Overpressure Protection Requirements

AB–525

Edition 2, Revision 0 – Issued 2021-12-13

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FOREWORD

The Administrator in the pressure equipment safety discipline has established that this ABSA document, AB-525: Overpressure Protection Requirements for Pressure Vessels and Pressure Piping, Edition 2, Revision 0, defines requirements that must be met in Alberta for systems that consist of pressure piping and/or pressure vessels where overpressure protection is provided by:

- **pressure relief valve(s) in accordance with subsections 38(1)(a), 38(2), and 38(3) of the Pressure Equipment Safety Regulation; and/or,**
- **other means of overpressure protection, as provided for by subsections 38(1)(b) and 38(3) of the regulation.**

In addition to providing guidance as to how overpressure protection requirements can be met, this document also establishes how certain cases of overpressure protection by system design for pressure vessels and pressure piping may be registered without applying for case-by-case consideration.

The next reaffirmation of AB-525 is scheduled for 2025.

1.0 INTRODUCTION

The Pressure Equipment Safety Regulation requires that all pressure equipment be protected from overpressure by means of a pressure relief valve, or by other means of overpressure protection acceptable to the Administrator.

Pressure relief valves are the most practical choice for many applications. Pressure relief valves are dedicated devices attached to the equipment that, by means of simple mechanical actuation, open to release some of the equipment's contents into a flare system or directly to the atmosphere in order to relieve excess pressure, providing a last line of defense against catastrophic failure of the equipment.

Pressure relief valves may not be suitable for all applications. In the past, the question was raised as to what other methods of overpressure protection can be expected to be acceptable to the Administrator, and how such systems need to be documented at the time of design registration. An industry task group was formed in January 2011 to address this question, with the goal of setting out guidelines to help ensure that designers can specify overpressure protection systems with confidence that they will be accepted.

Later that year, the group finalized and adopted a report proposing recommendations to ABSA for the use of overpressure protection by means other than by pressure relief valves; the report was reviewed and endorsed by the Boilers and Pressure Vessels Technical Council of the Safety Codes Council at their meeting in September 2011. The original edition of this document was based on the recommendations made in that report.

A task group was reassembled in 2018 to obtain feedback and discuss requests for changes to the 1st edition of this document. This resulting 2nd edition is a complete rewrite and restructure of the original, intended to more fully develop or otherwise clarify some concepts, and to facilitate comprehension and compliance.

ABSA policy documents are periodically reviewed to ensure that they are aligned with current industry practices. We would welcome any suggestions you have to improve this document. Please provide your comments to:

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2.0 SCOPE

This document applies to pressure piping systems and pressure vessels[1] that are subject to the Safety Codes Act and are not exempt from the Pressure Equipment Safety Regulation. It also applies to pipelines and other additional equipment which is required to be registered by ABSA in accordance with AER Directive 077 and IB10-006.

This document supplements and clarifies the requirements of the Safety Codes Act and the Pressure Equipment Safety Regulation.

Thermal relief for piping in liquid service shall be addressed by the designer and is not within the scope of this document.

The main body of this document establishes requirements for overpressure risk assessments and for overpressure protection of equipment by several specific means. The following supplementary appendices are mandatory and within the scope of this document:

- Annex A, ‘Alternative Approaches to this Document’ establishes requirements for submissions which make minor variations from this document, and contains brief discussion about other approaches not within the scope of this document.
- Annex B, ‘Alterations and Modifications’ establishes requirements for changes to existing equipment, when the equipment will rely on overpressure protection by means other than a pressure relief valve after the change is complete.
- Annex C, ‘Overpressure Reporting Requirements’ discusses the Safety Codes Act requirement to report accidents and unsafe conditions, and refers to IB18-004 for the definition of ‘unsafe condition’ as it applies to overpressure protection for the purposes of determining reporting requirements for overpressure events.
- Annex D, ‘Documentation of Existing Systems’ discusses the application of these requirements for systems predating the original 2013 publication of this document.
- Annex E, ‘Change of Equipment Ownership’ establishes and clarifies requirements pertaining to changes of equipment ownership.

[1] Requirements in this document for pressure vessels also apply to vessels registered as category ‘H’ fittings.

3.0 DEFINITIONS

ABSA Safety Codes Officer (SCO) – means a safety codes officer, designated under the Act, in the pressure equipment discipline. [PESR 1(1)(ee)]

Act and Regulations – means the Alberta Safety Codes Act and the following regulations:

Pressure Equipment Exemption Order (Alberta Regulation 56/2006),
Pressure Equipment Safety Regulation (Alberta Regulation 49/2006),
Power Engineers Regulation (Alberta Regulation 85/2003),
Pressure Welders Regulation (Alberta Regulation 169/2002)

Administrative controls – procedures that, in combination with mechanical locking elements, are intended to ensure that personnel actions do not compromise the overpressure protection of the equipment.

Administrator – means the Administrator in the pressure equipment discipline appointed under the Act. [PESR, 1(1)(b)]

Canadian Registration Number (CRN) – is the acronym for Canadian Registration Number and means a design registration number issued by a pressure equipment jurisdiction in Canada per the requirements of CSA B51 Code. CRNs are issued for boiler, pressure vessel or fitting designs. A boiler, pressure vessel or fitting that is planned to be used in Alberta must have a CRN issued by ABSA.

Note: In addition to CRNs, there are other types of provincial design registrations in Alberta. Alberta provincial design registration numbers (not CRNs) are issued for pressure piping design registrations (PP numbers), special design registrations (ALDs), or welding procedures (WPs).

Credible overpressure scenario – means an overpressure scenario that is foreseeable and which has not been demonstrated to be non-credible in accordance with one of the methods listed in section 3.1.2 of WRC 498.

Fired heater pressure coil – means the total fluid-retaining system with an internally insulated enclosure and header boxes of a petroleum or chemical plant direct-fired heater, including tubes, return bends, crossover piping, inlet and outlet headers, and manifolds. [PESR, 1(1)(m)]

Integrity management system (IMS) – means a system for ensuring that pressure equipment is designed, constructed, installed, operated, maintained, and decommissioned in accordance with the Pressure Equipment Safety Regulation. [PESR 1(1)(s)]

Intervening valve[2] – a valve which has the potential to block flow along the relief path of pressure equipment, due to being placed either between the protected equipment and its relief device, or between the relief device outlet and the point at which vented fluids are released to the atmosphere.

Maximum allowable working pressure (MAWP)[3] – means the pressure authorized on the design registration or a lesser pressure as indicated on the manufacturer's data report. [PESR 1(1)(v)]

Maximum upset pressure – for a specific pressure equipment component that is protected other than by a pressure relief device, means the maximum pressure condition that the component could foreseeably be exposed to in any credible overpressure scenario identified by an overpressure risk assessment.

Mechanical locking elements – means elements that when installed on a stop valve, provide a physical barrier to the operation of the stop valve, such that the stop valve is not capable of being operated unless a deliberate action is taken to remove or disable the element. Such elements, when used in combination with administrative controls, ensure that the equipment overpressure protection is not compromised by personnel actions. Examples of mechanical locking elements include locks (with or without chains) on the stop valve hand wheels, levers, or actuators, and plastic or metal straps (car seals) that are secured to the valve in such a way that the strap must be broken to operate the stop valve. [Sec XIII, App. B, Par. B-3]

Overpressure protection by system design (OPPSD) [4] – protection of pressure equipment from overpressure by means other than by use of a pressure relief valve, rupture disc, or pin device.

Overpressure risk assessment – means a risk assessment in which qualified personnel consider all credible overpressure scenarios with respect to each pressure equipment component within its scope, and determine either a required set pressure and capacity rating for a relief device, or a maximum upset pressure for which the component needs to be designed.

Owner – includes a lessee, a person in charge, a person who has care and control and a person who holds out that they have the powers and authority of ownership or who for the time being exercise the powers and authority of ownership [SCA 1(1)(v)]

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[2] Intervening valves were referred to as *controlled valves* in the previous edition of this document. Use of the term *controlled valve* has been discontinued in order to avoid potential confusion between *controlled valves*, which are valves that are subject to administrative *controls* in order to prevent their inadvertent operation, and *control valves*, which are valves used to *control* the flow of fluid in process applications.

[3] As defined herein and in the Pressure Equipment Safety Regulation, this term is equivalent to the term 'design pressure' with respect to pressure piping, as used in the pressure piping codes.

[4] In the original edition of this document, 'OPPSD' was used to refer only to overpressure protection by specific predefined methods; in this revised edition, it includes what was previously referred to as 'Other Methods of Overpressure Protection' (OMOPP).

Pin device – is a non-reclosing pressure relief device meeting the requirements of ASME Section VIII-1 which is actuated by inlet static or differential pressure and designed to function by the activation of a load-bearing section of a pin that supports a pressure-containing member.

Pressure equipment integrity management (PEIM) system – a PEIM system is a quality management system that meets the requirements of AB-512 and for which the owner holds a Certificate of Authorization Permit in accordance with Section 11(3) of the Pressure Equipment Safety Regulation.

Pressure relief device – means a pressure relief valve, rupture disc device, or pin device that meets the requirements of the ASME code.

Pressure relief valve – means a safety valve, relief valve, or safety relief valve that meets the requirements of the ASME Code.

Professional engineer – as defined in the Pressure Equipment Safety Regulation, a person who is properly registered as a professional engineer and authorized to practice engineering in any province or territory of Canada or in any state of the United States.

Public occupancy – means any facility where members of the general public are likely to be present. This would include schools, offices, shopping malls, stores, arenas, pools, restaurants, hotels, etc.

Rupture disc device – is a non-reclosing pressure relief device meeting the requirements of ASME Section VIII-1 which is actuated by inlet static pressure and designed to function by the bursting of a pressure-containing disc.

Safety-critical element – is an equipment or process parameter that can have an impact on the maximum upset pressure determined by an overpressure risk assessment, or another impact on overpressure protection of pressure equipment; may include equipment or instrument maintenance requirements, instrument redundancy, assumed fluid properties such as specific gravity or viscosity, power sources, mechanical components such as pump impellers, etc.

Technical justification – justification for an action or proposal that is based on the technical requirements of the intended application or on safety or environmental concerns.

Thermal liquid heating system – means one or more thermal liquid heaters, and any connected piping system or vessel, in which a thermal liquid that is not pressurized by the application of a heat source is used as the heat transfer medium. [PESR 1(1)(ff.1)]

Thermal relief – means protection against the phenomenon whereby an incompressible fluid contained in a fixed-volume container is exposed to an increase in temperature, and the resulting thermal expansion of the fluid causes a disproportionately large increase in system pressure.

4.0 REFERENCE PUBLICATIONS

The following documents are referred to in this document, and are listed here for reference only. These documents may be amended from time to time; please refer to the latest applicable edition of the referred documents, except in cases where a specific edition is explicitly referred to in later sections of this document.

AB-512: Owner-User Pressure Equipment Integrity Management Requirements, Alberta Boilers Safety Association

AB-513: Pressure Equipment Repair and Alteration Requirements, Alberta Boilers Safety Association

API Standard 521: Pressure-relieving and Depressuring Systems, American Petroleum Institute

API RP 585: Pressure Equipment Integrity Incident Investigation, American Petroleum Institute

ASME B31.1: Power Piping, The American Society of Mechanical Engineers

ASME B31.3: Process Piping, The American Society of Mechanical Engineers

ASME Boiler and Pressure Vessel Code / Section I: Rules of Construction for Power Boilers, The American Society of Mechanical Engineers

ASME Boiler and Pressure Vessel Code / Section IV: Rules of Construction of Heating Boilers, The American Society of Mechanical Engineers

ASME Boiler and Pressure Vessel Code / Section VIII, Division 1: Rules for Construction for Pressure Vessels, The American Society of Mechanical Engineers

ASME Boiler and Pressure Vessel Code / Section XIII: Rules for Overpressure Protection, The American Society of Mechanical Engineers

CSA B51:19: Boiler, pressure vessel, and pressure piping code, Canadian Standards Association, operating as CSA Group

CSA Z662:19: Oil and gas pipeline systems, Canadian Standards Association, operating as CSA Group

Directive 077: Pipelines – Requirements and Reference Tools, Alberta Energy Regulator

Information Bulletin IB10-006 Rev. 3: Interpretation: Steam Pipelines, Alberta Boilers Safety Association

Information Bulletin IB18-004: Interpretation: Pressure Equipment Safety Regulation Section 35: Reporting Unsafe Conditions, Accidents and Fires, Alberta Boilers Safety Association

Safety Codes Act: Revised Statutes of Alberta 2000, Chapter S-1, Province of Alberta

Safety Codes Act / Pressure Equipment Exemption Order (AR 56/2006), Province of Alberta

Safety Codes Act / Pressure Equipment Safety Regulation (AR 49/2006), Province of Alberta

WRC Bulletin 498: Guidance on the Application of Code Case 2211— Overpressure Protection by Systems Design, Welding Research Council

5.0 OVERPRESSURE RISK ASSESSMENTS

Prior to placing pressure equipment into service which is not protected from all overpressure scenarios only by means of pressure relief valves, an Owner shall undertake an overpressure risk assessment, in which one or more persons who are familiar with the equipment and with the associated process and experienced in process hazard analysis techniques, shall identify all credible overpressure scenarios, and shall determine that the equipment will be adequately protected from each.

5.1 Overpressure Scenarios

5.1.1 Scenarios to Be Considered

An overpressure scenario shall be considered to be credible and shall be evaluated if that scenario could foreseeably lead to an overpressure condition of the equipment, and it has not been demonstrated to be *'non-credible'* in accordance with one of the methods listed in section 3.1.2 of WRC 498.

Although selection and analysis of overpressure scenarios is dependent on the expertise of the persons conducting the overpressure risk assessment, API 521 provides guidance on potential causes of overpressure. Some potential sources of overpressure that may need to be considered include startup, shutdown, operating, and upset conditions; scenarios involving fire or operator error; and equipment or instrumentation failure such as valve failure, fail-open of a parallel pump, plugged filters, saturated adsorber trays, etc.

5.1.1.1 Special Scenario Requirement for Heat Exchangers

A shell and tube heat exchanger which relies on overpressure protection by system design shall give consideration to a scenario involving tube rupture and the resulting leakage of pressurized fluid from a higher pressure chamber to a lower pressure chamber. In considering this scenario, the full maximum allowable working pressure (MAWP) of the higher-pressure side shall be used as the maximum upset pressure for the lower-pressure side. The use of *'corrected hydrotest pressure'* discussed by paragraph 4.4.14.2.1 of API 521 (previously known as the *'10/13 Rule'* or the *'2/3 Rule'*) is not acceptable for use when determining the maximum upset pressure or required relief device set pressure for a heat exchanger.

5.1.1.2 Mitigation by Active Operator Intervention

Active operator intervention is generally not permitted to be used to mitigate any overpressure scenario, but may be considered on a case-by-case basis.

When active operator intervention is contemplated to mitigate any overpressure scenario, a design survey submission may be made for case-by-case consideration. The overpressure risk assessment shall include a summary statement made by the Owner that certifies that all of the requirements of API 521 clause 4.2.5 have been met, and which meets the following additional requirements.

The summary statement shall provide brief descriptions of the following:

- The scenario which is to be mitigated by operator intervention, and its expected frequency of occurrence
- The alarm or abnormal event that will alert the operator to intervene
- The intervention actions required to be taken by the operator, and an indication of the amount of time the operator will have to take the actions
- The consequences of failure to mitigate the scenario by operator intervention

The summary statement shall indicate the Owner's commitment to establish requirements in their integrity management system to train operators to recognize and act upon the scenario to be mitigated, and shall include a brief description of the training required for an operator to recognize and act upon the alarm or abnormal event, and an indication of the frequency with which that training will be repeated.

Any such summary statements are required to be submitted as a part of the overpressure risk assessment summary described in section 5.2.2 below.

In addition to the summary statement, an assessment of the probability of operator intervention failure shall include estimates of the quantitative probabilities of:

- The alarm successfully actuating, or of the abnormal event presenting in the expected (recognizable) fashion

- The alarm or abnormal event being recognized by the operator[5]
- The operator successfully undertaking the required mitigating actions within the required amount of time
- The mitigating actions undertaken by the operator successfully mitigating the overpressure scenario

The resulting probability of failure of operator intervention shall be calculated based on at least the above-listed factors, and the co-occurrence of the initiating scenario and of operator intervention failure shall be evaluated as described below for co-occurrence of scenarios.

The above requirements for operator intervention do not apply for the temporary operation of an intervening valve as provided for by ASME Section XIII, Mandatory Appendix B, paragraph B-7, if the requirements of this document are met.

5.1.1.3 Maximum Upset Pressure of a Connected CSA Z662 Line

If pressure equipment relies on the overpressure protection of a CSA Z662 pipeline which is protected from overpressure in accordance with CSA Z662 clause 4.18, then the maximum upset pressure used for the pressure equipment shall include the 10% overpressure that is permitted by CSA Z662 clause 4.18.1.2.

5.1.2 Consideration for Co-Occurrence of Scenarios

Co-occurrence of any set of overpressure scenarios shall be considered as a separate scenario:

- if their random co-occurrence meets the definition of a credible scenario, given the anticipated frequencies and durations of the independent random events; *or,*
- if their co-occurrence has a potential common cause (e.g., power failure) which itself meets the definition of a credible scenario.

5.1.3 Outcome of Scenario Evaluation

For each pressure equipment component, the overpressure risk assessment shall consider the effects of each credible overpressure scenario, and shall conclude either:

[5] An estimate of the probability of an operator recognizing a scenario shall consider the frequency at which the operator's attention is drawn to the potential for a scenario to occur through training or other means, and the operator's expected perception of the likelihood of the scenario occurring. It is cautioned that although unlikely scenarios seem to present a lesser danger due to their decreased frequency, they are less likely to be recognized when they do occur.

- that the equipment will be protected by a pressure relief valve, rupture disc device, or pin device, and establish a required set pressure and minimum capacity rating for that device; *or*,
- that there are other specific means by which the equipment will be protected, and specify the maximum upset pressure that could foreseeably be developed in the equipment under that scenario.

5.2 Documentation of the Overpressure Risk Assessment

If the overpressure risk assessment indicates that any equipment will be protected by any means other than by a pressure relief valve, then the overpressure risk assessment shall be documented to the extent required to demonstrate that all requirements of this document were met and to demonstrate that its contributors were adequately qualified and duly diligent in undertaking the assessment.

The risk assessment documentation shall be kept by the Owner in a manner that will allow it to be accessible for the life of the equipment that it pertains to, and shall be made available to a safety codes officer upon request.

5.2.1 Supplementary Documentation Requirement for Vessels

When a pressure vessel is to be protected from overpressure by any means other than by a pressure relief valve, rupture disc, or pin device, then the overpressure risk assessment documentation shall include the documentation described by ASME Section XIII subparagraph 13.2(b) or 13.3(f), as applicable.

It is acknowledged that manufacturers of ASME Section VIII-1 pressure vessels sometimes do not mark the Manufacturer's Data Report (MDR) as described by paragraph 13.2 of ASME Section XIII due to lack of information about overpressure protection; it is thus acceptable for a pressure vessel's data report not to be marked as described by this subparagraph.

5.2.2 Overpressure Risk Assessment Summary

When an overpressure risk assessment summary is submitted as a part of a pressure piping design submission, it shall be prepared at the time the risk assessment is completed, and shall include:

- A list of individual(s) who participated in the assessment, including for each individual, their job title, any credentials they have (P.Eng., etc.), and the name of their employer.[6]

[6] Additional information about the individuals who participated in the assessment may be required to be kept on file by the Owner in order to meet the general documentation requirements of section 5.2.

- A brief description of the methodology used for the analysis
- For each pressure equipment component, identification of the overpressure scenario that was determined to govern, and either the required relieving pressure and capacity rating if the component is to be relieved from overpressure by means of a pressure relief valve, rupture disc, or pin device; or the component's maximum upset pressure if it is to be protected by other means
- A list of all overpressure scenarios considered and an indication of any scenarios that were dismissed as non-credible
- Justification for the exclusion of any scenarios that were considered or which may typically be considered for similar applications, but were determined to not be credible
- In cases where separate methods of overpressure protection are used for various overpressure scenarios, an indication of which method is relied upon for each scenario
- A list of any overpressure scenarios which rely on operator intervention as described by 5.1.1.2 above, and any associated summary statements required by that section
- An indication of any safety-critical elements or other factors that were considered to mitigate any given overpressure scenario, either by reducing its maximum upset pressure or by making it not reasonably foreseeable or otherwise not credible
- A summary of any other important results and conclusions obtained from the assessment

The summary shall be prepared as a controlled document with an assigned document number and revision level, and shall be authenticated by a professional engineer and signed by an authorized representative of the Owner who participated in the assessment.

5.3 Revalidation of an Overpressure Risk Assessment

When an overpressure risk assessment is required to be revalidated, personnel who are qualified to undertake such an assessment shall review and accept responsibility for it with consideration of any changes made. Their review and acceptance shall be documented in a manner acceptable to the Owner.

6.0 METHODS OF OVERPRESSURE PROTECTION

Pressure equipment shall be protected from all credible overpressure scenarios identified by the overpressure risk assessment prior to being placed into service. For each scenario, overpressure protection shall be provided by at least one of the methods described in sections 6.1, 6.2, and 6.3 of this document.

6.0.1 Limitation to Protection by Pressure Relief Valves

Equipment meeting the following criteria shall be protected from all credible overpressure scenarios by means of pressure relief valves in accordance with section 6.1, and intervening valves are not permitted:

- Equipment constructed to ASME Section I or Section IV
- ASME B31.1 boiler external piping (BEP)
- ASME Section VIII-1 equipment subject to subparagraphs UW-2(c)[7] or UW-2(d)[8]
- Fired heater pressure coils
- Thermal liquid heating systems
- Pressure equipment in public occupancy locations

6.0.2 Limitation for Protection from Certain Chemical Reactions

Systems which are not self-limiting with respect to pressure resulting from chemical reactions shall be protected from all credible overpressure scenarios by means of pressure relief valves or rupture disc or pin devices in accordance with section 6.1.

6.0.3 Special Consideration for Adequately Vented Discharge Piping Systems[9]

A discharge piping system, including any intermediate pressure vessels[10], which meets the description for ‘adequately vented equipment’ listed as Case 3 in section 6.2.2 of this document and which meets the requirements of CSA B51 clause 12.2.2.7 by virtue of meeting its requirements for maintaining cross-sectional areas, is protected from overpressure in a manner acceptable to the Administrator in accordance

[7] UW-2(c) applies to “unfired steam boilers with design pressures exceeding 50 psi (343 kPa)”
[8] UW-2(d) applies to “pressure vessels or parts subject to direct firing”
[9] See subsection 2(2)(d) of the Pressure Equipment Exemption Order for an exemption for vented pressure equipment having a maximum allowable working pressure not exceeding 103 kPa, and meeting the requirements therein.
[10] Intermediate pressure vessels (e.g. flare knock-out drums) can be included in an adequately vented discharge piping system if the combined system meets the description of ‘adequately vented equipment’ with inclusion of the vessel. The cross-sectional areas to be considered for the vessel are the areas of its inlets and outlets, rather than the cross-sectional area of the vessel itself.

with subsection 38(1)(b) of the Pressure Equipment Safety Regulation when the following requirements are met:[11]

- An overpressure risk assessment meeting the requirements of 5.0 Overpressure Risk Assessments shall be conducted with respect to the equipment.
- The Owner shall establish a management of change (MOC) program which will require revision or revalidation of the overpressure risk assessment if changes are made which may affect the equipment in question.
- The equipment shall be represented in a pressure piping design submission which indicates that it meets the requirements of CSA B51 clause 12.2.2.7, that the cross-sectional area of the discharge piping is maintained to the point of atmospheric discharge, and that the requirements for this special consideration have been met.

6.1 Protection by Pressure Relief Valves, Rupture Disc, and Pin Devices

When pressure relief valves meeting the requirements of the ASME code are relied upon for protection of pressure equipment from one or more of the credible scenarios identified by the overpressure risk assessment, they are acceptable for use in accordance with subsection 38(1)(a) of the Pressure Equipment Safety Regulation, and the requirements of section 6.1 of this document shall be met.

When rupture disc or pin devices meeting the requirements of the ASME code are relied upon for protection from one or more of the credible scenarios identified by the overpressure risk assessment, they are acceptable for use in accordance with subsection 38(1)(b) of the Pressure Equipment Safety Regulation when the requirements of section 6.1 of this document are met.

Overpressure protection shall be provided for each remaining scenario, in accordance with section 6.2 or 6.3 of this document.

6.1.1 Integrity Management System Requirements

Owners of pressure equipment which is protected from overpressure by means of pressure relief valves, rupture disc, or pin devices shall establish an integrity management system as required by subsection 37(b) of the Pressure Equipment Safety Regulation.

If intervening valves are used, then the integrity management system shall describe the administrative controls which govern their operation.

[11] Adequately vented equipment which does not meet the cross-sectional area condition given in CSA B51 clause 12.2.2.7 can be considered for acceptance in accordance with 6.2 Overpressure Protection by System Design (OPPSD): Listed Cases, Case 3, in which case it is required to meet the requirements of that clause for an engineering analysis.

6.1.2 Overpressure Protection System Design Requirements

6.1.2.1 Required Relief Device Set Pressure and Capacity Rating

Pressure relief valves and rupture disc and pin devices shall be selected with a set pressure and capacity rating as prescribed by any required overpressure risk assessment and with consideration of the following regulatory requirements:

As required by subsection 38(2) of the Pressure Equipment Safety Regulation, a pressure relief device must be set to open before the pressure in the equipment exceeds its maximum allowable working pressure. Consideration shall not be given to the overpressure allowances permitted by some codes of construction in determining the set pressure of the relief device, such as those given in ASME Section VIII-1 subparagraph UG-154(e)(2), CSA Z662 clause 4.18.1.2, or ASME B31.3, paragraph 302.2.4.[12]

As required by subsection 38(3) of the Pressure Equipment Safety Regulation, a pressure relief device must be sized with an adequate capacity and vented such that the maximum pressure in the protected equipment will not exceed any prescribed limit of overpressure given in the applicable code of construction while the device is operating to relieve pressure, such as the limits given in subparagraph UG-153(a) of ASME Section VIII-1 and subparagraph 322.6.3(c) of ASME B31.3.

If multiple pressure relief devices are used in series, such as in the case where a rupture disc device is used in series with a pressure relief valve to protect the relief valve from exposure to the service fluid, then the above requirements shall be applied with consideration of the combination of these relief devices as a single relief device.

Consideration shall be given to the effects of back pressure on the effective set pressure and capacity rating of a pressure relief valve, rupture disc, or pin device.

6.1.2.2 Requirements for Intervening Valves

The following requirements shall be met with respect to the use of intervening valves:

[12] Since the Pressure Equipment Safety Regulation requires that a relief device be set to open before pressure equipment reaches its maximum allowable working pressure, the provision of ASME B31.3 for pressure and temperature variations does not apply, except *during operation* of the device.

- Intervening valves shall have mechanical locking elements meeting the definition of this term given in section 3.0, ‘Definitions’.
- Intervening valves shall be subject to administrative controls meeting the definition of this term given in section 3.0, ‘Definitions’, and which are described in the Owner’s integrity management system. Administrative controls shall include, as a minimum, documentation of operation and maintenance procedures, and training requirements for operation and maintenance personnel.
- If registration of the equipment as a pressure piping system is required, any intervening valves shall be represented on the submitted P&IDs with a clear indication that they are ‘car-sealed open’ (‘CSO’) or otherwise controlled to prevent their inadvertent operation.

Nonmandatory Appendix B of ASME Section XIII provides extensive additional information and non-mandatory guidance for the use of intervening valves.

6.1.2.3 Pressure Relief Valve Location for Fired Equipment

Any equipment subject to direct or indirect firing which is required by section 6.0 to be protected only by means of a pressure relief valve shall have that relief valve placed directly at or as close as is practicable to the equipment outlet.

6.1.2.4 Technical Justification Required for Rupture Disc and Pin Devices

Justification for the use of a rupture disc or pin device shall relate its use to safety, process, or environmental concerns.

6.1.3 Design Submission Requirements

Any equipment protected from overpressure by means of a pressure relief valve or by means of a rupture disc or pin device shall be represented in a pressure piping design submission, unless such a submission is exempt from registration in accordance with subsection 14(6) of the Pressure Equipment Safety Regulation.[13]

[13] Subsection 14(6) of the Pressure Equipment Safety Regulation provides an exemption from registration for a pressure piping system having an aggregate internal volume not exceeding 500 litres.

6.1.3.1 List of Pressure Relief Devices

As required by subsection 16(1)(c) of the Pressure Equipment Safety Regulation, any required submission for design registration of a piping system shall include a list of pressure relief devices.

As provided for by subsections 16(1)(c) and 16(1)(i) of the regulation, the list shall include the following minimum information pertaining to each device:

- Tag number or other device identification
- Type of device (pressure relief valve, rupture disc device, or pin device)
- Device set pressure
- Document number for the included P&ID or other layout drawing where the device is shown
- A list of pressure piping lines and other pressure equipment protected by the device[14]

The list shall be provided on a controlled document with assigned document number and revision level and shall be stamped by a professional engineer as required by subsection 16(2) of the regulation.

6.1.3.2 Additional Documentation for Rupture Disc and Pin Devices

As provided for by subsection 16(1)(i), any required submission for design registration of a piping system which makes use of rupture disc or pin devices for overpressure protection shall include the following additional documentation pertaining to such devices:

- Identification of the technical justification for use of the devices in lieu of relief valves
- A letter from the Owner specifically accepting the use of the devices
- A copy of the overpressure risk assessment summary described in section 5.2.2

6.2 Overpressure Protection by System Design (OPPSD): Listed Cases

When overpressure protection by system design (OPPSD) falling within the scope of one of the specifically permitted cases listed in section 6.2.2 below is

[14] It is acceptable to identify a pressure relief valve which protects each pressure piping line on the submitted line designation table in lieu of listing the lines protected by each device on the submitted list of pressure relief devices.

relied upon for protection of pressure equipment from one or more of the credible scenarios identified by the overpressure risk assessment, the requirements of section 6.2 of this document shall be met.

Overpressure protection shall be provided for each remaining scenario, in accordance with section 6.1 or 6.3 of this document.

6.2.1 Integrity Management System Requirements

Owners of pressure equipment which relies on overpressure protection by system design (OPPSD) for protection from any credible overpressure scenario shall establish an integrity management system as required by subsection 37(b) of the Pressure Equipment Safety Regulation.[15]

The integrity management system shall contain all of the elements described in this section.

6.2.1.1 System Documentation and Operation / Maintenance Procedures

The integrity management system shall:

- Establish a system for documenting the extent of equipment protected by OPPSD
- Establish a system for documenting, monitoring, and maintaining any additional equipment, instrumentation, and other safety-critical elements that are relied upon for protection of the equipment by OPPSD
- Establish any inspection and maintenance activities that are required to ensure the continued integrity of the overpressure protection, including required intervals
- Specify responsibilities for operations, maintenance, inspection, and engineering staff related to OPPSD
- Ensure that the Owner's operating and maintenance procedures and associated documentation are adequate to ensure that:
  - Operators and maintenance personnel are aware of systems that rely on OPPSD[16]
  - Maintenance procedures are adequately detailed to ensure that all portions of the OPPSD systems will continue to function as required
  - Changes to safe operating limits and changes during maintenance will not be permitted to OPPSD systems

[15] Establishment of a PEIMS in accordance with AB-512 is *mandatory* in the case that the equipment protected by OPPSD includes any pressure vessel; see section 6.2.1.4 below.

[16] It is particularly important to stress to operations and maintenance personnel that the equipment is not protected from overpressure by a relief valve or similar pressure relief device.

without following the requirements of the established management of change program
- Records of maintenance activities are created and maintained
- A process for safe shutdown of plant equipment and/or reduction of pressure is established, in the event that equipment operating pressure exceeds the safe operating limits established in accordance with subsection 37(e) of the Pressure Equipment Safety Regulation

6.2.1.2 Establishment of a Monitoring Program

A monitoring program shall be established which is capable of providing assurance that the maximum pressure the equipment has been exposed to in operation has remained below its maximum allowable working pressure.

At a minimum, the monitoring program must:

- Provide for continuous recording of the pressure conditions adequate to determine whether the operating pressure of the monitored equipment goes above the maximum upset pressure
- Provide for maintenance and retrievability of recorded conditions
- Establish requirements for periodic calibration, maintenance, and testing of monitoring devices and instrumentation, and for keeping records of these activities
- Be designed to duly notify appropriate personnel in the event that the operating pressure in any of the monitored equipment exceeds its maximum permitted pressure
- Be acceptable to ABSA for the purpose for which it is intended
- Establish a system for investigating and reporting unsafe overpressure conditions in accordance with Annex C, ‘Overpressure Reporting Requirements’

6.2.1.3 Establishment of a Management of Change (MOC) Program

A management of change program shall be established which is capable of ensuring that any change that is proposed to be made to the equipment or to any safety-critical element affecting the equipment, will be reviewed by qualified individuals prior to its implementation.

At a minimum, the management of change program must:

- Require one or more individuals deemed competent by the Owner to undertake and document a thorough analysis of the proposed change, evaluating for safety and for its effect on the overpressure protection of any pressure equipment that may be affected by it
- Require revision or revalidation of the overpressure risk assessment in accordance with section 5.0, ‘Overpressure Risk Assessments’
- Ensure that the requirements of Annex B, ‘Alterations and Modifications’ and any other applicable requirements of this document are met with respect to the change
- Require that records of the management of change analysis be signed by the qualified individuals who took part in it, and kept by the Owner
- Provide for follow-up to ensure that all required actions that are identified by the management of change analysis are undertaken
- Establish a process for change of ownership that meets the requirements of Annex E, ‘Change of Equipment Ownership’

6.2.1.4 Supplementary Requirements for Vessels

If the equipment that relies on overpressure protection by system design includes any pressure vessel, then the integrity management system must be established as an Owner-User pressure equipment integrity management system (PEIMS) which meets the requirements of AB-512.

In addition to revalidation of the overpressure risk assessment when changes are made in accordance with the management of change program, the integrity management system shall establish a regular interval at which the overpressure risk assessment shall be reviewed and revalidated, even when no changes have been proposed.

6.2.2 System Design Requirements

6.2.2.1 Permitted Cases

Use of section 6.2 is limited to overpressure protection by system design (OPPSD) in which system operating pressure is limited in one of the following ways:

1. Centrifugal Pumps or Compressors:[17] the limiting source of pressure in the equipment is a non-positive-displacement pump or compressor, which for the installed configuration, is not physically capable of producing a pressure higher than the maximum upset pressure identified in the overpressure risk assessment
2. SAGD Pressure Source: the limiting source of pressure in the equipment is pressure from steam-assisted gravity drainage (SAGD) piping from a well head, which in turn has its pressure limited by the use of a non-positive-displacement pump which for the installed configuration, is not physically capable of producing a pressure higher than the maximum upset pressure identified in the overpressure risk assessment
3. Adequately Vented Equipment: pressure equipment, such as an open flare line or discharge piping, which is vented to atmosphere with no potential sources of blockage, such that no combination of flow rate, fluid composition, and other factors could foreseeably produce a pressure higher than its maximum allowable working pressure
4. Connected CSA Z662 Line: pressure equipment is protected with a connected CSA Z662 line that itself is protected in accordance with clause 4.18 of CSA Z662, except that the maximum upset pressure used for design of the equipment must be 10% higher than the maximum operating pressure of that line[18]

6.2.2.2 Required Maximum Allowable Working Pressure

Each pressure equipment component shall have a maximum allowable working pressure (MAWP) at least equal to the maximum upset pressure specified by the overpressure risk assessment for that component.

The MAWP of a component may not be reduced below the determined maximum upset pressure to take advantage of the overpressure allowances permitted by ASME Section VIII-1 subparagraphs UG-153(a) or UG-154(e)(2), nor by CSA Z662 clause 4.18.1.2, nor for the occasional pressure / temperature variations permitted by ASME B31.3, paragraph 302.2.4.

[17] This permitted case applies exclusively to scenarios where system pressure is limited by the capability of a non-positive-displacement pump or compressor; it is not acceptable to rely on an automated control valve to similarly limit downstream system pressure.

[18] This 10% buffer is required because CSA Z662 clause 4.18.1.2 permits such a line's maximum operating pressure to be exceeded by 10%, which does not meet the requirements of subsection 38(2) of the Pressure Equipment Safety Regulation.

6.2.2.3 Supplementary Requirements for Section VIII-1 Vessels

Pressure vessels built to ASME Section VIII-1 which rely on overpressure protection by system design need to meet the applicable requirements of ASME Section XIII, Part 13.

6.2.2.4 Engineering Assessment for Adequately Vented Equipment

For pressure equipment which meets the description of 'adequately vented equipment' other than discharge piping meeting the requirements of section 6.0.3, an engineering assessment shall be provided as a part of the overpressure risk assessment, and shall demonstrate that no combination of flow rate, fluid composition, and other factors could foreseeably produce a pressure higher than the equipment's maximum allowable working pressure for any credible overpressure scenario.

6.2.3 Design Submission Requirements

Pressure equipment that is protected from one or more overpressure scenarios in accordance with section 6.2 shall be represented in a pressure piping design submission meeting the requirements of this section. If the equipment which relies on section 6.2 for overpressure protection includes any pressure vessel, then this pressure piping submission is required even if the piping system has an aggregate internal volume not greater than 500 liters, so that the method of overpressure protection can be considered for specific acceptance by the Administrator as required by subsection 38(1)(b) of the Pressure Equipment Safety Regulation.[19]

The proposed method of overpressure protection is acceptable for use in Alberta in accordance with subsection 38(1)(b) of the Pressure Equipment Safety Regulation (PESR) when it is acknowledged on the acceptance letter associated with that piping submission, or when such a piping submission is not required by the above paragraph and all of the requirements of section 6.2 of this document are met.

[19] When the aggregate internal volume of piping is not greater than 500 liters, and only piping but no pressure vessel relies on section 6.2 for overpressure protection, then the exemption from registration provided in subsection 14(6) of the Pressure Equipment Safety Regulation applies and a submission need not be made to Design Survey, but all other requirements of this document still apply.

6.2.3.1 Required Submission Contents

In addition to the documentation normally required to be submitted for registration of a piping system, the submission shall include the following, as provided for by subsection 16(1)(i) of the PESR:

1. **A statement from the Owner –** a representative authority from the Owner shall issue a signed statement which has the following elements and features:
   - A statement accepting the principles relied upon for OPPSD
   - A statement acknowledging the Owner's responsibility for OPPSD, and accepting the risks associated with it
   - A commitment to implement and maintain the required monitoring program
   - A commitment to implement the required integrity management system
2. **A copy of the overpressure risk assessment summary** – a copy of the overpressure risk assessment summary as described in 5.2.2 Overpressure Risk Assessment Summary, authenticated by a professional engineer and signed by the Owner's authorized representative
3. **A description of the monitoring program** – a description with details adequate for the design surveyor to determine that the monitoring program will meet the requirements of this document and is suited to its intended purpose
4. **A list of pressure piping system lines protected by OPPSD –** a detailed list of all pressure piping system lines which rely on OPPSD for protection from any overpressure scenario; for each line, this list shall include:
   - Line identification number or other identifying characteristic
   - Method of overpressure protection used, including an indication of the permitted 'case' type used in the case of overpressure protection by system design
   - Maximum upset pressure for the line specified by the overpressure risk assessment
   - Design pressure for the line
   - Indication that the line is in lethal service, if applicable
5. **A list of pressure vessels protected by OPPSD** – a detailed list of all pressure vessels which rely on OPPSD for protection from any overpressure scenario; for each vessel, this list shall include:
   - Vessel Canadian Registration Number (CRN)
   - Vessel serial number or other identifying characteristic
   - Maximum allowable working pressure (MAWP) for the vessel or for each pressure chamber

- Method of overpressure protection used, including an indication of the permitted ‘case’ type used in the case of overpressure protection by system design
- Maximum upset pressure for the vessel or for each pressure chamber, as specified by the overpressure risk assessment
- Indication that the vessel is in lethal service, if applicable

6.2.3.2 Supplementary Requirements for Vessels

Design submissions for systems containing pressure vessels which rely on OPPSD for protection from one or more overpressure scenarios shall meet the following additional requirements:

- The statement from the Owner described in item 1 above shall have an additional statement accepting the responsibilities described in paragraph UG-151 and subparagraph UG-152(a) of ASME Section VIII-1, and paragraph 13.2 of ASME Section XIII.
- Process and instrumentation diagrams (P&IDs) shall be submitted which show the vessels and all connected process and safety systems.

6.3 Overpressure Protection by System Design (OPPSD): Unlisted Cases

When overpressure protection by system design falling outside the scope of one of the specifically permitted cases listed in section 6.2.2 is relied upon for protection of pressure equipment from one or more of the credible overpressure scenarios identified by the overpressure risk assessment by either mitigating the scenario, or by actively relieving excess pressure, the requirements of section 6.3 of this document shall be met.

Overpressure protection shall be provided for each remaining scenario, in accordance with section 6.1 or 6.2 of this document.

6.3.0.1 Consideration on a Case-by-Case Basis

Approaches to overpressure protection provided for by section 6.3 are considered on a case-by-case basis depending on their technical merits and the level of safety achieved. If there is any doubt as to whether a given approach may be acceptable, then it is recommended that the designer or Owner contact ABSA Design Survey in advance to determine whether it is acceptable for use in Alberta, prior to relying on its acceptance.

It should be noted that the requirements presented herein are base requirements, and additional requirements may apply depending on the approach being proposed.

6.3.1 Integrity Management System Requirements

The Owner's integrity management system shall meet the requirements of 6.2.1 Integrity Management System Requirements, and shall incorporate any additional elements that are needed in order to ensure that the proposed method of overpressure protection will remain effective and safe.

6.3.2 System Design Requirements

6.3.2.1 Technical Justification Required

Justification for the use of the alternative method of overpressure protection shall be acceptable to the Owner, and shall relate its use to safety, process, or environmental concerns.

6.3.2.2 Required Maximum Allowable Working

The requirements given in section 6.2.2.2 of this document shall apply.

The means of overpressure protection shall mitigate the overpressure scenario which relies upon it, either by preventing excess pressure from building up, or by actively relieving excess pressure before the equipment reaches its maximum allowable working pressure.

6.3.2.3 Equivalent Safety to a Pressure Relief Valve

The means of overpressure protection shall be at least as safe as a pressure relief valve that is properly selected and suitable for the service.

In comparison to such a relief valve, an overpressure protection system which is required to actively function to provide pressure relief shall:

- Be at least as reliable, in terms of its probability of functioning on demand, *and*
- Be at least as effective at preventing overpressure when it functions

6.3.2.4 Supplementary Requirements for Vessels

The requirements given in section 6.2.3.2 of this document shall apply.

6.3.3 Design Submission Requirements

Pressure equipment that is protected from one or more overpressure scenarios in accordance with section 6.3 shall be represented in a pressure piping design submission meeting the requirements of this section. This is required in order for the method of overpressure protection to be considered for specific acceptance by the Administrator in accordance with subsection 38(1)(b) of the Pressure Equipment Safety Regulation, even if that piping system has an aggregate internal volume not greater than 500 liters and would otherwise have been considered exempt from registration requirements.

The proposed method of overpressure protection is acceptable for use in Alberta in accordance with subsection 38(1)(b) of the Pressure Equipment Safety Regulation when it is specifically acknowledged on the acceptance letter associated with that piping submission.

6.3.3.1 Required Submission Contents

In addition to the documentation normally required to be submitted for registration of a piping system and the additional items required by section 6.2.3 (including ‘Supplementary Requirements for Vessels’, if applicable), the design submission shall include the following, as provided for by subsection 16(1)(i) of the PESR:

- A written commitment by the Owner to implement any elements of the required integrity management system that are specifically incorporated for the proposed method of overpressure protection as required by section 6.3.1, and brief descriptions of those elements
- A brief description of the required technical justification, including a statement of acceptance by the Owner
- A detailed description of the proposed overpressure protection approach, adequate to demonstrate the required equivalent safety to a suitably selected pressure relief valve

It should be noted that depending on the complexity of the proposed approach of overpressure protection, the design surveyor may need to request additional information to determine whether it is suitable for registration, as provided for by subsection 16(1)(i) of the Pressure Equipment Safety Regulation.

ANNEX A: ALTERNATIVE APPROACHES TO THIS DOCUMENT

Although this document gives an indication of how overpressure protection can be achieved in a way that is acceptable to the Administrator in accordance with subsections 38(1)(a) and 38(1)(b) of the Pressure Equipment Safety Regulation, it is intended to suit a majority of general applications, but cannot be expected to suit all applications.

Submissions proposing overpressure protection by means which do not comply with this document in its entirety are considered on a case-by-case basis.

A-1 Statement of Variations from AB-525 Required

In the case that the general principles of this document are followed but individual variations are made with respect to one or more specific sections, a pressure piping submission is to be made with the information required by the applicable sections of this document, and is to be accompanied by a comprehensive ‘statement of variations’ which meets the requirements of this annex.

The statement of variations shall be clearly labeled "Statement of Variations from AB-525" and shall list all individual variations from this document. For each individual variation, it shall provide: [20]

- The specific section of this document from which the variation is made
- A short, plain-English description of the rule from which the variation is made
- A description of technical justification for the variation
- A proposal of how equivalent safety will be achieved

The statement of variations shall conclude with a clear statement that all other requirements of the applicable sections of this document have been met.

The statement of variations shall be prepared as a controlled document with an assigned document number and revision level, and shall be authenticated by a professional engineer and signed by the Owner’s authorized representative.

The proposed methods of overpressure protection are deemed acceptable to the Administrator in accordance with subsection 38(1)(b) of the Pressure Equipment Safety Regulation despite the described variations only when the statement of variations is accepted and specifically acknowledged on the acceptance letter associated with that piping submission.

[20] The required information may be provided as one or more tables, in point format, in paragraphs, or in any other suitable format, as long as the required information is clearly associated with each individual variation.

A-2 Alternative Approaches

This document is intended to primarily provide guidance for common overpressure protection cases that are acceptable to the Administrator, and to provide a starting point for reasonable variations from those cases. It should be noted that if the rules and guidance provided herein do not suit the Owner's overpressure protection situation or if there are other special circumstances, it is possible for alternative means of overpressure protection to be specifically accepted in accordance with subsection 38(1)(b) of the Pressure Equipment Safety Regulation on a case-by-case basis.

A-3 Variance Required for Variations from Regulated Requirements

It is not possible to vary from regulated requirements by registration of a piping system design which describes the proposed variation. In such cases, an application for a variance which makes an effective argument for equivalent safety must be made to the Administrator in accordance with subsection 38(1) of the Safety Codes Act.

ANNEX B: ALTERATIONS AND MODIFICATIONS

This annex presents requirements for changes to existing equipment, and for additions and modifications to existing equipment, in cases where any pressure vessel or pressure piping system will rely on overpressure protection by means other than by a pressure relief valve after that change is complete.

B-1 Increase in Maximum Upset Pressure

If upon any reassessment of the overpressure risk assessment, a maximum upset pressure is determined for a pressure equipment component which is above that component's maximum allowable working pressure, then that pressure equipment component shall be subjected to an alteration in accordance with AB-513 as required to suit the new maximum upset pressure, or alternatively the component may be replaced.[21] In the case of piping, the line designation table associated with the piping system registration shall be revised to reflect the required increase of design pressure.

A new design registration application shall be made for modification of the existing piping system in order to reflect the changes to the overpressure risk assessment summary and the maximum allowable working pressures of the applicable components.

B-2 Change of Overpressure Protection Approach

If any change is made to the approach relied upon for protection of any pressure equipment component then all of the requirements of this document shall be met with respect to the new approach.

If the change in overpressure protection approach is to an approach other than protection by a pressure relief valve, then a new design registration application shall be made for modification of the existing piping system in order to meet the requirements of this document relating to design submissions for the new overpressure protection approach.

B-3 Additions and Modifications to Pressure Equipment

When an addition or modification is made to any piping system or other pressure equipment, all of the requirements of this document shall be met for both the existing equipment and for the addition or modification.

If any existing pressure equipment is relied upon for overpressure protection of the addition or modification, or may otherwise be affected by the addition or modification, then its overpressure risk assessment shall be revised or reaffirmed to reflect the system in the modified condition. A pressure piping design

[21] In the case of a vessel for which initial construction is not complete, the registered design for the vessel may in some cases be revised and the vessel then initially built to the revised design.

submission shall be made to represent the addition or modification, and any portion of the existing system that is relied upon for overpressure protection shall be represented in the submission. In particular:

- P&IDs shall be provided to show any portions of the existing system that are relied upon for overpressure protection of the addition or modification
- Any pressure relief devices in the existing system that are relied upon by the addition or modification shall be represented in the required list of pressure relief devices

If the existing equipment relies upon overpressure protection by system design and makes use of overpressure allowances given in the applicable codes of construction, as permitted only by paragraph D-2, 'Use of Overpressure Allowances by Legacy Equipment' in Annex D, then the required design submission shall clearly indicate that the overpressure allowance was used with respect to design of that legacy equipment, and the newly added or modified portion of the equipment shall have a maximum allowable working pressure which suits the full maximum upset pressure, without making use of the overpressure allowance permitted for the legacy equipment.

B-4 Exemption from Registration for Small-Volume Additions

When a pressure piping system is being added to or modified, and the addition or modification thereto has an aggregate internal volume not exceeding 500 liters, then design registration of the addition or modification is exempt[22] in accordance with subsection 14(6) of the Pressure Equipment Safety Regulation (PESR), only if any pressure vessel contained in the added or modified portion is adequately protected from all credible overpressure scenarios by means of a pressure relief valve, rupture disc, or pin device, or if the pressure vessel was already present and the addition or modification does not change the means by which it is protected.

If the added or modified portion contains any pressure vessel which relies on overpressure protection by any other means, then the addition or modification shall be represented in a pressure piping design submission as an addition to the existing system in order for that means of overpressure protection to be considered for specific acceptance by the Administrator as required by subsection 38(1)(b) of the PESR, even if that addition or modification has an aggregate internal volume not greater than 500 liters and would otherwise have been considered exempt from registration requirements. The proposed method of overpressure protection is acceptable to the Administrator if it is specifically acknowledged on the acceptance letter associated with that piping submission.

[22] This exemption is from design registration only; all other requirements of the Pressure Equipment Safety Regulation and of this document shall be met.

ANNEX C: OVERPRESSURE REPORTING REQUIREMENTS

C-1 Unsafe Overpressure Conditions

The following scenarios constitute “process operating conditions outside of acceptable limits and which require immediate action to shut down the equipment” as described by API RP 585, and therefore fall within the definition of ‘unsafe condition’ given in ABSA Information Bulletin IB18-004. Any such near-miss incidents are to be reported to the Administrator as required by that Information Bulletin and by subsection 35(1) of the Pressure Equipment Safety Regulation:

- A pressure equipment component which relies on a pressure relief valve, rupture disc, or pin device for overpressure protection is subjected to a pressure above its maximum allowable working pressure, and the relief device does not operate
- A pressure equipment component which relies on a pressure relief valve, rupture disc, or pin device for overpressure protection is subjected to a pressure during operation of the relief device which is above the limit specified by the component's code of construction for overpressure while the device is operating
- A pressure equipment component which relies on a method of overpressure protection other than a pressure relief valve, rupture disc, or pin device is subjected to a pressure greater than its maximum allowable working pressure[23]

C-2 Investigation and Follow-Up by Owner

The Owner shall conduct an investigation into the root cause of any unsafe condition described above, and shall revise the overpressure risk assessment and shall take any corrective actions necessary to prevent recurrence of the unsafe condition.

[23] Any limit permitted by a component's code of construction for overpressure while a relief device is operating may not be considered for equipment that is not protected by a pressure relief valve, rupture disc, or pin device, except as described under 'Use of Overpressure Allowances by Legacy Equipment' in Annex D, ‘Documentation of Existing Systems’.

ANNEX D: DOCUMENTATION OF EXISTING SYSTEMS

It is recognized that there is pressure equipment in Alberta that relies on overpressure protection by means other than by a relief valve which predates the 2013 publication of the original edition of this document. The requirement of the Pressure Equipment Safety Regulation that equipment be protected by a pressure relief valve meeting the ASME code or by other means acceptable to the Administrator predated that original publication.

Any pressure equipment which predates the 2013 publication of this document and which is protected by means other than by a pressure relief valve shall meet the requirements of this annex, if that means of overpressure protection has not previously been specifically accepted by the Administrator.[24]

It should be noted that the Owner is fully responsible for the operation of their own equipment and for compliance with the Safety Codes Act and associated regulations, and it is the Owner's responsibility to ensure that these requirements are met with respect to their existing equipment.

D-1 Identification of Overpressure Protection

The Owner shall undertake an overpressure risk assessment meeting the requirements of section 5.0 of this document, documenting the means by which each pressure equipment component is protected from each credible overpressure scenario.

D-2 Use of Overpressure Allowances by Legacy Equipment

If a system which predates the 2013 publication of the original edition of this document makes use of overpressure protection by system design and the maximum upset pressure for a pressure equipment component relies on the overpressure allowance of ASME B31.3 paragraph 302.2.4 or ASME Sec VIII-1 subparagraph UG-153(a), then this alternative selection of maximum upset pressure is permitted only for this legacy equipment, and the use of this overpressure allowance shall be clearly documented in the overpressure risk assessment.[25]

D-3 Update of Integrity Management System

The Owner's integrity management system shall be updated to meet all applicable requirements of this document with respect to the means by which overpressure protection is achieved.

[24] Such systems which comply with section 6.0, ‘Documentation of Existing OPPSD Systems’ of the original edition of this document are understood to have been accepted by the Administrator, and are not intended to be subject to this annex.

[25] The equipment may alternatively be rerated as described in ‘Increase in Maximum Upset Pressure’ in Annex B, ‘Alterations and Modifications’.

Upon regular scheduled audit of the Owner's integrity management system, at the auditor's discretion, the ABSA auditor / safety codes officer may accept the required updates pertaining to the existing means of overpressure protection without requiring a formal review and acceptance, or may require the Owner to make an application to ABSA for design registration of a piping system which contains the documentation required by this document for the applicable means of overpressure protection.

D-4 Acceptance of Overpressure Protection

Overpressure protection of that equipment is acceptable to the Administrator in accordance with subsection 38(1)(b) of the Pressure Equipment Safety Regulation when the ABSA auditor / safety codes officer specifically accepts the Owner's updated integrity management system, or when the Owner makes the required submission to ABSA for design registration of a piping system and that piping submission is accepted for registration and the alternate means of overpressure protection is specifically acknowledged on the associated acceptance letter.

D-5 Timeline for Implementation

It is expected that the requirements of this annex would have been implemented in the years following the initial publication of this document. In the event that they have not yet been met, the required overpressure risk assessment and updates to the Owner's integrity management system shall be completed on a schedule established by the Owner and acceptable to ABSA.

ANNEX E: CHANGE OF EQUIPMENT OWNERSHIP

When pressure equipment that is protected from overpressure by means other than by a pressure relief valve is subjected to a change of ownership, the following requirements shall be met in order for that overpressure protection to continue to be acceptable to the Administrator in accordance with subsection 38(1)(b):

- All of the requirements of subsections 36(1), 36(2), 36(3), and 36(4) of the Pressure Equipment Safety Regulation shall apply with respect to that equipment, regardless of whether the equipment is limited to the types of equipment listed therein as subject to those requirements.
- The new Owner shall implement an integrity management system that meets the requirements of this document for the types of overpressure protection that are relied upon.

REVISION LOG

Edition	Revision	Date	Description
1	0	2013-03-18	Initial Publication
2	0	2021-12-13	Major restructure / rewrite