National Grid UK Electricity Transmission plc

NATIONAL SAFETY INSTRUCTION 9

and

Guidance

TESTING HIGH VOLTAGE EQUIPMENT



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DOCUMENT HISTORY

Issue	Date	Summary of Changes / Reason	Author(s)	Approved By (Title)
1	Dec 2010	New Guidance Document to follow 3rd. edition Electricity Safety Rules layout.	NSI Working Group	MDE Manager Les Adams 
2	April 2014	Renamed as “National Safety Instruction and Guidance” which now incorporates and replaces NSI 9 Issue 3 and NSI 9 Guidance Issue 1.	NSI Review Group	ETAM Operations North Manager Mike Dean
3	Feb 2021	Updated & Reformatted	Electricity Transmission Operations Safety Rules Team	Head of ET Operations Matt Staley
4	Sep 2024	Minor update	Electricity Transmission Operations Safety Rules Team	Paul Gallagher Director of Asset Operations
5	Oct 2025	Minor update	Electricity Transmission Operations Safety Rules Team	Kate Grant Director of Asset Operations

KEY CHANGES

Section	Amendments
5.4 Rule and Guidance	Guidance on application and / or removal of Fixed Primary Earth(s) and Portable Primary Earth(s) outside of a designated work area.
5.5 Rule and Guidance	Removal and / or Application of Fixed Primary Earth(s) and Portable Primary Earth(s) at a remote location inside a designated Work Area. (5.5 added in as a New Point in Section 5 Rule and Guidance)
5.6 Rule and Guidance	Removal and / or Application of Fixed Primary Earth(s) and Portable Primary Earth(s) at a remote location outside a designated Work Area. (5.6 added in as a New Point in Section 5 Rule and Guidance)

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TESTING HIGH VOLTAGE EQUIPMENT

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1 SCOPE

To apply the principles established by the **Safety Rules** and provide guidance on National Safety Instruction 9, for **Personnel** carrying out tests on **HV Equipment** using electrical test supplies at dangerous voltages / energy levels or give rise to dangerous voltages as part of the work activity or when a **Primary Earth** is removed e.g., **HV** withstand test, footprint testing and capacitance and loss angle (tan delta) testing.

The use of any other test set that has an output of over 1kV, i.e., 5kV / 10kV Insulation Resistance Test Set will require NSI 9 authorisation. These test sets nominally release a level of energy considered harmful that may lead to injury and thus are within the scope of this NSI.

All test set usage will require some form of recordable competence training to ensure that the test set is operated as per the manufacturer's instructions to prevent harm to individuals.

The following test activities are ***not*** subject to the requirements of this document:

- Testing using a micro-ohmmeter
- Multimeters including a 500v / 1000v Insulation Resistance Test Set
- Testing covered within NSI 5
- Testing under an **Approved** Restoration of Motive Power procedure (ROMP)

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, 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.

2 DEFINITIONS

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

Title	Definition
Compartment	An enclosure, chamber, cubicle or cell designed to prevent uncontrolled access to **Equipment** having exposed **HV** conductors. This term does not apply to metalclad / metal enclosed switchgear
Physical Separation	A gap of sufficient distance to allow **HV Equipment** to be tested and exclude **Danger** to **Personnel** who would otherwise be affected by the test supplies whilst working on other **HV Equipment** within the same **Isolated** zone.
Structure	A tower, gantry or other means of supporting or giving access to exposed **HV** conductors.

3 DANGERS

The **Danger(s)** to **Personnel** during the course of testing are electrocution, burns and effects on eyes arising from: -

- Contact with electrical test supplies at dangerous voltages / energy levels
- Contact with the unearthed **System**
- Contact with **Charged HV Equipment**
- Incorrect management of circulating currents

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NSI 9
4.1 to 4.2

4. Preparation for Testing

4.1 Testing which does not cross control boundaries shall be coordinated by the **Senior Authorised Person**.

4.2 Testing across **HV** control boundaries shall be coordinated by the **Control Person (Safety)** and can only be carried out under a **Sanction for Work**.

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4.1 to 4.2

4 Preparation for Testing

4.1 Control boundaries are identified in the Site Responsibility Schedule.

If another **Permit for Work** is in force on other **Equipment** within the same zone established by the **Point(s) of Isolation**, additional precautions may be necessary.

The **Senior Authorised Person** shall ensure communication between all working parties involved has taken place and appropriate controls recorded on either the Risk Assessment & Method Statement (RAMS) or toolbox talk form, ensuring other working parties are not affected by any test supplies. This may include creating a *Physical Separation* between the **Equipment** to which the test supplies are to be applied and the other **Equipment** that would be affected.

The procedure for the application of test voltages to cables where there is more than one **Permit for Work** in force on the cable circuit is detailed in Management Procedure NSI 5 - “Cable Systems”.

If a **Permit for Work** needs to be issued to a **Competent Person** who is not authorised to NSI 9, the Status of Transfer form can be used stating “No testing to be carried out”. This shall be managed as per the ROMP Process in Safety Rule Guidance R3.4

4.2 When testing across HV control boundaries the Control **Person (Safety)** shall co-ordinate with the third-party safety coordinator to establish a safe working zone. Coordination of activities such as temporary equipment transfer for test purposes shall be managed in accordance with Grid Code OC8 and AMBP 101.

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NSI 9
5.1 to 5.6

5 Testing

5.1 Connections used for test supplies shall be of adequate strength and capability for the testing to be carried out. They shall be easily visible when in the test position and be sufficiently protected to prevent accidental contact.

5.2 Work that requires the application of test voltages from a test source shall be carried out by a **Competent Person** or individuals under the **Personal Supervision** of a **Competent Person**.

5.3 The **Competent Person** in receipt of the **Safety Document** is responsible for maintaining safety concerned with the testing. This includes controlling the work to ensure that they do not endanger any member(s) of their or another **Working Party**.

5.4 Testing under a **Sanction for Work** shall be carried out by a **Competent Person** in accordance with an **Approved Sanction for Work** procedure.

Where defined on a **Sanction for Work**, the **Competent Person** may remove or replace **Primary Earth(s)** within the designated Work Area and Fixed **Primary Earth(s)** outside of the designated Work Area.

5.5 If as defined under a **Sanction for Work**, it is required to remove or replace a **Primary Earth(s)** at a site remote from the work **Location** but within the designated Work Area (e.g. Associated CSE Compound) then these steps shall be followed:

1. A **Competent Person** who is the recipient of the **Sanction for Work** shall give **Personal Supervision** to the removal or replacement of the **Primary Earth(s)** remote from the Work **Location** but within a designated work area. If this cannot be achieved step 2 shall be followed:
2. A **Competent Person,** who is also Authorised as an **Authorised Person**, and is the recipient of the **Sanction for Work** shall instruct via a switching instruction to another **Authorised Person**, within their **Working Party** to remove or replace **Primary Earth(s)** at a site remote from the work **Location** but within a designated Work Area defined on the **Sanction for Work**.

5.6 If any type of **Primary Earth(s)** is to be varied at a site remote from the work **Location** but outside of the designated Work Area as defined on the **Sanction for Work**, then the following steps shall be followed:

1. The **Competent Person** who is the recipient of the **Sanction for Work** shall have **Personal Supervision** by a **Senior Authorised Person** who is a member of the **Working Party** to remove or replace **Primary Earth(s)** as required. If that cannot be achieved step 2 shall be followed:
2. The **Senior Authorised Person** as the recipient of the **Sanction for Work** shall instruct via a switching instruction to another **Senior Authorised Person** to remove or replace **Primary Earth(s)** at a site remote from the work **Location** outside of the designated Work Area as defined on the **Sanction for Work**.

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5 Testing

5.1 To avoid **Danger** to **Personnel** from induced voltages under no circumstances shall a test lead be attached or remain connected to the **HV Equipment** unless:

a) The other end of the test lead is securely connected to test equipment which is **Earthed** or to the substation earth
b) The primary conductor is **Earthed** via an **Earthing Device**

Where disconnections / test connections are not easily visible they shall be recorded on a ROADDRAT form (NSI 12 – "Low Voltage Equipment"), available via the SHES Briefcase.

5.3 The **Competent Person** in receipt of the **Safety Document** shall ensure that there is effective control of the area where the test voltage or current is to be applied. If the area is small enough to allow effective surveillance this should be carried out under his **Personal Supervision**. Where the area is too large for this or where the nature of the testing means that the **Competent Person** is not continuously present, then effective control will need to be secured by other means.

Examples of which are lockable enclosures or barriers, warning notices indicating the presence of test voltage or current, and if necessary, the posting of sentries will be required.

If the **Equipment** being tested has remote end(s) which may become **Live** when the test voltage or current is applied and which is readily accessible from ground level, e.g. not within a **Locked** *Compartment* or on a *Structure*, it is the responsibility of the **Competent Person** in receipt of the **Safety Document**, to ensure that the remote end is cordoned off and under the control of a **Person** before a test voltage or current is applied.

It is the responsibility of that **Person** to ensure that no one (including themselves) approach the **Equipment** unless instructed to do so by recipient of the **Safety Document**.

All **Personnel** shall be members of the **Working Party**.

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5.4 Generic **Approved Sanction for Work** procedures shall be used for work e.g. circuit breaker timing tests, pressure testing **HV** cables etc. where **Primary Earth(s)** are removed.

Where an **Approved Sanction for Work** procedure does not exist or suffice, the **Senior Authorised Person** shall ensure that one is produced and **Approved** for use as per Management Procedure NSI 31 - "Control of National Grid Electricity Transmission Safety Rules and Supporting Documentation".

The procedure may include the commissioning program, standard test sheets, test procedures or diagrams of test connections.

Where **Primary Earth(s)** are removed / applied under a **Sanction for Work** a fixed **Earthing Device** shall where reasonably practicable be used to make the first and break the last earth connection. If there are **Portable Primary Earth(s)** defined on the **Sanction for Work** and they are located outside the designated Work Area but within the same **Location**, a **Senior Authorised Person** shall provide **Personal Supervision,** as part of the **Working Party,** for either the removal or application process. For further guidance refer to Management Procedure NSI 2 – "Earthing High Voltage Equipment".

All **Personnel** shall be members of the **Working Party**.

5.5 A site remote from the work **Location** can be defined as not within the same voltage **HV** Compound that the designated Work Area in which the **Equipment** to be tested is located. (e.g. Associated CSE Compound, etc). Both designated Work Areas are defined under the **Sanction for Work**.

5.6 A site remote from the work **Location** can be defined as not within the same voltage **HV** Compound that the designated Work Area in which the **Equipment** to be tested is located. (e.g. Associated CSE Compound, etc). Fixed or Portable **Primary Earth(s)** that are located outside of the designated Work Areas and are defined under the **Sanction for Work**.

Note: For 5.5 and 5.6 Guidance

- Switching instructions shall be formally recorded in the switching log book in accordance with the requirements of NSI 1 Operational and Safety Switching.
- All **Personnel** shall be technically competent to carry out any Testing Activity irrespective of Authorisation.
- Testing across boundaries (via CPS1 Coordination) is nominally undertaken under section 5.5 (2) & 5.6 (2).

NSI 9
6.1

6 Completion of Testing

6.1 On completion of testing, when a **Safety Document** which includes testing as part of the work activity is to be cleared, the **Competent Person** shall ensure that any safety precautions that were varied for the testing and are not restored to the original state are listed as exceptions on the **Safety Document**.

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6 Completion of Testing

6.1 Where disconnections / test connections have been recorded on a ROADDRAT form this shall be updated as appropriate by the **Competent Person**.

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Appendix A - Authorisation Matrix for Contractors Personnel

Contractor **Personnel**	**Person**	**Competent Person (SFW)**	**Authorised Person**	**Senior Authorised Person**
Sections		5 6.1		

Contractors are only authorised to NSI 9 if a **Sanction for Work** is issued, as this may interfere with **HV** safety precautions unique to National Grid. Contractors can hold a **Permit for Work** for testing without being authorised to NSI 9.

Contractors Personnel

Contractors by law have a duty to provide a safe system of work for their employees.

National Grid have a duty in law to employ competent Contractors to undertake testing on **HV Equipment** and provide them with National Grid's safe system of work to enable them to develop their own safe systems of work.

National Grid Supply Chain Management processes ensure competent Contractors are selected.

Once a competent Contractor is selected, National Grid has a duty to ensure the Contractor will be conversant with **Safety Document(s)**, demarcation and safe access and egress, including movement of objects and vehicles etc. This is accomplished by Contractors employees being authorised to National Grid Safety Rules and relevant NSI's as identified in Management Procedure - NSI 30 "Appointment of Persons".

The Contractor selected shall be an expert in the area of testing on **HV Equipment**. If the testing does not interfere with safety precautions, there is no requirement for authorisation to NSI 9.

Before a **Safety Document** is prepared or issued the **Senior Authorised Person** shall be authorised to NSI 9 and shall ensure the Contractors risk assessment and method statements cover the controls identified in NSI 9.

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