National Grid UK Electricity Transmission plc

NATIONAL SAFETY INSTRUCTION 9

and

Guidance

TESTING HIGH VOLTAGE EQUIPMENT

Copyright National Grid plc 2021 ©, all rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise, without the written permission of National Grid obtained from the issuing location.

The contents of National Grid documents are based on the needs of National Grid and the conditions under which it operates. It shall not therefore be assumed that the contents stated therein necessarily meet the particular circumstances and requirements of other organisations. The principles set out in this document are for information only and therefore National Grid is not liable to any third party for any loss or damage resulting from reliance on the contents. It is the responsibility of such external organisations to check that the document is the latest version and is appropriate for their purposes.

© National Grid plc 2021 – All Rights Reserved
Uncontrolled when printed
## DOCUMENT HISTORY

<table>
<thead>
<tr>
<th>Issue</th>
<th>Date</th>
<th>Summary of Changes / Reason</th>
<th>Author(s)</th>
<th>Approved By (Title)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>April 2014</td>
<td>Renamed as “National Safety Instruction and Guidance” which now incorporates and replaces NSI 9 Issue 3 and NSI 9 Guidance Issue 1.</td>
<td>NSI Review Group</td>
<td>ETAM Operations North Manager Mike Dean</td>
</tr>
<tr>
<td>3</td>
<td>Feb 2021</td>
<td>Updated &amp; Reformatted</td>
<td>Electricity Transmission Operations Safety Rules Team</td>
<td>Head of ET Operations Matt Staley</td>
</tr>
</tbody>
</table>

## KEY CHANGES

<table>
<thead>
<tr>
<th>Section</th>
<th>Amendments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TESTING HIGH VOLTAGE EQUIPMENT

CONTENTS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scope</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Definitions</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Dangers</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Preparation for Testing</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Testing</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Completion of Testing</td>
<td>4</td>
</tr>
</tbody>
</table>

Appendix A – Authorisation Matrix for Contractors Personnel | 5    |
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 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, 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.

<table>
<thead>
<tr>
<th>Title</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compartment</td>
<td>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</td>
</tr>
<tr>
<td>Physical Separation</td>
<td>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.</td>
</tr>
<tr>
<td>Structure</td>
<td>A tower, gantry or other means of supporting or giving access to exposed HV conductors.</td>
</tr>
</tbody>
</table>

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
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.

Guidance

NSI 9
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 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 per 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 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.
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 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.

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.
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 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.

---

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**.

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**.
Appendix A - Authorisation Matrix for Contractors Personnel

<table>
<thead>
<tr>
<th>Contractor Personnel</th>
<th>Person</th>
<th>Competent Person (SFW)</th>
<th>Authorised Person</th>
<th>Senior Authorised Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sections</td>
<td></td>
<td>5</td>
<td>6.1</td>
<td></td>
</tr>
</tbody>
</table>

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.