PR-NET-OSM-099

# MANAGEMENT OF LIVE WORKING ACTIVITIES ON THE HIGH VOLTAGE SYSTEM

## OPERATIONAL MANUAL - SECTION 15.1



Scottish & Southern Electricity Networks

| | Name | Title |
|---|---|---|
| **Author** | N/A | Distribution SHE Team |
| **Checked by** | Peter Vujanic | Head of SHE Distribution |
| **Approved by** | Richard Gough | Designated Engineer |

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# 1 Introduction

1.1 This document describes the procedures and processes to be used for the management of, and the justification for the use of **High Voltage Live Line Work Techniques** on the distribution **Systems** owned and operated by **SSEN-D**. It is supported by the Work Instructions contained within the **Live** Line Working Manual.

1.2 **SSEN-D** has been performing work on **Live** overhead power lines since the early 1960's. The particular methods employed are termed 'Hot Stick' working whereby the worker is distanced from the electrical source by the use of insulating poles manufactured of fibreglass reinforced plastic (FRP) to recognised International and, more recently, European Standards, and 'Hot Glove' where the worker is electrically protected by insulating gloves and other insulating equipment, and carries out the work in direct mechanical contact with **Live Conductors** and / or **Apparatus**.

# 2 Scope

2.1 This document relates to the decision-making process required for justifying the use of **High Voltage Live Line Work Techniques** on the Distribution **Systems** owned and operated by **SSEN-D**.

2.2 This document contains **Approved** processes and procedures to be used in the management of **High Voltage Live Line Work**.

2.3 It applies to all persons employed by or working on behalf of **SSEN-D**.

# 3 References

The documents detailed in Table 3.1 - Scottish and Southern Electricity Networks Documents, and Table 3.2 - External Documents, should be used in conjunction with this document.

**Table 3.1 - Scottish and Southern Electricity Networks Documents**

| Reference | Title |
|---|---|
| PR-NET-OSM-006 | SSEN Distribution Operational Safety Rules – Operational Safety Manual – Section 1.1 |
| PR-NET-OSM-028 | Switching Terminology and Approved Abbreviations - Operational Safety Manual - Section 4.4 |
| PR-NET-OPS-001 | Networks Operational Approval and Authorisation |
| WI-PS-334 | Live Line Work Auditing and Monitoring |
| WI-NET-OSM-002 | Personal Protective Equipment and Workwear for Live Environments |
| WI-PS-230 | Live Line Working – Tools and Associated Equipment |
| MA-PS-020 (MA-NET-OHL-004) | Live Line Manual |
| PR-PS-089 | Live Line Working General Information |
| N/A | SSEN SHE Handbook (Held in Safety, Health and Wellbeing SharePoint Site) |

**Table 3.2 - External Documents**

| Reference | Title |
|---|---|
| HASAWA | Health & Safety at Work etc Act 1974 |
| ESQCR | Electricity Safety, Quality and Continuity Regulations 2002 |
| EAWR | Electricity at Work Regulations 1989 |
| MHSAWR | Management of the Health & Safety at Work Regulations 1999 |
| PUWER | Provision and Use of Work Equipment Regulations 1998 |

# 4 Definitions

4.1 The words printed in bold text within this document are either headings or definitions. Definitions used within this **Approved** Procedure are defined within the list presented immediately below, or within section 2 of the **Operational Safety Rules**.

4.2 **High Voltage Live Line Work Techniques**

Work in an **Approved** manner on the **Conductors** or **Apparatus** of a **High Voltage** overhead line with the **Conductors Live**.

4.3 **Operational Safety Rules (OSR)**

The **SSEN-D** Distribution set of rules, as read with related documents and procedures, that provide generic safe systems of work on the **System** therefore ensuring the health and safety of all who are liable to be affected by any **Danger** that might arise from the **System**.

4.4 **Live Line Auditor**

A suitably **Authorised Person** with sufficient understanding to provide meaningful feedback and improvements for the operational team.

4.5 **Person(s)**

Collective term for **Competent Person(s)** and / or **Authorised Persons(s)**

# 5 General Responsibilities

5.1 Persons who are required to undertake work on the **System** or part thereof, **Shall** have a thorough understanding of the work and ensure on-site risks are suitably assessed and appropriate control measures put in place before, during and after all activities.

5.2 Persons must ensure that at all times during the work (or associated testing) **General Safety** arrangements are maintained and that other work areas are not adversely affected by the activities for which they are responsible.

5.3 Specific **High Voltage Live Line Work** responsibilities are listed in section 11 of this **Approved** procedure

# 6 Authorisation

6.1 **Persons** who are required to undertake **High Voltage Live** Line Work **Shall** hold the appropriate competence and authorisation to carry out specified duties. It **Shall** be the responsibility of the individual to ensure that any actions performed are within the bounds of their competency and authorisation level.

6.2 **High Voltage Live Line Work Shall** be carried out by, or under the **Personal Supervision** of, an **Authorised Person**.

6.3 Competence and authorisation certificates **Shall** be retained personally and be made available upon request.

# 7 Personal Protective Equipment

7.1 **Persons** who are required to undertake **High Voltage Live Line Work Shall** wear suitably **Approved** Personal Protective Equipment (PPE).

7.2 As a minimum, PPE **Shall** meet the requirements of WI-NET-OSM-002.

# 8 Justification Statement

## 8.1 General

8.1.1 The need to improve overall cost effectiveness and the provision of a high-quality service to our customers through reductions in supply interruptions is a continual performance improvement objective for **SSEN-D**. The most cost-effective solution for work on distribution class systems is to embrace **High Voltage Live Line Work**.

8.1.2 **High Voltage Live Line Work** provides a number of benefits:

- Reducing the number of **Switching** operations compared with making the **Apparatus** to be worked on **Dead**, consequentially reducing operator risk particularly associated with road travel
- Managing customer expectations when taking into consideration the overall impact of planned supply interruptions on customer dependencies, traffic lights, private generation, continuous production requirements etc, see section 8.8.2
- Customers and communities benefitting from an improved continuity of supply, through the subsequent reduction in the number of planned outages and the inconveniences they cause
- Financial reward for **SSEN-D** through reduced planned outages, recovery of lost revenue and reduction in compensation claims

## 8.2 Hot Stick Working

8.2.1 The number of **Persons** required to perform a **Live** Line Stick or “Hot Stick” task is identified in the relevant Work Instruction within the **Live** Line Manual. For most applications the minimum team size is 3 **Persons**.

8.2.2 Whilst traditional ‘Hot Stick’ or distance method of **Live** working is an established, proven technique to achieving reductions in planned outages, experience has shown that the technique lends itself to efficient disconnection and reconnection of circuits or for creating temporary ‘sections’. While there are benefits to “Hot Stick” working, consideration of the risks to **Persons** of Musculo-skeletal issues should be made.

## 8.3 Hot Glove Working

8.3.1 The number of **Persons** required to perform a Rubber Glove or “Hot Glove” task is identified in the relevant Work Instruction within the **Live** Line Manual. For most applications the minimum team size is 3 **Persons**.

8.3.2 Musculo-skeletal issues presenting a risk to ‘Hot Stick’ teams are obviated by the use of ‘Hot Glove’ techniques, mainly due to the requirement for operators to work from the basket of a specialist mobile elevated work platform with insulating boom for electrical purposes, known as an Insulated Aerial Device (IAD). The ability to be close to the point of work, performing operations and using similar tools to working on a **Dead System**, allows improved visibility of actual task and component parts.

## 8.4 Essential Requirements

Essential requirements to be met when justifying **High Voltage Live Line Work** including the following:

- To demonstrate that there is a need to use these techniques and what the quantifiable benefits are, both to **SSEN-D** and to its customers
- To demonstrate that in all the circumstances the technique can be safely implemented, i.e. without harm to operators or the general public

- To demonstrate in all circumstances that:
  - It is unreasonable for the work to be carried out **Dead**
  - It is reasonable for the operator to be near the **Live Conductors**
  - Suitable precautions are taken to prevent **Danger**

## 8.5 The Requirement to Work Live

8.5.1 **Live** Working reflects the societal influences on **SSEN-D** to ensure that work is undertaken in the most cost-effective method without sacrificing, and in most cases improving, the service to customers.

8.5.2 The competitive influences on industrial and commercial customers, sometimes necessitate a continual source of electricity to be supplied where possible.

8.5.3 Increasingly, rural communities have come to rely on a continuous supply of electricity. This includes growth in the use of traffic lights as traffic densities increase, all electric properties as gas supplies are rarely available in these geographical locations, care of the elderly and infirm and the use of community services for early release of patients from hospital.

8.5.4 For some customers, mobile generators can be a solution, however, application of generation carries its own risks (handling fuel, maintaining safe electrical connections, etc.) and is not suitable for all networks and applications. Additionally, supplies may need to be disconnected to enable safe generator connections to be made.

8.5.5 It is acknowledged that **High Voltage Live Line Work** is not a necessity for each and every task and therefore, it **Shall** only be used where a definite need has been identified. This need may include:

- Strategically important circuits
- Work involving extended outages
- Work involving considerable resources
- Where large numbers of customers are affected

8.5.6 Section 8.8 provides information on the various critical tasks identified by **SSEN-D** and some of the effects on particular electricity dependant customers.

## 8.6 Safe Implementation

8.6.1 There are many facets which have been considered by **SSEN-D** in order to implement **High Voltage Live Line Work**. The Operational Safety Manual, of which this Justification Statement forms a part, details the various elements identified in order to work safely and in conformity with the law.

8.6.2 All work **Shall** be carried out in accordance with the **OSR**, and any **SSEN-D Approved** procedures.

8.6.3 Suitable and sufficient risk assessments have been carried out by analysis of the work practice and identification of the generic and individual task risks together with hazards associated with those risks and the likelihood and severity of injury. The risk assessments revealed the following:

- Failure of Personal Protective Equipment (PPE) is negligible
- Failure of equipment, including Insulated Aerial Devices (IAD), is negligible
- Most accidents related to failures in human behaviour (complacency; loss of concentration)

8.6.4 **SSEN-D** has adopted the concept of multiple barriers to deal effectively with the hazards arising from performing the work, whereby a number of controls **Shall** be put in place such as the specialist tools and equipment, the insulating shrouding, the IAD and the PPE.

8.6.5 There **Shall** always be a minimum of two barriers, and both would have to fail simultaneously for an event to happen. Whilst the severity of total failure is possible fatality, the likelihood is insignificant and therefore the risk is manageable.

8.6.6 In order to deal effectively with the risks arising from adverse human behaviour, **SSEN-D** has incorporated a discriminating staff selection and recruitment policy and structured training programme. This is supported by coherent documentation comprising:

- **Live** working justification
- **Live** working risk assessment (Appendix A)
- **Approved** procedures and work instructions
- On-site assessments and job planning
- A regulated system governing the procurement and periodic testing of PPE, tools and equipment

8.6.7 Operations on the **System** are managed by rigorous monitoring, safety auditing, refresher training and a control policy for the issue of **Safety Documents**, change controls, failure and defect reporting.

8.6.8 All elements are inter-related and thus need to be considered as a whole system rather than individual elements.

## 8.7 Typical Tasks Identified

**SSEN-D** acknowledges that the requirement to undertake **High Voltage Live Line Work** does not apply in a general manner but is specific relative to certain tasks as detailed in the **Live Line Working** Manual. Some suitable examples for which **Live Line Working** may be appropriate are:

- Intermediate Pole Replace Pin Insulator
- Replace Tension Insulator
- Jumper Connection / Disconnection
- Maintain ABSD
- Intermediate Pole Replace Cross Arm
- Install / Remove Barrier / Flying Section
- Repair Damaged **Conductor**
- Change a Stay
- Tree Trimming
- Fitting Bird Flight Divertors
- Connect / Disconnect Pole Box

## 8.8 Electricity Dependant Customers

8.8.1 **SSEN-D** recognises that there are some customers to whom a continuous supply of electricity is essential to ensuring financial performance and/or safety and health. Whilst some customers will have standby generation for emergencies, reliance on it as the primary means of supply during a planned interruption to electricity supplies increases the risks.

8.8.2 The list of customer requirements below is indicative and not comprehensive:

- Process or other critical industries with continuous production activities, and where there is an impact on information technology. Supply interruption requires substantial work to resume production, causes damage to plant and equipment, or may introduce **General Safety** and health risks to workers or the public
- Where domestic medical apparatus is installed
- Sewage and effluent treatment works. Without an electrical supply a gravity fed sewage plant would be subject to sewage overflow and flooding. The biological systems of effluent treatment would also be damaged
- Particular livestock farms (chickens, pigs, hatcheries etc.) where ventilation is required to ensure the animal welfare
- Dairy farms requiring operation of refrigeration plant from the early morning milking through the late afternoon milking to collection by the tanker. Should the milk be at a temperature above 4°C it may be rejected with the farmer incurring a financial loss and also an effluent disposal problem
- Other farms such as fish, crops, and vegetables are also impacted by a lack of supply where aeration, irrigation, ventilation and refrigeration may be adversely affected

# 9 Legal Requirements

9.1 There are many requirements to be satisfied including directives, which are mandated by the European Commission. **SSEN-D Shall** ensure that all applicable provisions are complied with. The range of legislation most relevant to **Live** working techniques are detailed in this section.

9.2 The Health & Safety at Work etc Act 1974 places a duty on an employer to secure the health, safety and welfare of employees and of other persons not at work but connected with it, including members of the public. Similarly, employees have a duty to take reasonable care for the health and safety of themselves and of other persons who may be affected by their acts or omissions.

9.3 Electricity Safety, Quality and Continuity Regulations 2002 contains certain provisions for disconnection, the essence is that a supplier of electricity **Shall** maintain that supply to a customer. The Regulations also require that the means of supply **Shall** be sufficient for the purpose.

9.4 The relevant aspects of the Electricity at Work Regulations 1989 provide that where there is a need for the work to be undertaken whilst the circuit is **Live**, with **Competent Persons** near to the **Live** parts, that within the system of work, suitable precautions are taken commensurate with the risk.

Two Regulations are pertinent to this work:

*Regulation 14 Work on or near **live conductors***

*No person **Shall** be engaged in any work activity on or so near any **Live Conductor** (other than one suitably covered with insulating material so as to prevent **Danger**) that **Danger** may arise unless -*

*(a) it is unreasonable in **all** the circumstances for it to be **Dead**; and*

*(b) it is reasonable in all the circumstances for him to be at work on or near it while it is **Live**; and*

*(c) suitable precautions (including where necessary the provision of suitable protective equipment) are taken to prevent **injury**.*

The fundamental principles of this technique, when applied to Hot Glove working, require that the **Live** parts to be worked upon, as well as those **Live** parts within a defined area, be covered with **Approved** insulating material (insulating shrouds and barriers) as a prerequisite to performing the task and that the work be performed from an insulating platform to provide isolation of the worker from **Earth**. The worker **Shall** be provided with **Approved** insulating gloves and insulating sleeves to provide additional protection to the upper arm from inadvertent contact with a **Live** part. At all times the worker **Shall** be expected to maintain predetermined **Safety Distances**.

*Regulation 16* ***Persons** to be competent to prevent **danger** and injury*

*No person **Shall** be engaged in any work activity where technical knowledge or experience is necessary to prevent **Danger** or, where appropriate, **injury**, unless he possesses such knowledge or experience or is under such degree of supervision as may be appropriate having regard to the nature of the work*.

**SSEN-D Shall** take all the necessary actions to ensure that persons carrying out this work **Shall** have the technical knowledge and be competent to prevent **Danger**.

9.5 Management of the Health & Safety at Work Regulations 1999 (as amended) invoke relevant European Directives, such as the Personal Protective Equipment Directive, and place the duty on the employer to assess the risks and associated hazards, take appropriate and adequate measures to eliminate or control those hazards.

9.6 Provision and Use of Work Equipment Regulations 1998 place a duty on employers to ensure the work equipment they own, operate, and have control over, is safe to use at all times.

# 10 Staff Competence

## 10.1 Selection and Training

10.1.1 Although the provision of quality tools and equipment is a significant element in achieving safety during **High Voltage Live Line Work**, great reliance is placed upon selecting the right people for the job and ensuring that they are properly trained.

10.1.2 Only existing qualified linesmen **Shall** be considered for recruitment to a **High Voltage Live Line** Working team.

10.1.3 The individual Shall be selected upon:

- Standard of general work
- Understanding of **Live** Working principles
- **HV** OHL working experience
- Attitude and behaviour to work, environment and colleagues
- Overall competence

10.1.4 For **High Voltage Live Line Work** team recruitment, Linesmen who are successful in the initial selection process **Shall** attend an assessment centre. The assessment centre **Shall** comprise the following activities:

- Ability Test

- Group Exercise
- Practical Exercise
- Scenario
- Interview, to a predetermined standard by a panel comprising a manager and a **High Voltage Live Line** engineer with a recommendation for nomination as detailed in Networks Operational Approval and Authorisation process and passed to an Authorisation Officer

10.1.5 Individuals nominated as per the Networks Operational Approval and Authorisation process **Shall** undergo a training course provided by experienced and qualified instructors.

10.1.6 Individuals **Shall** be constantly assessed throughout the training course to identify strengths, development areas and whether the requirements have been met.

## 10.2 Authorisation Process

10.2.1 Individuals who satisfactorily complete the initial training school-based section of the training course, **Shall** be invited to attend an interview with an Authorisation Officer.

10.2.2 The Authorisation Officer, supported by a **Person** who is knowledgeable in **High Voltage Live Line Work** procedures or by a representative from the Learning and Development group, **Shall** review the candidate's operational portfolio, which **Shall** include the formal course detail and feedback. They **Shall** interview the candidate to confirm, as far as reasonably practicable, a suitable level of competence and **Shall** issue an Authorisation Certificate for **High Voltage Live Line Work** under **Personal Supervision**.

10.2.3 Once the Authorisation Officer issues a certificate with the limitation, the candidate **Shall** experience a varying range of tasks and activities during their field training under the **Personal Supervision** of a fully authorised member of the **High Voltage Live Line Working** team and **Shall** keep an operational portfolio to demonstrate the activities undertaken. During this training the individual **Shall** not fulfil the role of the Groundsman.

10.2.4 Once a number of varying activities have been completed and the candidate's performance is deemed to meet the rigorous standards set for **High Voltage Live Line Work**, an onsite assessment **Shall** be carried out by an independent **Person** holding Cat 16 to formally identify the candidate's readiness to receive full authorisation.

10.2.5 To receive the full authorisation the candidate **Shall** be interviewed by an Authorisation Officer supported by an **Person** who is knowledgeable in **High Voltage Live Line Work** procedures or by a representative from the Training and Assessment Centre. If successful, the 'under **Personal Supervision**' restriction **Shall** be removed. The on-site assessment and authorisation interviews may be held simultaneously.

10.2.6 Only those individuals that satisfy all the requirements **Shall** be authorised.

## 10.3 Refresher Training and Skill Continuity

10.3.1 Staff are required to undertake a wide range of tasks within a three-month period. The range of tasks Shall include the following skills:

- Care and use of PPE
- Tool and Equipment checks.
- IAD checks
- Making and breaking of **Live** connections
- Installation and removal of shrouding

10.3.2 Records of tasks completed **Shall** be maintained by the Supervisor responsible for **High Voltage Live Line Work** teams and activities. Where the range of skills have not been covered the authorisation **Shall** be deemed to have lapsed.

10.3.3 Tasks falling outside the three-month period **Shall** be refreshed as follows:

For periods < 6 months -

- Staff to be interviewed; and
- Task to be performed on **Live** line under **Personal Supervision** of an **Authorised Person** assessed as competent before working **Live** without supervision
- The training is undertaken **Live** under the **Personal Supervision** of an experienced **Person** and the team assessed as competent before working **Live** without supervision

10.3.4 For a written procedure, issued to formalise findings on workings that are part of, or variations of, an existing procedure, it is at the discretion of the **Designated Engineer** as to whether a practical assessment is required.

10.3.5 In all of the above cases, the records of the individuals trained in the procedure **Shall** be updated appropriately.

10.3.6 Should it be considered necessary, training sessions **Shall** be undertaken on **Dead Apparatus**, preferably in a training environment. These training sessions **Shall** be used to introduce **High Voltage Live Line** teams to new procedures.

10.3.7 No procedures or item of equipment **Shall** be used until each of the following criteria have been satisfied:

- The required development work has been performed on a **Dead** line
- A written procedure (along with any necessary diagrams) has been prepared
- The procedure or item has been **Approved** by the **Designated Engineer**
- The operators to perform the procedure or use of equipment have been trained and authorised specifically in its use

# 11 Responsibility of Persons

## 11.1 High Voltage Live Line Team Member

11.1.1 Responsible for their own safety and that of others who may be affected by their acts or omissions.

11.1.2 Has a duty to bring to the attention of the **Working Party** and, where required, their supervisor any hazard or risk they consider to be a **Danger**.

11.1.3 **Shall** be responsible for wearing the PPE required to work safely and efficiently.

11.1.4 **Shall** have the ability to understand how to identify PPE defects and to ensure that defective or out of test PPE is identified and taken out of service.

11.1.5 **Shall** have a knowledge of and be skilled in operating tools and equipment within the designed limitations.

11.1.6 **Shall** understand how to identify operating equipment defects and be responsible for ensuring those in their charge which are defective or out of test are identified and taken out of service.

11.1.7 Is responsible for having a working knowledge of the standards, procedures, rules and regulations applicable to **High Voltage Live Line Work**. When in doubt, clarification **Shall** be sought from the Supervisor.

11.1.8 **Shall** be responsible for the quality of their work.

11.1.9 **Shall** carry out all checks and inspections of tools, equipment and PPE as required and confirm satisfactory or unsatisfactory to the Groundsman.

11.1.10 **Shall**, should the Groundsman become incapacitated, cease work and return to the ground.

11.1.11 Identify any reasonable objection regarding the equipment or procedure to be used for the **Live** Line Work and discuss with the Groundsman. If necessary, the objection **Shall** be referred to a higher authority for a decision before proceeding.

## 11.2 Groundsman

11.2.1 **Shall** observe the **High Voltage Live Line Work** as it is carried out and ensure the agreed control measures are maintained to minimise risk.

11.2.2 **Shall** confirm that that all equipment, tools and PPE are within their test date and fit for use in accordance with the **Approved** procedures.

11.2.3 **Shall** confirm that preliminary inspections and risk assessments for the site, the overhead line to be worked on and the task to be completed have been carried out and recorded in accordance with this **Approved** procedure.

11.2.4 **Shall** confirm that all checks and inspections of the IAD are carried out and recorded before **High Voltage Live Line Work** commences and that any defects are also recorded, and remedial actions taken as appropriate. In addition, the Groundsman **Shall** ensure that the IAD chassis is effectively **Earthed** in accordance with the **Approved** procedure.

11.2.5 The Groundsman in charge of the work **Shall** have complete authority. They **Shall** place visitors in a safe position, and if their instructions are not complied with, **Shall** request that the person(s) leave site. In such circumstances they **Shall** make a written statement to their Line Manager.

## 11.3 Supervisors Responsible for High Voltage Live Line Teams

11.3.1 **Shall** ensure safe working conditions for the teams.

11.3.2 **Shall** ensure that work equipment, tools, materials and PPE are properly maintained and available for use when required.

11.3.3 **Shall** plan to ensure that tools & equipment are inspected and, where required tested at the correct intervals.

11.3.4 That insulated tools and **Live** working PPE are inspected, tested and replaced in accordance with **SSEN-D Approved** Procedures.

11.3.5 **Shall** ensure that the IAD is within test (12 monthly dielectric, 6 months thorough examination).

11.3.6 **Shall** ensure work is performed in accordance with the prescribed standards, procedures, rules and regulations.

11.3.7 **Shall** effectively communicate information to all employees under their supervision including monthly briefings.

11.3.8 **Shall** ensure that **High Voltage Live Line** authorised staff are competent through proper instruction and training to work safely and that they fully understand their role in the work to be done.

11.3.9 **Shall** ensure a sufficient number of staff are allocated to safely carry out the work.

11.3.10 **Shall** know the capabilities and limitations of their staff.

11.3.11 **Shall** maintain a record of operations and ensure staff authorisations are current.

11.3.12 **Shall** ensure **Approved** work instructions have been developed for the tasks to be undertaken.

11.3.13 **Shall** carry out regular **Live** working safety inspections on sample jobs and submit a brief report to their manager.

11.3.14 **Shall** schedule the teams work so they work predominantly on **High Voltage Live Line Work** and allow **SSEN-D** to realise a maximum return on Customer Minutes Lost (CML) and Customer Interruption (CI) savings.

11.3.15 **Shall** provide relevant information to assist other job owners to justify and plan **High Voltage Live Line Work**.

11.3.16 **Shall** ensure that all justification documents and Tailboard conference sheets are filed and held in accordance with an **Approved** Procedure.

# 12 Management of Safety

## 12.1 System Control

12.1.1 **High Voltage Live Line Work Shall** not be carried out unless communication is made with the **Control Engineer**.

12.1.2 Work **Shall** not commence until the **Authorised Person** in charge of the **High Voltage Live Line Work** has advised the appropriate **Control Engineer** of the nature and location of the work to be carried out, and permission has been granted to proceed.

12.1.3 On completion of the **High Voltage Live Line Work**, the **Control Engineer Shall** be informed when the work is complete, and all **Persons** and tools have been withdrawn from the point of work.

12.1.4 When undertaking **High Voltage Live Line Work** there must be a form of communication available. This communication device must not be left in the Mobile Elevated Work Platform and must be adjacent to the working area.

12.1.5 Where **High Voltage Live Line Work** is being carried out for isolation purposes, the procedure must be completed, a **Caution Notice** posted and the **Control Engineer** informed when all **Persons** and tools have been withdrawn from the point of work before the circuit is made safe in accordance with Operational Safety Rules 4.1.1.

12.1.6 If it is necessary to suspend **High Voltage Live Line Work**, for example due to poor weather conditions, the **Conductors**, **Plant**, **Apparatus** and **Live** Line equipment **Shall** be left in a safe condition and the **Control Engineer** informed that **High Voltage Live Line Work** has been suspended. Work **Shall** not recommence without the permission of the **Control Engineer**.

12.1.7 If the circuit on which **High Voltage Live Line Work** is being carried out becomes **Dead** due to the operation of protection equipment or for any other reason, the **Control Engineer Shall** not sanction the circuit to be re-energised without the agreement of a member of the **Live** Line team.

12.1.8 It is not permitted for more than one **Live** Line Team to be working beyond the same source circuit breaker at the same time. Preparations for **Live** Line Working can be made at various locations along the circuit but only one team may be work aloft upon the circuit **Conductors** at any given time.

## 12.2 Audits and Monitoring

12.2.1 Effective inspection, monitoring and auditing of **Persons** authorised by **SSEN-D** to carry out **Live** line working activities is essential to ensure that work is carried out safely and in accordance with the **SSEN-D** Work Instructions (**Approved** procedures) applicable to each **Live** line work task.

12.2.2 **Persons** authorised by **SSEN-D** to carry out **Live** Line working activities on the **SSEN-D HV System Shall** be subject to Technical Audits and Monitoring Checks to confirm compliance with the **Approved** procedures for the work activity.

12.2.3 A Technical Audit is an in-depth operational assessment of a team and/or individual, authorised to carry out **Live** line working activities on the **SSEN-D HV System**. A Technical Audit may only be carried out by a **Person** authorised in writing and holding an **SSEN-D** Certificate of Authorisation for Category 16i (**Approved Live** Line Assessor/Auditor).

12.2.4 A Monitoring Check is an operational assessment of a team and/or individuals' compliance with the **Approved** procedures prior to carrying out **Live** Line working activities. A Monitoring Check may be carried out by a **Person** authorised in writing and holding an **SSEN-D** Certificate of Authorisation for Category 3b (Supervise a **Working Party** in an Exposed **Live HV** Overhead Environment) or Category 16i (**Approved Live** Line Assessor/Auditor).

12.2.5 Regional **Live** Line Business Leads **Shall** be responsible for ensuring that each **Person** in their Region who is authorised to carry out **Live** Line working activities on the **SSEN-D HV System**, receive Technical Audits and Monitoring Checks.

12.2.6 Persons authorised under **SSEN-D** Category 16i (**Approved Live** Line Assessor/Auditor) **Shall** receive a peer review of their audit process on an annual basis. The peer review **Shall** be carried out by an ISO accredited auditor or another **Person** authorised under **SSEN-D** Category 16i (**Approved Live** Line Assessor/Auditor).

12.2.7 There is no requirement to complete peer reviews on **Persons** who complete Monitoring Checks.

## 12.3 Frequency of Auditing and Monitoring

For each **High Voltage Live** Line team, the number of technical audits and monitoring checks **Shall** be no less than those shown below in Table 12.1.

**Table 12.1 - Minimum Number of Technical Audits and Monitoring Checks**

| | Authorisation Category | | |
|---|---|---|---|
| **Type of Assurance Required:** | **Pole Erection** | **Hot Stick** | **Hot Glove** |
| Technical Audit | 1 | 2 | 4 |
| Monitoring Check | 2 | 4 | 6 |

# 13 Equipment

## 13.1 General

13.1.1 Given the safety critical nature of **High Voltage Live Line Work**, the provision of **Approved High Voltage Live Line Work** tools and equipment that are suitable and sufficient for the work activity is imperative.

13.1.2 A list of **Approved** standards for the equipment, shrouding, IAD and PPE designed for **High Voltage Live Line Work**, **Shall** be maintained.

13.1.3 All **High Voltage Live Line Work** equipment which insulates the worker from **Live** parts **Shall** be subjected to an electrical acceptance test in accordance with the applicable technical standards before receipt into a storage location.

13.1.4 All **High Voltage Live Line Work** equipment before issue and subsequent periods thereafter, **Shall** be subjected to a visual inspection to identify any mechanical defects and a dielectric test to ensure the equipment meets the required standards of performance. The frequency of inspection and dielectric testing **Shall** be at regular intervals of time, determined by experience and statistical information, and in accordance with the applicable technical standards.

13.1.5 Prior to inspection and testing, equipment **Shall** be cleaned in accordance with the manufacturers specific recommendations using solutions which do not impair the insulating qualities, or which leave conductive residues.

## 13.2 Testing and Maintenance

13.2.1 **SSEN-D** recognises the importance of the periodic inspection and testing of equipment, see Table 13.1, and that it appears as a critical node in the risk assessment.

13.2.2 **SSEN-D Shall** ensure that periodic inspection and testing of equipment, **Shall** only be carried out by qualified **Competent Persons** who are knowledgeable and who have received training in these specific testing methods and who understand the modes of failure.

13.2.3 To ensure adequate standards are maintained, **SSEN-D Shall** require evidence of operator experience and that regular independent audits of the operator and calibration of the equipment are carried out.

13.2.4 Testing **Shall** only be performed using equipment which has been specifically designed and specified in accordance with the relevant technical standards. Where appropriate, suitable measures **Shall** be in place to provide environmental controls such as temperature and humidity.

13.2.5 The following testing and maintenance criteria **Shall** apply at the specified frequencies.

**Table 13.1 - Live Line Equipment Testing and Maintenance Schedule**

| Material/Equipment | Pre–Use | Monthly | Quarterly | Annually |
|---|---|---|---|---|
| IAD | V, O, P | V, M, O, P | V, M, O, P | V, M, O, D, P |
| Basket Liner | V, P | V, P | | V, D, P |
| Hot Sticks | V, O, P | V, O, P | | V, O, D, P |
| Hydraulic Hoses | V, O, P | V, O, P | | V, O, D, P |
| Hydraulic Tools | V, O, P | V, O, P | | V, M, O, D, C, P |

| | | | |
|---|---|---|---|
| V = | Visual | O = | Operational Checks |
| D = | Dielectric Testing | P = | Cleaning and/or Polishing |
| C = | Calibration | M = | Maintenance Checks |

13.2.6 Visual Inspection

**Shall** confirm that there are no obvious defects with the equipment and everything appears to be in good serviceable order.

13.2.7 Operational Checks

Confirm that the equipment **Shall** operate in the manner intended. Due to the nature of some equipment, an operational check when required is mandatory before use of the equipment.

13.2.8 Dielectric Testing

Electrical testing of the equipment to confirm that the equipment still meets the required level of insulation as quoted in the appropriate standard.

13.2.9 Calibration

This is a certificated test to confirm that the tools or test equipment are accurate and concur with the required standard, e.g. testing the compression pressure of the hydraulic crimping head or testing and proving the **High Voltage** testers with known parameters.

13.2.10 Maintenance Checks

These are checks or routine service requirements that **Shall** be accordance with manufacturers standards and specifications particular to the type of tool or equipment.

13.2.11 Cleaning and Polishing

Following use or exposure to weather, the tools and equipment **Shall** require cleaning and, in some cases, polishing to restore the surface properties i.e. 'Hot Stick' tools can be polished with a silicon impregnated cloth to improve the tools resistance to the build-up of dirt and grime on the exterior surface.

## 13.3 Maintenance and Periodic Testing of Insulated Aerial Device (IAD)

13.3.1 Maintenance and testing of both vehicle and IAD Shall be performed in accordance with the manufacturer's recommendations, technical standards and in-line with the Approved **SSEN-D** procedures.

13.3.2 **SSEN-D Shall** ensure that only qualified **competent persons** carry out periodic inspection, maintenance and testing of the IAD.

13.3.3 The Team Manager or nominated **High Voltage Live Line** lead is responsible for the administration of all testing and maintenance of the IAD (including, where appropriate, insulating basket, insulating basket liners and insulating jib) and ensuring that valid test certificates are current, a copy of which **Shall** be retained with the operator's handbook.

13.3.4 The nominated **High Voltage Live Line Working** lead **Shall** ensure that the integrity of the IAD is not compromised by the use of inferior parts during maintenance. Where it is necessary to replace or affect a repair to an insulated component, the following **Shall** apply:

- Dielectric testing of the IAD is required where work / repairs are carried out or when there is an oil leak on the IAD that could affect the electrical integrity of an insulated component. This test **Shall** be carried out prior to for **High Voltage Live Line Work**
- Dielectric testing is not required if the components to be repaired / replaced are below the turret or do not affect the dielectric properties of boom
- Where any hoses are replaced, they **Shall** be replaced with orange hoses marked 'Non-Conductive' and to the relevant specification, i.e. SAE 100R7 or equivalent

13.3.5 Adequate notice **Shall** be given to the Team Leader associated with the **High Voltage Live Line** team when it is required to maintain the vehicle and/or test the IAD.

13.3.6 In cases where safety may be affected the vehicle and IAD **Shall** be removed from service until repairs have been completed.

13.3.7 The deterioration of the vehicle **Shall** be monitored throughout its life and when required be refurbished / replaced based on condition rather than on a fixed period. The following **Shall** be considered when making this decision:

- Relevant maintenance history and costs associated with each vehicle
- Through the thorough examinations that are carried out every 6 months
- Through dielectric tests that are carried out on an annual basis

### 13.4 Defective Equipment

13.4.1 Any **High Voltage Live Line** equipment that does not meet the required standards, **Shall** be readily identified and segregated from compliant equipment. A permanent mark **Shall** be applied to the equipment which cannot be repaired, until it can be destroyed or disposed of.

13.4.2 **High Voltage Live Line** equipment that has been identified as defective **Shall** not be used.

## 14 Work Stages Risk Avoidance

### 14.1 Pre-Work Site Assessment

Before the day of work, where practicable, the proposed site **Shall** be risk assessed to confirm:

- Suitable terrain accesses and egresses to the work position
- Suitable ground conditions for the stability of the IAD
- Suitable overhead line construction
- Network configuration (e.g. transformers, cable sections, load breakers etc)
- The condition of the **Apparatus** to be worked upon is acceptable and not likely to fail during the work
- The condition of the overhead line at least two spans either side of the point of work is acceptable and not likely to fail during the work
- The landowner is aware of the nature of the proposed work
- There are no other specific hazards that may affect the proposed work

### 14.2 Arrival on Site

The Groundsman **Shall** ensure that, if weather and other conditions permit, the following operations are carried out. The Groundsman **Shall** stop all work if the weather deteriorates or other circumstances make it necessary:

- On arrival on site, the ground **Shall** be inspected for suitability
- A stage 2/3 risk assessment **Shall** be completed
- Where appropriate, the site **Shall** be cordoned off in the **Approved** manner and notices displayed as required
- The general public **Shall** be excluded from site
- Only authorised visitors and Safety Auditors **Shall** be allowed on-site
- The MEWP is positioned on firm ground, levelled, stabilised and the chassis **Earthed** and/or barricaded as appropriate

- The MEWP **Shall** be checked in accordance with **Approved** procedures and all controls **Shall** be confirmed as working correctly
- All equipment, tools, PPE and everything necessary for the work to be done **Shall** be inspected
- A visual examination of the overhead line **Shall** be carried out in accordance with **Approved** procedures

## 14.3 Weather Conditions

14.3.1 On the day of the work, the weather report **Shall** be checked prior to work commencing to confirm that the weather is suitable for **High Voltage Live Line Working**.

14.3.2 If during the work a Lightning Risk Warning is received, the equipment **Shall** be made safe and the work suspended as quickly as practicable. Similarly, if the weather becomes unsuitable for **High Voltage Live Line Working** to continue the site **Shall** be made safe and the work suspended.

14.3.3 All tools and equipment **Shall** be thoroughly dried following exposure to the rain and before further use.

14.3.4 If the level of natural light is not deemed sufficient to carry out the task safely, suitable and sufficient portable lighting **Shall** be used, or the work **Shall** be suspended until light conditions are sufficient.

## 14.4 Pre-Work Stage

14.4.1 Before any work commences the Groundsman and the team **Shall** discuss and plan the job and record the details.

14.4.2 This **Shall** detail the job sequence, allocate specific tasks, identify the risks involved in each task together with the control measures, recognise anything unusual which may affect the work.

14.4.3 Team members **Shall** be reminded of the correct work procedures, which are designed eliminate the risks of falls, falling objects, and electrocution.

14.4.4 The team **Shall** be reminded of the emergency measures each **Shall** take if it becomes necessary. If a team member becomes ill, work **Shall** cease.

14.4.5 Communication between Groundsman and team **Shall** be confirmed or tested where applicable.

14.4.6 Safe access and egress from the site **Shall** be checked.

## 14.5 During Work

The Groundsman **Shall** at all times keep the work and individuals under close observation:

- The Groundsman **Shall** direct the team member responsible for the vehicle to carry out frequent checks of stability
- Communications between individuals and the Groundsman **Shall** be constantly checked provided it does not interfere with concentration on the task
- The immediate vicinity of the work area **Shall** be kept clear
- No member of the **Working Party Shall** leave the site without the express permission of the Groundsman and only then when work ceases

- If during work, it is perceived that a change to the agreed work procedure is necessary, all work **Shall** cease, and the team **Shall** move away from the work area to agree a revised procedure which **Shall** be recorded
- No person **Shall** approach the chassis of the MEWP unless the work platform is positioned out of the work area

### 14.6 Completion of Work

When the work has been completed and all staff are at ground level:

- The Groundsman and team **Shall** discuss the work from the viewpoint of acknowledging that there were no problems or that improvements were possible. Where appropriate, the Groundsman **Shall** take notes and submit a brief report to nominated **High Voltage Live Line Working** lead
- All tools, equipment and PPE **Shall** be checked for damage and stored in accordance with instructions. On return to the depot, items that are suspect **Shall** be removed and subsequently dealt with
- The MEWP booms and baskets **Shall** be stored correctly and secured in the travelling position. Boom / basket covers **Shall** be installed
- Stabilisers **Shall** be stored, and everything prepared to allow safe travel from the site to depot
- All **Danger** signs, barriers, chassis **Earth** rods etc., **Shall** be recovered and stored

## 15 Risk Assessment

15.1 The system of work implemented is designed to:

- Identify the hazard
- Evaluate the risk
- Identify suitable control measures to reduce or eliminate the risk
- Develop a plan
- Implement the plan
- Monitor

15.2 The risks associated with **High Voltage Live Line Work** includes those, which may arise from the following hazards:

- Electrical
- Mechanical
- Gravitational

15.3 Apart from the general hazards, the system of work **Shall** also consider operator error or human behavioural failings.

15.4 The plan **Shall** ensure:

- Responsibilities are defined
- Hazards are eliminated if possible

- Measures are introduced to control hazards, which cannot be eliminated, and to protect against injury in case control is lost. Similarly, a contingency is required in order to minimise any injury that may be sustained
- PPE, tools and equipment are procured and routinely tested to adequate standards
- A fully documented system of procedures is issued to the relevant staff and a process of control and updating is implemented
- Staff are appropriately selected and adequately trained

15.5 Monitoring ensures:

- That any shortcomings are identified in either the work practice and management of the work practice, staff capability or tools and equipment (including inspection and testing requirements)
- Remedial actions are implemented as appropriate following the review and subsequent developments

**Table 15.1 - Summary of Key Generic Hazards, Risks and Controls**

| Hazard | At Risk | List of Controls or Where Information may be Found |
|---|---|---|
| Vehicle becomes unstable or overturns | Operative and Groundsman | MEWP/IAD design stability Factor of Safety 1.5x rated capacity on 5° slope.<br>Ground is examined prior to work to ensure it is firm and solid and levelling of vehicle is carried out.<br>Pre work checks take boom through position of minimum stability.<br>Groundsman provides constant monitoring. |
| MEWP/IAD control, hydraulic or mechanical failure | Operative | Regular periodic inspection and maintenance by both crew and appointed service management company.<br>MEWP/IAD designed with check/holding valves.<br>Operators trained in evacuation and rescue techniques. |
| Error when operating MEWP/IAD controls | Operative | Operatives trained to 'feather' controls.<br>MEWP/IAD to be in 'low speed' for operation approaching or within the 'work area'. |
| Overloading MEWP/IAD | Operative and Groundsman | All loads to be assessed by Groundsman and operators before raising or lowering. Loads to be raised /lowered where feasible from static boom position. If this is not possible worst-case load radius to be assessed before raising or lowering loads.<br>Upper and lower boom angle indicators are used in conjunction with load capacity chart at operator station to indicate lifting capability in particular position. |
| Defective PPE | Operative | Individual responsible for own PPE.<br>All PPE examined by operator, on ground, prior to use.<br>PPE subject to regular periodic inspection and electrical testing by trained and **Competent Person**. Only **Approved** test facility to be used.<br>PPE stored correctly. |
| Defective **Live** Line tools and equipment | Operative and Groundsman | All **Live** Line tools and equipment cleaned and examined by operator, on ground, prior to use.<br>All **Live** Line tools and equipment subject to regular periodic inspection and electrical testing by trained and **Competent Person**. Only **Approved** test facility to be used.<br>All **Live** Line tools and equipment stored correctly when not in use.<br>Tools never laid direct on ground or against wall or other support but on clean, dry tarpaulin or tool rack. |
| Failure of components outside the work zone. | Operative, Groundsman, 3rd parties and Livestock | Ground patrol for 2 spans or up to a section pole either side of zone of work using binoculars.<br>Inspection from base of pole. |

# 16 Justification for High Voltage Live Line Working (Stage 1 Risk Assessment)

16.1 The justification for **High Voltage Live Line Working** (Stage 1 risk assessment) in Appendix A **Shall** be filled out by the Issuing Manager.

16.2 The completed document **Shall** be issued to a member of the **Working Party** to complete the on-site risk assessment.

16.3 The competed document **Shall** remain on-site for the duration of the work.

# 17 The Tailboard Conference Sheet (Stage 2/3 Risk Assessment)

17.1 For **Live** Line working the justification process Shall be reviewed and noted on the Stage 2/3 Risk assessment.

17.2 Before writing the risk assessment a visual site inspection **Shall** be carried out.

17.3 The Risk assessment **Shall** include:

- Exact Location
- Grid ref no. (including letters)
- NRN
- Name/location of nearest Hospital A&E Dept
- If the phone signal is poor it **Shall** be noted and an alternative method of maintaining communications arranged e.g.: via Satellite phone or public landline. Where a landline is used the land line number **Shall** be recorded
- Signatures of all of the **Working Party**
- Environmental constraints **Shall** be noted such as nesting birds, bats, badger sett, red squirrel, water courses, SSSI, TPOs etc
- The task and location
- **Live** Line Justification
- Any changes or 'no changes' **Shall** be recorded in the Stage 3 section after a break and all members of the **Working Party Shall** re-sign on
- Any situation where approval has been given by a Team Manager

17.4 A Hazard is the potential to cause harm; Risk is the likelihood of harm and Severity is the level of damage that the hazard could cause to a person.

17.5 All significant hazards and adequate control measures **Shall** include:

- Voltage and vicinity zone
- Road name, town or village
- Position of branches or tree in relation to work area (in or out or potential to breach)
- Condition of **Apparatus** – if significant (rotten poles, joints, type of **Conductor** and any damage)
- Other services on-site oil, gas, water, telephone, other electrical equipment, roads, paths other site users
- Trainees (who is being supervised; what task is being carried out; the level of supervision required and who is supervising)

- Extreme weather
- Terrain – only when significant
- Maximum length of cut sections (when relevant)

17.6 It may be acceptable to record, 'No additional hazards, standard controls apply' if there are genuinely no additional hazards.

17.7 The site/job **Shal**l be continually assessed during the works for any new safety or environmental hazards or change of conditions and **Shall** be monitored throughout the duration of the works. Any changes **Shall** be noted on the Stage 3 risk assessment with control measures, and all members of the **Working Party Shall** be informed.

# 18 Revision History

| No | Overview of Amendments | Previous Document | Revision | Authorisation |
|---|---|---|---|---|
| 01 | New document created | TBC | 1.00 | Richard Gough |
| 02 | | | | |

# Appendix A Stage 1 Risk Assessment

| | | |
|---|---|---|
| Issuing Manager:<br>(Print): (Signed): | | Date:<br>Tel: |
| Job Reference: | Job No: | |
| Job Location: | Note: If the work is on 16mm2 PVC Insulated conductor, Live Work shall not be carried out | |
| Job Description: | | |