

# National Grid UK Electricity Transmission plc

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## NATIONAL SAFETY INSTRUCTION and Guidance

### NSI 17 PRESSURE SYSTEMS

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## DOCUMENT HISTORY

Issue	Date	Summary of Changes / Reason	Author(s)	Approved By (Title)
1	November 2010	New Guidance Document to follow 3 <sup>rd</sup> 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 17 Issue 4 and NSI 17 Guidance Issue 1.	NSI Review Group	ETAM Operations North Manager Mike Dean

## KEY CHANGES

Section	Amendments
4.6 Guidance	Reference to Technical Guidance Note 230 changed to Transmission Procedure 222 - Compliance with Pressure Systems Safety Regulations.
2	Definitions modified and updated.
6.3 Guidance	Additional words added to clarify disconnected equipment testing.

## PRESSURE SYSTEMS

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## 1 Purpose and Scope

To apply the principles established by the Safety Rules and provide guidance on National Safety Instruction 17, to achieve **Safety from the System** for personnel, working on Pressure Systems.

National Grid **Personnel** working on pressure systems shall be appointed to this NSI. For contractor appointment see Appendix A.

Any pressure system containing sulphur hexafluoride gas and forming an integral part of the **HV System** is exempt from the Pressure System Safety Regulations.

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 standard.

## 2 Definitions

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

Title	Definition
<i>Pressure System</i>	Incorporates: <ul style="list-style-type: none"> <li>a) System comprising one or more pressure vessels of rigid construction, any associated pipe work and protective devices</li> <li>b) Pipe work with its protective devices to which a transportable pressure receptacle is, or is intended to be connected, or</li> <li>c) A pipeline and its protective devices which contains or is liable to contain a relevant fluid, but does not include a transportable gas container</li> </ul> Examples include air dryers, air receivers, air operated circuit breakers and associated equipment, nitrogen accumulators on hydraulically operated circuit breakers, SF <sub>6</sub> gas handling equipment. <i>Note: This is not an exhaustive list.</i>
<i>Safe Operating Limit</i>	The <b>design</b> operating limits (incorporating a suitable margin of safety) beyond which failure is liable to occur
<i>Protective Devices</i>	Devices designed to protect the <i>Pressure System</i> against <b>excess pressure</b> failure and devices designed to give warning that failure might occur, and includes bursting discs
<i>Scheme of Examination</i>	A <b>documented</b> written scheme produced by a competent person, <b>as defined by the Pressure System Safety Regulations</b> , specifying the nature and frequency of examination. It shall cover all protective devices, every pressure vessel and those parts of pipelines and pipe work which, if failure occurs may give rise to <b>Danger</b>
<i>Examination</i>	Examination of the <i>Pressure System</i> as specified in the <i>Scheme of Examination</i>
<i>System Failure</i>	The unintentional release of stored energy (other than from a pressure relief system, <b>acting within its' performance criteria</b> ) from a <i>Pressure System</i>

### 3 Dangers

The main **Danger(s)** from *Pressure System(s)* arise from

- Mistaking **Equipment** that is in service from **Equipment** which has been made safe from the **System**
- Accidental release of stored energy
- Accidental release or injection into the body of compressed hydraulic fluids or gas
- Impact from parts of equipment that fail
- Noise
- Trapped compressed fluid or gas that cannot be released by normal means of venting

**NSI 17**  
4.1 to 4.7

**4 General Requirements**

- 4.1 The **Senior Authorised Person** shall assess the means of achieving **Safety from the System**.
- 4.2 All *Pressure System(s)* shall be legibly and indelibly marked with the *Safe Operating Limit(s)*. **Equipment** shall not be operated unless the *Safe Operating Limit(s)* are established.
- 4.3 A non-return valve shall not be considered as a shut-off valve unless it is capable of being **Locked** in the closed position.
- 4.4 When establishing **Safety from the System**, electrically and manually operated valves shall be set to the required position and **Locked**. The electrical supply to electrically operated valves shall be **Isolated** or the mechanical drive disconnected.
- 4.5 Hydraulic and pneumatic control valves shall be **Locked** in the appropriate position.
- 4.6 Where a *Scheme of Examination* is required, no work shall be carried out on a *Pressure System* that does not have a written *Scheme of Examination*.
- 4.7 Pressure vessels shall be regarded as confined spaces.

**Guidance**  
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4.6 to 4.7

**4 General Requirements**

- 4.6 The Location Manager shall ensure that those parts of the *Pressure System* included in the written *Scheme of Examination* are examined by a competent person within the intervals specified in the written *Scheme of Examination*, refer to **Transmission Procedure 222 - Compliance with Pressure Systems Safety Regulations**.

The examination shall be carried out by a competent person.

If the competent person, **defined within the Pressure System Safety Regulations as appointed via Contract Management**, carrying out the examination under the written *Scheme of Examination* is of the opinion that the *Pressure System* or part of the *Pressure System* will give rise to imminent **Danger** they shall forthwith make a written report identifying the system and specifying the repairs, modifications or changes concerned.

The Location Manager will ensure that the **Equipment** is not operated or used until work is undertaken to carry out the repairs, modifications or changes, as the case may be.

- 4.7 When access is necessary the requirements of Management Procedure NGUK/PM/SHE/018, 'Confined Spaces' shall be applied.

**NSI 17**  
5.1 to 5.4

## 5 Dissipation of Trapped Stored Energy

- 5.1 When stored energy cannot be **Vented** via a vent valve the **Senior Authorised Person** shall identify how the stored energy is to be safely dissipated.
- 5.2 The identified connection at which trapped stored energy is to be **Vented** shall be capable of being re-secured during the process.
- 5.3 The **Senior Authorised Person** shall identify the point(s) at which the **Equipment** is to be **Vented** and record these point(s) on the **Safety Document**.
- 5.4 The recipient of the **Safety Document** shall provide **Personal Supervision** during the venting process. If the recipient of the **Safety Document** undertakes the venting they shall be accompanied by another **Person** during the venting process.

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NSI 17  
5.1 to 5.3

## 5 Dissipation of Trapped Stored Energy

- 5.1 Due to the design of some **Equipment** it is not always possible to vent to atmospheric pressure prior to the issue of a **Safety Document**. Venting can be achieved via an appropriate vent valve or by the disconnection of **Equipment** or opening of a coupling creating vent points.

Prior to the creation of a vent point, the **Senior Authorised Person** shall firstly consider venting the **Equipment** via an appropriate vent valve by establishing safety precautions further back into the **System**, even if it requires taking out more of the air system.

Where this is not reasonably practicable the **Senior Authorised Person** shall identify the smallest diameter pipe work for the controlled dissipation of stored energy.

- 5.3 During the controlled dissipation of stored energy the vent point shall always be capable of being re-tightened e.g. slow release. This is required should it be found that the isolation provided is not functioning correctly. In this case the recipient of the **Safety Document** shall report back to the **Senior Authorised Person** before proceeding.

The **Senior Authorised Person** shall physically identify the point(s) at which the **Equipment** is to be vented using temporary labels (if required) and record these points in further precautions to be taken during the course of the work to avoid **System** derived hazards Section of the **Safety Document** to be issued.

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5.3 Cont:



Figure 5.3A – Example of physically identifying the point(s) at which the **Equipment** is to be vented using temporary labels



**NSI 17**  
6.1 to 6.3

**6 Testing and Calibration of Equipment**

- 6.1 Safety valves are not to be tested whilst **Equipment** is in service.
- 6.2 Testing and calibration of **Equipment** released from service shall be carried out under the **Personal Supervision** of the **Safety Document** recipient.
- 6.3 **Equipment** removed from the **System** shall not be subject to the requirements of the National Grid UK Electricity Transmission Safety Rules.

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6.1 to 6.3

**6 Testing and Calibration of Equipment**

- 6.2 If **HV Equipment** is required for a short duration outage e.g. to enable *Scheme of Examination* over pressure test to be undertaken the following process shall be adopted:-
- The **Senior Authorised Person** shall contact the **Control Person (Operation)** and receive an instruction as per Management Procedure NSI 1 “Operational and Safety Switching”, to take operational control as required for the relevant **Equipment**
  - The relevant **Equipment** shall then be selected to local control at either the substation control point or the local control point by the **Senior Authorised Person**.
  - **LV** and mechanical safety precautions shall then be established as per the requirements of the Safety Rules
  - On completion of the work the **Senior Authorised Person** shall contact the appropriate **Control Person (Operation)** to return control of the relevant **Equipment** via an instruction as per Management Procedure NSI 1 “Operational and Safety Switching”
- 6.3 The testing of **disconnected equipment such as** safety valves and pressure gauges will normally be carried out on a test rig in compliance with the working instructions / safe system of work for that particular rig using appropriately trained staff. When this is carried out it will not be part of the **System**, so the Safety Rules do not apply. However such equipment will be subject to specific legislation e.g. Provision and Use of Work Equipment Regulations 1998 etc.

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## Appendix A - Authorisation Matrix for Contractors Personnel

Contractor Personnel	Person	Competent Person	Authorised Person	Senior Authorised Person
Sections	N/A	N/A	N/A	N/A

### 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 work on pressure systems 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 understands **Danger(s)** associated with undertaking work within a **HV** compound, permit systems, 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 to NSI 6 and 8, via Management Procedure - NSI 30 "Appointment of Persons".

The contractor selected shall be an expert in the area of pressure systems and therefore there is no requirement for authorisation under NSI 17.

Before a **Safety Document** is issued the **Senior Authorised Person** shall be authorised to NSI 17 and shall ensure the contractors risk assessment and method statements cover the **Danger(s)** identified in NSI 17.

The National Grid **Senior Authorised Person** will issue a **Safety Document** to a contractors **Competent Person** authorised to NSI 6 & 8.