

DRAFT
UK Pressure Equipment

**A guide to pressure system installation where site
assembly is required**

SAFed publication PEDG2 – issue 01
EEMUA publication XXX – issue 01

INSERT APPROPRIATE PHOTOGRAPH HERE



PECF

Foreword

This document has been developed by the Pressure Equipment Consultation Forum (PECF), Safety Assessment Federation (SAFed) and Engineering Equipment and Materials Users Association (EEMUA) in consultation with other stakeholders within the pressure equipment industry to help designers, purchasers, installation contractors, users and other parties achieve their legal requirements to ensure pressure equipment can be correctly certified prior to use in the United Kingdom.

This document has been prepared using technical advice provided by the Health and Safety Executive (HSE).

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1. Introduction

1.1 This document is written to assist stakeholders in understanding the roles and activities when assembling pressure equipment on site. The need for the document has arisen after many years of questions and interpretations of Regulations and is perhaps more important as the UK evolves in its relationship with other trading partners following its departure from the EU trading bloc. The primary intention of this document is to address activities on site whether under the control of the end user of the pressure equipment or by other parties. It refers to other guidance where activities overlap with previous documents and does not repeat the content of existing documents.

1.2 This document primarily relates to pressure systems containing a relevant fluid as defined under the Pressure Systems Safety Regulations 2000 (PSSR). Where a relevant fluid is not present, other relevant legislation that may be applicable (such as PUWER, COMAH, DSEAR) must be consulted, the methodology in this document may still be a useful means of complying with such legislation.

1.3 The Pressure Equipment (Safety) Regulations 2016 (PE(S)R) originally transposed European Directive 2014/68/EU and remains the UK law relating to design, manufacture and supply of pressure equipment which has a pressure greater than 0.5 bar gauge.

1.4 The PE(S)R includes requirements for the type and level of audit-trail, testing and certification required, to demonstrate that the pressure system is safe before it can be operated. Often this may involve a Conformity Assessment Body at the Design, Construction and Installation stages, to review this evidence.

1.5 Guidance from BEIS also involves identification of the relevant fluid Group (1 or 2) and additional criteria based on the pressure and volume that the pressure system is intended to contain (referred to as Classification charts). BEIS guidance can be obtained via the weblink(s) in section 8 of this document.

1.6 PE(S)R commenced on 08th December 2016 and applies to the majority of pressure systems, with exclusions and limitations stated within the Regulations. These relevant clauses with respect to this document are reproduced below:

Pressure equipment and assemblies

3. *(1) Subject to paragraph (2) and regulation 4, these Regulations apply to pressure equipment and assemblies with a maximum allowable pressure PS greater than 0.5 bar.*

(2) These Regulations apply to pressure equipment and assemblies placed on the market on or after the commencement date.

Excluded pressure equipment and assemblies

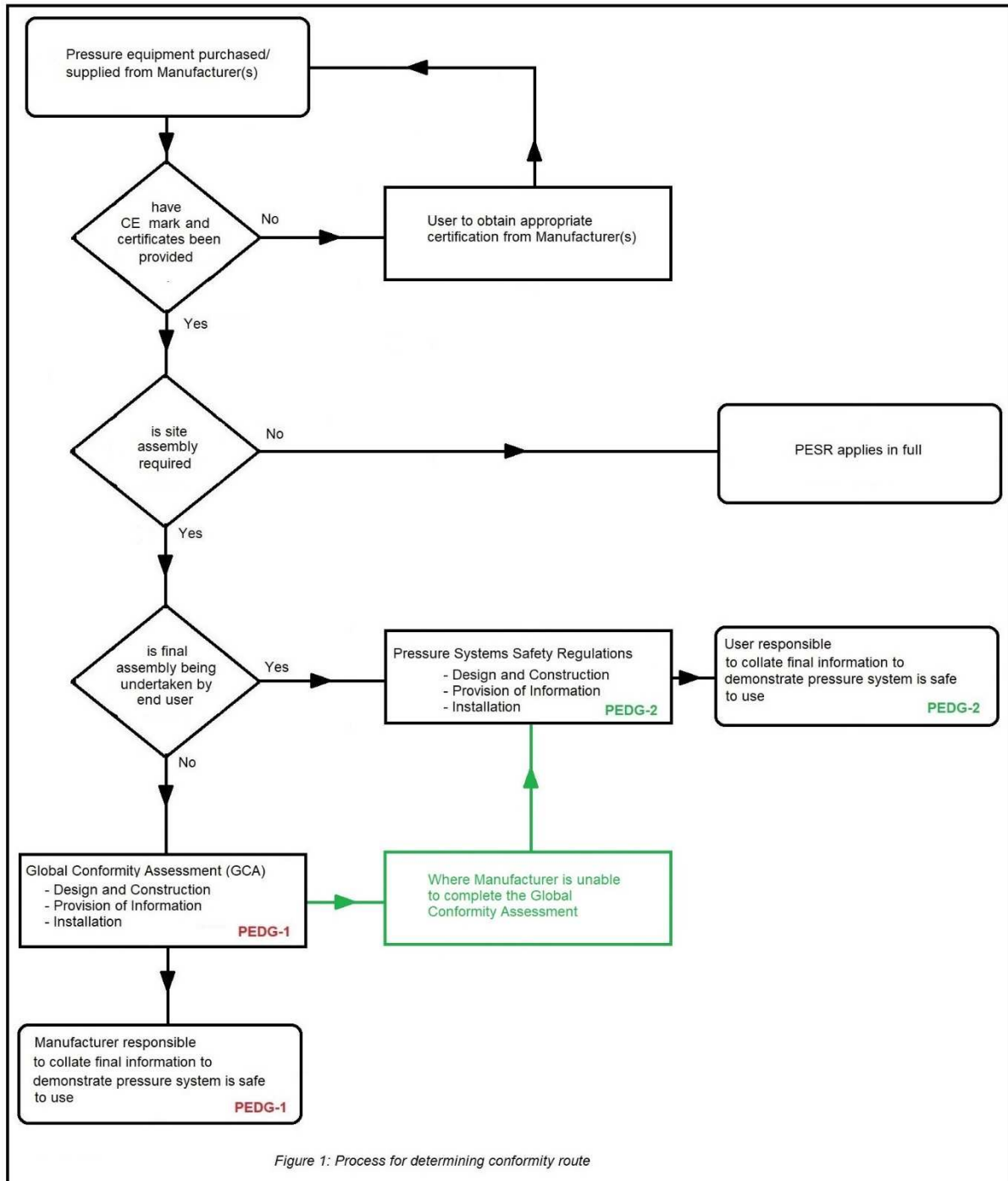
4. *(1) These Regulations do not apply to the items listed in Schedule 1.*

(2) These Regulations do not apply to the assembly of pressure equipment on the site of and under the responsibility of a user who is not the manufacturer.

2. Scope

2.1 The purpose of this document is to provide practical advice on how legal compliance should be demonstrated where on-site manufacture and assembly of pressure equipment are undertaken under the direct control of the intended user of the equipment (and shall be subsequently referred to as “the end user” in this document).

2.2 A summary of the various design, construction and installation assessment routes related to pressure equipment are illustrated in the flowchart (figure 1) below. The end user should follow this flowchart, to ensure they have correctly followed the appropriate compliance route.



NOTE 1 - In exceptional circumstances where the GCA cannot be completed, the end user may assume the role for the on-site assessment. This is shown in green in figure 1

NOTE 2: For “CE” mark, after 31 December 2020 a UKCA mark is allowed and after 31 December 2021 a UK CA mark is required in lieu or addition to a CE mark.

3. Application

3.1 This document relates only to the on-site manufacture, assembly and integration aspects for a pressure system containing a relevant fluid as defined under the Pressure Systems Safety Regulations 2000 (PSSR)¹.

NOTE 1: Where on-site assembly and integration of the pressure system is undertaken by the end user, they must identify and refer to all other relevant legislation that may be applicable (such as PUWER, COMAH, DSEAR) especially where the pressure system does not contain a relevant fluid.

3.2 Where third-party manufacture or installation takes place on-site as part of the final installation of the pressure system under the control of an intermediary, such as a main/ principal contractor, this requires a Global Conformity Assessment (GCA), defined within PE(S)R².

NOTE 2: Guidance PEDG-1 has been produced to provide a route for compliance for the overall (i.e. "global") assessment of the on-site final assembly by a manufacturer or person in direct control, other than the end user.

3.3 For clarification, the term "manufacture" relates to the creation of a component that is introduced into the pressure system. The term "assembly" relates to the bringing together and jointing of components that already exist i.e. they have previously been manufactured. The PE(S)R refers to items of equipment, these are all "manufactured", prior to assembly.

3.4 For the purposes of this document, the end user remains responsible for confirming that the correct conformity paperwork accompanies all pre-assembled and manufactured pressure equipment in compliance with PE(S)R. This document expands on the particular requirements of Regulations 4 to 7 of PSSR to meet the requirements for on-site manufacture and assembly under the control of the end user, together with a quick reference guide in Appendix B that acts as an aide-memoire for the requirements.

3.5 Additionally, regulation 8 of PSSR requires the end user to engage a Competent Person, in order to produce a Written Scheme of Examination (WSE), before the pressure system is operated. To allow creation of the WSE in good time, the Competent Person will need to refer to the relevant conformity documentation (to be provided by the end user) so as to devise a suitable WSE. The Competent Person in this instance is not responsible for reviewing or authorising the design, construction or on-site installation of the pressure system unless agreed under specific circumstances.

4. Design and construction

4.1 PSSR Regulation 4 is intended to ensure that manufactured components include appropriate design and construction validation (e.g. via PE(S)R) so as to prevent danger, prior to final assembly on-site.

4.2 For on-site manufacture and assembly by the end user, the areas for validation should include relevant documentation to ensure:

- Correct design specification of materials used as part of on-site assembly
- Verification that any construction materials meet the design specification
- Flexibility studies (if required) are completed – i.e. the loading, stressing, expansion and contraction rates, influences of any supporting members and pipework fastenings are sufficient for the on-site application
- Confirmation that there is sufficient access to allow examination of pressure system internals
- There are protective devices intended to prevent the pressure system from exceeding its allowable limits.

Design

4.3 The level of ‘design’ review as part of the on-site work will vary and is heavily dependent on the extent of assembly that is required.

4.4 The PE(S)R will still apply to individual items of pre-manufactured pressure equipment and sub-assemblies forming part of the installation. The end user should therefore ensure the equipment purchased to form the installation is compliant with the PE(S)R where appropriate. It should be noted that where equipment is acquired from outside of the UK (EU until 31 December 2020), the end user will assume the duties of an importer (refer to PEDG-1 for the details of importer in relation to on-site assembly).

4.5 Whilst they may not be directly responsible for the detailed engineering design, generally the end user (or their appointee) should have an awareness and understanding of the design and function of the equipment, classification of the contained fluids under the PE(S)R, PSSR and COMAH, design pressures and temperatures, materials of construction and the conformity assessment processes to be applied by the nominated parties during the contract.

4.6 To ensure the “end user” can demonstrate they are responsible for on-site assembly, they must put in place effective arrangements to obtain or procure items of pressure equipment for on-site assembly. They may do this directly, or they may employ someone to draw up the technical specifications or conceptual design used for procurement of the equipment. To be regarded as ‘effective’ the arrangements should demonstrate the parties’ have suitable knowledge and experience in this role.

4.7 Where items of on-site assembly are involved, the extent and methods of jointing together components will influence the level of design assessment required. It is therefore considered that any recognised standards, which would generally be an integrated system of standards for design and construction of pressure systems and equipment, can be used to assist compliance with on-site assembly, provided they address the overall requirement to prevent danger and ensure safe use as specified in PSSR, PUWER and/ or COMAH to achieve an equivalent level of safety to the PE(S)R.

4.8 It is recognised that for pressure systems, apart from the BS EN harmonised system, recognised standards that may assist design assessment include:

- ASME system including
 - Section I Power Boilers
 - Section VIII Unfired Pressure Vessels
 - B31.1 Power Piping
 - B31.3 Process Piping
- PD 5500 Specification for Unfired Fusion Welded Pressure Vessels
- Merkblatt AD 2000 system

4.9 The end user will need to ensure that all tender documentation and specifications are produced with the necessary consideration of the agreed standards, before the equipment is assembled.

4.10 The end user remains responsible for agreement and specification of the design and construction requirements. When not following PE(S)R for assembly on site, an equivalent arrangement to conformity assessment will be needed (which may require independent verification and inspection).

Construction

4.11 During the on-site assembly of pressure equipment it is envisaged that some manufacture or modification could be required. A minor modification may be the orientation of steam traps on a handed boiler assembly.

4.12 Where a fabrication contractor has been appointed to build and install the piping (or other elements) connecting items of pressure equipment in accordance with a design layout and specification provided by others, the fabricator is required to provide all technical documentation relating to the fabrication to whichever party is deemed to be taking the overall responsibility.

4.13 This technical documentation which is compiled by the party taking responsibility, will include such things as material certification, welding qualifications, weld maps, NDT reports, pressure test certificate etc. and it will need to demonstrate that all of the applicable Essential Safety Requirements of the PE(S)R have been complied with.

4.14 Where work involves manufacture performed on site, then PE(S)R would apply. If this work is undertaken on-site under the control of a contractor, then guidance PEDG-1 should be consulted as the activity would be included within the Global Conformity Assessment¹.

NOTE 1: Where a User Inspectorate is involved then the equipment would not be Conformity marked.

4.15 It is acknowledged that there may be circumstances where the manufacturer of a pressure equipment assembly is unable to retrospectively provide validation through the PE(S)R conformity assessment process. The legislation still applies. Where limited manufacture (or adaptation) is required to complete the on-site assembly under the control of the end-user, consideration must be given as to how the scope of on-site work can be demonstrated to be of safe design and construction².

NOTE 2: It is acknowledged that where pressure equipment is manufactured there remains a requirement on the end-user to verify the origin of the original Conformity marking and certification.

4.16 For practicality, whilst not addressed in the UK legislation, the end-user may approach their Competent Person to assess the on-site manufactured component used to join the items of pressure equipment together, or to interface with the existing pressure system. Such an assessment would be undertaken under Regulation 4 of PSSR³. The end user must recognise that the conformity assessment becomes increasingly demanding as the PE(S)R hazard category increases. Above category 2, a retrospective assessment may not be possible⁴. Conformity assessment marking and certification remains under the requirements of the PE(S)R.

NOTE 3: This assessment is at the discretion of the Competent Person, under PSSR Regulation 4, following as a minimum, the validation requirements detailed at the start of this section.

NOTE 4: The suggestion of Category 2 is because PE(S)R does not require a third party design assessment for category 2 and below.

5. Provision of information and marking

5.1 PSSR Regulation 5 requires the end user to ensure the transfer of all necessary information and documentation relating to the pressure system takes place. Even where Regulation 5(1) is excluded by PSSR Part II schedule 1, paragraph 1; it is important that all relevant information is passed on at each stage of the design, supply and on-site manufacture and installation process.

5.2 Where on-site manufacture and installation work takes place, it is essential that the user ensures co-ordination and receipt of all relevant information. Ideally this should be planned in advance of on-site installation, at time of purchase (such that it is identified clearly as part of the contract). If this is not undertaken proactively, the user must retrospectively obtain and collate all necessary information, to ensure the completed pressure system can be placed safely into service.

Information

5.3 Anyone who supplies a pressure system or its component parts (including those manufactured on-site) should provide sufficient information concerning the design, construction, examination, operation and maintenance. This will also include details of the means undertaken to achieve their installation on-site.

- i. The end user must use this information as part of their maintenance strategy, in relation to the theoretical design life, limitations in operating environment and service life.
- ii. The end user must also provide this information in good time, to allow consideration by the Competent Person who will incorporate the information into the Written Scheme of Examination.

5.4 The end user should ensure all requirements for conformity assessment to PE(S)R are met for the assembly and its constituents (items of pressure equipment or sub-assemblies) by the various parties involved. Conformity assessment will need to be addressed at the appropriate stages of the work and not at the end. Retrospective conformity assessment or equivalent is unlikely to be successful and it is therefore important that responsibilities of the various parties are agreed at the start of the work.

5.5 Information, details of standards used in design, associated design records, certification, verification and conformity assessment for the manufacture and installation, operating and maintenance instructions should be collated (as required both within Regulation 5 of PSSR and more generally in Regulation 8 in PUWER). Such collated information is called "technical documentation" and is often referred to as the "technical/ project file".

5.6 The end user must ensure, as part of their responsibility for on-site assembly that all process and instrumentation diagrams (P&IDs) accurately reflect the completed (or 'as-built' installation).

5.7 The end user should also ensure suitable hazard and risk analysis processes are applied by all relevant parties, including consideration of the integration of equipment from different suppliers when appropriate. Additional hazard and risk analysis will be required, where a new pressure assembly is integrated into an existing system.

Marking

5.8 When assembling on-site, the user should ensure it includes clear and indelible marking on all items of pressure equipment with the following information as a minimum:

- The manufacturer's name
- A serial number to identify any item
- The date of manufacture of any item
- The standard to which any item was built
- The maximum allowable pressure of the equipment
- The minimum allowable pressure of the equipment where it is other than atmospheric
- The design temperature

5.9 And any other markings required by the operative legislation.

5.10 It may be more practical to include this information in a controlled document that is traceable to the item of equipment by a serial, line or asset number. The end user should not create an assembly of equipment containing equipment that is not appropriately marked.

6. Installation

6.1 PSSR Regulation 6 requires those installing a pressure system (which may include manufacturers, contractors and end user) to:

- i. for standalone assemblies, ensure that the method of on-site installation does not create additional danger, or impair the operability of any protective device or intended means of access for inspection to be carried out; and
- ii. for integration into an existing system, effectively ensure continuity in the original design criteria for the new installation.

6.2 For the purposes of site installation under the control of the end user (including jointing to any existing pressure system), they will need to:

- understand and manage the integration and joining risks
- comply with all relevant legislative requirements
- be competent to do the above

6.3 The end user should have full understanding of the scope of the assembly, its limits and terminal points. These must be identified and agreed and should form part of any contractual basis with equipment manufacturers, contractors and the elements of on-site manufacture and assembly (that they are responsible for).

6.4 The end user may choose to engage other parties (acting under their control) to install a site-built system. In these circumstances, the other party acting as the 'installer' will need to demonstrate through the contract process that they do not have the legal responsibility of being the 'manufacturer' of the assembly¹. This should be clarified at the outset, to ensure understanding that the 'end user' is taking that legal responsibility. Once this has been established then the end user will need to inform the installer what information they will provide².

NOTE 1: Where an installer is acting as a main contractor and is taking overall responsibility, they will need to refer to PE(S)R and mark the assembly using a GCA (The responsibilities of a main contractor taking overall responsibility are described in PEDG-1).

NOTE 2: An installer may be appointed for the purpose of installing items of pressure equipment in accordance with the design drawings/specification or putting together larger items of pressure equipment that have been delivered to site as modules. The installer will have similar duties and responsibilities to the fabricator with respect to the supply of technical documentation.

6.5 Where multiple contractors and parties are involved in a site installation the end user should ensure the hierarchical structure of the final assembly and its sub-assemblies are identified.

Pressure testing

6.6 Any pressure testing as part of the on-site manufacture or assembly requires appropriate safety precautions to be in place and reference should be made to HSE guidance GS4, BS 14100, EEMUA-168 and SAFed guidance PSG21.

6.7 Pressure testing of final assemblies should be considered in the contract specification phase by the end user to check/ verify its strength of construction and quality. Testing is carried out as specified in the test specification.

6.8 It may be impractical or undesirable to fully flood a finished assembly due to foundation loadings or similar concerns. In such circumstances a modular approach to testing should be considered and agreed with installers, with activities undertaken to provide justification of pressure test waivers and

the use of comprehensive surface and volumetric NDT as a substitute, together with appropriate certification for any on-site welding undertaken.

6.9 To verify the vessel or system can hold its pressure without leakage, a leak test of a vessel or system is normally carried out at low pressure. Where this is not possible, the first-fill of the system would be regarded as a leak test.

7. Safe Operating Limits

7.1 PSSR Regulation 7 ensures that the safe operating limits of that system shall be clearly established by the end user. This may involve referral to data from the original pressure equipment manufacturer.

7.2 For the scope of this document, this will require the end user to have carried out an adequate assessment on how the addition of an on-site assembly will affect any existing pressure system installation, ensuring that any new risks are controlled as a result of changes to pressure, volume and temperature, thus preventing a compromise of the structural and safety integrity.

7.3 Prior to putting the new pressure assembly into service the end user should provide this assessment to their competent person, who will draw up an appropriate WSE.

7.4 There needs to be suitable communications and planning between all relevant parties involved in the supply and installation, including the manufacturer, end user and competent person for drawing up the written scheme of examination (WSE) at an appropriate stage of the installation including the safe operating limits.

7.5 It remains the responsibility of the end user to establish the safe operating limits of the overall pressure system including assessment of how connection to an existing system may alter these parameters.

8. References

The 'Blue Guide' on the implementation of EU products rules 2016[ES10]
EU CABF PE(S)R/SPVD 2014-06-17 Principles for the Assessment of Assemblies
EU CABF N17/036 Assemblies according to the Pressure Equipment Directive
EU Pressure Equipment Directive (97/23/EC), (implemented by the UK Pressure Equipment Regulations (PER) 1999)
Pressure Equipment Directive (2014/68/EU), (implemented by the Pressure Equipment (Safety) Regulations (PE(S)R) 2016)
Pressure Systems Safety Regulations (PSSR) 2000[ES11]
Product Safety and Metrology etc. (Amendment etc.) (EU Exit) Regulations 2019
HSE GS4 - Safety requirements for pressure testing 2012
Safety of pressure systems. Pressure Systems Safety Regulations 2000. Approved Code of Practice L122 HSE Books 2000
BS 14100 - Control of hazardous energy on machinery. Specification
EEMUA-168 - A guide to the pressure testing of In-service pressurised equipment
SAFed guidance PSG21 - Guidelines for Competent Persons involved in witnessing of Pressure Tests

NOTE: Text shown in italics in this document is a quotation from one of the above references

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/640795/nlf-pressure-equipment-regulations-2016-guidance.pdf

This is the link correct at the time of publication. Using the information the manufacturer can identify the relevant chart in Annex II of the Directive and determine the correct classification of the equipment by plotting the maximum allowable pressure and, in the case of vessels, the volume in litres or, for piping, the nominal size (DN).

9. Glossary

PE(S)R	UK Pressure Equipment Safety Regulations 2016
PED	EU Pressure Equipment Directive
PSSR	Pressure Systems Safety Regulations 2000
WSE	Written Scheme of Examination
PEDG-1	Pressure Equipment Directive – Global Conformity Assessment
PUWER	Provision and Use of Work Equipment Regulations 1998
COMAH	Control of Major Accident Hazards Regulations 2015
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations 2002
BEIS	UK Department of Business, Energy and Industrial Strategy
EU	European Union
SAFed	Safety Assessment Federation
HSE	UK Health and Safety Executive
BREXIT	UK exit from the European Union (voted on in 2016)
EEMUA	Engineering Equipment and Materials Users Association
PECF	UK Pressure Equipment Consultation Forum
ASME	American Society of Mechanical Engineers
DN	Nominal Piping Size

Appendix A – Worked examples of assemblies and installations

The following examples have been compiled to outline approaches to managing responsibilities to achieve compliance. The examples are taken from actual situations however may have been stylised to highlight the pitfalls being illustrated. The examples are not a code of practice or the preferred or required way to address the issues, they are to assist the readers understanding of the Regulations and some practical considerations that may be encountered.

The overall aim is to ensure that consideration is given to providing a robust strategy and ensuring processes are in place at an early stage of projects to designate key responsibilities and manage the interfaces between various stakeholders.

A0. A package boiler

A package boiler has been purchased by the end user without any conformity assessment evident. The end user has imported the dismantled boiler and all its components into their UK facility for their own assembly on-site as part of a new boiler room. The purchased equipment will replace the existing steam generator (which will be de-commissioned). The new boiler will be connected into existing process steam pipework and sparge pipes (used to heat process water across the site).

Some issues to consider:

- The new boiler does not bear any conformity marking.
- The end user has assumed the role of importer
- The system may be seen as a replacement.
- The new boiler will modify the existing system and PSSR WSE

The New Boiler Does Not Bear Any Conformity Marking.

All pressure components will require traceability to confirm their origin of design and construction. To ensure compatibility of all components for the intended application, knowledge of the overall 'new system' will be required. This would therefore identify the relevant category, applicable under PE(S)R. It is that information that the user will still require from source, to determine whether the information has already been appropriately assessed by a Notified Body, or if the end user is able to arrange for a UK Notified Body, who is prepared to retrospectively carry out the appropriate assessment to the relevant category of PE(S)R.

The End User Has Assumed The Role Of Importer

Unless the package Boiler is manufactured in the UK (or EU until 2022), whoever places it onto the UK market (as a UK based entity) is the Importer. Therefore the responsibility rests with them to have all of the appropriate paperwork and approvals. If the User is not the Importer, then the User can expect the material and item certification from the Importer.

The System May Be Seen As A Replacement

Where site activities are undertaken to modify/ install additional pipework, the end user will need to assess the level of fabrication and manufacture that is required:

* Where items of pipework are formed by a contractor working directly for the end user, and/ or standard pipe lengths being cut (via bandsaw) to bridge between the new boiler and existing pipework, then this installation would require design review, to determine suitable specification of the materials used, so as to be suitable for application.

The New Boiler Will Modify The Existing System And PSSR WSE

Prior to completion of the installation, the end user should reflect on chapters 5-8 of this document and notify their competent person, so that the WSE can be reviewed and amended before operation of the new system.

A1. Multiple Suppliers/Installers of an Assembly/System

The use of PE(S)R Regulation 4. (2) is often quoted as a reason for not requiring Global Conformity assessment.

Excluded pressure equipment and assemblies

4.—(1) These Regulations do not apply to the items listed in Schedule 1.

(2) These Regulations do not apply to the assembly of pressure equipment on the site of and under the responsibility of a user who is not the manufacturer.

It is important to recognise that for this exclusion to apply, it would be expected that the “User” would need to be able to demonstrate a good understanding of the design and the safety of the pressure equipment. It is not satisfactory to solely state “This is under the responsibility of the User.” As in this case the User takes responsibility for ensuring the assembly complies with the essential safety requirements of the PE(S)R, appropriately documented responsibilities and actions need to be recorded.

In the following example a new construction facility is described. There is no doubt that the PE(S)R should be considered and that the assembly would need to have global conformity assessment if it does not fall within the user’s responsibility. That is, the User, has no input to the design of the system other than stating system requirements.

A building owner requires a compressed air system to be designed and installed into a new facility.

The system will comprise of;

Compressor house (responsibility of designer installer 1).

Suitably sized air compressors 2 off,

A “wet” air receiver

A refrigerated dryer

Associated filters

A “dry” air receiver

Site Equipment (Responsibility of designer installer 2).

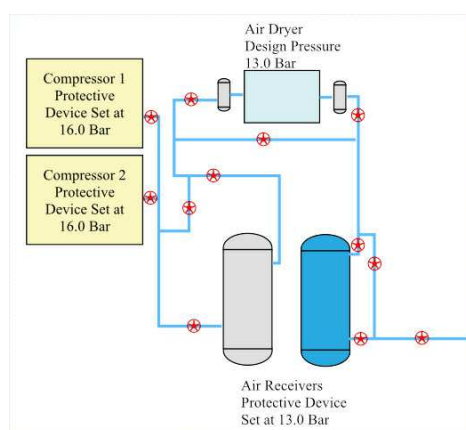
80 Bench air take off points.

6 Dust filters (Bag shakers)

Shot blast Cabinet

The compressor house equipment was installed first, by a local compressed air equipment supplier/installer. Basic specifications for the system were supplied to the local company, who, using this information designed the compressor house system. They then proceeded and installed the plant up to the final isolation valve before distribution to the site.

There is no doubt that the PE(S)R applies to both the equipment and the assembly as the User has only specified the requirements, not engaged in the control of the installation company.



The design and installation failed to consider the maximum pressures of individual components. No consideration was given to global conformity assessment, this showed when the written scheme was created. The design intent was that the air receiver safety valves would protect the dryer, however as air receivers could be bypassed the 13.0 Bar protection for the drier was defeated. Maximum system pressure can be supplied to the dryer.

Additionally, they had used a popular aluminium air pipework system which is rated to 10.0 Bar at 23 deg C. It clearly states this in black lettering along its length.

It was therefore not possible to comply with regulation 7 of the Pressure System Safety Regulations. When the Competent Person asked for the Global Conformity certificate it rapidly became apparent that this hadn't been considered. The maximum pressure supplied to the site was foreseeably 16.0 Bar exceeding the design capabilities of the components.

The distribution system was installed by a different contractor and they also installed several items of pressure equipment with a maximum design pressure of 8.0 Bar. No additional protective devices were installed despite the air supply being a theoretical 16.0 Bar.

Failings

1. The end user failed to specify who was the “manufacturer” or understand the requirements of the PE(S)R.
2. The end user failed to establish safe operating limits.
3. The end user placed a potentially unsafe assembly into service.
4. The supplier(s) failed to confirm who was taking responsibility as manufacturer, failed to complete the design regarding compatibility of parts and failed to recognise that the PE(S)R would apply.
5. The supplier(s) installed a potentially unsafe system.

A2. Site assembly of a pressure system

A new energy from waste plant has been built by a facilities management (FM) company for handover to the end user once all site activities have been completed. However during the build, the relationship between the FM company and the end user breaks down and the FM company is removed from site due to its poor performance.

This leaves the plant physically finished consisting of both cat II & cat III elements, but without all of the supporting paperwork or evidence of compliance, including site-built pipework. The end user is now in the position of not being able to use the energy from waste plant until they demonstrate that the systems are compliant by reverse engineering and forensic document review.

Main issues to consider:

- The extent of original supporting paperwork for CE manufactured component parts needs to be ascertained
- The assembly of pressure equipment was not under the responsibility of the end user, however all site manufactured pipework must be established, to review the ability to retrospectively complete the Global Conformity Assessment
- The overall system containing elements of cat II and cat III
- A Written Scheme of Examination must be in place prior to boiler operation

Extent of original supporting paperwork for CE manufactured component parts

The end user will need to engage with the original Notified Body to help with certifying the OEM system components in compliance with the appropriate category of PESR.

Global Conformity Assessment

Details of the site manufacture and assembly will need to be collated by the end user, through engaging with sub-suppliers and further discussion with the original Notified Body/ User Inspectorate and by making reference to PEDG-1.

Remainder of pipework site manufacture and assembly

Due to the overall system containing elements of cat II and cat III, the higher level of conformity assessment must be applied to the overall assembly. Further explanation can be found in PEDG-1

Written Scheme of Examination

The end user must engage their Competent Person at the earliest opportunity to review the available design and construction documentation, in order to produce a Written Scheme of Examination. Subsequently an initial out-of-service examination will need to be completed, after an agreed initial running period.

A3. Assemblies where the operator and owner are different parties

This example refers to a UK recognition within PSSR between an Owner and a User. This is not evident in the PE(S)R.

The following discusses a situation where the OWNER is responsible for compliance and the End User is the Operator

- What is an Owner under PE(S)R
- How can a User take responsibility when they do not own the equipment?

What is an Owner under PE(S)R

The PE(S)R talks about either a "User" or an "End User". The PSSR and UK Law recognize that a user maybe a different entity to an owner. In the case where one entity owns the asset (assembly) and another operates it, then the PE(S)R recognizes the Operator as the "User". That effectively means that the Owner of the equipment would be a "manufacturer" under the terms defined in the PE(S)R. So if an entity commissioned equipment to be assembled on their site, with no intention of operating it themselves, they would in effect be outside the Regulation 4 exclusion for "assembly on the site of and under the responsibility of a user".

Note: A "User" in relation to a pressure system is defined as the person or organization that has overall control of the operation of the pressure system(s). In the case of a fixed offshore installation (including fixed production and storage units), the term "Duty Holder" is used as defined in PSSR and the Offshore Regulations.

How can a User take responsibility when they do not own the equipment?

This simplistic approach can be interpreted in a number of ways, provided the initial position, that a user must intend to operate the equipment, is established. The scenario is then broken down into 2 main scenarios:

New assets – in this case the owner, acting as the user, has the pressure equipment assembled on his site, under his responsibility. He operates the equipment, as a minimum during the functional commissioning, before handing over to the operating entity. The Owner has therefore fulfilled the role of a user and hands the completed asset to the operator / duty holder with PE(S)R/PSSR compliance or offshore equivalence. The operator then complies with PUWER and PSSR (amongst other Regulations).

Existing assets - subject to major modification or augmentation – in this case the Owner is no longer the user as the asset has been in the control of the operator. Any major changes or modifications will undoubtedly be subject to contractual restrictions; however, the PE(S)R only considers a "user". Therefore, the operator must become the user in order to take advantage of the Regulation 4 exclusion. The possibility of returning control and operation to the owner is unlikely to be practical.

The other option in either scenario above is that one entity becomes the "manufacturer" and the assembly is conformity marked as new and then the modifications are also marked. The same would apply to a consortium of companies involved in a project

A4. Repairs to existing systems – guidance.

Pipework in an existing pressure system needs to be rerouted so that a new building steelwork stanchion can be installed. As well as carrying out the rerouting work, the opportunity is to be taken to: repair various corroded parts of the pipework by welding in like for like replacement sections; replace a welded isolating valve with a new flanged one with the same characteristics; and install a new temperature monitoring pocket welded into the pipework.

Main issues to consider:

- Whether the modification would be classified as important in accordance with Guideline A-03¹. Pressure equipment which has been subject to important modifications that change its original characteristics, purpose and/or type after it has been put into service has to be considered as a new product covered by the PE(S)R.
- Whether the replacements are repairs, which, according to Guideline A-03, are not covered by the PE(S)R but are covered by national regulations.
- Whether replacement is an entire change which would be covered by the PE(S)R.

Modifications:

In this case three modifications are being made: rerouting; new flanged valve in place of a welded one; new temperature monitoring pocket.

In accordance with Guideline A-03, pressure equipment which has been subject to important modifications that change its original characteristics, purpose and/or type after it has been put into service has to be considered as a new product covered by the directive. This has to be assessed on a case by case basis.

Examples of important modifications that need to be covered by the PE(S)R are converting a steam boiler to operate as a high-pressure hot water boiler or converting a pressure vessel designed and constructed to contain a HFC based refrigerant for use with ammonia. On the other hand, simple modifications that do not change the original characteristics, purpose and/or type of the equipment will be subject to national legislation, in this case Regulation 13 of PSSR or Regulation 7 of PUWER. Examples of simple modifications would be installing an additional nozzle on a pressure vessel or connecting a new autoclave to an existing steam main.

None of the three modifications being made would be classified as important as none change the original characteristics, purpose or type of the equipment. The modifications would therefore in the first instance fall under national legislation and not PE(S)R. The modifications will therefore need to meet all the relevant requirements of PSSR and meet Regulation 13 (Repairs and Modifications) in particular. In cases where PSSR doesn't apply to a pressurised system, all relevant regulations under PUWER would apply (e.g. regulations 5 and 7 in particular). A competent person should be involved and changes to the WSE should be considered.

The new valve should be supplied CE marked under PE(S)R.

¹ In order to ensure a coherent application of the Pressure Equipment Directive, Guidelines are developed and agreed by the European Commission's Working Group "Pressure". Whilst the Guidelines are not legally binding, they represent a reference for ensuring consistent application of the Directive agreed by the member states. Guidelines are published in the DocsRoom on the Europa website.

Repairs

Repairing the pipework by replacing corroded sections is not, in accordance with Guideline A-03, covered by the PE(S)R but is covered by national regulations. The repairs will need to meet the relevant requirements of the PSSR and Regulation 13 in particular. A Competent Person should be involved.

Some repairs may also be considered as maintenance under Regulation 12. Changes to maintenance schedules and WSE should also be considered.

Entire change:

Entire change, that is the complete replacement of an item of pressure equipment by a new one is covered by the PE(S)R. In this case, except for the replacement of the valve, neither of the other modifications nor the repairs represent a complete change and the requirements fall under PSSR or PUWER as described.

Further Guidance:

SAFed PSG 15 Guidelines for Competent Person, Repairs or Modifications to Pressure Systems, provides useful information about documentation and level of detail and verification required.

Appendix B: PEDG-2 : Quick reference guide to the requirements of on-site assembly of pressure equipment

Where the on-site assembly and integration of a pressure system by the end user takes place (involving a relevant fluid), the user needs to ensure that the responsibilities of PSSR for the assembly aspects have been complied with. A brief (non-exhaustive) checklist is given below:

NOTE: The user does not need to carry these activities out themselves, just have them performed, however they take responsibility under PSSR for them.

Regulation 4: Design and construction	
a.	The pressure system or article, as the case may be, shall be properly designed and properly constructed from suitable material, so as to prevent danger.
b.	Assessment of all the included components to confirm they are suitably CE marked (if relevant), including pipework, protective devices etc, protection strategy.
c.	Assess the integration of the assembly and its design, including flexibility studies, safety valve reaction loads, pipework loads etc. Competent Person may consider certification under PSSR for Category 2 systems PE(S)R and below.
Regulation 5: Information and marking	
d.	Drafting Operating Instructions for the assembled system, including P&ID's, usually from the individual equipment manufacturer but also including the assembly.
e.	Assemble and assess all the documentation associated with d).
f.	Assemble all the appropriate test reports that may be needed, from a) to f).
Regulation 6: Installation	
g.	Have carried out a Hazard/Risk analysis, including an assessment of the possible failure modes of the system.
h.	Pressure testing to include two specific test criteria: <ul style="list-style-type: none"> Decide if a 'strength' pressure test of the site-installed assembly is required, or provide justification why this cannot take place and document appropriate alternatives to such a test (via calculation, certification and appropriate NDT). Perform a leak test of the final assembly (1.1 x MWP) to verify the containment aspects of the system, prior to introduction of the relevant fluid. Where this is not possible, treat the first-fill of the system as a pressure test, taking appropriate safety precautions by reference to HSE guidance GS4, BS14100, EMMUA-168 & SAFed guidance PSG21.
i.	Qualify the effects of the new installation to: <ul style="list-style-type: none"> the on-site assembly and connection point(s) to the existing pressure system the wider implications and stresses from integrating the new pressure system to existing infrastructure
j.	If the new/ extended/ modified system comes under PSSR advise their Competent Person that the system needs inclusion under the Written Scheme of Examination as soon as reasonably practicable.
Regulation 7: Safe Operating limits	
k.	It remains the responsibility of the end user to establish the safe operating limits of the overall pressure system including assessment of how connection to an existing system may alter these parameters.
l.	Ensure all protective devices are set at their minimum value, so as to protect the weakest component in the overall pressure system.