



Pressure

Systems

GUIDELINES

**Guidelines for Examination of Pressure
and Non-Pressure Plant Items under
PUWER**

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1. Introduction

This guidance is intended to clarify how a Competent Person can assist in the inspection of pressure plant, which would not require compliance with the Pressure Systems Safety Regulations (PSSR).

PSSR defines criteria for inclusion within a thorough examination under a Written Scheme of Examination (WSE) produced by a Competent Person. This is specified in Schedule 1 of PSSR and requires the pressure medium to be:

- a relevant fluid
- at or greater than 250 bar litres capacity

Owner/ users should not confuse the need for maintenance with the requirement for thorough examination under PSSR. They are two separate issues, although problems identified during an examination under the WSE may require maintenance to correct.

Where pressure equipment is excluded from PSSR, and a Written Scheme of Examination has not been produced, it is recommended that an equivalent inspection programme is still undertaken under Provision and Use of Work Equipment Regulations 1998 (PUWER).

Owners and Users of all work equipment are required to ensure it is maintained in an efficient state, in efficient working order and in good repair to comply with the PUWER. To assist in meeting this requirement, a suitable inspection regime may also be considered necessary:

80. When work equipment is first installed, and when it is moved or relocated, it must be inspected to make sure that it has been correctly installed and is operating safely. Where it is possible that the equipment is exposed to conditions that could cause it to deteriorate, it must be inspected regularly.

NB: The scope of this document does not include any assets that fall within the Control of Major Accident Hazard (COMAH) regulations.

2. Maintenance

All equipment can deteriorate in use due to working environment, application of the equipment and the amount of use. The User should base their inspection and/ or maintenance programme on the manufacturers recommendations, however those putting equipment in use for work for a specific application will need to carry out a risk assessment, taking into account the intensity of use, likely misuse, operating environment and variety of operations. Such site-specific information would not necessarily be available to the Manufacturer.

Maintenance is the act of performing tasks of testing, repair and replacement of parts on equipment without modification i.e. restoring like for like.

Maintenance can be achieved through the following systems:

- Breakdown repair
- Planned preventive (routine)
- Planned predictive
- A combination of the above

Where the safety of work equipment exposed to conditions causing deterioration, which is liable to result in unacceptable risks, every employer shall ensure that it is inspected at suitable intervals.

Persons responsible for determining the nature of the inspection regime should hold sufficient knowledge and experience to allow determination of the significant risks with the work equipment.

Under PSSR, the owner/ user must inform the competent person of any significant repairs or modifications to the system. For pressure equipment not within the scope of PSSR, the owner/ user must make suitable and effective arrangements to make sure the equipment is properly maintained. Where the manufacturer or supplier has provided maintenance instructions for all or part of the system, these will form the basis of the maintenance programme. If they are not comprehensive enough to cover the on-site operating conditions, they should be supplemented as appropriate.

2.1. Types of Maintenance

There are many terms used to describe maintenance methods for the purpose of managing it. Below are a list of common terms and an explanation of what they mean in practice and what they should involve:

2.1.1 Routine or Running Maintenance:

This is the day to day, regular ongoing tasks such as greasing, level checking and top up, filter changing etc., carried out by maintenance technicians and or owner/ operators. This activity will normally be done in accordance with the manual of the equipment and has in effect a prepared safe system of work and can therefore be done by people familiar with it. The activity is normally low risk and can be done from a safe position without the need to isolate the machine.

2.1.2. Breakdown, or Failure Maintenance:

This is where equipment is either run until it fails, or it is new and it is not known what all the failure points are likely to be. With time machinery will have a history and accomplished technicians can see patterns of failure and start to plan when parts need changing before they fail. This method can also be used instead of planned maintenance if the knowledge and experience of the technicians is limited and they cannot plan or hold stock of items for future failures. This type is the most difficult to manage since it may not be foreseen where and when they might occur. The activity to investigate the failure should still be properly planned and the technician should be at no greater risk than an operator whenever possible.

2.1.3. Planned Preventive or Condition Based Maintenance:

This is where knowledge of the likely failures is gained over time, or from manuals as to when parts are likely to need replacement and the frequency of their replacement. The aim being that machinery does not breakdown and runs efficiently, until a predetermined time where parts can be replaced before they fail.

- **Planned preventive**
This is where a fixed period for replacement is identified, e.g. the owners experience recommends replacement of a motor after so many hours.
- **Condition Based**
This is predictive based on the evidence, e.g. the condition of bearings can be monitored by attaching heat or vibration sensors, for example, to determine if they are becoming excessively worn and hence can be monitored until they show distress levels requiring replacement.

Regardless of the methods or information used to initiate the work, the activity needs to be planned. The planning should be done by competent people and a safe system of work devised from manuals, knowledge and experience and existing safe systems of work to ensure the safety of all personnel involved in the activity.

2.2 Management of maintenance

The person carrying out the inspection (who may not necessarily be the same person determining the inspection regime) should have adequate knowledge to identify the key components, fault-find and report back. Note the necessary level of competence will vary according to the type of equipment and where and how it is used. For some equipment, the level of competence to determine the nature of the inspections or even to carry them out may not be available in-house. Relevant maintenance instructions must be made available or passed to the people involved in maintaining work equipment. The maintenance regime should be reviewed periodically to ensure it remains suitable.

2.2.1. Hire equipment

Some equipment may not be owned by the user. Many items of plant and equipment are hired. It is important for both the hire company and the person responsible for hiring the equipment to establish which party will carry out safety-related maintenance. The hirer owns the equipment. They provide equipment to subsequent and probably various end-users as part of their core business function. Hired equipment has greater potential for abuse and misuse to take place, as the equipment is not owned by the end users and they may not be too familiar with how it is supposed to be operated. There may also be a lack of knowledge in how the machine is supposed to be correctly inspected. Hired equipment is subject to a very high service duty i.e. “if equipment is not out being used on hire, then it is not making money”.

Where equipment is hired, the hirer has significant responsibility to ensure ongoing adequate inspection and maintenance takes place (i.e. during each hire and through the overall consecutive hires, forming the service life). The hirer of the equipment should consider the high service duty and other factors relating to ongoing hire. This assessment illustrates how the equipment is provided and remains fit for continued hire.

2.2.2. Ageing plant

Once an item of plant or machinery has been purchased, the primary responsibility for its upkeep rests with the owner of that item of equipment. There is occasion where design or manufacturing defects are present. In these circumstances, it would be anticipated such defects emerge during the early part of the equipment life and would be covered under warranty.

Although plant and machinery will have a theoretical design life, it is through time, application and level of use that its service life will deteriorate.

Wearing parts are by their nature, subject to repeated use, abuse, corrosion environment, etc. Note that seizure of parts can take place through lack of use. – This is an important consideration.

As plant gets older, a level of wider structural deterioration will most likely occur. The condition of the underlying construction of the structural framework of the equipment (such as welded and bolted joints, bonded structure, cast components, paint or anodized protection, etc.) may not be apparent. Deterioration can occur from corrosion, repeated flexion, fatigue and historical overload(s).

The age of the equipment is an important consideration when determining the ongoing economic viability of work equipment and steps must be taken to evaluate and monitor potential deterioration. Those responsible for the placement of work equipment into service, must monitor and assess the ongoing overall condition, considering potential deterioration in order to ensure it remains available for use at work in an efficient state, in efficient working order and in good repair.

3. Examples of Pressure Systems falling outside scope of Regulations 8 and 9 of PSSR

The majority of hydraulic oil and pressurised hot water systems will not be regarded as a relevant fluid, these are not subject to Examination under PSSR. Consequences from failure, however, are potentially significant.

SAFed member companies have compiled a list of work equipment which, based on their extensive experience, is likely to require some form of periodic inspection, this is not an exhaustive list. The typical inspection periodicity ranges listed are purely for guidance and are not a requirement of PUWER 98. The risks imposed by work equipment must be evaluated by the duty holder or by an individual or organisation competent to do so on the duty holder's behalf. The results of the risk assessment may result in the frequency of inspection being increased for different aspects of use of the work equipment and also be dependent upon the protective devices fitted.

It is important before an examination occurs, that the correct Item to be examined is identified. This may prove particularly challenging for small items so serial number check is recommended. It is also essential that Safe Operating Limits are established on completion of any examinations.

Atmospheric steaming oven Internal/External visual inspection



- Identify the Equipment

- Ascertain Safe operating limit
- Clarify vent is clear
- Clarify door seal in satisfactory condition and sealing oven
- Located to ensure safety of persons operating item
- Clarify Operating limits maintained
- Observe Operation
- Report and record findings

Lube oil tanks
External visual inspection



- External condition, impact damage
- External condition, paintwork/ coverings
- Thickness checks
- General Housekeeping,
- Area clear of flammables, sources of ignition

Air receiver < 250 bar/litres internal /external inspection



- Identify and establish Safe Operating Limit
- Test safety valve
- Internal and external examination
- Use of RVI internally

- Observe operation of pressure limit switch

Non PSSR Chiller



- Visual external inspection
- Located safely

Hot water heating plant



- Housekeeping, ventilation, gas/fire alarms
- External inspection, remove covers
- Identify Safe operating limits boiler and pressurisation vessel
- Identify safety devices
- Service /Maintenance records
- Pressurisation vessel thickness checks

3.1 Other typical plant types

There are extensive types of plant which can be designed and manufactured to operate in different processes, a horizontal multi tubular boiler for example with design parameters of pressure at 11.0 bar and temperature range up to 200 deg.c would be suitable for both steam and hot water applications, production of steam would require a Written Scheme of Examination in accordance with the PSSR, whereas hot water produced at less than 100 deg.c would only need consideration of an inspection under PUWER.



Pressurised cleaners, found in the workplace also have applications of both steam and hot water the design and appearance of this type of equipment can be similar , once again production of steam by way of a chamber enclosed within the cleaner would fall under the requirements of the PSSR , in the case of production of hot water PUWER could apply



Tubular heat exchangers are another example where design allows various applications



There are examples of pressure plant, which due to low stored energy are excepted from the Pressure Systems Safety Regulations (this only applies to Regulation 8,9,10 and 14), although due to size of the item this may not be immediately apparent. The Competent person in these instances can provide assistance when assessing requirements.

For example, a packaged refrigeration unit



Or a plate heat exchanger



4. Table1 Typical frequencies of inspection

The following table details a range of work equipment which, based on extensive experience, SAFed recommends would benefit from inspection

Note 1. This table is not exhaustive. It indicates where SAFed considers that the inherent risks from the installation or use of the work equipment would normally be such as to warrant inspection by an independent competent person

SAFed publication “PUWER 98 – Risk Based Compliance” provides further information on the SAFed approach to identifying and assessing the risks associated with the use of work equipment.

Note 2. Only those parts of work equipment where deterioration will result in an increased risk of serious injury need to be periodically inspected.

Work equipment**Frequency / Range (Months)**

Air Conditioning Plant/Refrigeration <25 kW (Non PSSR)	24 to 60
Atmospheric Steaming Oven	12 to 26
Domestic Hot Water Heater	12 to 48
Domestic Water Tube Heating Boiler	12 to 48
Electric Domestic Hot Water Heater	12 to 48
Electrically Heated Hot Water Boiler	12 to 48
Metallic Storage Tank	12 to 60
Non-metallic Storage Tank	12 to 60
Hot Water Heating Battery	12 to 48
Hot Water Heating Boiler	12 to 48
Hot Water Heating Calorifier	12 to 48
Low Temperature Plate Heat Exchanger	12 to 48
Low Temperature Tubular Heat Exchanger	12 to 48
Modular Hot water heating boiler	12 to 48
Open vented hot water café boiler	12 to 48
Pressure Washer (non-PSSR)	12 to 48
Pressurisation vessel < 250 bar/litres	48 to 60
Timber Impregnation Vessel	12 to 26
Vacuum Vessel	12 to 48
Air receiver < 250 bar/litres	12 to 48

5. References

The following documents may also be useful in preparation of any examination procedures to meet the requirements of PUWER

- a) PUWER (Provision and Use of Work Equipment Regulations 1998) and other relevant Guidance
- b) The Pressure Systems Safety Regulations 2000 (SI 2000 No 128)
- c) Health and Safety at Work etc. Act 1974
- d) Relevant SAFed Technical Guidance: - <http://www.safed.co.uk/technical-guides/pressure-equipment/>