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# National Grid UK Electricity Transmission plc

## NATIONAL SAFETY INSTRUCTION 4

and

## Guidance

# WORK ON OR NEAR HIGH VOLTAGE OVERHEAD LINES



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## Document History

Issue	Date	Summary of Changes / Reason	Author(s)	Approved By (Title)
1	Apr. 08	Reformatted and re-drafted to follow 3 <sup>rd</sup> edition Electricity Safety Rules layout. NSI 4 working group updates, safety notes and safety bulletins have been incorporated.	OHL Manager Doug Lockwood  NSI 4 Working Group	MDE Manager Les Adams 
2	March 09	NSI 4 working group updates, safety notes and safety bulletins have been incorporated.	SRAT Manager Mick Brown, OHL Manager Doug Lockwood NSI 4 Working Group	MDE Manager Les Adams 
3	March 10	NSI 4 working group updates details below	SRAT Manager Mick Brown, OHL Manager Doug Lockwood  NSI 4 Working Group	MDE Manager Les Adams 
4	March 2011	Reformatted and re-drafted. NSI 4 working group updates details below	SRAT Manager Mick Brown, OHL Manager Doug Lockwood  NSI 4 Working Group	MDE Manager Les Adams 
5	April 2013	NSI 4 working group updates, safety notes, safety bulletins and OHL memos have been incorporated.	NSI 4 Working Group	MDE Manager
6	Jan 2020	NSI4 rules and guidance have been separated from the earthing schemes and other OHL related content. These schemes are now located within document TGN 313 and associated documents.	NSI4 Working Group	Matt Staley Head of Operations ET Operations
7	Jan 2021	Update to Initial Condition requirements	Electricity Transmission Safety Rules Team	Matt Staley Head of Operations ET Operations
8	Feb 2022	Update to Control Boundaries and Reorganisation role changes.	Electricity Transmission Safety Rules Team	Matt Staley Director of Asset Operations
9	Jan 2023	Amendments made as per Key Changes.	Electricity Transmission Safety Rules Team	Matt Staley Director of Asset Operations

### Document History cont.

10	Mar 2024	Minor clarifications and updates added	NSI 4 Working Group & ET Safety Rules Team	Ro Quinn Director of Asset Operations
11	Feb 2026	Minor clarifications and updates added	NSI 4 Working Group & ET Safety Rules Team	Kate Grant Director of Asset Operations

### Key Changes

Section	Amendments
1 – 4.1 Guidance	Additional guidance added for the management of a DrESS between site and the TNCC.
1 – 6.3 Rule	Information added to the rule to confirm the control of Drain Earth(s) when being left on a tower and a Safety document is cancelled, including the use of a Technical Limitation Request (TLR).

## WORK ON OR NEAR TO HIGH VOLTAGE OVERHEAD LINES

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## WORK ON OR NEAR TO HIGH VOLTAGE OVERHEAD LINES

### SECTION 1

### STANDARD REQUIREMENTS

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## 1 Purpose and Scope

To provide guidance on National Safety Instruction 4, when applying principles established by the Safety Rules to achieve **Safety from the System** for **Personnel** working on 275 / 400 kV overhead lines (OHLs). For work on all other voltages the principles of this NSI apply but additional advice shall be sought from an OHL Engineer.

For work on HV Overhead Lines reference to Technical Guidance Notes (TGN) and Asset Management Business Procedures (AMBP) shall be made.

For information on the Planning Process, then relevant Transmission Procedures should be referenced.

Work activities not within the scope of this NSI:

- Work on phase conductors, insulators and fittings of **Live** circuits.
- Utilising an **Approved** G3 procedure

The layout of this guidance note reflects that of legislative codes of practice, where the rule (or mandatory obligation) is identified by a green panel on the left-hand side. The guidance follows after the rule and is identified by a blue panel.

Within National Grid the guidance notes hold equivalent status of an Approved Code of Practice (ACOP) in law. If not followed, you will be required to demonstrate that your safe system of work is of an equal or higher standard.

This demonstration may be evidenced by the completion of a Temporary Sanction, this document records the decisions taken, by whom and when.

The Schemes detailed in TGN 313 indicate the requirements for the application of portable **Drain Earth(s)** and Field Equipment Earths in preparation for various work procedures. The Schemes detailed may need to be changed or supplemented in exceptional circumstances. A **Senior Authorised Person** can initiate such modifications, but all modifications shall be agreed and recorded on the TGN 313 F1 form.

## 2 Definitions

Terms printed in bold type are as defined in the Safety Rules.

Term	Definition
Complex Circuit	A <b>Dead</b> circuit that has two or more <b>Live</b> circuits inducing current into it.
Disconnected Circuit Primary Earth(s)	A permanent <b>Primary Earth</b> rated to protect against inadvertent re-energisation and of a specific design as detailed in TGN 313 Section 5
Double DrESS	As a Single DrESS but having a rated current-carrying capability of 900 Amps.
Downdropper	The final connection from the bottom of the Downlead to the Substation or other termination equipment (e.g. busbars, line traps, cable sealing ends etc.) (See Figure 1).
Downlead	The connection from the terminal tower on a circuit to the Substation gantry or anchor blocks, or when an OHL connects to an underground cable, the connection from the crossarms to the cable sealing end structure (see Figure 1).
Duplex Drain Earth	Type Registered <b>Drain Earth</b> used in Substations to facilitate work on Downleads and Downdroppers.
Earthing for Induced Currents	<b>Drain Earth(s)</b> applied to control and manage the flow of induced currents on the circuit to be worked on.
Earthing for Induced Voltages	<b>Drain Earth(s)</b> applied to reduce and control induced voltages at the point of work/work zone.
Earthing Team	A team led by the recipient of the <b>Safety Document</b> or by a <b>Competent Person</b> under the instruction of the recipient of the <b>Safety Document</b> to apply / remove <b>Drain Earth(s)</b> in accordance with an <b>Earthing Schedule</b> .
Equipotential Zone	An arrangement of conducting metallic footplates, designed to ensure that during fault conditions, dangerous potential differences do not appear across the body of <b>Personnel</b> working near ground based machinery.
Field Equipment	Items such as winches, pullers, tensioners, conductor access platforms, access equipment and cranes which could be subject to dangerous induced voltages/currents.
Field Equipment Earths	Type Registered connections used for bonding items of Field Equipment to earth. The earths are distinctively coloured orange to identify them from <b>Drain Earth(s)</b> and are not included on an <b>Earthing Schedule</b> .
Fully Conductive Conductor System	A system used in tension stringing where induced currents are allowed to flow in a controlled manner using Type Registered equipment.
<b>Impressed Voltage</b>	Conditions which could cause dangerous induced voltages or currents, differences in earth potential or voltage differences across any break in the conductive path.
Multiple <b>Safety Documents</b>	A series of identical <b>Safety Documents</b> that have the same number but a unique suffix to identify the individual document. The suffix is alpha/numerical.
OHL Engineer	A <b>Senior Authorised Person</b> (NSI 4) or a person with sufficient technical qualifications and / or experience to assess the <b>Drain Earth</b> requirements for Induced Voltage and Current management when appropriate.
OHL <b>Primary Earth</b>	A pre-determined arrangement of portable OHL <b>Drain Earth(s)</b> providing adequate protection against inadvertent re-energisation in accordance with the Management Procedure - NSI2 Earthing <b>High Voltage Equipment</b> . (The OHL <b>Primary Earth</b> shall have a National Grid Portable <b>Primary Earth</b> "No unauthorised interference" notice affixed to it to ensure it is readily identifiable as a <b>Primary Earth</b> ).

OPGW	Optical Ground Wire
Partial DrESS	A <b>Drain Earth</b> Shorting Scheme (DrESS) which provides at a point on the circuit (e.g. a tower), a low resistance connection between any two phases or between the top phase and the earthwire having a rated current carrying capacity of 450 A.
Permanently Disconnected OHL Circuit	A section of overhead line circuit that has been permanently disconnected from the National Grid <b>HV System</b> but remains under National Grid Safety Rules (see TGN 313 Section 5).
Sectionalised OHL Circuit	An OHL circuit whereby a temporary disconnection(s) has been made in order to restore part of the same OHL circuit back into <b>Operational Service</b> (see TGN 313 Section 5).
Short Bridging Earths	Type Registered Bridging Earth with a maximum length of 1.5 m
Short <b>Drain Earth</b>	Type Registered <b>Drain Earth</b> with a maximum length of 1.5 m
Simple Circuit	A <b>Dead</b> circuit that has only one <b>Live</b> circuit inducing current into it.
Single DrESS	A <b>Drain Earth</b> Shorting Scheme (DrESS) which provides, at a point on the circuit (e.g. a tower), a low resistance connection between the earthwire, top-phase, middle-phase and bottom-phase having a rated, current-carrying capability of 450 A.
Structure	A tower, gantry or other means of support giving access to exposed <b>HV</b> conductors.
Substation Applied DrESS	A <b>Drain Earth</b> Shorting Scheme (DrESS) applied in a Substation on the Downloads or Drowndroppers from the terminal tower suitable for use as an OHL <b>Drain Earth</b> or <b>Primary Earth</b> .
Type Registered	Items of equipment that have been designed tested and added to a Type Registered List (TRL).

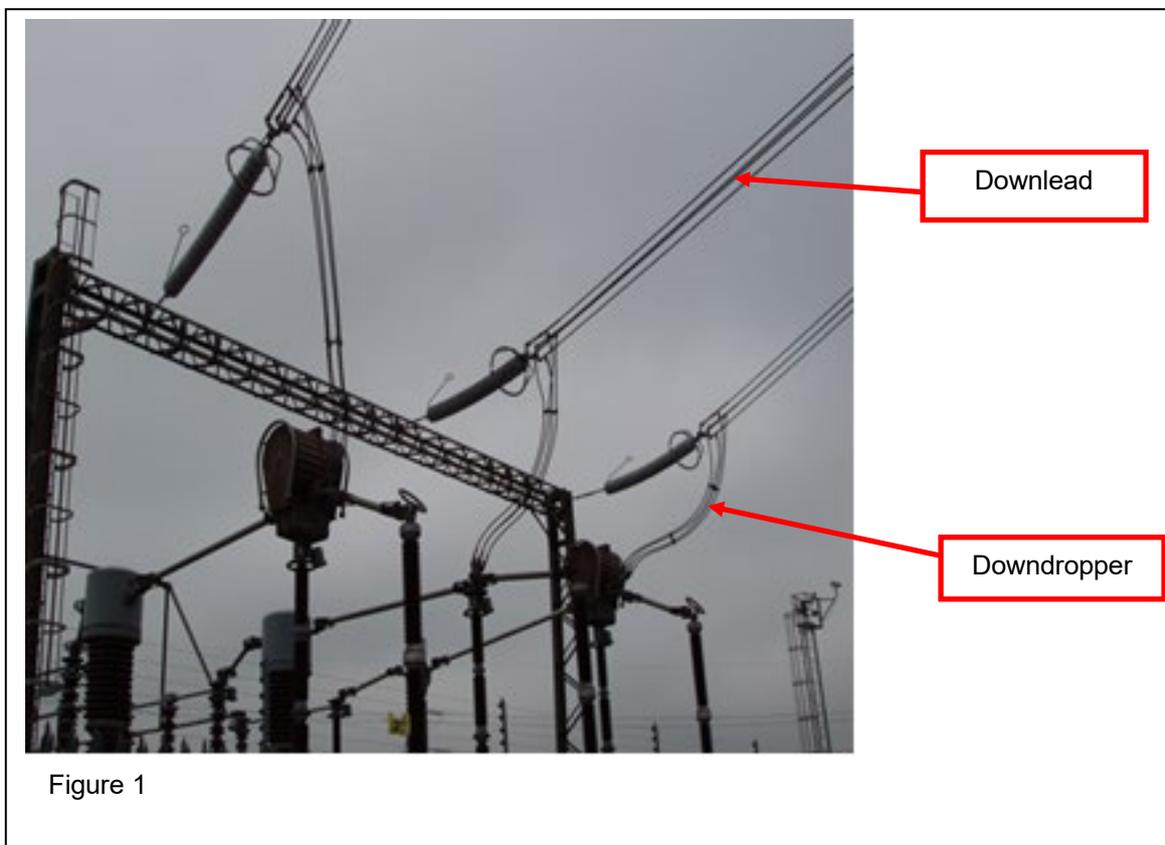
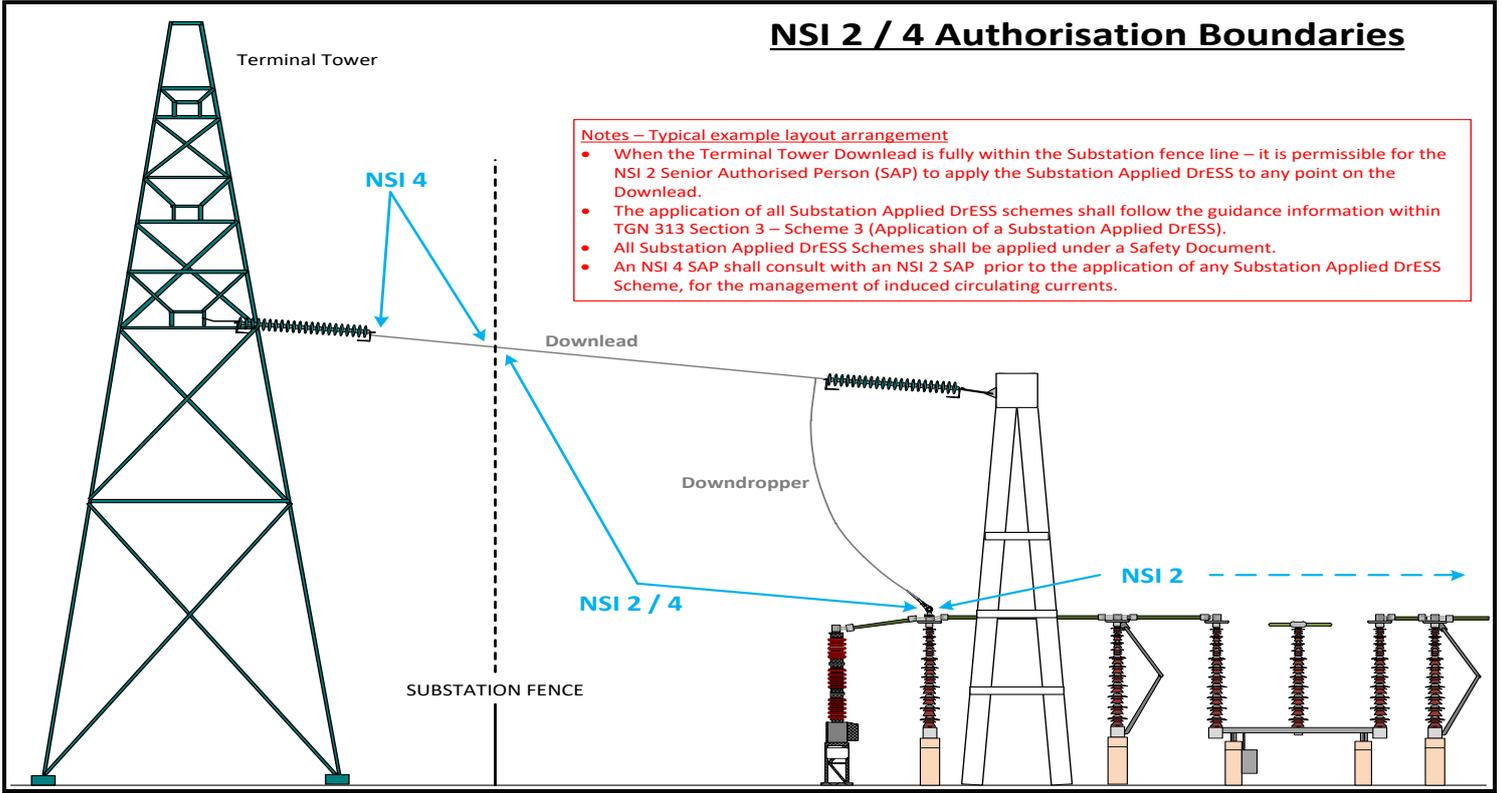
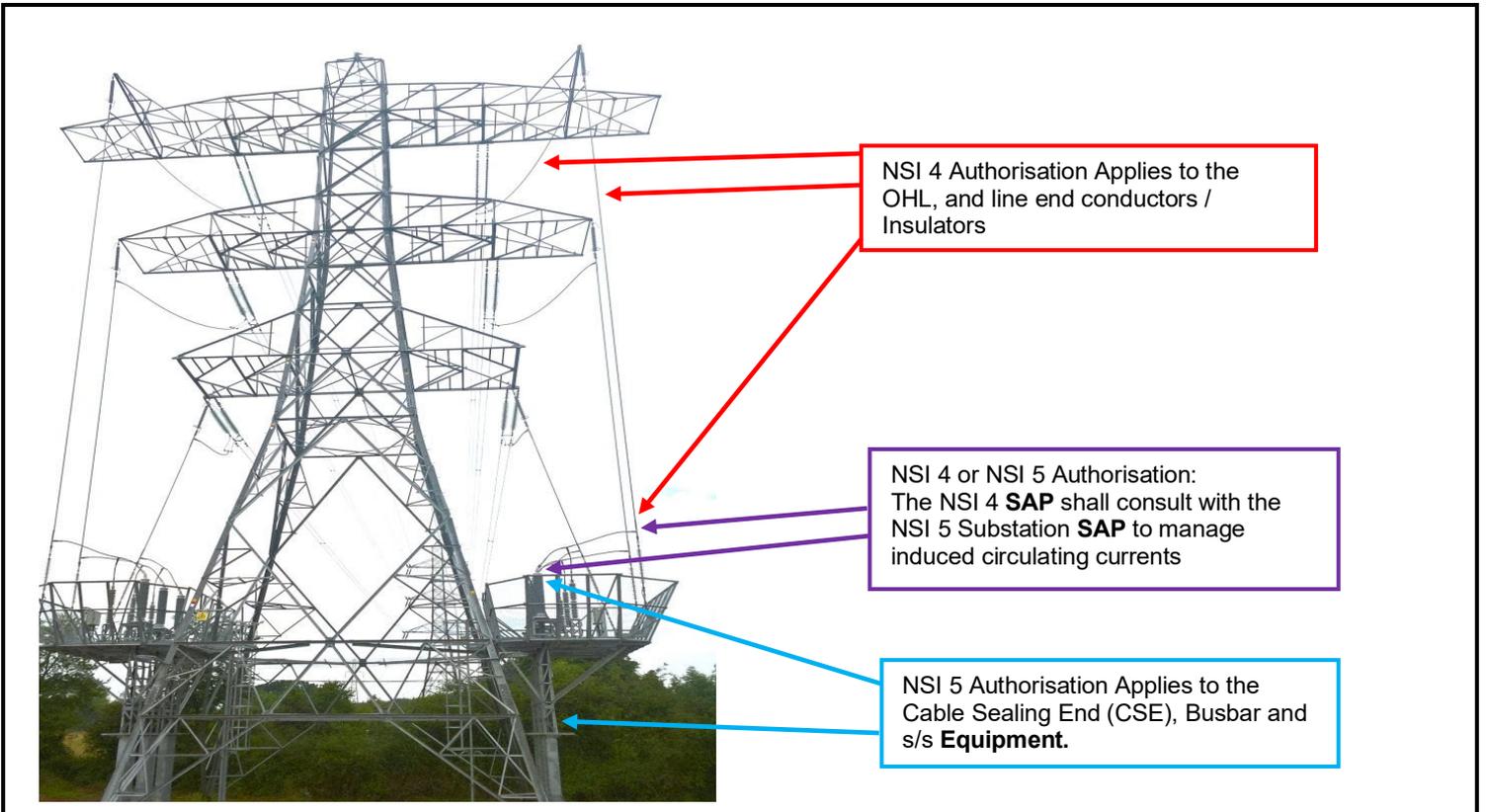


Figure 1

NSI 2 / 4 Boundary Information



NSI 5 Boundary Information



### 3 Dangers

The main **Dangers** to **Personnel** working on overhead lines and towers are electric shock and burns arising from:

- Inadvertently infringing **Safety Distance**
- The application of **Earthing Device(s)** to **Live High Voltage Equipment**
- Inadequate precautions to safely manage **Impressed Voltage** in the conductors and associated fittings
- Inadequate precautions to provide and maintain an equipotential environment for **Personnel** working with Field Equipment or other associated equipment.
- Badly connected, insecure or inadequate **Earthing Device(s)**
- The Rise of Earth Potential around the base of a tower (R.O.E.P.)
- Inadequate, damaged or missing earth bonding from Terminal Towers to the Substation main Earth System
- Effects of lightning strikes on towers and conductors
- Inadvertently infringing **Safety Distance** with objects, tools or access equipment.

## 4 General Requirements

**NSI 4 Rules**  
**Section 1**  
4.1 to 4.4

- 4.1 For work on OHL circuits **Point(s) of Isolation** and **Primary Earth(s)** shall be established to cover all infeeds.

A **Safety Document** will then be **Consented** to, provided any circulating currents present are managed.

The initial management of circulating currents will be achieved by having all points of infeed up to the terminal towers solidly bonded to a 'line end' (or equivalent) **Primary Earth**. This may require **HV Equipment** being **Locked** in the closed position to establish and maintain the earth path

Where the **Primary Earth** cannot be used to manage the circulating current and voltage for the duration of the outage, an alternative earth path shall be established. A **Safety Document** will be **Consented** to and issued, to apply a Substation or Tower DrESS for the management of circulating current and voltage.

Where it is not practicable to satisfy the above, alternative earthing arrangements shall be applied using an agreed safe system of work, via an **Approved** procedure, such as form F1 – TGN 313 – OM Report.

Additional OHL **Safety Document(s)** can be issued, which may include temporary or permanent disconnections, on the OHL circuit provided that the induced current / voltage issues are managed throughout the work by an OHL **Senior Authorised Person**.

The OHL **Senior Authorised Person(s)** shall consult, agree, and record any Safety Precautions that need to be established and maintained throughout the course of the work. This may include relevant Substation **Senior Authorised Person(s)**, **Control Person(s) (Safety)**.

- 4.2 For Complex Circuit configurations, the section of the circuit identified to be worked on shall be converted to a Simple Circuit, prior to work commencing, in accordance with a TGN 313 Earthing Scheme.

- 4.3 Where **Charged Equipment** may cause **Danger**, **Drain Earth(s)** shall be applied in accordance with an **Earthing Schedule** that will be issued along with the **Safety Document**.

The recipient of the **Safety Document** is responsible for the control and safe custody of **Drain Earth(s)** issued with an Earthing Schedule.

The **Competent Person**, or a **Person** under their **Personal Supervision** may apply and remove **Drain Earth(s)** in accordance with an **Earthing Schedule** under a **Safety Document**.

- 4.4 If any work is to be carried out on phase conductors within 5 towers of the terminal tower or on the terminal tower itself, the integrity of the terminal tower earth tape connections to the Substation main earthing system shall be verified.

<b>NSI 4 Rules</b> <b>Section 1</b> 4.5 to 4.7	<p>4.5 For any work on Downloads and Drowndroppers, a separate, dedicated <b>Permit for Work</b> shall be issued.</p> <p>4.6 When the work requires use of <b>Multiple Safety Documents</b>, then the <b>Senior Authorised Person</b> shall issue all the <b>Drain Earth(s)</b> for the work with one <b>Safety Document</b> (the Master <b>Safety Document</b>).</p> <p>4.7 When working adjacent to a <b>Live</b> circuit, the <b>Senior Authorised Person</b> shall assess the requirement to switch out the DAR on the adjacent circuit.</p>
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## 4 General Requirements

<b>NSI4 Guidance</b> <b>Section 1</b> 4.1	<p>4.1 Consultation should include the OHL <b>Senior Authorised Person</b>, OHL Team Leader, <b>Control Person (Safety)</b>, Substation <b>Senior Authorised Person</b> and Engineering and Asset Management to develop an effective scheme, documented via TGN 313 Form F1.</p> <p>Where alternative earth paths to the <b>Primary Earth(s)</b> are required for the management of circulating currents, this is done by the application of a DrESS - which must be appropriately referenced on the <b>Safety Document</b>.</p> <p>A <b>Safety Document</b> can be used to manage the earthing requirements of a circuit to provide a Safe System of Work for other <b>Safety Documents</b>. (e.g. PFW 'A' is to apply &amp; remove DrESS, enabling PFW's 'B' and 'C')</p> <p>The point a DrESS is being applied to must be connected to a <b>Primary Earth</b> at the time of application and removal. This can be achieved on the same document that makes a disconnection between the point of work and the <b>Primary Earth</b>, provided the sequencing of work ensures a connection between the point of application and a <b>Primary Earth</b> is in place at the time it is applied / removed.</p> <p>Where the point at which a DrESS is required cannot be connected to a <b>Primary Earth</b> at the time of application (e.g. downed conductors), an alternative Safe System of Work will need to be established.</p> <p>As with any other <b>HV Safety Precaution</b> established under a <b>Safety Document</b>, a DrESS declared as a <b>Primary Earth</b> in a <b>Safety Document's</b> exceptions will remain under the <b>Control Person (Safety)</b> control until such time as it is formally agreed and logged as no longer being an <b>HV Safety Precaution</b>. A precaution which required an <b>HV Safety Document</b> to establish it, will generally be considered to require an equivalent <b>HV Safety Document</b> to remove it, and should be appropriately referenced in that document. Where a change in circumstances means such a <b>HV Safety Document</b> is no longer required, the <b>Control Person (Safety)</b> should be made aware, and in agreement, as to what alternative methodology is to be used.</p> <p>Appropriately rated DrESS can be declared to the <b>Control Person (Safety)</b> as a <b>Primary Earth</b> on cancellation of a <b>Safety Document</b>; to allow for alternative earthing that can be quoted on further <b>Safety Documents</b>.</p>
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**NSI4 Guidance  
Section 1**

**4.1 Cont. to 4.4**

For any disconnections made under a **Safety Document**, the OHL **Senior Authorised Person** shall ensure that the resulting induced current and voltage issues will be addressed via the application of this Management Procedure and TGN 313 and must ensure no adverse effect is made upon existing or subsequent **Safety Documents**.

In the case of Permanently Disconnected OHL Circuits, advice shall have been sought from Engineering and Asset Management.  
(Additional guidance is given in TGN 313 Section 5).

- 4.2 Induced currents (up to 900 A) can flow in the Drain Earth(s) applied to a Complex Circuit. The conversion of a Complex Circuit to a Simple Circuit can be achieved by the application of DrESS earthing schemes to sectionalise the OHL circuit or by the local application of a DrESS earthing scheme at the point of work.

Induced currents (up to 450 A) can flow in the conductors of a Simple Circuit. The management of this current involves the provision of parallel paths to enable the current to flow. This will limit the flow of current in lifting tackle, winch bonds and conductor stockings. The **Senior Authorised Person** shall assess the requirement for **Drain Earth(s)**.

- 4.3 The **Safety Document** recipient shall ensure that **Drain Earth(s)** when not in use are kept in safe custody – e.g. in a locked vehicle.

All earthing equipment shall be inspected and maintained in accordance with company Management Procedures and Type Registered.

The **Senior Authorised Person** may decide it is not necessary to apply **Drain Earth(s)** to all phases. This reduced earthing shall not affect the safety of **Personnel**.

For Point of Work Earthing, **Drain Earth(s)** will be applied and removed in accordance with the **Drain Earth Schedule** from a position on the tower steelwork maintaining the maximum distance from the conductor for practical application / removal of the **Drain Earth(s)**. Where this cannot be practically achieved, the **Senior Authorised Person** shall assess and record the practical application to be utilised.

*Following a study carried out by Cardiff University in 2017 it was calculated that the maximum voltage induced onto an un-earthed (floating) conductor could be in the region of 22.5kV. This assumes that the integrity of the **Primary Earth(s)** could be compromised at any time and create dangerously high voltages.*

*Using the ENA guidelines set out in TS43-8 this would equate to a 0.8m clearance to be applied at all times to a locally un-earthed conductor. (Verified by Asset Engineering March 2019 – worse-case scenario resulted in 28kV – which still equates to a 0.8m clearance)*

Consideration shall also be made of **Equipment** disconnected from earth resulting in a floating section which may in itself become Charged (i.e. when replacing jumpers)

- 4.4 If the integrity of the earth tape is compromised: -
- the terminal tower earth tape is repaired or by exception
  - a Single DrESS shall be applied to the terminal tower, or between the Point of Work and the terminal tower.

**NSI 4 Guidance**  
**Section 1**  
4.5 to 4.6

4.5 The dedicated **Permit for Work** may include other work on the towers being worked on e.g. replacement of insulators on the adjacent side of the tower or work on other towers where **Drain Earth(s)** are applied which are associated with the dedicated **Permit for Work**.

4.6 The Master **Safety Document** number generated shall always be **Safety Document** Number - MP – Master – i.e. 12345MP Master. Multiples will be numbered 12345MP 1 of n, 12345MP 2 of n,.....  
The Master **Safety Document** shall record the total number of **Drain Earth(s)** issued.

The Master **Safety Document** Section 2 Further Precautions shall be endorsed with;

*“Drain Earth(s) shall be applied as directed by the recipient of this Master Safety Document and in accordance with attached Earthing Schedule”.*

All secondary multiple **Safety Documents** shall record zero **Drain Earth(s)**. A copy of the Master **Earthing Schedule** shall be issued with each secondary multiple **Safety Document**.

All Secondary multiple **Safety Documents** Section 2 Further Precautions shall be endorsed with;

*“Drain Earth(s) shall be applied as directed by the Master Safety Document recipient and in accordance with Safety Document No.--  
----- (master Safety Document number)”*

The principles of the use of multiple **Safety Documents** can be applied for work under a **Limited Access Certificates**.

Further guidance to the management of multiple **Safety Documents** is within AMBP 130.

Guidance for the management of tower painting works.

One Multiple **Safety Document** will be issued that covers all work to be undertaken including **Drain Earth(s)** application or removal, fall arrest rope rigging, painting and QA activities.

The **Safety Document** Section 1, Work to be done: - Carry out tower painting and associated activities.

The Master **Safety Document** shall be issued to the contractors nominated **Competent Person** who is responsible for setting their own staff to work. The Master **Safety Document** has the total number of **Drain Earth(s)** issued with it.

All Secondary **Safety Documents** associated with the Master **Safety Document** will have zero **Drain Earth(s)** issued along with a copy of the Master **Earthing Schedule**.

The Master **Safety Document** Section 2 Further Precautions shall be endorsed with;

*“Drain Earth(s) shall be applied as directed by the recipient of this Master Safety Document and in accordance with attached Earthing Schedule”.*

**NSI 4 Guidance**  
**Section 1**  
4.6 Cont. to  
4.7

All Secondary multiple **Safety Documents** Section 2 Further Precautions shall be endorsed with;

*“Drain earth(s) shall be applied as directed by the Master **Safety Document** recipient and in accordance with **Safety Document No.--** ----- (master **Safety Document** number)”*

Contractor RAMS shall include how the levels of **Competent Persons** will be managed to ensure the appropriate authorisation for the task.

National Grid QA teams issued with a Secondary **Safety Document** and a copy of the **Earthing Schedule**. National Grid **Competent Person** shall coordinate with Master **Safety Document** recipient to ensure only towers within Earthed sections are QA checked.

**Earthing Schedule(s)**

The following statement shall be included on the **Earthing Schedule** “A daily check shall be made before work starts that appropriate **Drain Earth(s)** are still in place. In accordance with TGN 313.

4.7 Examples of activities that may require the DAR to be switched out:

- Tension stringing of conductors
- Raising or lowering of earthwire
- Raising or lowering of conductors on middle or top phases
- Use of Cranes or Mobile Elevated Work Platforms

The **Senior Authorised Person** shall ensure that the nominated **Competent Person** responsible for requesting the DAR is aware of their responsibilities to inform all other Working Parties affected by the DAR outage or its restoration and any associated lightning risk notifications. See TGN 313.

When contacting the **Control Person (Operation)** to request a DAR outage, the **Competent Person** will convey the following information to ensure the correct DAR is switched out:

- Circuit Name
- Route Designation
- Outage Booking Reference
- Confirm with CP(O) at the TNCC, that all associated Route DAR schemes applicable to the requested circuit are switched out.

In the event of a fault on the adjacent circuit, the **Competent Person** nominated as DAR contact shall ensure that all **Competent Person's** in receipt of **Safety Document(s)** have been notified of the fault. All work shall cease until further assessment has been undertaken.

The nominated DAR contact shall liaise with the relevant **Senior Authorised Person** and NGET Control to ensure that the restoration of circuit can be managed efficiently which may include implementation of any actions required to ensure safety of personnel.

## 5 Application and Removal of Drain Earths

**NSI 4 Rules**  
**Section 1**  
5.1 to 5.6

### Drain Earthing Schemes for OHL are referenced in TGN 313

#### Application of Drain Earth(s)

- 5.1 The earth end connections of all **Drain Earth(s)** shall be attached before any conductor ends are connected, utilising an earthing pole.
- 5.2 When Sparrow Plates are used, all Connecting Bonds and **Drain Earth(s)** shall be connected before any **Drain Earth(s)** are applied to the conductors, utilising an earthing pole.
- 5.3 At tension towers, provided the jumper is connected at both ends and Earthed; the fitting of **Drain Earth(s)** to the line side of tension insulators may be carried out using a 600mm earthing pole, from a suitable working position at the line end of the insulator set.
- 5.4 If at any time an earth connection is found to be defective, no attempt shall be made to touch it until a **Senior Authorised Person** has been consulted and assessed the requirements.

#### Removal of Drain Earth(s)

- 5.5 At tension towers, provided the jumper is connected at both ends and **Earthed**, the removal of the clamps from the line side of tension insulators may be carried out using a 600mm earthing pole, from a suitable working position at the line end of the insulator set.
- 5.6 Conductor end clamps of all Portable **Drain Earth(s)** shall be removed first, using the earthing pole. At no time, shall the earth end clamp of a Portable **Drain Earth(s)**, a Sparrow Plate or a Sparrow Plate Connecting Bond be disconnected whilst a conductor end clamp is attached.

## 6 Control of Drain Earth(s)

**NSI 4 Rules**  
**Section 1**  
6.1 to 6.3

- 6.1 A register of all **Drain Earth(s)** that are applied or removed shall be maintained.
- 6.2 Immediately prior to the clearing of **Safety Document(s)**, all issued **Drain Earth(s)** shall be accounted for.
- 6.3 If any **Drain Earth(s)** / earthing equipment are to be left on the tower as part of the **Safety Document** clearance process, then the relevant sections of the **Safety Document** shall be completed by the **Competent Person** clearing the **Safety Document**.

A **Safety Document** may be cancelled with these remaining **Drain Earth(s)** still in place, provided this is recorded in the exceptions of the relevant **Safety Document** and the **Control Person (Safety)** is informed. These will then become under the control of the **Control Person (Safety)** and recorded in a Technical Limitation Record (TLR) to ensure visibility. Cancellation of that TLR, will include agreement to return control to the **SAP** for use on a new **Earthing Schedule**. Where such **Drain Earth(s)** are to be immediately transferred to the **Earthing Schedule** of a new **Safety Document** (Eg one already being prepared for **Consent**), the TLR stage can be bypassed, and the transfers simply logged.

**NSI 4 Rules**  
**Section 1**  
6.4 to 6.5

- 6.4 Prior to cancelling the **Safety Document(s)**, the **Senior Authorised Person** shall ensure that they have all the necessary forms required to satisfy themselves that all **Drain Earth(s)** have been accounted for.
- 6.5 Prior to Return to Service, the **Senior Authorised Person** will decide (if any) the extent of any further inspection that is required in order to verify that all towers are de-earthed prior to **Safety Document** cancellation.

## 7 Control of Drain Earth Shorting Schemes (DrESS)

**NSI 4 Rules**  
**Section 1**  
7.1

- 7.1 DrESS earthing schemes shall be controlled via an **Earthing Schedule** and / or **Safety Document Card Safe**.

## 7 Control of Drain Earth Shorting Schemes (DrESS)

**NSI 4 Guidance**  
**Section 1**  
7.1

- 7.1 DrESS earth scheme(s) controlled via an **Earthing Schedule**.
- This will normally be carried out when a single **Working Party** is carrying out a task(s) during an OHL outage. The **Earthing Schedule** shall make reference to the application / removal of the DrESS earth scheme(s) and the fact that it shall be applied prior to the task(s) being carried out and removed only when the task(s) has been completed.
- DrESS earth scheme(s) controlled via a **Safety Document Card Safe**.
- This will normally be carried out when there is more than one **Working Party** of any one company e.g. National Grid, OHL Contractor or tower painting Contractor etc. The relevant **Permit for Work** and associated **Earthing Schedule** for the application / removal of the DrESS earthing scheme will be locked in a **Card Safe**.
- All subsequent **Permit For Work** shall be endorsed in Section 2, under "Further Precautions", with the words "DrESS earthing scheme is applied to tower ..... under **Permit for Work** .....".
- The **Card Safe** number shall be entered in the appropriate box in Section 4 of the **Permit for Work**.
- The **Senior Authorised Person** issuing the **Permit for Work** shall, in addition to all other items, issue a **Key** for the **Card Safe** holding the DrESS **Permit for Work**. This issue will be recorded on the **Permit for Work** in Section 4.

## 8 Access / Egress and Work which Requires Circuit Outages

### NSI 4 Rules Section 1 8.1 to 8.2

- 8.1 Access / Egress and work where **Safety Distance** may be infringed shall be carried out under a **Permit for Work**.
- 8.2 During the issue / transfer of a **Permit for Work** the recipient of the **Safety Document** shall confirm that the **Circuit Identification** complies with the details in the Technical Data Sheet(s).

## 8 Access / Egress and Work which Requires Circuit Outages

### NSI 4 Guidance Section 1 8.2

- 8.2 The **Senior Authorised Person** issuing the **Permit for Work** shall also issue to the **Competent Person** receiving the **Permit for Work** the following items:
- Sufficient **Circuit Identification** wristlets for each member of the **Working Party**
  - Sufficient **Circuit Identification** flags which fit the sockets or brackets on the towers to be climbed
  - Sufficient **Drain Earth(s)** and an associated **Earthing Schedule**, where applicable

Prior to the issue of the **Safety Document** the **Senior Authorised Person** will confirm to the **Competent Person** all the relevant information from the Technical Data Sheet, highlighting the flag bracket identification nomenclature. The Technical Data Sheet **shall** be issued with the **Safety Document**.

On notification that a flag bracket is reported as either missing or incorrect the **Senior Authorised Person** will take the following action.

- Stop all work immediately at the tower.

If Flag bracket is reported as missing.

- Using operational diagrams and Technical Data Sheets the **Senior Authorised Person** shall positively identify the circuit and instruct the **Competent Person** to fit a new flag bracket. Work can then proceed.

If Flag bracket is reported as incorrect.

- Using operational diagrams and Technical Data Sheets the **Senior Authorised Person** shall positively identify the circuit on site to confirm that the flag bracket is incorrect, and then instruct the **Competent Person** to replace with the correct flag bracket. Work can then proceed.

During the work preparation stages the **Senior Authorised Person** shall make reference to the available condition monitoring data and where reasonably practicable rectify any missing or incorrect flag brackets prior to the issue of the **Safety Document**.

The **Senior Authorised Person** may decide it is not necessary to

**NSI 4 Guidance**  
**Section 1**  
8.2 Cont.

apply **Drain Earth(s)** to all phases. This reduced earthing shall not affect the safety of **Personnel**.

The **Senior Authorised Person** shall in the case of 'T' Pylons apply demarcation as per Section 11.2. They may for other Pylon work, via risk assessment, determine the need for any further work area demarcation.

The **Competent Person** who has received the **Permit for Work** shall ensure that:

- All members of the **Working Party** are fully briefed on all aspects of the work, hazards and their roles.
- The **Working Party** Register is completed.
- A **Circuit Identification** flag is correctly fitted to the appropriate socket or bracket at the tower to be worked on.
- Each member of their **Working Party** is in possession of a **Circuit Identification** wristlet.
- All demarcation to be in place to clearly identify limits of the safe working area
- **Drain Earth(s)** are fitted by the Earthing Team in accordance with the **Earthing Schedule**. A copy of the Drain Earthing requirements shall be issued to the **Competent Person** in charge of each Earthing Team.

Each **Person** climbing the tower shall:

- Check that the **Circuit Identification** flag is correctly fitted.
- Check the tower nomenclature corresponds with the tower nomenclature on the **Safety Document**.
- Wear the **Circuit Identification** wristlet so that it is readily visible at all times while climbing.
- Ensure that the wristlet matches the **Circuit Identification** on the circuit on which is to be worked on.

## 9 Access / Egress and Work which does not require Circuit Outages

**NSI 4 Rules**  
**Section 1**  
9.1

- 9.1 Access / egress and work on towers where there is no significant risk of infringing **Safety Distance** during the course of the work may be carried out with circuit(s) **Live**.

## 9 Access / Egress and Work which does not require Circuit Outages

**NSI 4 Guidance**  
**Section 1**  
9.1

9.1 When the **Senior Authorised Person** decides, it is necessary to confirm these instructions in writing, they shall record the assessment and controls to be applied in AMBP 311 RAMS. Where the RAMS control all **Safety from the System** hazards there is no requirement to issue a **Limited Access Certificate**.

Where contractors are carrying out work near **HV** Equipment and the means of achieving **Safety from the System** is by limiting the work area, a **Senior Authorised Person** shall confirm these instructions in writing by the issue of a **Limited Access Certificate**. The only exception to this requirement is where the identified work, and / or work area, as detailed and controlled in the risk assessment and method statement are limiting in their own right, thus ensuring there is no risk from the **System**.

The **Senior Authorised Person** shall, in the assessment of the work, consider that the conductors and insulators may be moved by the wind from the still air position.

The **Senior Authorised Person** issuing the **Limited Access Certificate** shall also issue to the **Competent Person** receiving the **Limited Access Certificate** the following items:

- Sufficient **Drain Earth(s)** and an associated **Earthing Schedule**, where applicable

The **Competent Person** who has received the **Limited Access Certificate** shall ensure that:

- All members of the **Working Party** are fully briefed on all aspects of the work, hazards and their roles.
- The **Working Party** Register is completed.
- Red pennants, in accordance with RAMS, are fitted to clearly identify limits of the safe working area.
- **Drain Earth(s)** are fitted by the Earthing Team in accordance with the **Earthing Schedule**. A copy of the earthing requirements shall be issued to the **Competent Person** in charge of each Earthing Team.

Each **Person** climbing the tower shall:

- Check the tower nomenclature corresponds with the tower nomenclature on the **Safety Document**.

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## 10 Access / Egress and Work within 300 mm of the Earthwire

**NSI 4 Rules**  
**Section 1**  
10.1 to 10.3

- 10.1 For earthwire work Short **Drain Earth(s)** or Short Bridging Earths shall be used to maintain all earth bonding connections or to maintain earthwire continuity.
- 10.2 The **Senior Authorised Person** preparing the **Safety Document** shall define the use of the Short **Drain Earth(s)** / Short Bridging Earths in the **Earthing Schedule**.
- 10.3 Whenever **Personnel** are required to access the tower peak and carry out work which may bring them closer than 300 mm to the Earthwire i.e. Condition Assessment or Tower Painting, then a Short **Drain Earth(s)** shall be applied between the tower steelwork and earthwire using, as a minimum, a Type Registered 600 mm Earthing Pole.

## 10 Access / Egress and Work within 300 mm of the Earthwire

**NSI 4 Guidance**  
**Section 1**  
10.1

- 10.1 Access is permitted for the duration of applying / removal of the Short **Drain Earth(s)**, utilising, as a minimum, a 600 mm Earth Pole.

Where Short **Drain Earth(s)** are applied to earthwires carrying fibre optic wrap, extra care shall be taken when applying the Short **Drain Earth(s)** to ensure that the Fibre Optic Cable is not crushed or damaged. Where possible the Short **Drain Earth(s)** shall be applied to the conductor between the earthwire fitting / anchor clamp and fibre optic clamps or support frames.

On certain towers OPGW extends from the peak of the tower to base level. If the integrity of the permanent earth bonds fitted to the OPGW extending down the tower leg(s) is verified, then there is no requirement to apply a Short **Drain Earth** to this OPGW to approach within 300 mm.

Calculations have been undertaken to confirm that the Type Registered 600 mm Earth Pole, will provide sufficient clearance from the maximum **Impressed Voltage Condition** that could be imposed onto the Earthwire / OPGW.

## 11 Tower Demarcation

**NSI 4 Rules**  
**Section 1**  
11.1 to 11.2

- 11.1 The **Senior Authorised Person** shall ensure the tower is demarcated to clearly define the safe working area.
- 11.2 The **Senior Authorised Person** shall ensure that all 'T' Pylons are demarcated to define the safe working area, and recorded on a risk assessment that will include a diagram to confirm placement.

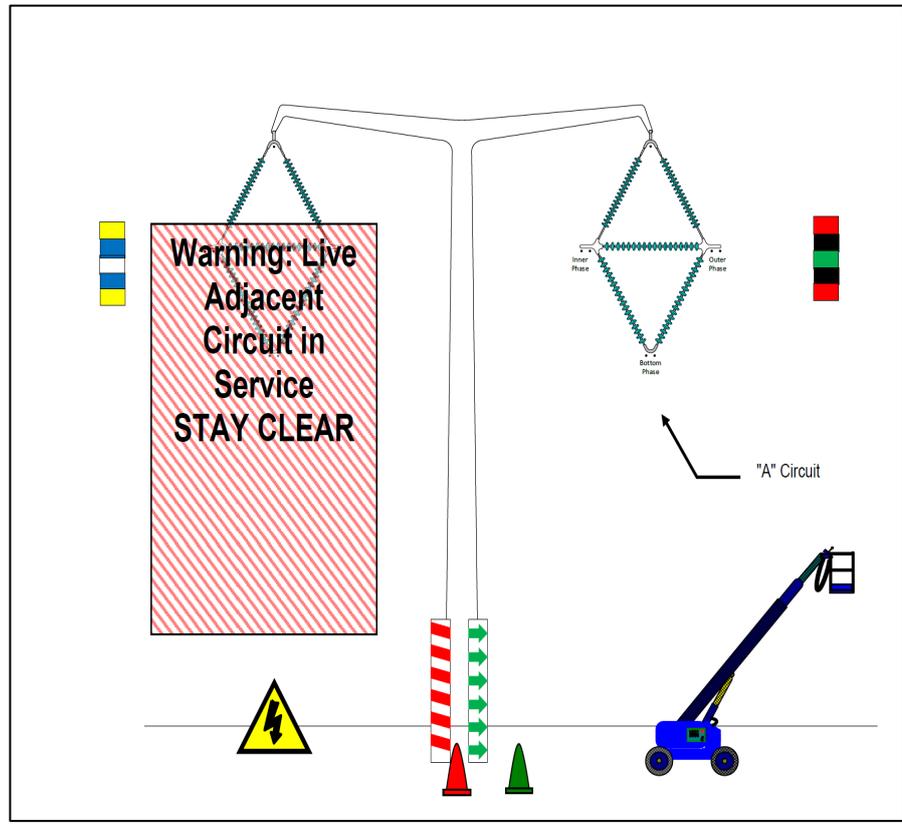
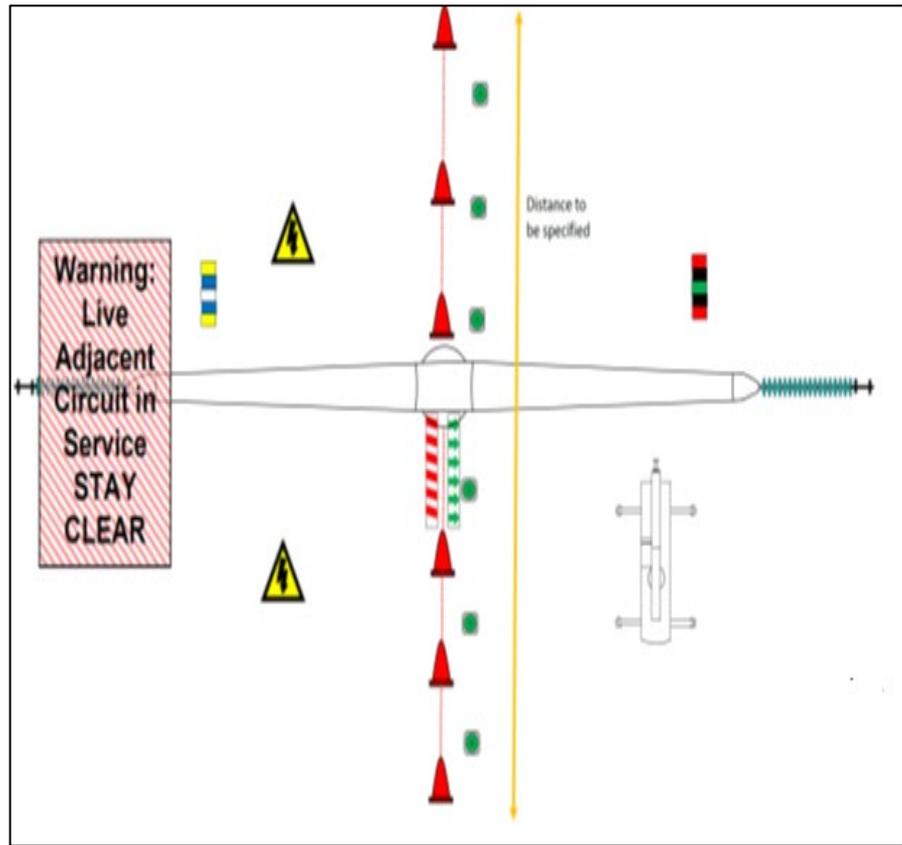
## 11 Tower Demarcation

**NSI 4 Guidance**  
**Section 1**  
11.1 to 11.2

- 11.1 The work area on the tower shall be demarcated by the use of red pennants.
- The **Senior Authorised Person**, via RAMS, shall provide specific instructions and / or a detailed sketch of the demarcation position.
- The red pennants shall be applied when working under **Safety Documents** before work commences. Where RAMS are used in place of an **LAC**, the same standard shall be applied.
- The **Person(s)**, whilst fixing or removing red pennants, shall be under the **Personal Supervision** of a **Competent Person**.
- 11.2 The demarcation will be placed prior to work commencing.
- The **Competent Person** or **Person(s)** under **Personal Supervision** of a **Competent Person** shall place the demarcation as per the **Senior Authorised Person's** instructions / diagrams.
- Magnetic signage is required to denote the **Live** and **Dead** sides. Red cones, red and white chains, green cones and 'Danger Live' signs are also used to delineate the work area as per the diagrams below.
- Flags and wristlets shall also be issued.

Example diagrams overleaf.

**NSI 4 Guidance**  
**Section 1**  
11.2 Cont.



## 12 Adverse Weather Conditions

**NSI 4 Rules**  
**Section 1**  
12.1 to 12.4

- 12.1 Prior to work the **Competent Person** shall check the weather forecast and contact NGET Control for lightning risk.
- 12.2 In the event of, or near approach of a lightning storm where storm clouds or lightening is visible, or Thunder can be heard – all work shall cease until the storm passes.
- 12.3 When the weather conditions are such that wind induced conductor, movement could cause **Safety Distance** from the **Live** circuit to be infringed, then the work shall be stopped.
- 12.4 Work shall also be discontinued if fog or poor visibility prevents observers from fulfilling their role.

## 12 Adverse Weather Conditions

**NSI 4 Guidance**  
**Section 1**  
12.1 to 12.2

- 12.1 Contact may be via telephone or the SafeGrid app.
- On receipt of a Lightning Risk 1 notification, the PIC or site supervisor shall identify any specific risk associated with a Lightning Risk 1 in the area. Suitable controls shall be implemented, recorded and communicated to the working party before work continues.
- 12.2 **Personnel** are to withdraw to a minimum of 10 metres from any tower and connected equipment.
- Personnel** shall be vigilant with regard to lightning and other adverse weather. They shall inform colleagues and NGET Control immediately of any adverse weather conditions which may affect the work. NGET Control shall pass this information as appropriate.
- The **Senior Authorised Person** shall ensure that the nominated **Competent Person** responsible for requesting the Lightning Risk status is aware of their responsibilities to inform all other working parties that are affected along the route.

## 13 Actions Following Faults on Adjacent Circuits

**NSI 4 Rules**  
**Section 1**  
13.1

- 13.1 Where a circuit has been subject to a fault all **Earthing Device(s)** shall be inspected before further work is carried out.

## 13 Actions Following Faults on Adjacent Circuits

**NSI 4 Guidance**  
**Section 1**  
13.1

- 13.1 Where a circuit has been subject to a fault, the integrity of **Earthing Device(s)** cannot be guaranteed. Therefore, following a fault on an adjacent circuit, all **Earthing Device(s)** shall be inspected before further work is carried out.
- This shall be in the form of a visual inspection to identify any **Drain Earth(s)** that have become detached or severely burnt or if there are signs of excessive arcing onto tower steelwork as a result of high fault currents.

## 14 Installations on Towers including 3<sup>rd</sup> Party Systems

**NSI 4 Rules**  
**Section 1**  
14.1

14.1 Where items are fitted to overhead line towers that include a third - party system such as low voltage supplies i.e. aircraft warning lights, Cellular Installations i.e. radio or microwave frequency transmitters, a safe system of work shall be implemented.

## 14 Installations on Towers including 3<sup>rd</sup> Party Systems

**NSI 4 Guidance**  
**Section 1**  
14.1

14.1 When work is to be under-taken, which could involve exposing employees or contractors to danger from these systems; a minimum of industry standard precautions and controls shall be implemented. These may be in conjunction with the third-party operator and for all Work on or Near to Cellular installations further information is contained within a Management Procedure.

## 15 Control of Objects, Tools and Access Equipment

**NSI 4 Rules**  
**Section 1**  
15.1 to 15.2

- 15.1 Objects, tools and access equipment shall be stored, moved and used in a controlled manner to ensure that they do not infringe **Safety Distance**.
- 15.2 The **Senior Authorised Person** shall ensure that the risks of use of objects, tool and access equipment are considered and recorded via a **Safety from the System** Risk Assessment.

## 15 Control of Objects, Tools and Access Equipment

**NSI 4 Guidance**  
**Section 1**  
15.1 to 15.2

15.1 Examples of objects could include – tools, ropes, 3<sup>rd</sup> party equipment, platforms, MEWPs, **Drain Earth(s)**. (not an exhaustive list)

The Safe System of Work (National Grid or Contractors) shall specifically identify adequate control measures.

15.2 When assessing the risks, **Safety from the System** shall be maintained. The following information should be considered:

- Wire clearance diagrams or other methods of checking safety clearances
  - The objects, tools and access equipment being operated or lifted near or on a tower
  - The type / scope or manner of work being undertaken
  - Weather conditions that could introduce further / increased risk
  - The competence of those using the equipment
  - Earthing requirements for the object, tool or access equipment
- (not an exhaustive list)

Further reference to TGN 313 – Section 9 may also be considered.

Risk Assessments could utilise:

- As built drawings
- Wire clearance drawings
- Laser measurement
- LiDAR surveys
- Site confirmation visits

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## WORK ON OR NEAR TO HIGH VOLTAGE OVERHEAD LINES

### SECTION 2

#### SAFETY REQUIREMENTS FOR CONTINUOUS TENSION STRINGING OF OVERHEAD LINE PHASE CONDUCTORS AND EARTHWIRE

#### CONTENTS

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2 Competency of Staff	31
3 Communications and Control	31
4 Emergency Procedures	32
5 Weather Conditions	33

## Section 2 Additional Safety Requirements for Continuous Tension Stringing of Overhead Line Phase Conductors and Earthwire

This section of this NSI details **Safety from the System** requirements for the continuous tension stringing of Phase Conductors and Earthwire, under single circuit outage conditions, on all 275 kV and 400 kV double circuit lattice tower construction overhead lines designed pre-1991. Work on L3 design towers, 'T'-off towers, junction and terminal towers, certain large angle towers, high river crossings, towers of special construction and future designs may need special consideration and additional documented procedures.

The raising or lowering of complete spans of Earthwire to or from the ground and the handling of long tails of optical Earthwire are not covered by these safety requirements.

### Planning

As a part of the planning process, consideration shall be given to the practicalities of completing the pull in one day. The length of the pull, number of intermediate angles and access to machine sites shall be clearly identified in order to estimate the approximate duration of the pull. It may be necessary to revise the scope of the works if there are insufficient daylight hours during the winter months preventing the pull from being completed in one day.

Checklists for Key Activities are in TGN 313.

## 1 Basic Safety Requirements

### NSI 4 Rules Section 2 1.1 to 1.9

- 1.1 The safety requirements throughout this section shall be fully understood and implemented by a **Senior Authorised Person** and the **Competent Person**.
- 1.2 Prior to agreement that the work can be undertaken, the **Senior Authorised Person** shall carry out for all sections of the overhead line an assessment that includes, the effect of Circulating Currents on temporary joints i.e. use of conductor stockings, reeving ropes and polyester slings.
- 1.3 Ensure that the Delayed Auto Reclose (DAR) is switched out during all Tension Stringing Operations.
- 1.4 All **Safety from the System** measures shall be in place prior to the commencement of Tension Stringing operations and remain in place until the work has been completed.
- 1.5 All Earth Bonding shall be in place prior to the Tension Stringing Operation.
- 1.6 **Drain Earth(s)** shall be applied in accordance with the **Earthing Schedule**.
- 1.7 The **Senior Authorised Person** shall satisfy themselves that any plant, equipment, crossing protection and associated activity does not infringe safety distance.
- 1.8 At the end of the work period before **Personnel** leave site, the Conductor section shall be pulled through and secured at around normal erection tension to prevent excessive sag.
- 1.9 When tension stringing Earthwire, brushed running blocks shall be used, throughout the pulling section. When tension stringing Phase Conductors brushed running blocks are required at the puller and tensioner tower.

## 1 Basic Safety Requirements

**NSI 4 Guidance**  
**Section 2**  
1.1 to 1.2

- 1.1 The **Senior Authorised Person** shall have sufficient technical knowledge and experience of the work to be undertaken, the techniques to be employed and the **Safety from the System** implications to enable them to make the necessary arrangements and decisions for planning the work. They will also issue the appropriate **Safety Document(s)**. They shall be specifically appointed to NSI4.

The **Competent Person** shall have sufficient technical knowledge and experience of the work to be undertaken, the techniques to be employed and the **Safety from the System** implications. They shall be present on site during the work with their attention dedicated to this task. Their role is to satisfy them self that all appropriate measures are being taken to maintain **Safety from the System**. They shall be specifically appointed to NSI4.

- 1.2 The **Senior Authorised Person** shall produce a report identifying those towers or sections requiring special working arrangements, the requirements for circuit outages (double circuit on Earthwire work) or any restrictions on the positioning of plant or on the equipment to be used for the work.

Pulling of conductors shall be completed within the working day. NB this statement refers to the actual process of pulling in the new conductor and does not include all the ancillary preparation or finalisation works e.g. inserting make-up lengths of conductor, catching off at tension towers, sagging, clamping in etc. However, at the end of the working day all conductors shall be left overnight in a safe and secure state.

Form F10, Daily Check list for key activities, located in TGN 313 shall be completed on a daily basis

Where work is required on an intermediate tower during a pulling operation involving insulated links, currents up to 450 Amps may be present in any set of **Drain Earth(s)** applied to any intermediate tower in the section being pulled.

Reeving ropes (non-metallic) can be used to winch in the existing conductor(s) to the puller under the following conditions:-

- The reeving rope is inspected at every pull to gauge its condition and integrity
- It shall only be raised up the tower and connected immediately prior to the pull once it has been agreed that the pull can commence.
- Under no circumstances shall the rope be left up the tower exceeding the normal working day, particularly overnight.

Conductor stockings shall not be left in stationary contact with the running blocks.

<p><b>NSI 4 Guidance</b> <b>Section 2</b> 1.3 to 1.6</p>	<p>1.3 Before tension stringing is carried out, the <b>Competent Person</b> shall request the <b>Control Person (Operation)</b> to switch out the DAR on the <b>Live</b> circuit. At the end of the restringing, the <b>Competent Person</b> will request the restoration of the DAR. This will be carried out and recorded on the daily check sheet.</p> <p>In the event of the circuit tripping during the work, the <b>Control Person (Operation)</b> shall not initiate the re-closure of the circuit until they have obtained the agreement of the <b>Competent Person</b> on site.</p> <p>1.4 Tension stringing shall not proceed until agreed by the <b>Competent Person</b>, who shall be present in the section to be worked on during the installation of the conductors with their attention dedicated to the task.</p> <p>The <b>Competent Person</b> is responsible for ensuring that all appropriate measures are being taken to maintain <b>Safety from the System</b>.</p> <p>A <b>Senior Authorised Person</b>, conversant with the work, shall be readily contactable and available to deal with any emergencies. These arrangements shall be agreed by the <b>Senior Authorised Person</b> and the <b>Competent Person</b> before the <b>Competent Person</b> allows the work to commence.</p> <p>During the tension stringing operation, using binoculars if necessary, the conductors and each running block shall be continuously monitored by observers in communication with the tensioner / puller operators. If damaged conductor, joints or repair sleeves are to be pulled through the running blocks, the puller operator shall be advised of the progress of the obstruction and the pulling speed reduced as necessary.</p> <p>During the tension stringing process <b>Personnel</b>, shall not position themselves underneath the conductors being restring.</p> <p>1.5 At Substation terminal towers, the integrity of the earth connection to the Substations earth mats shall be checked prior to the work commencing.</p> <p>The integrity of the Permanent Earth Bonds on the earthwire shall be checked at the nearest towers on each side of the sections to be restring and on the earthwire that will not be disconnected.</p> <p>To protect the operators of the tensioner / puller and <b>Personnel</b> working on the reel winders, drums and associated equipment against the effects of any rise in potential of the machines and equipment with respect to the ground they are standing on, an Equipotential Environment shall be provided. This shall be in accordance with TGN 313. Access to the machines and equipment in the Equipotential Zones by operators and other <b>Personnel</b> shall be controlled.</p> <p>1.6 The <b>Senior Authorised Person</b> shall make reference to the tables in TGN 313 for the correct number of <b>Drain Earth(s)</b> required for sub-conductors under this section.</p>
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**NSI 4 Guidance**  
**Section 2**  
1.6 Cont. to 1.7

A fully conductive system shall be capable of carrying a combined current of 450A, therefore any swivel / link shall be capable of carrying this maximum figure. This will only apply to bundled conductors i.e. two or more sub-conductors.

If temporary joints are not capable of carrying 450A, then use shall be made of insulated links to reduce the current that can pass through lifting equipment and machines.

If utilising the insulated pulling system, an insulated sheath shall be applied over the full length of the conductor stocking.

When using the insulated link, at no time shall a section of conductor between two insulated links be allowed to be **Drain Earth(s)** free. The insulated link is designed to withstand the passage of current and cannot withstand high floating induced voltages.

For this reason, during re-conductoring:-

- At a tension tower when inserting a make-up length of conductor, only one insulated link shall be inserted per sub-conductor.

To reduce to a minimum the time that current can flow through non-current carrying temporary joints, it's imperative that the **Drain Earth(s)** applied on the line side of any temporary joint is not removed until immediately prior to pulling the conductor.

- If a short single span is located in a long pulling section such that during the pulling operation that span would at any time become free of **Drain Earth(s)**, then joints at one end shall be capable of carrying 450A.

Additional Guidance for Work on Earthwires

**Drain Earth(s)** shall be applied in accordance with TGN 313. **Drain Earth(s)** shall be fitted to all phase conductors on the **Isolated** and **Earthed** circuit at all towers in the section to be worked on and at the nearest towers on each side of the section.

The **Drain Earth(s)** shall remain in position for the duration of the work which will ensure the provision of the maximum number of parallel earth paths during the stringing operation.

No work shall be undertaken on the phase conductors, insulators or associated fittings in the section being worked on unless the earthwire is tensioned and permanently made off at both ends and electrically bonded to the towers in the section. This will ensure that earthwire continuity is maintained throughout the route. This statement shall be recorded in Section 2 of the **Permit for Work**.

- 1.7 The **Senior Authorised Person** may need to refer to the appropriate overhead line design drawings.

When failure of a component (e.g. a running block or means of attachment at angle tower peaks) could allow the conductor to move towards the **Live** circuit, the method of working shall ensure that in the event of such a failure, the conductor is restrained and **Safety Distance** is not infringed.

**NSI 4 Guidance**  
**Section 2**  
1.8 to 1.9

- 1.8 The **Senior Authorised Person** may need to refer to the appropriate overhead line design drawings.

The earthwire shall be tensioned, as a minimum, to a position where, under all conditions, **Safety Distance** from the **Live** phase conductors will not be infringed. It shall be terminated at appropriate towers to minimise the dependence on the temporary joints and the tensioner / puller machines and to prevent excessive sag. The Earthwire shall be caught off avoiding any stocking connections being positioned in the running block. If this is not possible, bridging earths shall be applied to reduce any burning of the stockings. At all intermediate connections, a temporary safety clamp shall be placed onto the Earthwire and secured to the tower with a metallic sling. **Drain Earth(s)** can then be applied outboard of the temporary clamps.

- 1.9 All the conductor running blocks shall comply with the requirements of TRL 2.2 part 5. All conductor running blocks at machine end towers shall be brushed.

## 2 Competency of Staff

**NSI 4 Rules**  
**Section 2**  
2.1

- 2.1 The **Competent Person(s)** in receipt of **Safety Document(s)** for this work shall understand the relevant sections of TGN 313 and have completed the applicable TGN 313 E-Learning course.

## 2 Competency of Staff

**NSI 4 Guidance**  
**Section 2**  
2.1

- 2.1 The **Competent Person(s)** shall have read the relevant sections of TGN 313.

Documented evidence shall be available confirming the **Competent Person(s)** in receipt of **Safety Document(s)** for this work has successfully completed the relevant sections of the TGN 313 E-Learning.

The installation, removal or replacement of optical cable using the wrap technique, will be carried out under a minimum of a **Limited Access Certificate**.

## 3 Communications and Control

**NSI 4 Rules**  
**Section 2**  
3.1

- 3.1 An effective and efficient communications system shall be in place prior to any work associated with these procedures.

### 3 Communications and Control

**NSI 4 Guidance**  
**Section 2**  
3.1

- 3.1 The **Competent Person** responsible for DAR outage requests shall also take responsibility for ensuring that communication is established between the site and the **Control Person (Operation)** using an effective communication channel.
- Before the actual installation work is commenced, the site **Personnel** carrying out the work shall explain to the satisfaction of the **Competent Person** the method of communication, signalling and control that will be adopted. This communication system shall be checked each day before the start of work and immediately prior to the stringing operation. Work shall be stopped immediately if the communication system is found to be defective.

### 4 Emergency Procedures

**NSI 4 Rules**  
**Section 2**  
4.1 to 4.2

- 4.1 In the event of an unplanned action whereby the conductor or any other equipment or material, could potentially come within **Safety Distance** of a **Live** circuit, the **Competent Person** shall immediately arrange for the **Live** circuit to be switched out in order to recover the situation.
- 4.2 The **Senior Authorised Person** shall have a documented emergency plan which caters for the interface with all other Utilities, Emergency Services and the **Control Person (Operation)**.

### 4 Emergency Procedures

**NSI 4 Guidance**  
**Section 2**  
4.1

- 4.1 At the planning stage, NGET Control shall consider emergency outages in the possible fault risk category. Following emergency circuit switch out, system security standards may not be met and therefore NGET Control shall implement any planned action to restore security standards.

Each day before work commences, the **Competent Person** shall request the **Control Person (Operation)** to switch out the DAR on the adjacent **Live** circuit. At the end of each day's work, the **Competent Person** will request the restoration of the DAR on the adjacent circuit. This will be carried out and recorded on the Daily Checklist Forms found in TGN 313. In the event of the adjacent **Live** circuit tripping during the work, the **Control Person (Operation)** shall not initiate the re-closure of the circuit until they have obtained the agreement of the **Competent Person** on site.

Where a circuit has been subject to a fault, the integrity of **Earthing Device(s)** cannot be guaranteed. Therefore, following a fault on an adjacent circuit, all **Earthing Device(s)** shall be inspected before further work is carried out.

**NSI 4 Guidance  
Section 2  
4.2**

4.2 **Personnel** carrying out the work shall have a documented emergency plan available on site to instruct all staff in the actions to be taken should the conductor or any other equipment or material come within or have the potential to come within **Safety Distance** of the **Live** circuit. The plan shall include the following:

- All **Personnel** shall be withdrawn immediately to a distance greater than **Safety Distance** from the unsecured item.
- The immediate area shall be secured to prevent access.
- The **Competent Person** shall be informed.

Should the approved procedures fail, advice shall be sought from the **Senior Authorised Person**.

## 5 Weather Conditions

**NSI 4 Rules  
Section 2  
5.1 to 5.4**

5.1 Prior to the tension stringing of conductors, the **Competent Person** shall contact the appropriate local weather centre to ascertain the forecast on wind speed and precipitation and NGET Control for lightning risk.

5.2 When the weather conditions are such that wind induced conductor movement could cause **Safety Distance** from the **Live** circuit to be infringed if conductor tension was lost during the stringing, then the work shall be stopped.

5.3 In the event of, or near approach of, a lightning storm, all work on the conductors shall cease.

5.4 Work shall also be discontinued if fog or poor visibility prevents observers from fulfilling their role.

## 5 Weather Conditions

**NSI 4 Guidance  
Section 2  
5.1 to 5.3**

5.1 NGET Control team shall inform the **Competent Person** of any change in lightning risk that has reached level 1 severity or other weather conditions which could adversely affect the work.

5.2 Work on earthwire shall not proceed if the mean average hourly wind speed is 15 mph or more, measured at a height of 10 metres above ground level.

5.3 The **Control Person (Operation)** may request that the DAR be restored on the **Live** circuit for the duration of the storm or until such time as it is agreed work can resume. **Personnel** shall also keep a minimum of 10 metres away from the overhead line and the stringing equipment whilst a lightning storm is in the area.

**WORK ON OR NEAR TO HIGH VOLTAGE OVERHEAD LINES**

**APPENDIX A**

**NSI 4 AUTHORISATION MATRICES FOR PERSONNEL**

<b>National Grid Senior Authorised Person Authorisations (Core)</b>			
<b>Senior Authorised Person Authorisation</b>	<b>Required theory of Sections</b>	<b>Authorised to Section(s)</b>	<b>Awareness of TGN 313 Earthing Schemes</b>
<b>Senior Authorised Person Core</b>	<b>Section 1-All</b>	<b>Section 1-All</b>	
<b>Additional Authorisations</b>			
<b>Senior Authorised Person Additional Authorisations</b>	<b>Section 2-All</b>	<b>Section 2-All</b>	

## National Grid Competent Person Authorisations

CP Authorisation	Required theory of Sections	Authorised to Section(s)	Awareness of TGN 313 Earthing Schemes
Competent Person Core	Section 1-All	Section 1-All	
<b>Competent Person Enhanced</b>			
Competent Person Enhanced Authorisation(s)	Section 2-All	Section 2-All	

## Contractors Competent Person Authorisations

CP Authorisation	Required theory of Sections	Authorised to Section(s)	Awareness of TGN 313 Earthing Schemes
<b>CP A.</b> (LAC only) Non-application of <b>Drain Earth(s)</b>	<b>Section 1-All</b>	<b>Section 1-All</b>	
<b>CP B</b> (LAC & PFW) Non-application of <b>Drain Earth(s)</b>	<b>Section 1-All</b>	<b>Section 1-All</b>	
<b>CP C</b> (LAC & PFW) Application of <b>Drain Earth(s)</b> (No access onto Conductors)	<b>Section 1-All</b>	<b>Section 1-All</b>	
<b>CP D</b> (LAC & PFW) Application of <b>Drain Earth(s)</b> (Work on Conductors)	<b>Section 1-All</b> <b>Section 2-All</b>	<b>Section 1-All</b> <b>Section 2-All</b>	