved** form to identify a *Fixed Drain Earth* applied around the earth clamp and tower steelwork connections.

7. RELATED DOCUMENTS

ScottishPower Safety Rules (Electrical and Mechanical) 4th Edition handbook.

PSMSP 1.6 Portable Primary Earths, Drain Earths, and Field Equipment Earths for use in Substations, Power Stations and on Overhead Lines

PSMSP 1.7 Application, Removal, Storage and Inspection of Portable Earths and Field Equipment Earths

PSSI 4 HV Overhead Lines – Work on Phase Conductors



8. INTRODUCTION

With the increased use of *Working Parties* who have no requirement for Authorisation to apply/remove **Drain Earths** e.g. tower painting contractors, and to ensure overhead line work continues to be managed efficiently and safely there is a requirement to improve the management of **Drain Earths**. Principally this document introduces the use of *Fixed Drain Earths* that will be managed by the **Senior Authorised Person** through the use of **Earthing Schedules**.

The general principle is that **Drain Earths** can be applied to the conductors by an *Earthing Party* under a **Permit for Work** and remain in position for subsequent *Working Parties*. The **Drain Earths** will be identifiable through the use of a *Fixed Drain Earth Notice* to distinguish them from other **Drain Earths** and make them clearly visible to the *Working Party*.

An **Earthing Schedule** shall be used when there is a requirement for *Fixed Drain Earthing*. This will enable the **Senior Authorised Person** to implement control measures over a section of the overhead line prior to the work starting.

To enable this process to be managed effectively and safely there will be a requirement for a **Senior Authorised Person** to ensure that all the aspects of application, utilisation and removal of **Drain Earths** are managed. He will require to have complete knowledge of the various *Working Parties* activities, on the relevant part of the overhead line, to ensure that work on a section of overhead line is complete before the *Fixed Drain Earths* are removed without compromising Safety.

An example of where there is a need to manage the use of portable **Drain Earths** and *Fixed Drain Earths* is described in Appendix 2. General considerations to facilitate the use of *Fixed Drain Earths* and portable **Drain Earths** are described in Appendix 3.

9. APPLICATION OF FIXED DRAIN EARTHS

The procedures below will only be undertaken when the overhead line has been **Isolated** and the **Primary Earths** applied.

9.1 Considerations prior to implementing Fixed Drain Earths

When the earthing requirements can be met by the application and removal of **Drain Earths** issued with a **Permit for Work** for *Working Parties* and there is no merit in terms of safety or efficiency then there will be no requirement to use *Fixed Drain Earths*.

Consideration should also be given to the practicability of meeting the return to service time of the outage and the number of *Fixed Drain Earths* being left on the overhead line.



9.2 Situations where Fixed Drain Earths shall be used

Where the *Working Party* has no **Drain Earth** authorisation and there is a need to implement an earthing system prior to the work commencing to ensure safety from induced voltages, impressed voltages or inadvertent backfeed, *Fixed Drain Earths* shall be used

When **Drain Earths** are required to be left in position on the tower at the time of cancelling the **Permit for Work** they shall become *Fixed Drain Earths*. This will highlight their position on the overhead line and their details shall be recorded on an **Earthing Schedule**.

9.3 Guidance on the Permit for Work and application of Fixed Drain Earthing

Scenarios on how *Fixed Drain Earths* can be implemented.

9.3.1 *Fixed Drain Earth* application prior to work commencing

The *Earthing Party* will receive a **Permit for Work** to apply red pennants and **Drain Earths** on towers as specified by the **Senior Authorised Person** and they shall be applied as directed through the use of an **Earthing Schedule**. Guidance is given below on the completion of the **Permit for Work**.

Section 1(iii) of the **Permit for Work** records the work to be done, an example would be Apply Red pennants and apply *Fixed Drain Earths* in accordance with **Earthing Schedule** (include number). The **Earthing Schedule** number will be the next in sequence on the schedule pad or allocated a number as per OPSAF-11-31.

Section 2(ii) of the **Permit for Work**, Further precautions to be taken during the course of work to avoid system derived hazards, would not require any further information and N/A would be suitable for the example given above.

After the earths have been applied to the conductors, before descending the tower, the prescribed notice will be affixed around the earth end connections and tower steelwork, all three phases shall have separate *Fixed Drain Earth Notices* attached, to indicate that it is a *Fixed Drain Earth*. Appendix 1 shows an example of the prescribed *Fixed Drain Earth Notice*.

When the earthing requirements have been met; as stated on the **Earthing Schedule**; the **Permit for Work** will be cancelled.

Section 5, Clearance, of the **Permit for Work** will state that *Fixed Drain Earths* are applied as per **Earthing Schedule**, the **Earthing Schedule** number will also be recorded and should be that recorded in Section 1.

9.3.2 The Change of **Drain Earth** to *Fixed Drain Earths*

During certain types of work there may be unforeseen circumstances or changes to the planned earthing arrangements that may require the **Drain Earths** to be left in situ on the



cancellation of the **Permit for Work**. On these occasions the **Senior Authorised Person** shall, where reasonably practicable, issue *Fixed Drain Earth Notices* and have them applied to the earth end connections. The **Senior Authorised Person** shall record the *Fixed Drain Earth* details i.e. location and quantity, on an **Earthing Schedule**. The **Earthing Schedule** number will be the next in sequence on the schedule pad or allocated a number as per OPSAF-11-31.

The Clearance section, 5, of the **Permit for Work** will record that *Fixed Drain Earths* have been applied as per **Earthing Schedule** (include number).

This procedure should be completed prior to the cancellation of the **Permit for Work**.

9.3.3 The Planned Application of *Fixed Drain Earths* during the course of work

During the course of overhead line work consideration should be given to reducing the application and removal of earths by multiple *Working Parties* accessing the same towers. To assist with this principle it is acceptable for a *Working Party* to leave **Drain Earths** on the conductors, if it is foreseen that a *Working Party* may later make use of them for the control of induced voltages, impressed voltages or inadvertent backfeed.

To manage this situation the *Working Party* will require sufficient **Drain Earths** associated with the work to be done, to be issued with their **Permit for Work**. The quantity of **Drain Earths** and *Fixed Drain Earth Notices* issued will reflect the requirement to cover the continuous application of **Drain Earths** without removal.

On completion of the work and the application of **Drain Earths**, the *Fixed Drain Earths* shall be recorded in the clearance section of the **Permit for Work** as described in section 9.3.2 above.

9.3.4 **Drain Earths** applied on the same towers as *Fixed Drain Earths*

When **Drain Earths** are required to be applied due to a **Drain Earth** being damaged that is associated with *Fixed Drain Earths* on an **Earthing Schedule**, then this should be noted by the **Senior Authorised Person** but does not require an **Earthing Schedule** to record its application.



10. FIXED DRAIN EARTH NOTICE

Fixed Drain Earth Notices shall be affixed to inform **Persons** that a **Drain Earth** shall be regarded as a *Fixed Drain Earth* and should be suitable, after inspection, to form part of a scheme required to manage induced voltages, impressed voltages or inadvertent backfeed.

The notices must be attached by wrapping around the earth clamp connections and the tower steelwork. They will be issued with the **Permit for Work** or when required by the **Senior Authorised Person**.

Fixed Drain Earth Notices shall be applied under the instruction of a **Senior Authorised Person**. *Fixed Drain Earth Notices* shall only be removed when the *Fixed Drain Earth* is removed under a **Permit for Work**. This process is further explained in section 11 below.

Working Parties shall not move or interfere with *Fixed Drain Earth Notices*.

Fixed Drain Earth Notices shall be of the flexible, high visibility orange background type in accordance with Appendix 1.

11. EARTHING SCHEDULES

An **Earthing Schedule** has various applications which can be used for listing the earthing requirements and this document considers the use of an **Earthing Schedule** for works associated with overhead line work. Guidance is also delivered on the issue of a **Permit for Work** to the *Working Party* and how *Fixed Drain Earths* are recorded.

11.1 Guidance on the processes for an Earthing Schedule

An **Earthing Schedule** will be prepared by a **Senior Authorised Person** specifying the earthing requirements for a section(s) of the overhead line and shall be issued with a **Permit for Work** for an *Earthing Party* to apply, as previously described in section 9.3.1.

When the **Permit(s) for Work** is ready to be cancelled which will leave *Fixed Drain Earths* on the overhead line then the **Senior Authorised Person** will notify the **Control Person** that *Fixed Drain Earths* are applied to the overhead line conductors and recorded on an **Earthing Schedule**. This will be recorded in the clearance section of the **Permit for Work** as per section 9.3.1 or 9.3.2 above.

The **Senior Authorised Person** shall be responsible for retaining the **Earthing Schedule**, which states the location and number of *Fixed Drain Earths*, until the earths are removed. The **Control Person** shall record that an **Earthing Schedule** is in place and detail the **Senior Authorised Person** responsible for the **Earthing Schedule**.

A copy of the **Earthing Schedule** will be provided at the earliest opportunity to the Control Centre responsible for maintaining the safety documentation. This will ensure that there is a copy held at a central location.



11.2 Earthing Schedules listing Fixed Drain Earths for the Working Party

The *Fixed Drain Earths* previously installed, by an *Earthing Party* or left in situ by a previous *Working Party*, will have been recorded on an **Earthing Schedule(s)**, which will be the responsibility of the **Senior Authorised Person** to manage. The **Earthing Schedule(s)** shall be issued with the **Permit for Work**. The application of a high visibility notice around the earth clamp and tower steelwork connections will make the *Fixed Drain Earths* application clearly visible and the Recipient of the **Permit for Work** will have a responsibility to ensure they are in place.

The *Working Party* will receive a **Permit for Work** making reference to an **Earthing Schedule** but depending on the circumstances and the work to be done there may be a requirement to issue additional **Drain Earths**.

11.2.1 Guidance when no additional **Drain Earths** are required by the *Working Party*

The **Earthing Schedule** that lists the **Drain Earth** requirements for the work to be done will be recorded in Section 2(i), Precautions taken to achieve safety from the system, of the **Permit for Work**.

Example: *Fixed Drain Earths* have been applied in accordance with **Earthing Schedule** (include number) and shall remain in place.

There will be a requirement for the **Authorised Person** receiving the **Permit for Work** to ensure that the *Fixed Drain Earths* are applied and meet the requirements of the earthing schedule.

11.2.2 Guidance when additional **Drain Earths** will be required by the *Working Party*

The **Earthing Schedule** will be recorded in Section 2(i) of the **Permit for Work**, as per section 11.2.1 above.

The additional **Drain Earths** will be recorded in Section 3, Issue, of the **Permit for Work** i.e. Number off and the **Earthing Schedule** should it be required.

Section 2(ii) of the **Permit for Work** will describe the application and removal of further portable **Drain Earths** required to meet earthing scheme, indicated, to achieve the work to be done.

11.3 Considerations on the Preparation and Management of Earthing Schedules

The **Senior Authorised Person** shall be the responsible **Person** for **Earthing Schedules** during the overhead line works to manage the safe co-ordination of the *Working Parties* and *Earthing Parties*.

Earthing Schedules can be created and stored electronically and only require being in hard copy when being issued with a **Permit for Work**.



When there is a large number of *Fixed Drain Earths* and multiple **Earthing Schedules** being managed on the overhead line consideration should be given to maintaining a record of earthing that records all the earths on the overhead line in a single location/format.

11.3.1 Transfer of responsibility of an **Earthing Schedule**

In circumstances where the **Senior Authorised Person** requires to transfer responsibility of the **Earthing Schedule** this will be done face to face, and the relevant information will be explained to the **Senior Authorised Person** taking responsibility for the **Earthing Schedule**. There will also be a requirement for the work in progress being delivered by the various *Working Parties* to be transferred in the same manner, this will ensure the **Senior Authorised Person** understands all aspects of the activities being carried out on the overhead line.

The control centre holding a copy of the **Earthing Schedules** being used on the overhead line shall be informed that the **Senior Authorised Person** responsible has changed and shall record their details.

12. REMOVAL OF FIXED DRAIN EARTHS

The removal of *Fixed Drain Earths* will only be allowed once all **Safety Documents** quoting the **Earthing Schedule(s)** with *Fixed Drain Earths* have been cleared and cancelled. If this has been completed then a **Permit for Work** may be issued for the specific task of removing **Drain Earths**. The work to be done will be to remove earths as stated on the **Earthing Schedule**, should there be any additional **Drain Earths** applied on the towers specified on the **Earthing Schedule** these will be removed also.

13. GUIDANCE ON SAFETY DOCUMENT COMPLETION

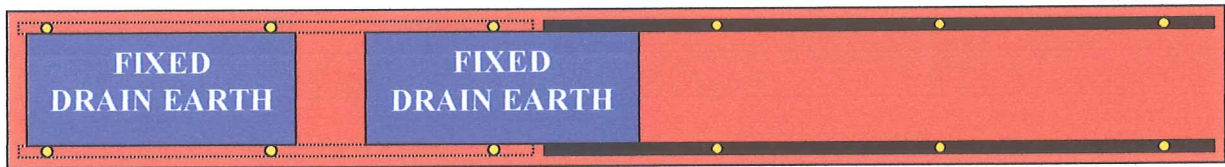
Guidance on the completion of all sections of a **Permit for Work** can be found in OPSAF-11-031 and should be used in conjunction with this document when completing a **Permit for Work** that will make use of *Fixed Drain Earths*.



APPENDIX 1

Fixed Drain Earth Notice

Flexible, with High Visibility Orange Background





APPENDIX 2

Earthing Example

A situation that would facilitate the use of *Fixed Drain Earths* would be for tower painting, where the painters have no **Drain Earth** authorisation. An *Earthing Party* would establish an earthing scheme as directed by the **Senior Authorised Person** suitable for painting e.g. **Drain Earths** applied at every 10 towers.

A *Working Party* could then be issued with a **Permit for Work** to replace insulators through that section of overhead line. To do this the **Permit for Work** they have been issued with would have a record of the **Earthing Schedule** for the painting in section 2(i) of the **Permit for Work**. In section 2(ii) there would be a requirement to apply and remove **Drain Earths** in accordance with the appropriate scheme number. On the towers that are earthed and highlighted by the use of a *Fixed Drain Earth Notice* there would be no requirement to earth the conductors further on that tower to manage induced voltages, impressed voltages or inadvertent backfeed and the earths could be used to facilitate the *Working Party*.



APPENDIX 3

General considerations for earthing management

When conductors are required to be broken i.e. removing jumpers, experience has shown that it may be prudent not to earth at the tension towers with the *Earthing Party*. In this case the *Working Party* will be issued with **Drain Earths** for application and removal at these towers, this will ensure that multiple **Drain Earths** are not being left on the tower due to the application and removal process of earths for this task.

On completion of the work above and there is a requirement for *Fixed Drain Earths* to be left affixed to the tension towers for subsequent *Working Parties* this can be addressed as per section 9.3. However it should be noted that if any **Drain Earths** are required to be taken down from the tower on completion of the work, all earths would require to be removed from all conductors to allow the removal of the earth end connections and then re-application of the appropriate amount of **Drain Earths** as indicated by the **Senior Authorised Person**.