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NATIONAL SAFETY INSTRUCTION

UK BP/SE/NSI 17
PRESSURE SYSTEMS

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PRESSURE SYSTEMS

CONTENTS

1 SCOPE

This National Safety Instruction applies the principles established by the Safety Rules to achieve **Safety from the System** for personnel working on Pressure Systems.

Everybody operating, installing, maintaining, repairing, inspecting and testing pressure equipment should have the necessary skills and knowledge to carry out their job safely. This includes actions to be taken in an emergency.

Systems affected by the Pressure System Safety Regulations 2000 include all compressed air systems including pipework, air dryers etc, air receivers, air operated circuit breakers and associated equipment, Accumulators on hydraulically operated circuit breakers; Hydrogen cooled Synchronous Compensators, Carbon Dioxide and Halon fire protection installations and Hydrogen cooling systems on synchronous compensators. This is not an exhaustive list.

2 DEFINITIONS

For the purposes of this document, the following definitions apply:

- *Pressure System* -

  a) system comprising one or more pressure vessels of rigid construction, any associated pipework and protective devices

  b) the pipework with its protective devices to which a transportable pressure receptacle is, or is intended to be connected, or

  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.

- *Safe Operating Limit* - The operating limits (incorporating a suitable margin of safety) beyond which **System** failure is liable to occur.

- *Protective Devices* - Devices designed to protect the pressure system against system failure and devices designed to give warning that system failure might occur, and include bursting discs.

- *Scheme of Examination* - The scheme is to be drawn up by a competent person. The scheme must specify the nature and frequency of the examination. It must cover all protective devices. It must also include every pressure vessel and those parts of pipelines and pipework which, if they fail may give rise to danger.

- *Examination* – Examination of the Pressure System as specified in the Scheme of Examination.

- *System Failure* - Means the unintentional release of stored energy (other than from a pressure relief system) from a pressure system.

- *Relevant Fluid* - Means: steam; any fluid or mixture of fluids which is at a pressure greater than 0.5 bar above atmospheric pressure, and which fluid or mixture of fluids is a gas or a liquid which would have a vapour pressure greater that 0.5 bar above atmospheric pressure when in equilibrium with its vapour at either the actual temperature of the liquid or 17.5 degrees Celsius or; a gas dissolved under pressure in a solvent

contained in a porous substance at ambient temperature and which could be released from the solvent without the application of heat.

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

3 EQUIPMENT IDENTIFICATION

Equipment on which work is to be carried out must be readily identifiable. Where necessary a means of identification must be fixed to it, which will remain effective throughout the course of the work.

Where work on a pressure system is in proximity to other **equipment** which remains in service, then a **Senior Authorised Person** must assess if demarcation is required to reduce the risk of mistaking **equipment** which is safe to work on, from **equipment** which is dangerous.

Reference to UK BP/SE NSI 6 Work and Demarcation in Substation.

4 DANGERS

The main **Dangers** from *Pressure Systems* arise from

- Impact from the blast of an explosion or release of compressed liquid or gas.
- Impact from parts of equipment that fail or any flying debris.
- Contact with the released liquid or gas, such as steam.
- Fire resulting from the escape of flammable liquids or gases.
- Mistaking **equipment** that is in service from **equipment** which has been made safe from the **system.**

5 MAINTENANCE

5.1 All pressure equipment and systems should be properly maintained. There shall be a maintenance programme for the system as a whole. It shall take into account the system and equipment age, its uses and the environment.

5.2 When work is to be carried out on *Pressure Systems* a **Senior Authorised Person** must assess the means of achieving **Safety from the System**. Work may be carried out under one of the following conditions subject to risk assessment.

a) **Isolated**, **Points of Isolation** established, **drained**, **Vented**, **Purged** and cooled when necessary

b) **Isolated**, **Points of Isolation** established but containing pressurised substances (See section 8)

c) With the **Equipment** operational (e.g. Painting an air receiver)

d) With the **Equipment** partly **Isolated** and partly in its operational mode. (See section 7)

6 WORK WITH THE EQUIPMENT ISOLATED AND NON OPERATIONAL

6.1 The **Equipment** must be **Isolated** from all external sources of energy and **Points of Isolation** established.

6.2 A non-return valve must not be considered as a shut-off valve unless it is capable of being **Locked** in the closed position.

6.3 Electrically and manually operated valves must be adjusted to the required position and **Locked**. The electrical supply to electrically operated valves must be **Isolated** or the mechanical drive disconnected.

6.4 Hydraulic and pneumatic control valves must be **Locked** in the appropriate position.

6.5 The contents of the **Equipment** must be adjusted to a level which will avoid **Danger**.

6.6 The **Equipment** must be **Vented** and **Purged** as appropriate.

6.7 Pressure vessels must be regarded as confined spaces. When access is necessary the requirements of UK BP/SE NSI 21, 'General Confined Spaces' must be applied.

6.8 A **Permit for Work** must be issued.

7 TESTING SAFETY VALVES

7.1 The testing of Safety Valves 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.

7.2 The safe system of work for operation of the test rig must be specific to the rig/location and must incorporate a written risk assessment. A method statement must be developed as part of the safe system of work. All persons expected to utilise the test rig must be trained to use the rig as per the method statement. A record of training/authority to use the rig must be retained by the location manager.

7.3 However it may be necessary to test Safety Valves in the operational mode for either final adjustment or at the request of the Air System Inspector. Operational Testing of Safety Valves will only be carried out under the **Personal Supervision** of a **Competent Person** who will ensure that:-

- Gauges to monitor pressure have been accurately calibrated.
- Pressure rise can be halted and the **System** isolated and pressure released by use of stop valves and drain valves.
- Compressors feeding the **System** are capable of being switched off from a control position.
- Good communications are established with persons operating valves, etc.
- Individuals not directly involved with the test are excluded from the test area and others are warned that the test is being carried out.

- The test pressure is raised gradually and will not be taken above the maximum permissible working pressure.

- Safety Valves are not adjusted whilst in operating mode.

8 WORK ON ISOLATED EQUIPMENT CONTAINING STORED ENERGY WHICH CANNOT BE VENTED BY NORMAL MEANS

It is not always possible to vent pressurised air systems to atmosphere prior to the issue of a **Safety Document.**

When pressurised air is trapped in pipework and is required to be released, the **Senior Authorised Person** must **vent** where reasonably practicable by applying **isolation** further back into the **system,** even if it requires taking out more of the air system. Where this is not possible the following procedure will be followed:

8.1 The air coupling to be broken must be identified by the **Senior Authorised Person** issuing the **Safety Document** and detailed on the **Safety Document** under further precautions to be taken during the course of the work to avoid **System** derived hazards.

8.2 After the issue of the **Safety Document**, the **Competent Person** will provide Personal Supervision to a controlled breaking of the identified air coupling. If the **Competent Person** breaks the joint himself, he must be accompanied by another **Person**.

8.3 The coupling must always be capable of re-tightening should it be suspected that the isolation provided is not functioning correctly. In this case the **Competent Person** must report back to the **Senior Authorised Person** before proceeding.

8.4 A method statement should be produced by the **Senior Authorised Person/**General Safety Supervisor which specifies additional controls necessary for a safe system of work e.g. the use of Personal Protective Equipment such as eye protection, to prevent eye injury during the venting of trapped air. Reference can be made to UK BP/SE 310 Setting staff to work.

9 INSPECTION AND HYDRAULIC TESTING

All *Pressure Systems* must be legibly and durably marked with safe operating limits and the mark is clearly visible. The equipment should not be operated unless it is established what the safe operating limits of that system are.

No *Pressure System* is to be operated until it has a *Written Scheme of Examination* and it is ensured that the system has been *Examined*. When a new system is installed it must comply with the requirements of the Safety Regulations 2000.

The *Written Scheme of Examination* must cover all protective devices. It must also include every pressure vessel and those parts of pipelines and pipework which, if they fail, may give rise to danger.

The *Examination* must be carried out by a competent person who has the necessary knowledge, experience and independence to undertake the functions required of them.

10 GENERAL INFORMATION

NGT Asset Strategy has currently appointed Lloyds British Testing plc as the Company's competent person to produce the Written Scheme of Examination and carry out the Examinations.

The Written Scheme of Examination will identify Examination periods in accordance with the legislation and shall be planned.

No work shall be carried out on a pressure system that does not have a Written Scheme of Examination. The appropriate 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.

If the competent person 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 unless certain repairs or modifications have been carried out or unless suitable changes to the operating conditions have been made, he shall forthwith make a written report to the effect identifying the system and specifying the repairs, modifications or changes concerned. The location Manager will ensure that the equipment is not operated until the repairs, modifications or changes, as the case may be, have been carried out or made.

The location Manager shall ensure that all Pressure Systems are properly maintained and in good repair, so as to prevent danger.