



Strategy for conformity of non-standard cryogenic equipment

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2

Contents

- Safety at CERN
- CERN Mechanical Safety Rules
- Pressure Equipment Directive (PED)
- Launch Safety Agreement (LSA)
- Application of CERN Mechanical Safety Rules
- Conformity assessment by HSE
- Conclusions

Safety at CERN

- CERN Safety Policy



- **Objectives:** “to ensure the best possible protection in health and safety matters of all persons participating in the Organization’s activities or present on its site [...]”
- **Means:** “the Organization establishes and updates Safety Rules and ensures compliance therewith”.

- HSE Unit shall:

- Support and monitor the implementation of the CERN Safety Policy, the CERN Safety Rules, the CERN Safety Objectives and best practices at all levels;
- Grant Safety clearance for installations, activities, projects and CERN Experiments with major Safety implications.

CERN Mechanical Safety Rules

- Purpose of the rules
 - To define the minimum Safety requirements applying to mechanical equipment used or intended for use at CERN. Applicable to all stages of the equipment's life cycle, from design to decommissioning.
 - Take into account:
 - Laws and regulations of the Host States;
 - EU regulations and **directives**;
 - International regulations, standards and directives.
- Scope
 - Mechanical equipment: lifting (GSI-M-1), pressure equipment (GSI-M-2), **cryogenic equipment (GSI-M-4)**, lifts (GSI-M-5).

Pressure Equipment Directive (PED)

- **Essential Safety Requirements** - pressure equipment must be:

- Designed
- Manufactured
- Checked
- Equipped and installed (if applicable)

As to ensure its safety when

- Put into service as per manufacturer's instructions
- Other foreseeable conditions (including potential misuse)

- And they qualitatively cover:

Design

- Adequate strength
- Appropriate Safety factors
- Calculation/experimental method
- Provisions for safe handling/operation
- Safety accessories against overpressure

Manufacturing

- WPS and welding personnel to be approved by NoBo or recognized third party
- NDT
- Operating instructions
- Final proof test (normally hydrostatic, other tests allowed with additional measures, such as NDT)

Materials

- Appropriate properties
- Covered by EN, EAM or PMA
- Compulsory declaration from material supplier affirming compliance with a specification.
- Traceability of material from receipt of material through final testing

Pressure Equipment Directive (PED)

- Conformity assessment
 - Conformity assessment modules: Higher the category, more demanding requirements (increase of supervision from Notified body over the whole fabrication process).
- Notified bodies
 - Organizations appointed by EU states to assess conformity of a product to the ESRs before being put in the market.
 - Categories II-IV require having conformity assessed by external independent Notified bodies.
- CE marking
 - Affixed to equipment by the manufacturer.
 - Statement that the equipment meets requirements of all relevant Directives – *Declaration of conformity*.
 - Permitted only after Notified body attests full conformity to the Directive(s).

Launch Safety Agreement (LSA)

- Launch Safety Agreement (LSA):
 - Agreement between HSE and the project for the compliance with CERN Safety rules;
 - Not only for pressure equipment, but other domains too, i.e. fire safety, electrical safety, environment protection, etc.).
- Terms of compliance defined in LSA:
 - Definition of Safety requirements as per CERN Safety Rules;
 - Classification as equipment liable to have ‘major Safety implications’ (mSi).

Application of CERN Mechanical Safety Rules

- Baseline approach for pressure equipment
 - Design, manufacturing and testing as per EN harmonized standards.
 - Compliance with Pressure Equipment Directive (PED) 2014/68/EU.
 - CE marking.
- Exceptions to the baseline approach:
 - Foreseen by the rules – equipment liable to have ‘major Safety implications’;
 - mSi equipment requires Safety clearance from HSE;
 - HSE defines the Safety requirements that need to be met for the Safety clearance;
 - HSE performs **conformity assessment**.

Conformity assessment by HSE

- Requirements for HSE Safety clearance:
 - Compliance with applicable Essential Safety Requirements from PED compulsory.
 - Use of harmonized European standards wherever applicable (presumption of conformity) for design, manufacturing and testing.
 - EN 13445 – Unfired pressure vessels;
 - EN 13458 – Cryogenic vessels – static vacuum-insulated vessels;
 - EN 13648, ISO 4126 – Cryogenic safety devices;
 - EN 10028 – Flat products made of steels for pressure purposes;
 - ...

Conformity assessment by HSE

- Requirements for HSE Safety clearance:
 - Where foreign standards may be used provided compliance with ESRs is fully demonstrated.
 - Eventual non-compliances to be assessed individually. The project shall propose compensatory measures to ensure commensurate level of Safety.
 - Assessment of conformity to the ESRs may be carried out by HSE acting as an 'independent' party.
- Provided Safety requirements are met and Safety clearance is achieved, **CE marking is not compulsory** as per the Safety Rules.
- HSE acts as *de facto* Notified body; involvement of external Notified body not required.

Conformity assessment by HSE

- Design examination
 - HSE will validate the design of the equipment prior to the commencement of fabrication;
 - Manufacturer must produce technical documentation as to enable an assessment of the conformity of the equipment with the ESRs.
- Production quality assurance
 - HSE and project to agree on the Inspection and Test Plan, including Safety relevant Hold Points;
 - Manufacturer to provide quality records for the manufacturing part of the QA system, such as inspection reports and test data, qualifications of personnel concerned, etc.;
 - Documentation to ensure full traceability of components and processes.

Conclusions

- CERN sets out Safety objectives for the Organization, HSE supports CERN in the attainment of said objectives.
- Pressure equipment at CERN must respect the ESRs of the PED.
- European standards to be implemented wherever possible. Alternative foreign standards may be accepted provided full compliance with ESRs is demonstrated.
- Non-compliances to be dealt with on a case-by-case basis. Compensatory measures may be required.
- Safety clearance from HSE required for mSi equipment. HSE defines Safety clearance requirements and assesses conformity.
- HSE becomes the *de facto* Notified body.
- Provided that HSE grants Safety clearance, **exemption from CE marking is permitted.**

