



ENGINEERING STANDARD

Pressure Equipment Protection Requirements

STANDARD NO: 15061

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DATE : 1/7/05

REVISION: 2

ESB TECH COMMITTEE: Pressure Equipment Protection
Technical Committee

Approved by:

Richard Salizzoni, Signature on File

Chairman, Engineering Standards Board

REVISION HISTORY

REV	DATE	DESCRIPTION OF REVISION
0	6/6/02	Initial Issue
1	12/04/03	Added Section 1.3; Edited Sections 1.2, 3.0, 5.2.1.2, 5.2.2.1-5.2.2.4, 5.3.3, 5.4.2.3, 5.5.1, 5.6.3, 6.0, and Appendices 1-4.
2	1/7/05	Added: 3.10, 3.11, changes to 5.2.1.1, 5.2.2.1.(c), 5.4.1.3, 5.4.1.4, 5.4.1.5, 5.4.1.7, Ap.2 Pressure Vessels P-code note in italic, Ap.2 noted retroactive fields, Ap.3 Note (6), added Ap.5.

1.0 PURPOSE AND SCOPE

- 1.1 This standard specifies the requirements for the Savannah River Site (SRS) Pressure Equipment Protection program, for the safe and reliable service of pressure vessels and pressure relief devices.
- 1.2 The standard applies to pressure vessels in the scope of the ASME Boiler and Pressure Vessel (B&PV) Code (all sections) and to all pressure relief devices that protect systems or components from overpressure.

Exceptions:

The following vessels and pressure relief devices may be exempted from the requirements of this standard. The Design Authority is responsible for initial and continued safety of pressure equipment exempted from this standard:

Vessels:

- (1) Filters and separators provided that documentation required by ASME B31.3 justifies their application as an unlisted component.
- (2) Gas cylinders regulated by the Department of Transportation.
- (3) Vessels in vehicle pneumatic and hydraulic systems.
- (4) Drained, depressurized and vented, out-of-service vessels.
- (5) Self-Contained Breathing Apparatus Air Cylinders.

ASME Code stamped vessels (regardless of application), low pressure vessels which accumulate above 18 psig, and pressure containers that rely solely on interlocks to limit the pressure to less than 15 psig may not be excluded without acceptance through an approval request OSR 19-8.

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Pressure Relief Devices:

- (1) Hydrostatic relief valves in non-flashing service (where liquid does not flash into vapor as it discharges to atmosphere), used only for pressure relief from thermal expansion in piping systems.
- (2) Rupture disk and fusible plugs on DOT gas cylinders.
- (3) Pressure relief devices on vehicle pneumatic and hydraulic systems.
- (4) Pressure relief devices on drained and depressurized, out-of-service vessels.
- (5) Non-metallic, non-Code pressure relief valves on portable eyewash stations which comply with the NSDA standard.
- (6) Fusible plugs on refrigeration equipment which conforms to ASHRAE 15.
- (7) Pressure relief devices that do not provide a pressure protection function.
- (8) Pressure relief devices on transformers.
- (9) Hydrostatic bubblers.
- (10) Machinery hydraulic systems (e.g. hydraulic press, hydraulic cutter).

- 1.3 Pressure vessels and relief devices shall be kept in the Pressure Equipment Protection program until the system is vented, drained and permanently placed out of service.

Questions regarding the application of this Standard shall be directed to the Site Pressure Equipment Protection Committee (PEPC) of the Engineering Standard Board (ESB).

2.0 DOE ORDER AND STANDARDS APPLICABILITY

- 2.1 DOE Order 440.1A "Worker Protection Management for DOE Federal and Contractor Employees".
- 2.2 DOE Order 433.1 "Maintenance Management Program for DOE Nuclear Facilities".

3.0 NATIONAL CODES AND STANDARDS APPLICABILITY

National codes and standards incorporated by reference in this standard shall be the revision number/date in effect at the time this standard is invoked, or as otherwise noted.

- 3.1 ASME Boiler and Pressure Vessel Code, American Society of Mechanical Engineers, New York.
- 3.2 ASME B31 Pressure Piping Codes, American Society of Mechanical Engineers, New York.
- 3.3 ASHRAE 15, Safety Standard for Refrigeration Systems, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, GA.
- 3.4 ASME B19.1, Safety Standard for Air Compressor Systems, American Society of Mechanical Engineers, New York, NY.
- 3.5 API 521, Guide for Pressure Relieving and Depressurizing Systems, American Petroleum Institute, Washington DC.
- 3.6 UL 2127, Inert Gas Cleaning Agent Extinguishing System Units, Underwriter Laboratories, Northbrook, IL.
- 3.7 UL 2166, Halocarbon Clean Agent Extinguishing System Units, Underwriter Laboratories, Northbrook, IL.
- 3.8 ANSI-NB-23, National Board Inspection Code, The National Board of Boiler and Pressure Vessel Inspectors, Columbus, OH.
- 3.9 UL 1776, Standard for Safety High-Pressure Cleaning Machines, Underwriter Laboratories, Northbrook, IL.
- 3.10 Pressurized Water Storage Tank Standard PST-2000, Water System Council, Washington, DC.
- 3.11 UL-1995 Heating and Cooling Equipment, Underwriter Laboratories, Northbrook, IL.

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4.0 ACRONYMS AND DEFINITIONS

4.1 Acronyms and Initials

- 4.1.1 ANSI – American National Standard Institute
- 4.1.2 API – American Petroleum Institute
- 4.1.3 ASHRAE – American Society of Heating, Refrigeration, and Air-Conditioning Engineers
- 4.1.4 ASME – American Society of Mechanical Engineers
- 4.1.5 B&PV – Boiler and Pressure Vessel
- 4.1.6 CF – Consequence of Failure
- 4.1.7 DOT – Department of Transportation
- 4.1.8 MAWP – Maximum Allowable Working Pressure
- 4.1.9 NCR – Non-Conformance Report
- 4.1.10 NSDA – National Soft Drink Association.
- 4.1.11 OME – Original Manufacturer Equipment (OME).
- 4.1.12 PEPC – Pressure Equipment Protection Committee
- 4.1.13 PIR – Problem Identification Report
- 4.1.14 PRV – Pressure Relief Valve
- 4.1.15 UL – Underwriter Laboratory

4.2 Definitions

- 4.2.1 Approval request: Form OSR 19-8 used to process PEPC approvals as specified in this Standard.
- 4.2.2 Code: The American Society of Mechanical Engineers (ASME) Boiler & Pressure Vessel Code, unless specified otherwise.
- 4.2.3 Consequence of Failure (CF): A classification, where:
 - CF1: Service fluids that are either flammable, radioactive, toxic, safety class, or damaging to human tissue.
 - CF2: Service fluids that are not CF1, and have either an operating pressure and temperature above 150 psi / 366 °F or 275 psi / 200 °F, or an operating temperature below –20°F.
 - CF3: No longer in use.
 - CF4: Service fluids that are neither CF1 nor CF2.
- 4.2.4 Original Manufacturer Equipment (OME): Standard catalog equipment (not modified) listed in section 5.2.2.3(a) in which the equipment package contains the only source of pressurization, and for which the manufacturer certifies, in writing, full compliance with the applicable industry standards. The OME classification is limited to the class of equipment listed in section 5.2.2.3(a).

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- 4.2.5 Verification Record: A calculation with standard format (OSR 3-171 relief valve, OSR 3-172 vessel), numbered "M-RVD-(area letter)-sequence number" for relief devices and "M-PVD-(area letter)-sequence number" for pressure vessels. The sequence number is obtained from Document Control, and the completed original record is filed in document control.
- 4.2.6 Technical Coordinator: Persons assigned by the Chairman, Pressure Equipment Protection Committee, to fulfill the responsibilities assigned in this Standard. Technical Coordinators are listed on the PEPC website.

5.0 REQUIREMENTS

The Pressure Equipment Protection Program consists of five activities addressed in section 5: (1) Procurement, (2) Verification, (3) Registration, (4) Fitness-for-Service, and (5) Repair.

5.1 Procurement

- 5.1.1 Pressure protection equipment shall be procured to comply with the ASME B&PV Code, ASME B31 code, and other applicable national standards.
- 5.1.2 When procuring new vessels, the procurement specification shall request the applicable ASME code design calculation and the applicable data report (U-1 data report for ASME VIII Div.1 vessels).
- 5.1.3 Procurement documents for pressure vessels and relief devices, including equipment that contains these items and replacement parts, require the approval of the PEPC Facility Coordinator.
- 5.1.4 Procurement documents for leased equipment that may contain pressure vessels and pressure relief devices require the approval of the PEPC Facility Coordinator.

5.2 Verification

5.2.1 Pressure Vessels

- 5.2.1.1 All pressure vessels in the scope of the ASME B&PV code must comply with the applicable ASME B&PV Code section, and be stamped accordingly.

Exception:

Pressurized water storage tanks in the scope of Water Systems Council Standard PST-2000 may be designed and constructed to the requirements of PST-2000, as an alternative to ASME Boiler and Pressure Vessel Code Section X.

- 5.2.1.2 Pressure vessels must have a verification record, numbered and filed in document control. The pressure vessel verification record shall include (a) the record cover sheet, (b) the design report (vendor or site-generated design calculation showing code compliance), and (c) the ASME data report (U-1 data report for ASME VIII Div.1 vessels).

Exceptions:

- (a) If an existing vessel was originally procured without a code stamp (no data report, no design calculation), its verification record must include calculation of the required minimum wall thickness.
- (b) A pressure vessel verification record is not required for CF4 vessels with: (1) incompressible liquid non-flashing at atmospheric condition, or (2) gas (including air) with a volume less than 5 cu.ft.
- (c) A verification record is not required for supplier-owned, site operated (e.g. leased) pressure vessels, but these vessels must be Code stamped if in the scope of the Code.
- (d) A verification record is not required for supplier-owned, supplier-operated pressure vessels. The supplier is responsible for the over-pressure protection of the equipment.

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5.2.1.3 Pressure vessel verification records must be approved by the PEPC Facility Coordinator prior to operational testing and operation. Operational testing may proceed prior to completing the verification record if approved by the Site Technical Coordinator through an Approval Request (OSR 19-8).

5.2.1.4 Where the provisions of ASME Section VIII Code Case 2211 are applied, an overpressure protection report must be prepared in accordance with Appendix 1.

5.2.2 Pressure Relief Devices

5.2.2.1 The ASME Code dictates the necessity of overpressure protection. The pressure protection requirements of other codes and federal regulations (such as ASHRAE, CGA, and DOT) must also be considered in the selection of pressure relief devices.

Exception:

- (a) Pressure components whose overpressure protection is not imposed by a national code or standard, and whose failure is safe to the worker, the public, and the environment need not be pressure protected provided (1) the energy release at failure is less than 10,000 ft-lb, and (2) the PEPC Facility Coordinator, the PEPC Technical Coordinator, and the facility Chief Engineer approve the engineering calculation (E7 procedure 2.31 calculation) substantiating the lack of overpressure protection.
 - (b) Extinguishing systems in the scope of UL-2127 or 2166, and high pressure cleaning machines in the scope of UL-1776, may meet the safety intent of the pressure protection provisions of these standards instead of the ASME Code.
 - (c) Small packaged refrigeration units that do not contain vessels within the scope of the ASME Boiler and Pressure Vessel Code, may meet the pressure protection provisions of UL-1995 as an alternative to ASHRAE-15 and the ASME Code.
- 5.2.2.2 All pressure relief devices with a set pressure at or above 15 psig must comply with the ASME B&PV Code, unless approved otherwise by the PEPC Technical Coordinator.
- 5.2.2.3 All pressure relief devices must have a verification record, numbered and filed in Document Control, which establishes their adequacy. Pressure relief device verification records must meet the intent of Manual E7 Procedure 2.31 for Type 1 calculations. A status "IP" or "VE" is assigned to each record. "IP" is assigned to a record that does not yet include field as-built verification. "IP" records may be either preliminary or confirmed. "VE" is assigned to a record that is confirmed installed in accordance with the record through field verification. "VE" status is required prior to operational testing and operation unless approved by the Site Technical Coordinator through an Approval Request (OSR 19-8). Refer to M-DP-G-00006 for guidance in designing a pressure relief system and completing verification records.

Exceptions:

- (a) A full verification record is not required for OME relief devices. The manufacturer is responsible for sizing, and certifying the relief device in compliance with the applicable OME standard listed below. The OME relief device Verification Record may be limited to the cover sheet containing the information required per Appendix 2 and the manufacturer's document that states compliance to the standard listed below. The OME relief device may be assigned a generic verification record. If the original manufacturer relief device or the OME equipment is modified, a verification record must then be prepared. OME are limited to the following equipment classes:
 - (a.1) Packaged air compressor units that comply with ASME B19.1 (with ASME B&PV Section VIII Code stamped PRVs) and API 521 for fire sizing the PRV on Code stamped vessels.
 - (a.2) Packaged refrigeration units, that complies with ASHRAE 15.

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- (a.3) Packaged inert gas and halocarbon clean agent extinguishing systems that comply with UL 2127 and UL 2166 respectively.
- (a.4) High pressure cleaning machines that comply with UL-1776.
- (a.5) Small packaged refrigeration units that do not contain vessels within the scope of the ASME Boiler and Pressure Vessel Code.
 - (a) A verification record is not required for supplier-owned, site operated (e.g. leased) pressure relief devices. However, a supplier sizing calculation is required and must be reviewed and approved by the PEPC Facility Coordinator.
 - (b) A verification record is not required for pressure relief devices on supplier-owned, supplier-operated pressure equipment.

5.2.2.4 Pressure relief device verification records must be approved by the PEPC Technical Coordinator, or personnel designated by the PEPC Chair or Technical Coordinator.

5.2.2.5 All in-place testing of pressure relief devices must follow a written procedure, approved by the PEPC Technical Coordinator prior to testing.

5.3 Registration

5.3.1 An equipment record must be entered in AIM or PASSPORT for each pressure vessel or relief device. The minimum entries to be recorded are listed in Appendix 2.

Exception: Supplier-owned equipment need not be registered.

5.3.2 Where required in Section 5.4, a Preventive Maintenance (PM) record must be established in PASSPORT, with PM frequencies and inspection or test methods in accordance with Section 5.4.

5.3.3 Registration and PM entries must be approved by the PEPC Facility Coordinator, who is responsible for their completeness and accuracy.

5.4 Fitness-for-Service

5.4.1 Pressure Vessels

5.4.1.1 All pressure vessels shall be periodically inspected (visual external, visual internal or volumetric) in accordance with the following schedule, unless more frequent inspections are deemed necessary by the Design Authority. If degradation mechanisms are detected which encroach on the vessel integrity, examination frequencies should be adjusted accordingly.

Vessels with consequence of failure CF1 or CF2:

External visual, every 3 years.

Internal visual or volumetric, every 5 years.

Vessels with consequence of failure CF4:

External visual, every 5 years.

Internal visual or volumetric, every 10 years.

Exceptions:

- (a) Vessel inspections for supplier-owned equipment are the responsibility of the supplier. This responsibility must be dictated to the supplier through the procurement documents.
- (b) Periodic inspection is not required for CF4 vessels with: (1) incompressible liquid non-flashing at atmospheric condition, or (2) gas (including air) with a volume less than 5 cu.ft. The Facility Coordinator is responsible for the continued adequacy of excluded vessels whose failure could cause a danger to the worker.

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(c) A vessel may be exempted from periodic internal visual or volumetric inspections, provided the following three conditions are met:

- (1) The vessel is in a Nuclear Facility.
- (2) The vessel is inaccessible for inspections (e.g. radiological constraints, jacketed vessel).
- (3) Leakage or rupture of the vessel is documented to have no adverse consequence on (1) workers, (2) the public and (3) the environment; including consideration of release of contents and explosion potential. This lack of adverse consequences must be established through the facility's Authorization Basis or through a calculation, approved by the Site Technical Coordinator, filed in document control, and referenced under the vessel CLI number in PASSPORT or AIM.

5.4.1.2 Vessel inspections shall be performed by personnel qualified in accordance with Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing (SNT-TC-1A).

5.4.1.3 Each facility shall provide the vessel inspector, prior to inspection and as part of the inspection work package, the minimum wall thickness t_{min} for the vessel shell and heads.

Upon completion of the inspection, the vessel inspector shall inform the Shift Operations Manager of minimum measured wall thickness t_{mm} where

$$t_{mm} < t_{min}$$

A minimum measured wall thickness $t_{mm} < t_{min}$ is a Non-Conforming condition (NCR) processed in accordance with Section 5.6.

Refer to Non-Mandatory Appendix 5 for Guidance on disposition of Non-Conforming vessel wall thickness.

5.4.1.4 The Facility Coordinator, or designee, is responsible for assuring that the results of periodic inspections are assessed for fitness-for-service. The inspection results and fitness-for-service assessment shall be documented in PASSPORT or AIM.

5.4.1.5 The vessel record shall be revised to incorporate the results of the inspection and the fitness-for-service analysis.

5.4.2 Pressure Relief Devices

5.4.2.1 New pressure relief valves shall be tested for pressure set-point and visually inspected at the SRS valve shop prior to being placed into service. A pressure relief valve shall be installed within six months of a successful test, provided there is no evidence of damage to the valve.

Exceptions:

- (a) Domestic water heater (120 gal or less) temperature-pressure relief valves need not be tested at the valve shop, provided they are manually exercised in the field to verify discharge.
- (b) New relief devices on OME need not be tested prior to initial service, but must be visually inspected for damage by the PEPC Facility Coordinator prior to initial service.
- (c) Steam pressure relief valves may be tested off-site by a PEPC approved VR certificate holder.
- (d) Henry and Superior refrigerant pressure relief valves need only be visually inspected (non-OME).
- (e) Oxygen service pressure relief valves need only be visually inspected (non-OME).
- (f) Pressure relief device testing and inspection of supplier-owned equipment is the responsibility of the supplier. This responsibility must be dictated to the supplier through the procurement documents.

5.4.2.2 All pressure relief valves shall be periodically inspected and tested at the SRS valve shop in accordance with Appendix 3.

Exceptions:

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- (a) If manually exercised in the field to verify discharge, replacement temperature-pressure relief valves need not be tested at the valve shop.
- (b) Steam pressure relief valves may be tested off-site by a PEPC approved VR certificate holder.
- (c) Henry and Superior refrigerant pressure relief valves are periodically replaced with new valves.
- (d) Oxygen service pressure relief valves are periodically replaced with new valves.
- (e) Each facility has the option of periodically replacing a pressure relief valve instead of inspecting and testing the current valve.
- (f) In-place testing is acceptable if indicated in the verification record, and the test procedure is signed-off by the PEPC Technical Coordinator.
- (g) Pressure relief device testing and inspection for supplier owned equipment is the responsibility of the supplier. This responsibility must be dictated to the supplier through the procurement documents.
- (h) Supplier owned, site operated pressure relief valves shall be tested by a VR certificate holder or replaced at a frequency no longer than 5 years.
- (i) Rupture discs need not be inspected at the SRS valve shop, as noted in Appendix 3.

5.4.2.3 The SRS valve shop shall make and affix a tag to valves in accordance with Appendix 4.

Exceptions:

- (a) The PEPC facility coordinator or designee may issue and install tags, complying with Appendix 4, for the following equipment:
 - In-place tested relief devices
 - OME relief devices
 - Rupture discs.
 - Temperature-pressure relief valves.
- (b) Tags are not required for supplier-owned, supplier-operated equipment.

5.4.3 Deferral of Testing and Inspections

5.4.3.1 Deferral of an inspection or test shall be through an Approval Request (OSR 19-8) approved by the PEPC Technical Coordinator. The PEPC Facility Coordinator may sign for the Technical Coordinator if the deferred date is less than 6 months from the original due date.

5.4.3.2 A delinquent test or inspection is considered a deficient condition processed in accordance with section 5.6.

5.5 Repairs

5.5.1 Repairs and alterations of pressure vessels shall comply with Manual WSRC-TM-95-1 Attachment 5, QC "Manual for Repairs and Alterations to Pressure Retaining Items". Through this process, the SRS Repair Engineer prepares the vessel repair package and obtains approval of the National Board Commissioned Inspector

5.5.2 Pressure relief valves shall be repaired under a VR-stamp program, WSRC-IM-90-59 "Pressure Relief Valve Repair Quality Control Manual".

5.6 Deficient Conditions

5.6.1 For all deficient or unsafe conditions, a nonconformance report (NCR), or quality approved equal, shall be generated in accordance with WSRC Procedure QAP 15-1 "Control of Non-Conforming Items".

5.6.2 The disposition of pressure protection NCRs, or quality approved equal, shall be approved by the PEPC Technical Coordinator and as required in section 5.7.

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5.6.3 A six-month conditional release of a pressure protection NCR may be granted by the Division Chief Engineer in place of the Technical Coordinator. Extension beyond six months requires approval of the PEPC Technical Coordinator.

5.6.4 The corrective action for the resolution of pressure protection PIRs shall be approved by the PEPC Technical Coordinator.

5.7 Deviations

5.7.1 Requests for deviations to the requirements of this standard shall be processed in accordance with Engineering Standards Manual WSRC-TM-95-1 "Requirements and Responsibilities."

6.0 REFERENCES

6.1.1 ASME Boiler and Pressure Vessel Code, American Society of Mechanical Engineers, New York, NY.

6.1.2 ASME B31 Pressure Piping Codes, New York, NY.

6.1.3 ASHRAE 15, Safety Standard for Refrigeration Systems, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, GA.

6.1.4 ASME B19.1, Safety Standard for Air Compressor Systems, American Society of Mechanical Engineers, New York, NY.

6.1.5 API 521, Guide for Pressure Relieving and Depressurizing Systems, American Petroleum Institute, Washington DC.

6.1.6 UL 2127, Inert Gas Cleaning Agent Extinguishing System Units, Underwriter Laboratories, Northbrook, IL.

6.1.7 UL 2166, Halocarbon Clean Agent Extinguishing System Units, Underwriter Laboratories, Northbrook, IL.

6.1.8 ANSI-NB-23, National Board Inspection Code, The National Board of Boiler and Pressure Vessel Inspectors, Columbus, OH.

6.1.9 M-DP-G-00006, Pressure Protection Design Guide.

6.1.10 E7 Conduct of Engineering, Procedure 2.31 Engineering Calculations

6.1.11 Manual WSRC-TM-95-1 Attachment 5, QC Manual for Repairs and Alterations to Pressure Retaining Items.

6.1.12 Manual WSRC-IM-90-59, Pressure Relief Valve Repair Quality Control Manual".

6.1.13 WSRC procedure QAP 15-1 Control of Non-Conforming Items

7.0 TABLES, FIGURES AND APPENDICES

7.1 Tables

None

7.2 Figures

None

7.3 Appendices

7.3.1 Overpressure Protection Report

7.3.2 Registration of Pressure Protection Items

7.3.3 Periodic Testing of Pressure Relief Devices

7.3.4 Identification Requirements for Pressure Protection Equipment

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APPENDIX 1 - OVERPRESSURE PROTECTION REPORT

Where the Design Authority chooses to apply ASME Section VIII Code Case 2211 to provide overpressure protection by system design (contain the maximum credible pressure) rather than install a pressure relief device, the analysis supporting this decision shall be documented in an Overpressure Protection Report. The Overpressure Protection Report is to be prepared as an engineering calculation, with signatures of author, checker and an approval signature by the facility Chief Engineer.

The Vessel Verification Record must reference the Overpressure Protection Report calculation number, and be submitted for approval to the Technical Coordinator.

The Overpressure Protection Report shall address, as a minimum, the following:

(a) The reason for invoking CC 2211 rather than installing a pressure relief device.

(b) The basis for establishing the maximum credible overpressure condition to be sustained by the pressure vessel. The Design Authority or designate shall conduct a detailed analysis which examines all credible scenarios which could result in an overpressure condition. The "Causes of Overpressure" described in Section 2 of API Recommended Practice 521 "Guide for Pressure-Relieving and Depressing Systems" shall be considered. An organized, systematic approach, using a multidisciplinary team, such as a Hazards and Operability Analysis (HazOp), Failure Modes, Effects, and Criticality Analysis (FMECA), Fault Tree Analysis, Event Tree Analysis, "What-if" Analysis, or other similar methodology shall be used. In all cases, the Design Authority or designate shall determine the potential for overpressure due to all credible operating and upset conditions, including equipment and instrumentation malfunctions. The analysis shall be conducted by an engineer(s) experienced in the applicable analysis methodology.

(c) The analysis of the pressure vessel integrity, shall be based on the following criteria:

Likelihood of overpressure condition	Integrity criterion
Equal to or more frequent than 10^{-2} / year	MAWP + 10% overpressure.
10^{-2} / year to 10^{-4} / year	(a) Overpressure not to exceed vessel or system test pressure, or (b) Stress analysis to establish integrity of the pressure boundary ⁽¹⁾ , or (c) Proof test to establish integrity of the pressure boundary.
10^{-4} / year to 10^{-6} / year	Permit failure if consequence determined to be acceptable by the Design Authority; otherwise, apply the rules of 10^{-2} / year to 10^{-4} / year.
Less frequent than 10^{-6} /year	May be considered if determined necessary by the Design Authority.
Design basis fire	MAWP + 21% overpressure.

Note (1): Stress analysis in accordance with ASME Boiler and Pressure Vessel Code, Section VIII Div.1 or Div.2, Section III.

(d) Requirements and responsibilities for periodic testing and inspection of instrumentation and controls, where used for overpressure protection.

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APPENDIX 2 – REGISTRATION OF PRESSURE PROTECTION ITEMS

All SRS pressure equipment requires the following information as a minimum for registration in PASSPORT or AIM.

Mandatory retroactive fields are indicated by an asterisk (*), unless exempted in the Standard.

For All Pressure Protection Items

CLI [with Functional Identifiers PSV (pressure relief valves), PSE (rupture disc), and VSL or other applicable vessel identifier, such as HX, RCVR.*

Items outside the program shall not use identifiers PSV or PSE.

Equipment description*

Equipment status*

Functional class*

Verification record number* (record to be approved by a Technical Coordinator)*

Verification record status*

Working Fluid*

PEPC Facility Coordinator identifier code*

Consequence of failure*

ASME certification code

For Pressure Vessels

Manufacturer*

Model number (if applicable)

Serial number (if applicable)

Year built

Design pressure*

Design temperature*

Set pressure or relief device*

Size (diameter, height, volume in ft³)

Tube design pressure (if applicable)

Tube design temperature (if applicable)

National Board number (if applicable)*

Maintenance program code = P for pressure vessels (in AIM and PASSPORT)*

Type of Inspection*

A Passport General Note (panel 30) or AIM general comments should be entered for vessel-like equipment (such as tanks and heat exchangers) not in the scope of 15061 and not labeled with the maintenance program code P, to indicate that the equipment is "not in the scope of the PEPC program".

Inspection frequency*

Code required minimum wall for shell and heads tmin*

For Pressure Relief Devices

Manufacturer and model number*

Set/nominal burst pressure*

Rupture disk class

Inlet size and type*

Outlet size and type (if applicable)

Capacity (if applicable)*

Blowdown [max and min] (if required in the verification record)*

PM testing frequency*

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APPENDIX 3 – PERIODIC TESTING OF PRESSURE RELIEF DEVICES

Everyone must be alert to unsafe conditions. Anyone discovering a pressure relief device installed on site without tags, with the seals (wires) missing or cut and/or any other abnormal device condition shall immediately notify the PEPC Facility Coordinator (SHRINE “PEPC” quick search)

Periodic Test Frequency

In order to ensure the continued adequacy of pressure relief devices to perform properly, periodic examination and testing is required. The following information is provided to establish test and inspection frequencies:

Service	Test or Inspect of Replacement or Reused Valves	Reuse or Replace	Frequency ⁽¹⁾
Gas	Test	Reuse or Replace	2 to 5 years
Steam (ASME Sec.I)	Test	Reuse or Replace	Yearly
Steam (ASME Sec.VIII)	Test	Reuse or Replace	1 to 3 years
Steam Pilot PRV	Test	Reuse or Replace	1 to 2 years ⁽⁵⁾
Refrigerant (Henry, Superior)	Inspect	Replace	5 years
Domestic Water Heater	Test ⁽²⁾	Replace	5 years
Dewar Vessel	Test	Replace	5 years
Oxygen	Inspect	Replace	2 to 4 years
Rupture Disk (class 1) ⁽⁴⁾	Inspect ⁽³⁾	Reuse or Replace ⁽³⁾	As required ⁽³⁾
Rupture Disk (class 2) ⁽⁴⁾	Inspect ⁽³⁾	Reuse or Replace ⁽³⁾	1 to 5 years
Non-Code soft-seated, inlet <3/4"	Test	Reuse or replace	1 to 2 years

Notes:

(1) Where a frequency range is specified, consider corrosion, fouling, vibration, pulsating loads, and consequence of failure to determine frequency within the range.

(2) Valves must be exercised by hand before initial service.

(3) Reuse or replacement, and inspection personnel, to be selected by the PEPC Facility Coordinator.

(4) Rupture Disk Class:

Class 1: Flat and forward buckling disk in non-plugging and non-lethal service.

Class 2: Flat and forward buckling disk in plugging or lethal service and reverse buckling disk.

If the pressure increase due to damage or reversal ratio of a rupture disc is less than the maximum allowable overpressure of the system, a reverse buckling rupture disc may be considered a class 1 disc.

(5) Complete disassembly required every two years.

(6) For conventional PRVs that are (a) protected from weather and insects, (b) in CF4 service, (c) with 1” NPT or smaller inlet, and (d) with a current MP frequency of 5 years; the PM frequency may be increased to a maximum of 7 years, provided the previous 5-year test was successful (first pop within 10% of set pressure). This extension does not apply if the valve is replaced by a Verification Record approved alternate.

Vacuum Relief Devices

If practical, a vacuum relief device shall be tested at the valve shop, or, secondarily, in place. If testing is not practical, the device should be inspected at the valve shop or, lastly, in place. Unless otherwise approved by the Technical Coordinator, vacuum relief devices should be inspected and/or tested annually.

Tank Valves

Unless otherwise approved by the Technical Coordinator, tank valves shall be inspected and/or tested at the same frequency and the same time that the tank is inspected or tested, but not to exceed 5 years.

Time from Testing to Installation

Refer to section 5.4.2.1 for pre-operational testing.

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APPENDIX 4 – IDENTIFICATION REQUIREMENTS FOR PRESSURE PROTECTION EQUIPMENT

Pressure vessels shall be tagged or labeled as a minimum with:

1. CLI (or marking traceable to CLI)
2. MAWP at temperature

Pressure relief devices shall be tagged as a minimum with:

1. CLI
2. Set / Burst Pressure
3. Test Date (mo/day/yr if applicable)
4. Test Procedure Number (if tested in place)
5. Due Date (mo/day/yr if applicable)
6. Late Date (mo/day/yr if applicable)

The pressure relief device tag shall be stainless steel or aluminum (approximately 1.5" x 4.5") with 1/8" lettering. The Tag shall be attached using stainless wire and a lead or aluminum seal. Other tagging material and attachment methods may be used provided:

1. The reason for the alternate material is safety related.
2. The tag will not hinder operation of the device.
3. The tag will be legible after 15 years of service.
4. The tag and attachment shall be capable of withstanding a 150-lb pull test.
5. The use of the alternate material is documented through an Approval Request (OSR 19-8).

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APPENDIX 5 – NON-MANDATORY - RESOLUTION OF VESSEL WALL NON-CONFORMANCE

Assessment of Fitness-for-Service of vessel may be conducted in accordance with API Recommended Practice 579 Fitness-for-Service.

Wall Thinning Assessment

Nomenclature:

tmm = measured minimum wall

tmin = minimum wall thickness required by design code (typically ASME VIII Div.1) for the vessel stamped MAWP, at design temperature. Obtained from the vessel verification record.

tam = averaged minimum wall thickness

tset = minimum wall thickness required by design code (typically ASME VIII Div.1) for the relief device set pressure, at design temperature, including allowance for pressure accumulation. The calculation for tset should be documented in the vessel verification record.

(a) Non-Conformance - In accordance with this Standard, the following is a Non-Conforming condition

$$tmm < tmin$$

(b) Conditional Release – A 60-day conditional release (or greater) can be approved based on one or more of the following criteria:

(b.1) Remaining Thickness - $tmm > \max \{ 70\% tmin ; 0.10'' \}$

(b.2) Low Set Pressure of PRV - $tmm > \max \{ 70\% tset ; 0.10'' \}$

(b.3) Barricade/Vessel location - A documented evaluation of the consequence of failure is required if this is the only criterion used. This criterion can be added as a mitigator in conjunction with another criterion without a calculation of consequence of failure. Vessels located inside another vessel, and vessels in a steel glovebox are considered to be barricaded.

(b.4) Leak before Break – If the NDE results show a localized flaw and the service fluid is non-hazardous, a vessel rupture may be shown to be incredible event over the short duration of the conditional release.

(b.5) Likelihood of high pressure – If the pressure basis for tmin is due to a highly unlikely event, the risk may be shown to be acceptable by the Division Chief Engineer over the limited duration of the conditional release.

(c) Options for permanent resolution of the NCR

(c.1) Assess the vessel for fitness-for-service (FFS) in accordance with API 579. This option will require detailed mapping of the corroded zone. In the API 579 evaluation, RSF_a should be 0.9 for safety class (SC) and safety significant (SS) vessels. It is recommended that the RSF_a be no less than 0.8 for production support (PS) and general services (GS) vessels.

(c.2) Repair the vessel in accordance with the site R-stamp.

(c.3) Replace the vessel.

(c.4) Derate the vessel, in accordance with the site R-stamp, to a pressure where the remaining wall complies with the design code minimum thickness requirements. (may require reducing the set pressure of the PRV)

(c.5) Retire or remove the vessel.