Strategy for conformity of non-standard cryogenic equipment

C. Arregui, S. Marsh
carlos.arregui@cern.ch
simon.marsh@cern.ch

Cryogenic Safety – HSE Seminar
22\textsuperscript{nd} September 2016
CERN
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:

<table>
<thead>
<tr>
<th>Design</th>
<th>Manufacturing</th>
<th>Materials</th>
</tr>
</thead>
</table>
| • Adequate strength  
  • Appropriate Safety factors  
  • Calculation/experimental method  
  • Provisions for safe handling/operation  
  • Safety accessories against overpressure | • 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) | • 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.