SPECIFIC SAFETY INSTRUCTION SSI-M-2-5

VACUUM CHAMBERS AND BEAM PIPES
1 INTRODUCTION

For the convenience of the reader, this Specific Safety Instruction used the masculine gender only. However, its use shall be understood as referring to both genders unless the context clearly indicates a reference to one gender only.

1.1 Legal basis

In accordance with its intergovernmental status, the Organization establishes and updates Safety Rules to implement its Safety Policy.

This Specific Safety Instruction forms part of the CERN Safety Rules and is issued pursuant to the Staff Rules and Regulations and the CERN Safety Policy.

1.2 Purpose and scope

The purpose of this Specific Safety Instruction is to define the additional Safety requirements relating to vacuum chambers and beam pipes, compared to General Safety Instruction GSI-M-2 “Standard pressure equipment”.

Cryogenic vacuum insulated vessels and windows for vacuum chambers are excluded from the scope of this Specific Safety Instruction.

1.3 Definitions

For the purposes of this Specific Safety Instruction, the following definitions shall apply:

- Cryogenic vessel: vessel used at a temperature equal to or lower than 123.15 K.
- Sound Engineering Practice (SEP): means that pressure equipment is designed taking into account all relevant factors influencing its safety. Furthermore, such equipment is manufactured, verified and delivered with instructions for use in order to ensure its safety during its intended life, when used in foreseeable or reasonably foreseeable conditions.
- Vacuum chamber: vessel subject to external pressure in the specific case where the external pressure is the normal atmospheric pressure and the absolute pressure in the vessel is approximately zero.

For other definitions please refer to section 1.3 of Safety Regulation SR-M “Mechanical equipment” and to General Safety Instruction GSI-M-2 “Standard pressure equipment”.

1.4 CERN Safety Rules and Laws

This Specific Safety Instruction is supplemented by the documents listed below, where they exist:

- Safety Regulations (SR);
- General Safety Instructions (GSI);
- Specific Safety Instructions (SSI);

and by the relevant provisions of the following Laws:

- EN 13445 – Unfired pressure vessels (Europe).
- EN 14917 – Metal bellows expansion joints for pressure applications (Europe).

In the event of any ambiguity or contradiction between the above-mentioned documents, they shall apply in decreasing order of priority, starting from the top.
2 ADDITIONAL SAFETY REQUIREMENTS COMPARED TO GSI-M-2

The following additional Safety requirements compared to General Safety Instruction GSI-M-2 shall apply to vacuum chambers and beam pipes:

<table>
<thead>
<tr>
<th>Relevant section GSI-M-2</th>
<th>Phase of life cycle</th>
<th>Additional Safety requirements compared to GSI-M-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Design</td>
<td>Vacuum chambers and beam pipes shall be designed according to Sound Engineering Practice and in accordance with harmonised standard EN 13445 Part 3 – Section 8. Metallic bellows used in vacuum applications shall be designed in accordance with harmonised standard EN 14917 or any other applicable harmonised standard. Stresses generated by the applied loads shall remain below the elastic range and the equipment shall be checked to demonstrate that no buckling occurs. Stiffener rings shall never be located over circumferential weld seams.</td>
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<tr>
<td>2.2</td>
<td>Manufacture</td>
<td>The vacuum chamber shall be manufactured according to Sound Engineering Practice and in compliance with the provisions set out at the design stage. Appropriate manufacturing technics (forging, extruding and laminating) shall be carried out in a way to avoid any defects in the material which may cause leaks.</td>
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<td>2.3</td>
<td>Procurement or arrival/presence on the CERN site</td>
<td>No additional Safety requirement compared to GSI-M-2.</td>
</tr>
<tr>
<td>2.4</td>
<td>Installation</td>
<td>Vacuum chambers and beam pipes shall be provided with a pressure limiting system to protect them against excessive pressure. The capacity of the protection system shall be established considering all of the probable conditions contributing towards internal excess pressure.</td>
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<tr>
<td>2.5</td>
<td>Acceptance and commissioning</td>
<td>Acceptance and commissioning of safety accessories against overpressure shall be carried out in compliance with the applicable CERN Safety Rules and Laws (cf. Section 1.4). At least, Non Destructive Testing (NDT) requirements given by the applicable standard shall be met. Visual inspections of all welds shall be done by certified personnel.</td>
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<tr>
<td>2.6</td>
<td>Use</td>
<td>No additional Safety requirement compared to GSI-M-2.</td>
</tr>
<tr>
<td>2.7</td>
<td>Periodic inspections</td>
<td>Vacuum chambers and beam pipes are exempt from periodic inspections. Safety accessories shall be periodically inspected as defined in the applicable CERN Safety Rules and Laws (cf. Section 1.4).</td>
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<td>2.8</td>
<td>Maintenance</td>
<td>No additional Safety requirement compared to GSI-M-2.</td>
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<tr>
<td>2.9</td>
<td>Recommissioning</td>
<td>No additional Safety requirement compared to GSI-M-2.</td>
</tr>
<tr>
<td>2.10</td>
<td>Decommissioning/dismantling</td>
<td>No additional Safety requirement compared to GSI-M-2.</td>
</tr>
</tbody>
</table>

3 FINAL PROVISIONS

3.1 Entry into force

This Specific Safety Instruction (version 1) enters into force upon its publication on the CERN website dedicated to the CERN Safety Rules: https://www.cern.ch/safety-rules.