

National Grid UK Electricity Transmission plc

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NATIONAL SAFETY INSTRUCTION

Guidance Notes


NSI 9

TESTING HIGH VOLTAGE EQUIPMENT

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DOCUMENT HISTORY

Issue	Date	Summary of Changes / Reason	Author(s)	Approved By (Title)
1	December 2010	New Guidance Document to follow 3 rd edition Electricity Safety Rules layout.	NSI Working Group	MDE Manager Les Adams 

KEY CHANGES

Section	Amendments

TESTING HIGH VOLTAGE EQUIPMENT

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1 Purpose and Scope

To provide guidance on National Safety Instruction 9, when applying principles established by the Safety Rules to achieve **Safety from the System** 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 following test activities are not subject to the requirements of this document:

- Testing using a micro-ohmmeter
- Testing under an **Approved** restoration of motive power procedure (ROMP)
- Testing using an insulation resistance meter on **Equipment** that does not require precautions to be taken away from the point of test.

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.

2 Definitions

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

Title	Definition
<i>Compartment</i>	An enclosure, chamber, cubicle or cell designed to prevent uncontrolled access to Equipment having exposed HV conductors. This term does not apply to metalclad switchgear spouts.
<i>Physical Separation</i>	A gap of sufficient distance to allow HV Equipment to be tested and exclude Danger to persons who would otherwise be affected by the test supplies whilst working on other HV Equipment within the same Isolated zone.
<i>Structure</i>	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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4.1 to 4.2

4 Preparation for Testing

- 4.1 Testing which does not cross control boundaries shall be co-ordinated by the **Senior Authorised Person**.
- 4.2 Testing across **HV** control boundaries shall be co-ordinated by the **Control Person (Safety)** and can only be carried out under a **Sanction for Work**.

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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 or tool box 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 the ROMP Process in Safety Rule Guidance R 3.4.

- 4.2 When testing across **HV** control boundaries the **Control Person (Safety)** shall co-ordinate with the third party safety co-ordinator to establish a safe working zone in accordance with OC8, Management Procedure UK/BP/SE/301 and NOC procedures AMWI NOC3.

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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 personnel 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 specified on a **Sanction for Work**, the **Competent Person** may remove or replace **Primary Earth(s)** or instruct another **Competent Person** to remove or replace **Primary Earth(s)** at a site remote from the work **Location**.

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

Where disconnections / test connections are not easily visible they shall be recorded on a RO\AD\DR\AT form.

- 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.

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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**.

- 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 - "Approval of Procedures".

The procedure may include the commissioning programme, 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. For further guidance refer to Management Procedure NSI 2 – Earthing High Voltage Equipment.

Where the recipient of the **Safety Document** instructs another **Competent Person** to remove or replace **Primary Earth(s)** at a site remote from the work **Location** the instruction shall be formally recorded in the switching log book.

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

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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 RO\AD\DR\AT form this shall be updated as appropriate by the **Competent Person**.

Appendix A - Authorisation Matrix for Contractors Personnel

Contractors appointment under this NSI shall be limited to the following sections.

Contractor Personnel	Person	Competent Person (SFW)	Authorised Person	Senior Authorised Person
Sections		5.4 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.