

Inspection & Servicing Requirements for In-Service Pressure Equipment

AB-506

Edition 3, Revision 0 – Issued 2020-12-07

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FOREWORD

As provided for under Sections 39 and 41 of the Pressure Equipment Safety Regulation (PESR), the Administrator in the pressure equipment discipline has established that ABSA document AB-506 *“Inspection & Servicing Requirements for In-Service Pressure Equipment”* specifies requirements for integrity assessment and pressure relief valve servicing requirements that must be met for in-service pressure equipment.

The next reaffirmation of AB-506 is scheduled for 2025.

1.0 INTRODUCTION

This edition of AB-506 has been revised to reflect current industry-recognized good engineering practices and to address improvements that were identified in the application of the previous AB-506. It provides additional information to assist users in ensuring the safe operation of their pressure equipment.

Repairs and alterations are not covered in detail in AB-506. Requirements for post-construction repairs and alteration are covered in document *AB-513 Pressure Equipment Repair and Alteration Requirements*.

Where the term *in-service inspection* is used in AB-506 or the referenced publications, it shall mean integrity assessments of in-service equipment under the Pressure Equipment Safety Regulation (PESR).

Pressure equipment installed in Alberta, which is governed by the Safety Codes Act, covers a broad range of facilities, from major petrochemical plants, pulp mills, and power utilities, to small oil and gas processing plants, other industrial facilities, and public occupancy facilities such as schools, hospitals, offices, shopping malls, apartment complexes, and hotels. All owners must maintain an integrity assessment program, but the scope of the program that the owner must have in order to ensure the safe operation of pressure equipment will vary considerably. AB-506 is intended to provide a consistent approach for establishing inspection and servicing requirements that are effective and practical for all sectors.

The maximum thorough inspection intervals and pressure relief valve servicing intervals that can be assigned for specific types of pressure equipment are defined in a progressive grading system that was developed based on industry experience.

Provision is made to allow an owner-user, who has provided an appropriate risk-based inspection program, to use risk-based engineering assessments to determine the examination and inspection requirements, and inspection and servicing intervals for their pressure equipment.

AB-506 and other ABSA documents were developed with the close cooperation of owners and other stakeholders. Their input has been invaluable in compiling this document. In particular, we would like to acknowledge the following user groups that represent the industry sectors in Alberta:

- Alberta Refinery & Petrochemical Inspection Association (ARPIA)
- Upstream Chief Inspectors Association (UCIA)
- Contract Chief Inspectors Association (CCIA)
- Generation Utilities Advisory Committee (GUAC)
- Integrity Management Association Pulp Producers (IMAPP)

ABSA “AB-500” documents are reviewed periodically 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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The American Petroleum Institute (API) Codes and The National Board of Boiler and Pressure Vessel Inspectors (NB) publications are recognized and generally accepted as good engineering practice. Relevant information from these documents and other reference publications has therefore been considered in preparing AB-506.

The API and NB publications are not adopted directly as regulations in Alberta. The application of these standards is established through their reference in AB-506 and other policy documents that are issued by the Administrator.

Owners are cautioned to ensure that current versions of the relevant good engineering practices that are applicable to their specific industry sectors are used to supplement AB-506.

Note: ASME PTB-2-2009 *Guide to Life Cycle Management of Pressure Equipment Integrity* provides a summary of some of the more commonly used codes, standards, recommended practices, specifications and guidelines for maintaining the integrity of fixed pressure equipment in process plants and in general industrial use.

Section 4 lists the recognized publications that are referenced in AB-506.

2.0 DEFINITIONS AND ACRONYMS

For the purpose of AB-506, the following definitions apply. Relevant definitions from the Alberta Safety Codes Act and Pressure Equipment Safety Regulation are also included in this section.

ABSA – is the organization delegated by the Government of Alberta to administer the pressure equipment safety legislation under the Safety Codes Act.

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 Items Regulation (Alberta Regulation 16/2004)

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

Alberta Identification Number – means a number that is assigned by a safety codes officer to an item of pressure equipment that identifies the item in an information system under section 58 of the Act. [PESR, 1(1)(c)]. Often referred to as the “(A) Number”.

API – American Petroleum Institute

ASME – American Society of Mechanical Engineers

Certificate of Authorization Permit – means a permit issued pursuant to section 44 of the Act authorizing a person to carry out the activities stated on the certificate of authorization permit. [PESR 1(1)(g)].

Certificate of Inspection Permit – means a permit issued pursuant to section 44 of the Act authorizing the operation of a boiler, pressure vessel, fired-heater pressure coil or thermal liquid heating system as stated on the Certificate of Inspection Permit. [PESR 1(1)(h)].

Competent – in relation to a person, means possessing the appropriate qualifications, knowledge, skill and experience to perform the work safely and in accordance with the Act; [PESR 1(1)(i)]. Note: competent includes working in accordance with AB-506.

CSA – Canadian Standards Association [PESR 1(1)(j)]

Damage Mechanism – any type of deterioration encountered that can result in flaws or defects that can affect the integrity of pressure equipment; for example, corrosion, cracking, erosion, dents, and other mechanical, physical, or chemical impacts.

Equipment Record – includes design information, data reports, inspection plans, and integrity assessment, repair, and alteration records [PESR 1(1)(k)].

External Inspection – a visual inspection performed from the outside of pressure equipment to find conditions that could impact the equipment’s ability to maintain pressure integrity. It includes verification of the pressure relief devices.

Fitness-for-Service (FFS) – quantitative engineering evaluations that are performed to demonstrate the structural integrity of an in-service component that may contain a flaw or damage.

In-service – the period of time during the life of pressure equipment from the beginning of commissioning until disposal.

In-service Inspection – a widely used term to describe activities associated with an item of pressure equipment after it has been installed but before it has been

permanently retired from service. Where the term "in-service inspection" is used, it shall mean integrity assessment of pressure equipment under the Pressure Equipment Safety Regulation.

In-service Inspector (ISI) – means a person who holds the required Alberta in-service inspector certificate of competency, has the required competency, and is authorized by their employer to perform integrity assessments of pressure equipment under their employer’s quality management system Certificate of Authorization Permit.

Inspection Interval – the time period between thorough inspections.

Inspection Plan – a documented plan and strategy for detailing the scope, methods, and timing of the examination and inspection activities for pressure equipment.

Inspector – means an Owner's Inspector, an In-service Inspector, or and ABSA Safety Codes Officer, who is responsible for inspecting and certifying the item of pressure equipment.

Integrity Assessment – means an examination of an item of pressure equipment, related processes and documentation to determine its conformity to the requirements established by the Safety Codes Act and the regulations [PESR 1(1)(q)].

Integrity Assessment Organization – an organization that conducts integrity assessments on behalf of pressure equipment owners under a Certificate of Authorization Permit issued per PESR Section 11(2). Often referred to as an “inspection company”.

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)]

Integrity Operating Envelope/Window – established limits for process variables that can affect the integrity of the pressure equipment if the process operation deviates from the established limits for a predetermined amount of time.

Internal Inspection – an examination performed from the inside of an item of pressure equipment using visual and/or non-destructive techniques.

Liquefied Petroleum Gas (LPG) – means any material that is composed predominately of propane, propylene, normal butane, isobutane and butylene either by themselves or in any mixture of them. [PESR 1(1)(t)].

Manufacturer’s Data Report (MDR) – means a manufacturer’s data report as defined in CSA Standard B51, Boiler, Pressure Vessel and Pressure Piping Code. [PESR 1(1)(u)].

Maximum Allowable Working Pressure (MAWP) – means the pressure authorized on the design registration or a lesser pressure as indicated on the manufacturer’s data report. [PESR 1(1)(v)].

Management of Change (MOC) – a documented management system that ensures that any physical or operational changes to pressure equipment, changes to procedures, and standards, and organizational changes do not adversely affect the integrity of the pressure system.

NB – The National Board of Boiler and Pressure Vessel Inspectors

NBIC NB-23 – National Board Inspection Code

Non-destructive Examination (NDE) – any of a number of techniques that can be used to examine a material, component, or system without causing damage. Common techniques include visual, ultrasonic, magnetic particle, liquid penetrant, radiographic, and eddy-current testing.

On-stream Inspection – an inspection performed from the outside of a pressure vessel using NDE procedures to establish the suitability of the pressure boundary for continued service.

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

Owner-user – an owner that has provided an Integrity Management System in accordance with the Pressure Equipment Safety Regulation and has been issued a quality management system Certificate of Authorization Permit under PESR Section 11(3).

PESR – Pressure Equipment Safety Regulation (Alberta Regulation 49/2006)

Pressure Equipment – means a boiler, a fired-heater pressure coil, a thermal liquid heating system and other equipment designed to contain expansible fluid under pressure, including, but not limited to, pressure vessels, pressure piping systems and fittings, as defined in the regulations. [SCA 1(1)(y)].

Pressure Relief Device (PRD) – means a pressure relief valve, rupture disc device, or pin device. For pressure relief valve, rupture disc device, or pin device, see definitions from AB-525.

Pressure Relief Valve (PRV) – means a safety valve, relief valve, or safety relief valve. For safety valve, relief valve, or safety relief valve, see definitions from AB-525.

Process Plant – refers to petrochemical, refining, upstream and mid-stream oil and gas processing facilities, kraft pulp and paper mills, chemical plants, power generation plants and other equipment that is not classed as public occupancy equipment.

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

Quick-Actuating or Quick-Opening Closures are those that permit substantially faster access to the contents space of a pressure vessel than would be expected with a standard bolted flange connection (bolting through one or both flanges). Closures with swing bolts are not considered quick-actuating (or quick-opening). ASME Section VIII-1 UG-35.2 and UG-35.3.

Risk Based Inspection Program (RBIP) – a risk-based inspection program that has been reviewed and accepted by ABSA and is identified under the authorized scope of an owner-user’s Alberta Quality Management Certificate of Authorization Permit issued per section 11(3) of the PESR.

Safety Valve – is a pressure relief valve actuated by inlet static pressure and characterized by rapid opening or pop action.

Safety Relief Valve – is a pressure relief valve characterized by rapid opening or pop action, or by opening in proportion to the increase in pressure over the opening pressure, depending on application.

Thermal Liquid Heating System (TLHS) – 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)]

Thorough Inspection – a thorough assessment of an item of pressure equipment in order to determine its actual condition and the period of time it may be safely used until the next thorough inspection. It shall include the following:

- an internal inspection or equivalent on-stream inspection in accordance with API-510, and
- an assessment of the equipment’s maintenance and operating history, external assessments records, on-stream monitoring data, process deviations, incidents, design and process changes, and other issues that could affect the integrity of the pressure equipment.

Thorough RBI Assessment – a risk based assessment, performed in accordance with a RBIP, that is used to determine the inspection requirements and inspection and servicing intervals of pressure equipment.

Upstream Equipment – pressure equipment, that is associated with the drilling, production, gathering, and treatment of liquid petroleum, natural gas, and natural gas liquids.

3.0 GOVERNING LEGISLATION

Legislation that governs the pressure equipment discipline includes the following:

- Safety Codes Act
- 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 Items Regulation (Alberta Regulation 16/2004)

Note: The Pressure Equipment Safety Regulation User Guide (AB-516) provides valuable information to assist stakeholders in meeting the requirements of the Pressure Equipment Safety Regulation and in assuring the safe operation of their pressure equipment.

4.0 REFERENCED PUBLICATIONS

Documents issued by the Administrator

The AB-506 and the following referenced ABSA documents have been approved by the Administrator to establish the requirements that must be met for in-service pressure equipment under the PESR. The requirements documents shown below, and other ABSA requirements documents and guidelines are available on the www.absa.ca website.

[AB-505 Risk-Based Inspection Requirements for Pressure Equipment](#)

This document [MP1] specifies requirements for the development and use of risk-based inspection (RBI) to manage the integrity of the pressure equipment.

[AB-512 Owner-User Pressure Equipment Integrity Management Requirements](#)

This document specifies quality management system requirements for owners who are required to hold a Certificate of Authorization Permit under PESR Section 11(3).

[AB-513 Pressure Equipment Repair and Alteration Requirements](#)

This document specifies inspection and certification and other requirements for repairs and alterations to pressure equipment.

[AB-515 Quality Management System Requirements for Integrity Assessment Organizations](#)

This document specifies quality management system requirements for inspection organizations that are required to hold a Certificate of Authorization Permit for integrity assessment under PESR Section 11(2).

[AB-518 Pressure Piping Construction Requirements](#)

This document specifies quality management system requirements for companies that are required to hold a Certificate of Authorization Permit to construct pressure piping under the PESR.

[AB-526 In-Service Pressure Equipment Inspector Certification Requirements](#)

This document specifies the requirements for certification of in-service pressure equipment inspectors (ISI).

[AB-524 Pressure Relief Devices Requirements](#)

This document specifies the quality management system requirements for companies that are required to hold a Certificate of Authorization Permit to service, repair, set or seal a pressure relief valve.

[AB-535 Requirements for Alteration Design Registration Based on Fitness-for-Service](#)

This document specifies requirements that must be met for registration of a Fitness-for-Service alteration design.

[AB-537 Thermal Liquid Heating System \(TLHS\) Requirements](#)

This document specifies requirements pertaining to systems in which thermal liquid is not pressurized by the application of heat.

ABSA Guideline Documents

[AB-516 Pressure Equipment Safety Regulation User Guide](#)

[AB-527 Guidelines for the Competence Assessment of Inspectors](#)

Referenced Recognized Industry Publications

API 510 – *Pressure Vessel Inspection Code*

API 570 – *Piping Inspection Code*

API 571 – *Damage Mechanisms Affecting Fixed Equipment in the Refining Industry*

API 579-1/ASME FFS-1 – *Fitness-for-Service*

API RP 572 – *Inspection of Pressure Vessels*

API RP 574 – *Inspection Practices for Piping System Components*

API RP 576 – *Inspection of Pressure Relieving Devices*

API RP 580 – *Risk Based Inspection*

API RP 581 – *Risk-Based Inspection Technology Second Edition*

AS/NZS 3788 – *Australian/New Zealand Standard Pressure Equipment In-Service Inspection*

ASME B31.1 – *Non-mandatory Appendix V, Recommended Practice for Operation, Maintenance, and Modification of Power Piping Systems*

ASME PTB-2 – *Guide to Life Cycle Management of Pressure Equipment Integrity*

CSA B51 – *Boilers, pressure vessel, and pressure piping code*

EEMUA publication 231 – *Guide to periodic examination and testing*

NB-23 – *National Board Inspection Code (NBIC)*

5.0 OWNER RESPONSIBILITIES

General

An effective integrity assessment (inspection) program is indispensable to the safe operation of pressure equipment and can optimize on-stream run time. However, pressure equipment safety cannot be assured unless the owner has an effective management system that covers the full lifecycle of their pressure equipment, encompassing design, construction, installation, operation, maintenance, inspection and decommissioning.

The Pressure Equipment Safety Regulation (PESR) requires every owner to maintain an effective integrity management system for their pressure equipment. Accordingly, this must be appropriate for their organization and the type of facility and equipment. For a small heating plant, simple work processes and limited documentation will normally suffice. However, for a major petrochemical facility, a comprehensive integrity management system, that incorporates formal process safety management, risk-based inspection, and integrated management safety systems, may be required.

Owners who are required to hold a quality management system Certificate of Authorization Permit per section 11(3) of the PESR, must provide an integrity management system that is documented and maintained in accordance with AB-512. These owners are termed “owner-users”.

Quality management system Certificate of Authorization Permits, required under the PESR, are issued by ABSA.

Most process equipment installed in Alberta is inspected under an owner-user’s Certificate of Authorization Permit or by Integrity Assessment Organizations that hold a Certificate of Authorization Permit.

All public occupancy equipment shall be inspected and certified by an ABSA Safety Codes Officer. Other equipment that is not inspected under a Certificate of Authorization Permit is also inspected and certified by an ABSA Safety Codes Officer.

5.1 Management of Change (MOC)

The owner must ensure that any changes that can impact the integrity of their pressure equipment are controlled through a documented MOC program that is appropriate and practical for their organization. A successful MOC that accommodates changes to the process and pressure equipment is indispensable to maintaining an effective integrity assessment program in accordance with AB-506.

The owner must ensure that effective ongoing communication is maintained between engineering, operating, maintenance, management, inspection, other relevant staff, and ABSA, to ensure that any items that can affect the inspection

and servicing requirements are relayed to the appropriate ISI and other required personnel and are promptly addressed.

5.2 Pressure Equipment Safety Regulation (PESR)

Section 37 of the PESR states that the owner must ensure pressure equipment meets the requirements of the PESR. Key responsibilities governing installed equipment are covered in the operations section of the PESR (sections 33 to 46).

Attention is drawn to AB-516 Pressure Equipment Safety Regulation User Guide. This contains all the requirements established in the PESR and provides additional information to assist owners and other stakeholders in meeting the requirements of the PESR and to assure the safe operation of their pressure equipment.

5.3 Integrity Assessment Program

Some basic responsibilities that the owner must meet are outlined below:

- Provide sufficient competent persons and other resources to manage their integrity assessment program. This may require that integrity assessments are outsourced to an Integrity Assessment Organization that holds the required Certificate of Authorization Permit under the PESR.
Note: All public occupancy equipment is inspected by ABSA. However, in all other cases, the owner must provide sufficient competent persons from within the organization who have the resources, authority, and accountability to ensure that all requirements of the PESR and AB-506 are met.
- Ensure that the scope of any contracted services — such as integrity assessments, engineering, NDE, construction, calibration services, pressure relief valve servicing and repairs — documented in contract form are clearly defined and sufficient information is provided to enable the supplier to meet the specified requirements in accordance with the legislation.
- Maintain appropriate planning and communication processes to ensure that appropriate inspection plans are prepared and executed and that each item of pressure equipment is inspected/serviced by the due date assigned in accordance with AB-506.
- Ensure all safety procedures are followed to safeguard inspection and other personnel.
- Ensure that equipment is suitably prepared and is safe for inspection, and provide the required assistance to the Inspector so that they can complete the required inspections.
- Ensure all staff are competent for their assigned tasks and have sufficient understanding of the relevant requirements and their assigned responsibilities.

6.0 EQUIPMENT RECORDS AND LOCATION CHANGES

The owner must maintain a current inventory of all pressure equipment items that are owned or operated by the company and also equipment records for each item of pressure equipment (refer to PESR Section 41). The equipment records shall include design information, data reports, inspection plans, and integrity assessment, repair and alteration records, NDE records, Certificate of Inspection Permits, pressure relief valve servicing records, and other relevant maintenance, servicing and test records.

Owners and vendors who sell or lease equipment must ensure that the equipment records are provided to the new owners. The owner who acquires the equipment must ensure that relevant equipment history and other equipment records are provided to them. The new owner must assess the integrity of all purchased assets. This would include reviewing all historical data and performing inspections when required (refer to PESR Section 36).

The owner must ensure that ABSA is notified when there is a change of ownership or location. This notification is required for all items that have been issued a Certificate of Inspection Permit (refer to PESR Section 36).

ABSA form AB-10 or Owner's Electronic Summary Reports (ESR) are used to notify ABSA when there is a change of ownership or location or other status changes. Information regarding the preparation and submission of the ESR is provided in Section 11.5 Inspection Reports and Electronic Summary Reports.

7.0 INTEGRITY ASSESSMENT ORGANIZATIONS

Integrity assessments shall be performed by:

- An owner-user under a Certificate of Authorization issued by ABSA per Section 11(3) of the PESR. Document AB-512 describes the integrity management system requirements that must be met by owner-users who are required to hold a Certificate of Authorization Permit.
- An authorized integrity assessment organization (a company that provides inspection services to owners under a Certificate of Authorization Permit issued per PESR Section 11(2)). AB-515 defines the requirements that Integrity Assessment Organization must meet in order to hold a Certificate of Authorization Permit to perform integrity assessments in the industry sector they have been authorized to perform assessments for, or
- An ABSA SCO for all public occupancy equipment. Additionally, process equipment that is not inspected by an owner-user or Integrity Assessment Organization, shall also be inspected by an ABSA Safety Codes Officer.

The Integrity Assessment Organization must maintain suitable documented processes and records within their quality management system; to demonstrate that the Inspector is competent to perform the assigned inspection activity and that the inspection activity

is performed to the required standard. Competent in this context means the Inspector has the appropriate qualifications, knowledge, skills, experience and behaviors to perform the assigned inspection activity in accordance with the PESR, AB-506, the applicable recognized and generally accepted good engineering practices, and the employer's requirements.

AB-527 provides guidance information to assist users in developing an effective documented competence management system. Two key publications that are referenced in AB-527 are:

- Cogent - Guidelines for Competency Management Systems for Downstream and Petroleum Sites (www.cogentskills.com)
- United Kingdom Accreditation Service (UKAS), RG 0 - Guidelines on the Competence of Personnel Undertaking Engineering Inspections (www.ukas.com)

8.0 QUALIFICATIONS OF PERSONS PERFORMING INSPECTIONS

A person performing in-service inspections must be competent to carry out the appropriate integrity assessments.

ABSA Safety Codes Officers who inspect and certify pressure equipment must hold the required Safety Codes Officer certification and designated powers under the Safety Codes Act. Sections 34 and 35 of the Safety Codes Act cover the powers that the Safety Codes Officer may exercise in performing inspections, reviews, and evaluations.

PESR Section 44 establishes the ABSA Safety Codes Officer's authority to require an owner to conduct an integrity assessment of pressure equipment.

A person who inspects and certifies pressure equipment under an owner-user or Authorized Integrity Assessment Organization's Certificate of Authorization Permit must hold the appropriate Alberta In-service Certificate of Competency. This person is referred to as an ISI (In-service Inspector) in this document. An ISI may only perform integrity assessments under the authorized scope of their employer's Certificate of Authorization Permit (owner-user or Integrity Assessment Organization).

The ISI must be directly involved in the inspection activity and may be assisted by persons who do not hold an in-service inspector's Certificate of Competency, provided these persons have been appropriately trained and qualified in accordance with their employers registered quality management system. In such cases:

- the ISI is responsible for all inspection and certification activities;
- suitable records must be maintained to document the training experience and competence verification of the inspectors;
- inspections must be completed in accordance with detailed inspection plans and checklists that are approved by the ISI;
- all inspection and examination records must be evaluated and approved by the ISI;

- Certificate of Competency and qualification requirements for in-service inspectors are covered in *AB-526 In-Service Pressure Equipment Inspector Certification Requirements*

Persons who perform non-destructive examinations do not require an ISI (refer to Section 14).

Where the term *Inspector* is used in AB-506, it shall mean the ISI or ABSA Safety Codes Officer who is responsible for inspecting and certifying the item of pressure equipment.

9.0 ALBERTA Certificate of Inspection Permit

Each boiler and pressure vessel installed in Alberta must have a valid Alberta Certificate of Inspection Permit prior to being placed into service, unless the item is otherwise exempted from a Certificate of Inspection Permit (see PESR Section 33). The Safety Codes Act Flowchart, AB-508, can provide guidance in determining when a Certificate of Inspection Permit is required.

Certificate of Inspection Permits are issued by an ABSA Safety Codes Officer upon completion of the shop inspection when the item is constructed in Alberta, or upon completion of an initial inspection by an ABSA Safety Codes Officer when the item is imported into Alberta.

The owner must have suitable controls for ensuring:

- ABSA SCO is notified for imported equipment
- the Certificate of Inspection Permit is retained (PESR Section 34)
- the terms and conditions of the Certificate of Inspection Permit are met

10.0 IN-SERVICE INSPECTION PROGRAM

To ensure the safe operation of their pressure equipment, the owner must maintain an effective integrity-assessment program that covers all equipment in the pressure system. Particular attention must be paid to piping installed on process plants, as most recorded catastrophic events and other pressure equipment failures on process plants were the result of failures or leaks in the piping systems.

Appendix B establishes exceptions and alternate arrangements for upstream vessels and for other classes of pressure equipment. All requirements in this section 10.0 shall be followed, except as otherwise provided for in Appendix B.

API and NBIC publications cover in-service inspection information for pressure equipment. The applicable information contained in these documents, and other relevant good engineering standards that apply, shall be followed for in-service inspection activities covered in AB-506.

NBIC Part 2 covers in-service inspection of boilers, pressure vessels, and piping systems. This provides information that can assist all users, but is of particular relevance for boilers and other equipment that is may not be covered by API documents.

The API documents were developed specifically for refining and chemical process equipment. These may also be used for other equipment at the user's discretion.

- API 510 and API 572 cover in-service inspection of pressure vessels.
- API 570 and API 574 cover in-service inspection of pressure piping.
- API RP 571 provides recommended practice for damage mechanisms affecting fixed equipment in the refining industry.
- API RP 573 provides recommended practice for inspection of fired boilers and heaters.
- AB-507 provides guidelines for the inspection of installed fired heaters.

Attention is also drawn to the following publications that were considered in developing AB-506. These provide additional information that can assist users in maintaining an effective integrity assessment program.

- AS/NZS 3788 – Australian/New Zealand Standard Pressure Equipment In-Service Inspection
- EEMUA publication 231 – Guide to periodic examination and testing

10.1 Initial Inspection

As per section 9.0 each boiler and pressure vessel installed in Alberta must have a valid Alberta Certificate of Inspection Permit prior to being placed into service, unless the item is otherwise exempted from a Certificate of Inspection Permit. This activity is considered to be an initial inspection.

All initial inspections shall be completed by an ABSA SCO and issued a Certificate of Inspection Permit when the item is:

- constructed in Alberta (upon completion of the shop inspection)
- imported into Alberta

10.2 Installation Inspection

An inspection shall be performed after the equipment has been installed and prior to commissioning/re-commissioning to verify that the equipment meets the Safety Codes Act and PESR and to initiate plant inspection records for the equipment.

All installation inspections of TLHS, ASME Section I and Section IV boilers shall be inspected by the ABSA SCO exclusively. Other installation inspections shall be conducted by an Inspector, except as otherwise provided for in *Section 8 Qualifications of Persons Performing Inspections*. Installation inspections may be completed by an ISI under the authorized scope of their employer's Alberta

Certificate of Authorization Permit (Owner-user or Integrity Assessment Organization).

The scope of the installation inspection shall include the following:

- verifying that the correct manufacturer's data report is available, that the design has been registered with ABSA, and that the nameplate information is correct;
- verifying piping construction quality assurance documentation when applicable;
- verifying that equipment is installed correctly, supports are adequate and secured, exterior equipment such as ladders and platforms are secured, insulation is properly installed, other mechanical connections are properly assembled, and that the equipment is clean and dry;
- verifying that the safety devices such as low water cut off, flow switch, high temperature limit control, and high pressure limit controls are installed;
- verifying that the pressure-relieving devices and other overpressure protection meet the requirements of the PESR; and
- verifying that the vessel is identified with an A-number and an Alberta Certificate of Inspection Permit has been issued (unless otherwise exempt per the Safety Codes Act);
- verification of supervisory requirements for TLHS, heating plants and power plants.

This inspection also provides an opportunity for the owner to collect desired baseline information and to take initial thickness readings at the designated corrosion monitoring locations.

Equipment installed in process plants must be inspected at installation by an owner-user or an authorized Integrity Assessment Organization acting on behalf of the owner.

10.3 Inspection Plans

Inspection plans shall be established for all pressure equipment that specifies the inspection activities needed to ensure the mechanical integrity of the pressure equipment.

The Inspection plan includes, but is not limited to the following information, as applicable:

- credible damage mechanisms (modes of deterioration) that could be expected to affect the specific equipment. **Note:** the referenced API and NBIC codes provide general information on damage mechanisms and detailed information is covered in API 571;
- primary areas of degradation and expected rate/susceptibility;

- the type and extent of NDE examinations and inspection techniques required to detect and evaluate the damage mechanisms;
- protective devices and/or safety critical equipment (SCE) to keep consistent with AB-512 requirements;
- cyclic service requirements (design life expectancy);
- corrosion monitoring plans, NDE surveys, monitoring of process variables, etc.;
- preparation required for the examinations and inspections; and
- inspection interval and dates of the next external and thorough inspections and servicing intervals for the pressure-relief devices.

Note: Generic inspection plans based on industry standards may be used as a starting point in developing specific inspection plans. The inspection plan may or may not exist in a single document.

Inspection plans must be finalized and validated within 12 months after the installation inspection has been completed. Inspection plans shall be developed, reviewed, and updated based on design data, monitoring information, examination and inspection results, process information, and other relevant factors.

Inspection plans must be approved and endorsed by an ISI. The processes for developing and approving inspection plans are covered in an owner-user's and Integrity Assessment Organization's documented quality system program.

This may also require that the plan be approved by operations, engineering, the chief inspector and other key personnel.

The applicable Inspection procedures and plans must be available to inspection personnel.

10.4 External Inspection

The external inspection comprises a detailed external visual inspection of the pressure equipment and verification of the overpressure protection, to identify conditions that may impact the integrity of the pressure boundary.

The external inspection for pressure vessels shall be conducted at a maximum interval of five years or the maximum thorough inspection interval (whichever is less), unless otherwise provided for in an owner-user's RBIP per Section 12 Risk-Based Inspection Program.

The external inspection for pressure piping shall be conducted at a maximum interval of ten years or less per API-570 for the applicable piping service — or as otherwise established through a RBIP.

External inspections are normally conducted by the Inspector. However, other qualified and competent persons who do not hold an ISI Certificate of Competency may conduct the external inspection when acceptable to the Inspector. (refer to Section 8 *Qualifications of Persons Performing Inspections*).

10.5 Thorough Inspection

The thorough inspection shall be conducted by the Inspector, except as otherwise provided for in *Qualifications of Persons Performing Inspections*. The Inspector shall normally be at the site to conduct and supervise the internal inspections of boilers, TLHS and pressure vessels. The inspector shall review and approve inspection results/findings.

The thorough inspection shall include:

- a) an internal inspection, or equivalent on-stream inspection per API-510;
- b) a periodic assessment at appropriate intervals, not to exceed the maximum thorough inspection interval of the equipment. This assessment shall include:
 - the equipment maintenance and operating history;
 - external inspection records;
 - on-stream monitoring data;
 - review of process deviations; incidents, design and process changes; and any other issues that could affect the integrity of the pressure equipment during the assigned thorough inspection interval.
 - review of Safety Critical Equipment to ensure maintenance and calibration have been conducted as required.

10.6 Operators Routine Rounds

Operators are indispensable to an effective integrity assessment program.

Operators must have suitable training to identify and report issues that can impact the integrity of the equipment.

The owner must ensure that effective communication processes are maintained between engineering, process, operating, maintenance, management, and integrity assessment staff, ABSA, and others to ensure that any items that can affect the inspection and servicing requirements are relayed to the appropriate ISI and other required personnel and are promptly addressed.

11.0 INSPECTION INTERVALS

The requirements covered in AB-506, and the applicable information from API-510, API-572, API-570, API-574, and NBIC, shall be used to determine the appropriate inspection intervals for boilers, pressure vessels, piping and pressure relief valves.

A progressive interval grading system is used to determine the maximum safe interval that can be assigned, based on the results from successive thorough inspections. Tables in Appendix A establish the maximum period of time that is allowed between initial and successive thorough inspections. The item shall be inspected by the inspection due date unless it has been deferred or revised in accordance with Section 11.4 *Inspection and Pressure Relief Valve Servicing Date Deferral and Revision*, or as otherwise allowed under a risk-based inspection program (RBIP).

The notes in Appendix A and requirements for vessels in specific service in Appendix B establish conditions and exceptions to the interval grades and inspection requirements for specific equipment, and are indispensable to the application of AB-506 and the interval tables.

An owner-user who has a RBIP identified under the Authorized scope of their Alberta Quality Management Certificate of Authorization Permit, has the option of using their RBIP to determine the inspection requirements and inspection intervals, without using the progressive grading system provided in this section. The interval of 10 years, which is shown in the tables in Appendix A, represents the maximum period of time that is allowed between the thorough RBI assessments.

The conditions for using a RBIP are established in section 12.

11.1 Interval Grades

Grade 1 - Initial Thorough Inspection Interval

The inspection interval shown in the table for grade 1 is the maximum thorough inspection and servicing interval that can be assigned when the item is first commissioned, unless the conditions for known service in section 11.3 are met, or the owner has provided a risk-based inspection program per above.

An inspection conducted at the grade 1 interval is intended to provide confirmation that the inspection plans and strategies are appropriate, and to identify any deficiencies in the design or construction that may be revealed during the initial operation.

ABSA assigns a nominal inspection interval for each new item that requires a Certificate of Inspection Permit (a one-year interval is normally assigned for Alberta-built equipment). This interval is shown on the Certificate of Inspection Permit and is intended to allow time for the inspection organization to develop suitable inspection plans and strategies and complete any inspection required in order to determine the appropriate maximum Grade 1 intervals for the equipment.

An owner-user or an Integrity Assessment Organization acting on behalf of the owner must provide records to ABSA to confirm the actual inspection interval they have assigned, as well as the current status of the equipment. It is expected

that this information will be provided within one year of the installation inspection. An ABSA ESR is normally used for this purpose (refer to Section 11.5).

Grade 2 - Extended Thorough Inspection Interval

A thorough inspection interval up to the maximum interval shown at Grade 2 may be assigned if the item has successfully concluded a period of service at Grade 1 and a thorough inspection has proven that the interval can be safely increased to Grade 2.

Grade 2 is the maximum interval that can be assigned unless the owner holds an owner-user Certificate of Authorization Permit.

Grade 3 - Extended Thorough Inspection Interval – Owner-Users Only

An owner-user may extend the thorough inspection interval up to the maximum interval shown at Grade 3 if the item has successfully concluded a period of service at Grade 1 and a thorough inspection has proven that the interval can be safely increased to Grade 3.

11.2 Review of Inspection Requirements

The owner must conduct an appropriate assessment to validate the inspection requirements and allocate equipment to a lower grade/interval as required:

- if the results of the external inspections or thorough inspections show that conditions for the assigned grade/interval are not being met;
- when data from corrosion probes, metal content of process streams, pH levels, etc., has indicated that there has been a potential change in the condition of the pressure equipment;
- if changes have taken place in the conditions of service of any item in the corrosion circuit, which could affect the equipment's deterioration in whole or in part;
- when a change of service is proposed. The grading allocation shall be reassigned based on the equipment history, the new service, and any knowledge of equipment in the same service. As a minimum, changes in pressure, temperature, throughput, additional loading, and susceptibility to corrosion, stress corrosion, fatigue, creep, etc., shall be considered;
- following an abnormal incident that has or could have affected the integrity of the equipment; and
- when the equipment approaches its intended design life or when it is proposed to extend the service life of the equipment beyond its original design life.
- when there are MOC's which have not been addressed. All MOC related to pressure equipment shall be addressed and closed.

- if the pressure equipment is in cyclic service. It shall be monitored, documented and reviewed against the initial design life. The unit shall be removed from service when the cycles have been used.

Suitable documentation must be kept to justify the new interval, and the applicable documentation and equipment records shall be approved and endorsed by an ISI designated by the employer under their registered quality management system.

11.3 Vessels in Known Service

Exceptions to the normal grading procedures may be applied in cases where:

- the vessels will perform the same duty as that of an existing vessel under similar operating conditions;
- the pressure equipment is substantially the same as the existing item regarding geometry, design, construction, and conditions of service; and
- there is sufficient and relevant inspection history to allow for a similar service comparison.

In such cases, the equipment may be given the same grade — up to maximum Grade 2 — as the item with which it is being compared.

Notwithstanding the above, an owner-user who has the appropriate organization structure and the required in-house engineering, corrosion, inspection, and other resources, as well as documented risk analysis processes, may establish a maximum inspection interval up to that listed for Grade 3.

11.4 Inspection and Pressure Relief Valve Servicing Date Deferral and Revision

Appendix A Table 1, shows the maximum time that may be allowed to elapse between thorough inspections and PRV servicing intervals. Equipment shall be inspected/serviced by this interval date, unless the interval has been deferred or revised in accordance with Section 11.4.

Owner-users must maintain documented procedures to control and document deferrals and revisions.

11.4.1 Interval Deferral

A deferral may be appropriate when the current interval for a thorough inspection interval or pressure relief valve servicing interval is still considered valid, given the available data, but an extension of the inspection or servicing date is appropriate, based on a documented risk-analysis process that includes experienced corrosion, maintenance, operations and inspection personnel as well as other required resources.

All proposed deferrals must be approved by the person in charge of operations, and the person in charge of the inspection program, and may also require approval from qualified engineering and other key persons per the owner-user's quality management system.

Deferrals are one-time, temporary extensions of equipment inspection/servicing due dates, and shall not be considered inspection/servicing interval revisions.

Notwithstanding the above, an inspection or PRV servicing interval may be deferred by the Inspector, without other approvals, based on a satisfactory review of the equipment history, when the period of time for which the item is to be deferred does not exceed 10 percent of the inspection/servicing interval or six months, whichever is less.

11.4.2 Reporting Deferrals to ABSA

Proposed deferrals by owner-users that exceed one year shall be submitted individually to ABSA for prior acceptance.

Owners who do not hold an owner-user Certificate of Authorization Permit must obtain ABSA acceptance for any proposed deferral that exceeds 10 percent of the inspection/servicing interval or six months, whichever is less.

11.4.3 Interval Revisions

An inspection/servicing interval revision is appropriate when review of the pressure equipment item and history indicates that the current interval was set too conservatively or liberally. Basic requirements for interval revisions are as follows:

- the revised interval shall not exceed the maximum interval established in Table 1, for this type of equipment;
- the pressure equipment history and condition shall be reviewed by the Inspector;
- the interval revisions shall be documented by the Inspector and include the technical basis supporting the interval revision.

The Inspector shall approve all interval revisions.

11.5 Inspection Reports and Electronic Summary Reports (ESR)

11.5.1 Inspection Reports

Detailed inspection reports must be kept on file by the Owner, Owner-user and/or Integrity Assessment Organization (refer to Section 7).

11.5.2 Electronic Summary Reports (ESR)

Owner-users, and inspection companies acting on behalf of owners, are required to submit an ESR to ABSA to report the thorough inspection status of all the pressure equipment they operate that is required to have a Certificate of Inspection Permit and is subject to annual fees, in accordance with the instructions that are provided with the ESR. The ESR is also used to update other vessel data as described in Section 6. Information provided to ABSA on the ESR is imported into ABSA's pressure equipment database.

The ESR is an Excel spreadsheet that contains a list of equipment, with instructions for completing the ESR. ABSA sends an ESR to owner-users and inspection companies who are acting on behalf of the owner. The ESR shows the thorough inspection due date of the owner's equipment for each item listed in ABSA's database. The owner-user or Integrity Assessment Organization must update the ESR to reflect the current thorough inspection status of each item listed.

The date of the last thorough inspection, and the current thorough inspection interval and vessel code, must be reported. The completed ESR shall be certified by an ISI designated by the owner-user or Integrity Assessment Organization.

The thorough inspection date that is reported on the ESR shall be the date of the thorough inspection, or the date the thorough RBI assessment is completed (refer to 11.0).

When Appendix B is used to determine the inspection requirements for upstream pressure vessels, and inspections are conducted on a representative sample for an equipment class, the reporting date for all items in that class shall be based on the representative sample inspection and assessment date.

Owner-users must provide an updated ESR by the end of January for the preceding year. ESRs should also be submitted quarterly when there are a relevant number of records that need updating.

Inspection companies, who prepare an ESR for owners who do not have an owner-user Certificate of Authorization Permit, must submit an updated quarterly ESR when there is information for an item of equipment that requires updating.

11.5.3 Decommissioned Equipment

Decommissioned pressure equipment is an item that has been permanently removed from service and properly stored or disposed of with

zero energy. The equipment records shall be updated and ABSA shall be informed using the ABSA AB-10 form or the ESR.

The ABSA form AB-10 or Owner's Electronic Summary Report (ESR) are used to notify ABSA when there is a change of ownership or location or other status changes such as:

- being removed from service (temporarily removed from service)
- been sold
- relocated to another address or site
- scrapped (permanently removed from service)

12.0 RISK-BASED INSPECTION (RBI)

Owner-users holding a Certificate of Authorization Permit which have included an RBI element in the integrity management system may apply the following section. This section does not apply to non- Owner-users or Integrity Assessment Organizations.

Risk-based inspection refers to the application of risk analysis principles to manage inspection programs for plant equipment. A management process is used to determine inspection requirements and inspection intervals based on the inherent risk of a pressure equipment item.

RBI appropriately applied as part of an effective IMS can enhance pressure equipment safety, provide a cost-effective system for managing inspection and maintenance activities, and enable online time to be extended for certain equipment. However, if not properly applied, the RBI process can focus attention away from items that are incorrectly assessed as having a low risk. This can result in hazardous situations.

These concerns prompted Alberta pressure equipment owners to take a lead role with ABSA in preparing AB-505 which was first published in 2002. AB-505 establishes the mandatory requirements governing the application of RBI in Alberta.

An owner-user, who maintains a risk based inspection program in accordance with AB-505 (RBIP), has the option of using a risk based assessment to determine the inspection requirements of pressure equipment and servicing intervals of pressure relief valves without using the progressive grading system established in AB-506.

In order for RBI to be included in the authorized scope of an owner-user's Certificate of Inspection Permit, their RBIP must be reviewed and accepted by ABSA and the RBI process must be clearly defined in the owner-user's quality system documentation.

A RBIP may be used to determine the extent and frequency of inspections, and servicing intervals for pressure relief devices. This requires formal management processes, detailed development and planning, and involvement of experienced corrosion, materials, maintenance and process engineers/technologists, and operating personnel. It should be noted that RBI is a dynamic process, so it is essential that the

required resources are available to validate the RBI assessments throughout the full lifecycle of the equipment.

These programs are generally only practical for major process plant owner-users.

However, owners who use the progressive grading system in AB-506 should also consider the basic risk-management principles that are covered in the published codes and standards.

Applying these principles can provide added assurance that the inspection resources are applied in the most cost effective way and that the assigned intervals are appropriate. This may also allow RBI to be introduced in an orderly fashion and that a formal RBIP be established once the required work processes, resources, and experienced staff are in place, and where there is suitable operating, maintenance, and inspection history. A risk based methodology can also be a valuable tool in ensuring that servicing intervals for pressure relief valves, established in accordance with Table 1, are optimized.

Risk information is included in recognized standards, such as API-510, API-570, and NB-23. Detailed information regarding risk-based management programs is covered in API-580 and ASME PCC-3.

13.0 FITNESS-FOR-SERVICE EVALUATIONS

Recommended Practice API-579-1/ASME FFS-1 covers fitness-for-service assessment procedures for evaluating commonly encountered flaws, including general and widespread corrosion and pitting, blisters, crack-like flaws, etc. As well, API-510 and NB-23 have some basic information for assessing local thin areas and pits.

While it may be appropriate to use these documents as the basis for fitness-for-service evaluations, all such proposals shall be submitted to ABSA Design Survey for acceptance whenever the minimum design conditions of the original code of construction are not met.

AB-535 Requirements for Alteration Design Registration Based on Fitness-for-Service provides guidelines and specifies requirements that must be met for registration of a Fitness-for-Service alteration design.

The criteria for accepting pits in accordance with API-510 and NBIC may be used without submitting the proposal to ABSA. The following may be generally accepted without submission to ABSA:

- API 510 FFS Analysis of Corroded Regions
- NBIC Evaluating Pressure-retaining Items Containing Local Thin Areas

14.0 NONDESTRUCTIVE EXAMINATIONS (NDE)

Owners and Integrity Assessment Organizations that use contract NDE services must ensure that the NDE contractor is competent for the scope of work and that the job requirements are clearly defined. This shall include the certification requirements for examiners and the method for reporting results, for flagging questionable readings, and for ensuring they are provided promptly to inspection personnel.

The NDE method used must be suitable to identify the potential damage mechanisms listed in the equipment plan. ASME Section V covers requirements for the various NDE methods. Documented procedures shall be maintained for the NDE methods used and be available to the Inspector.

The Inspector must ensure that the corrosion (condition) monitoring locations (CML) are suitable. They must also review and accept all NDE results and ensure timely follow-up action for any results that are questionable.

NDE examiners shall be trained and shall have demonstrated competence in the NDE procedures and the equipment used.

The examiner's employer must maintain appropriate documented work processes to ensure that the NDE they perform meets the client's requirements and AB-506. The employer shall maintain certification records of the examiners employed, including dates and results of personnel qualifications. These records shall be available to the owner, the Inspector, and ABSA.

Examiners who perform ultrasonic shear wave examinations must have demonstrated competence to detect and evaluate the potential flaw and hold a Level II CGSB certification for this method. SNT-TC -1A Level II certification in accordance with the SNT-TC-1A edition listed in the current ASME Section VIII Div 1 Code is also allowed, providing this certification is acceptable to the owner.

Examiners employed by NDE contractors who perform ultrasonic thickness examinations, magnetic particle examinations, or dye penetrant examinations of in-service pressure equipment must hold a level I or II CGSB or SNT certification.

When an examiner is employed directly by an owner-user or certified Integrity Assessment Organization and performs ultrasonic thickness examinations, magnetic particle examinations, or dye penetrant examinations under their employer's integrity assessment program, SNT or CGSB certification is not required, providing they have appropriate documented training and experience, that they have been certified competent to perform the examination method, and that suitable records are maintained to justify this certification.

15.0 PRESSURE RELIEF DEVICES (PRD)

PESR Section 38(1) requires owners to ensure that all equipment in the pressure system has suitable overpressure protection to ensure that its authorized maximum allowable working pressure is not exceeded.

The owner must ensure that all PRDs, and the instrumentation and controls that are necessary to ensure the safe operation of the pressure equipment, are periodically examined, tested, and maintained by competent persons in accordance with documented work processes.

API RP-576 and NBIC Part 4 covers information regarding the inspection and servicing of pressure-relief devices. The applicable information in these documents should be used to ensure that the pressure-relief devices are inspected, maintained and serviced in accordance with this section.

15.1 Isolation Valves

The Administrator may accept the installation of block valves in pressure relief piping for specific pressure vessels if the owner meets the requirements of ASME Section VIII, Division 1 Appendix M, and submits the relevant design and rationale to ABSA. The owner must have an auditable management system that establishes procedures and training requirements for the control of such valves. This management system must be available for review by ABSA at all sites where block valves are installed in the pressure-relief path.

A typical management system would include the following:

- a description of where block valves would be installed;
- the personnel responsible for the system;
- how the valves would be locked or sealed in the proper position;
- how the valves would be periodically checked;
- the procedure and controls required for isolation or servicing of the pressure-relief device if the protected pressure equipment remains energized;
- the associated training requirements of all people who work with the pressure equipment involved.

15.2 Maintenance of Pressure Relief Devices

PESR Section 39 states:

- (1) Adjustable parts of a pressure relief device must be sealed at the time of servicing and remain sealed during operation;*
- (2) Seals must be installed in a manner that prevents changing the adjustment of a pressure relief device without breaking the seal;*
- (3) A pressure relief device must be serviced at an interval acceptable to the Administrator;*

(4) A pressure relief valve may be serviced, repaired, set or sealed only by a person who holds a Certificate of Authorization Permit described in Section 11 and who complies with Section 13.

15.3 Online Visual Examination

An online external visual examination of pressure-relief devices shall be carried out by a competent person at appropriate intervals, based on the pressure-relief device history. The maximum interval for this on-stream examination is five years. An online visual examination shall be completed when relief devices are re-installed after they have been serviced and while pressure is in the system.

The scope of this visual examination shall ensure that:

- the correct device is installed and that the seals are intact;
- there is no external damage or leaks;
- the company identification provides means to establish the last servicing date and correct set pressure for the equipment protected by the device;
- there are no blinds or closed valves that would prevent the device from functioning;
- any isolating valves in the path of relief valves are fixed open and controlled;
- discharge piping is secured and clear; and correctly installed to prevent build up of liquids;
- any weather protection is in place;
- suitable records are maintained to document the on-line visual examination;
- any lifting lever is operable and positioned correctly; and
- any rupture disc is properly installed and oriented.

15.4 Pressure Relief Valve Servicing Intervals

PRV's must be serviced by an organization that has a valid ABSA Certificate of Authorization Permit per PESR section 11(1) to set and service pressure-relief valves.

AB-524 identifies the requirements for all PRDs on pressure equipment. The requirements for setting and servicing pressure relief valves are established in AB-524.

It is the owner's responsibility to ensure that the organization servicing the PRV is competent for the scope of work. Authorized PRV-servicing organizations are listed on the www.absa.ca website.

Table 1, shows the maximum periods of time a pressure-relief valve may remain in service before it requires servicing, unless it has been deferred or revised in accordance with Section 15.

The term pressure-relief valve (PRV) applies to safety valves, safety relief valves, and relief valves. The applicable progressive interval grading and known service requirements covered in Section 11 shall be used to determine servicing intervals for pressure relief valves, or as otherwise determined through a RBI assessment completed under an owner-user RBIP provided in accordance AB-506 Section 12.

The interval grading system does not apply for thermal relief valves and other protective devices not classed as pressure relief valves. These shall be inspected, tested and serviced/replaced at appropriate intervals based on their service history and the manufacturer's recommendations.

The owner must have appropriate documented work processes, methodology, and assessments to ensure that the intervals assigned are appropriate. The servicing interval shall be based on the history in a particular fluid service, cleanliness, and other servicing information. It shall also be assessed by performing an as-received pop test. This is required for all valves, unless the valve is extremely fouled and dirty or if a valve is in a hazardous service that may require neutralizing. When a PRV is replaced, the PRV that is replaced may still need to be assessed, through an as-received pop test, dismantling, etc., in order to establish a suitable servicing interval for the new valve that has been installed (refer to API RP-576).

When a pressure-relief valve servicing report indicates the valve was in unsatisfactory condition when it was removed from service, a lower interval may be required. The owner should conduct a root cause analysis for the purpose of preventing reoccurrence, because reducing the length of the service interval may not always address the cause. This is particularly important when the valve fails the service as-received pop test or is otherwise found to be in an inoperable condition.

Appendix D shows factors that may need to be considered when assigning servicing intervals for pressure-relief valves.

Servicing records and other data must be reviewed by the Inspector, except as otherwise specified per the owner-user's quality management system. The assigned servicing interval must be approved by the Inspector.

Servicing records and other required information to support the assigned servicing intervals must be maintained on file.

15.5 Rupture Discs

The device must be inspected at the assembly stage to verify that it has been installed correctly and that the disc meets the requirements defined in ASME Section VIII Div. 1.

Rupture discs shall be inspected and replaced at scheduled intervals, based on the applicable manufacturer's recommendations and equipment history.

The owner shall maintain documented work processes to ensure the correct rupture discs are installed and maintained safely.

16.0 REPAIRS AND ALTERATIONS OF IN-SERVICE PRESSURE EQUIPMENT

PESR Section 40 covers specific requirements for repairs and alterations to in-service pressure equipment.

The Administrator has established under the PESR, that the requirements in AB-513 Pressure Equipment Repair and Alteration requirements document, must be met for post construction repair and alterations of pressure equipment. AB-513 provides detailed information on the inspection and certification of repairs and alterations.



APPENDIX A - MAXIMUM THOROUGH INSPECTION AND SERVICING INTERVALS

TABLE 1 MAXIMUM THOROUGH INSPECTION AND SERVICING INTERVALS								Page 1 of 2
TYPE OF EQUIPMENT	MAXIMUM Thorough Inspection intervals (years) Boilers and Pressure Vessels			MAXIMUM Servicing Intervals PRVs (years)			NOTES The relevant notes identified are indispensable to the intervals established in this table.	
	GRADE			GRADE				
	1	2	3 Owner Users only Note 10	1	2	3 Owner-users only Note 10		
Power Boilers								
Pressure Plant H.P. Boilers	1	2	3	3	3	4	6	
Thermal Generating Station Boilers	1	2	3	4	4	4	6, 3	
Waste Heat Boilers	2	3	4	2	3	4		
Portable Boilers - Rig and Others	1	1	1	1	1	2	6, 2	
Public Occupancy, High Pressure Boilers	1	1	N/A	1	2	N/A	6, 1, 2	
Once Through Steam Generators – Heavy Oil Processing	1	2	3	2	3	4	6	
High Temperature Hot Water/Glycol Mixed Boilers	1	3	3	2	3	3	6	
Thermal Liquid Heating Systems (TLHS)	2	4	6	2	3	4		
Historical Boilers as described in AB-534	1	1	N/A	5	5	N/A		
Heating Boilers								
All types of heating boilers (not portable)	2	3	4	3	3	4	1, 2	
Pressure Vessels								
Air Receivers/Dryers	5	5	10	5	5	5	1, 2	
Misc. Vessels in Building Service – Expansion Tanks, Hydro Pneumatic	5	5	N/A	5	5	N/A	1, 2	
Potable Hot Water Storage Tanks	5	5	5	5	5	5	1, 2	
Boiler Blow Down Tanks	5	5	6					
Deaerators	5	5	6	4	5	6		
Vessels with Quick Actuating or Quick Opening Closures	4	4	4	4	4	4	12, 10	
Refrigeration Vessels Group A1	5	10	10	5	5	5	7	
Refrigeration (other incl. Ammonia)	5	5	10	5	5	5	7	
Storage vessels in non-corrosive service including ammonia storage vessels	5	10	10	5	5	6	7	
LPG plant storage vessels	5	10	10	5	5	6	7, 13	
Vessels in propane service within the scope of CSA B149.2	5	10	10	N/A	N/A	N/A	7, 9	
Cryogenic Vessels	5	10	10	5	5	6	7	
Vessels in Cold Boxes	5	5	5	5	5	6	4, 7	
Natural Gas and H2 Automotive On-Board Storage Vessels	Per CSA B51 Part 2							



TABLE 1 MAXIMUM THOROUGH INSPECTION AND SERVICING INTERVALS Page 2 of 2

TYPE OF EQUIPMENT	MAXIMUM Thorough Inspection intervals (years) Boilers and Pressure Vessels			MAXIMUM Servicing Intervals PRVs (years)			NOTES The relevant notes identified are indispensable to the intervals established in this table.
	GRADE			GRADE			
	1	2	3 Owner Users only Note 10	1	2	3 Owner-users only Note 10	
Fired Process Heaters, separately fired superheaters and similar equipment	3	4	6	3	4	6	8, 5
Div 2 Vessels and other items with a specified design life	4	5	10				5
Unfired process vessels not otherwise listed in the table	4	5	10	3	5	6	
Upstream Pressure Vessels (Refer Also to Appendix B) (pressure vessels that are associated with the drilling, production, gathering, and treatment of liquid petroleum, natural gas, and natural gas liquids) These include the following:							11
Well-head vessels (separators, methanol spheres, etc.)	5	10	10	5	5	6	
Fuel gas scrubbers	5	10	10	5	5	6	
Air cooled heat exchangers	5	10	10	5	5	6	
Indirect fired line Heaters	4	5	10	3	5	6	
Treaters, FWKO's	4	5	6	3	5	6	
Compressor Bottles in vibrating service	4	4	6	3	5	6	
Upstream pressure vessels not listed above that are in sour service	3	5	6	3	5	6	
Upstream pressure vessels not listed above that are in sweet service	4	5	10	3	5	6	
Refrigeration Vessels	5	10	10	5	5	6	7
Pressure Piping							
The applicable inspection principles covered in API-570 Piping Code, API-574, NB-23, and other relevant codes and standards shall be used to determine the inspection requirements and inspection frequencies that are appropriate for the type of piping.				3	5	6	8
Pressure Equipment Covered Under a Risk-Based Inspection Program (RBIP) The progressive grading system shown in this table does not apply when the owner uses a RBIP (covered under the authorized scope of their Quality Management CAP) - to determine the inspection requirements and pressure relief servicing intervals.				<p>The maximum thorough RBI assessment interval is ten years.</p> <p>The maximum thorough inspection interval for directly fired power boilers and heating boilers is four years.</p> <p>The maximum pressure relief valve servicing interval is ten years.</p>			

Notes

To be used in conjunction with Table 1

- 1 The Inspector may accept a satisfactory manual test or system test performed at the time of the thorough inspection instead of replacement or servicing for PSVs.
- 2 NBIC Part 2 covers recommendations for periodic manual and system tests that may be appropriate.
- 3 Assist-lift test at half the servicing interval. This must be done by an approved servicing organization.
- 4 Inspection intervals are for external assessment (external visual of cold box and gas monitoring, etc.) and thorough inspection of vessels, if insulation is removed.
- 5 Maintain suitable monitoring processes and records for equipment, such as items in cyclic service that have a specified design life. This equipment may require more frequent thorough inspections, and assessment as it approaches its design life.
- 6 Grade 2 and 3 intervals for boilers are limited to those plants that have adequate water treatment, maintenance, operating systems and an appropriate log book being maintained.
- 7 Owner-users who have the appropriate organization structure, work processes and competent in-house staff, and who maintain a formal PRV condition and interval assessment program under their owner-user Certificate of Authorization Permit, are allowed to set servicing intervals of up to ten years for PRV's that are in clean service based on satisfactory service and performance history. **Note:** Clean service is one involving fluids such as methane, nitrogen and other dry gases. Clean fluids are characterized by the condition of the device upon removal, where there is no evidence of fouling.
- 8 Guidelines for fired process heaters are covered in AB-507 and CSA B51.
- 9 For pressure vessels in propane service within the scope of CSA B149.2: See TABLE 2 below for owner-user inspection requirements; Refer to CSA B51-14 Clause 12 for pressure relief valve servicing requirements: the maximum intervals are 10 years for PRVs on vessels of volume greater than 2500 USWG, and 25 years for PRVs on vessels not greater than 2500 USWG.
- 10 *Owner-user (OU)* is an owner that has provided an Integrity Management System in accordance with the Pressure Equipment Safety Regulation and has been issued a quality management system Certificate of Authorization Permit under PESR Section 11(3).
- 11 **Appendix B** provides an option for applying alternative rules for the frequency and extent of inspection for upstream oil and gas equipment. The use of Appendix B is subject to conditions specified therein and elsewhere in AB-506.
- 12 Applies to sterilizers, autoclaves and similar equipment.
- 13 Table 2 establishes the minimum inspection and servicing requirements for commercial LPG vessels under an owner-user program (Refer to note 10).



**Table 2 Authorized Owner-User Programs
for Propane Storage Vessels in Commercial Use – See Note (1) below**

Vessel Size	Subject to SCA	Subject to PESR	ABSA Certificate of Insp. Required	Initial Insp. by ABSA	Initial Insp. By Gas Discipline Formerly by APGS	Installation Inspection By Owner	Maximum Thorough Inspection Interval (Years) (Internal + WFMT) Note (2)	AB-506 & NFPA-58 External Assessment	Maximum PRV Servicing or Replacement Interval
LPG Vessels > volume 10 m ³	YES	YES	YES	YES Note (3)	YES	YES APGS (as required) Competent Personnel	10 years Competent ISI	5 years	6 years
LPG Vessels ≤ volume 10 m ³ (10 m ³ = 10,000 liters = 2642 US gal)	YES	YES	No PESR 33 (2) (e)	No	YES	YES Competent Owner Personnel and APGS Licensed Gas Fitter	All Except Domestic Applications 10 Years Max. Regulatory Insp. Interval	Pre-Fill External Visual Note (6)	Pre-fill Inspection - All
							Domestic Applications To be Determined Note (5)		Pre-Fill External Visual Note (6)
									Domestic Applications per Table CSA B51 Table 5; 25 yrs. also see Note (7)

- (1) Commercial use shall include facilities where these storage vessels are used for vehicular fuel filling, fuel dispensing, commercial construction site usage and all other fuel uses, but does not include refinery, petrochemical processing or other industrial plant usage. For definition of Propane see CAN/CGA-B149.2.
- (2) Thorough Internal Inspection and NDE using Wet Fluorescent Magnetic Particle examination method. If a vessel has had one thorough inspection utilizing the Wet Fluorescent Magnetic Particle examination method and all of the following criteria are met then an on-stream inspection using automated ultrasonic and shear wave ultrasonic examination may be substituted for the internal inspection and internal NDE;
 - a) an internal inspection and internal NDE was completed after fabrication, and the general corrosion rate is known to be less than 0.125 mm (0.005 in.) per year,
 - b) the vessel has been exclusively in commercial propane service since the last internal inspection and internal NDE,
 - c) there is no evidence to suggest the vessel has been contaminated internally with any fluid which even in trace amounts could result in corrosion or environmental cracking or hydrogen damage to the vessel,
 - d) no questionable condition is discovered during the external inspection, and
 - e) the NDE inspection plan establishes characteristics and acceptance criteria for the flaw indications the NDE will be used to detect.
- (3) Within an Owner-User pressure equipment integrity management system initial inspection by ABSA is required for vessels constructed outside of Alberta, to assign the Alberta identification Number (A-Number). It is required that the Owners integrity management system include provisions for an installation inspection to verify all of the other Codes and Standards requirements (e.g. NFPA) have been met prior to placing the vessel in service.
- (4) Gas piping that is used to convey gas exclusively for fuel purposes and that is subject to the Gas Code Regulation (AR 113/2005).
- (5) A Domestic application is one in which a Propane storage vessel is used to provide gas for home heating purposes.
- (6) Pre-Fill External Visual Examination is completed by suitably trained Propane delivery personnel and is documented in the equipment records.
- (7) Pressure relief valve replacement if visual inspection indicates deterioration that could affect the ability of the valve to function, or if the valve malfunctions.

APPENDIX B - REQUIREMENTS FOR VESSELS IN SPECIFIC SERVICE

This appendix establishes the minimum inspection requirements for equipment in specific service applications. They were developed from considerable documented service history and the recognized engineering practices available for the service applications identified below.

All applicable requirements in AB-506 shall be followed, except as otherwise provided in this Appendix.

Section 1 Upstream Oil and Gas Pressure Vessels

This section establishes the minimum inspection requirements for pressure vessels that are installed in upstream facilities.

It provides the owner with the option of using API 510 Section 9 Alternative Rules for Exploration and Production Vessels (hereinafter referred to as API 510 Alternative Rules) to determine the inspection intervals and inspection requirements for their upstream pressure vessels, under the conditions specified below.

API 510 Alternative Rules sets forth the minimum alternative inspection rules for establishing the interval frequency and extent of inspection for upstream oil and gas equipment. It provides the owner with the option of establishing vessel inspection classes by grouping vessels into common classes of service, pressure, and/or risk. It defines two main risk classifications (higher risk and lower risk), and establishes appropriate inspection requirements and intervals for these two main risk classifications.

All requirements in AB-506 and API 510 Alternative Rules shall be followed except as otherwise provided for below.

Attention is drawn to AB-506 Section 10.5, Operators Routine Rounds, which is of particular importance when equipment is inspected in accordance with the alternate rules.

1.1 Assignment of Risk Inspection Classes

Owner-users who have the appropriate organization structure and the required in-house engineering, corrosion, and inspection resources, as well as documented risk-analysis processes, may establish vessel inspection classes for their upstream equipment and assign items to higher and lower risk classes in accordance with API 510 Alternative Rules. The application of these rules, for owners who do not meet the above requirements, is restricted to the types of vessels that are listed below:

- methanol vessels;
- indirect fired heater coils;
- air cooled heat exchangers;
- fuel gas scrubber vessels;

- The following vessels installed at well heads:
- separators in sweet service applications;
- separators that have a maximum operating pressure less than 30% of their maximum allowable working pressure.

The extensive service history available for these vessels shows that they can generally be assigned into the lower-risk inspection class or higher-risk class at the Inspector's and owner's discretion.

1.2 General Inspection Requirements

The owner shall establish an inspection strategy for the risk classes, considering, as a minimum:

- potential for vessel failure, such as the potential for cracking, corrosion and erosion;
- vessel history, e.g. design and operating conditions, properties of the contained fluid, operating conditions relative to the design limits;
- consequences of failure, such as location relative to the employees or the public, potential for equipment damage.

A periodic assessment shall be conducted at appropriate intervals, not to exceed five years, to validate the inspection strategies and risk classes. The assessment shall include an audit of the operator's routine inspection activities, the pressure relief valve servicing records, as well as on-stream monitoring records.

Suitable assessment and inspection records shall be kept on file to support the assignment of items into a risk class. These shall include:

- the type of equipment and number of representative items that will be inspected for the risk class;
- satisfactory inspection results of at least one thorough inspection for each item that is assigned to a risk class.

1.3 Higher-Risk Class Inspection Requirements

The inspection requirements for higher risk vessels in API 510 Alternative Rules shall be met.

External inspections shall be performed when an on-stream or internal visual inspection is performed or at shorter intervals at the owner's option.

On-stream or internal inspections shall be performed at least every ten years or $\frac{1}{2}$ the remaining life whichever is less.

In cases where the remaining life is estimated to be less than four years, the inspection intervals may be the full remaining life up to a maximum of two years.

Any signs of leakage or deterioration detected in the interval between inspections shall require an onstream or internal inspection of that vessel and a re-evaluation of the inspection interval for that vessel class.

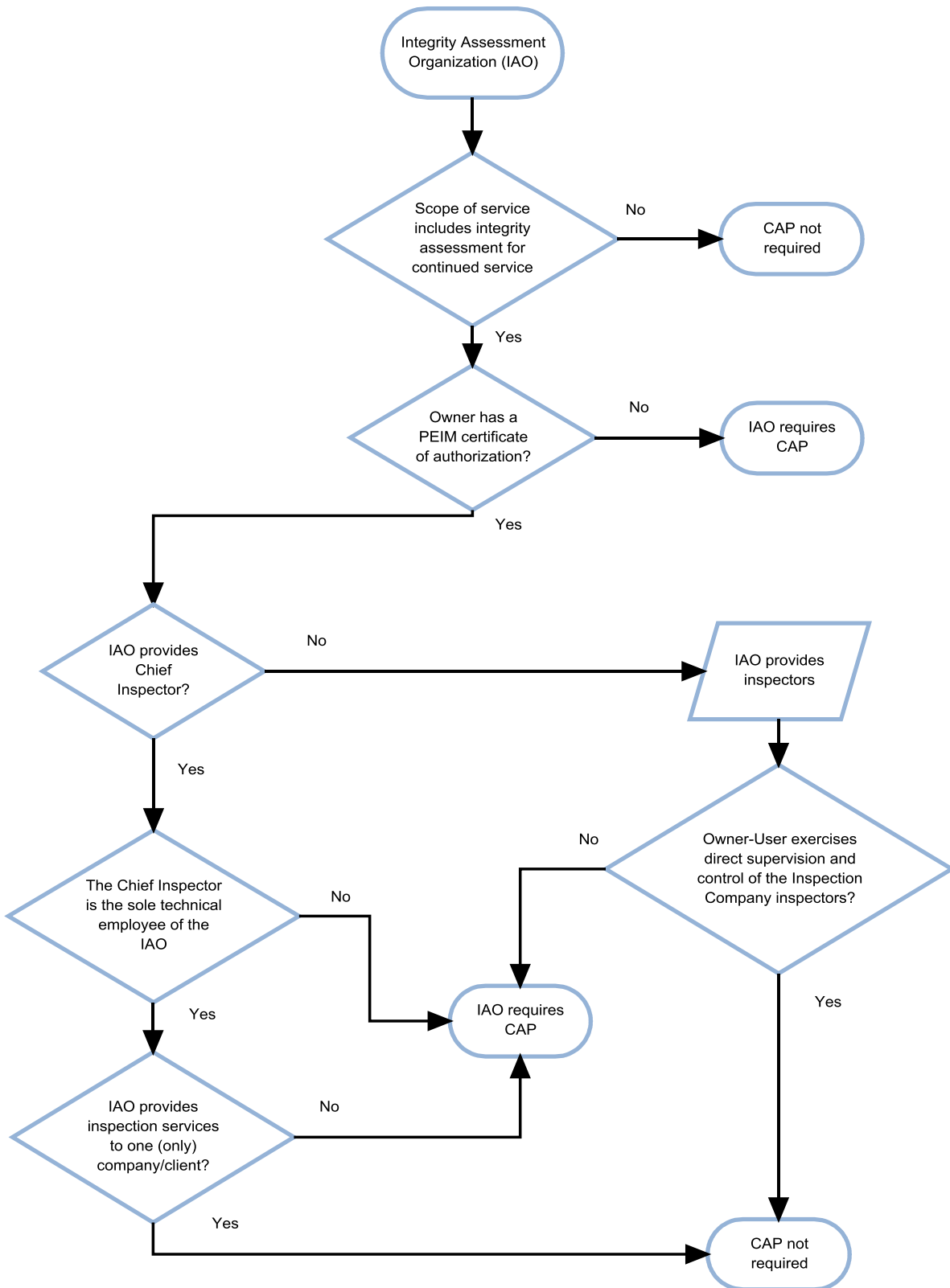
1.4 Lower Risk Class Inspection Requirements

The inspection requirements for lower-risk vessels in API 510 Alternative Rules shall be met.

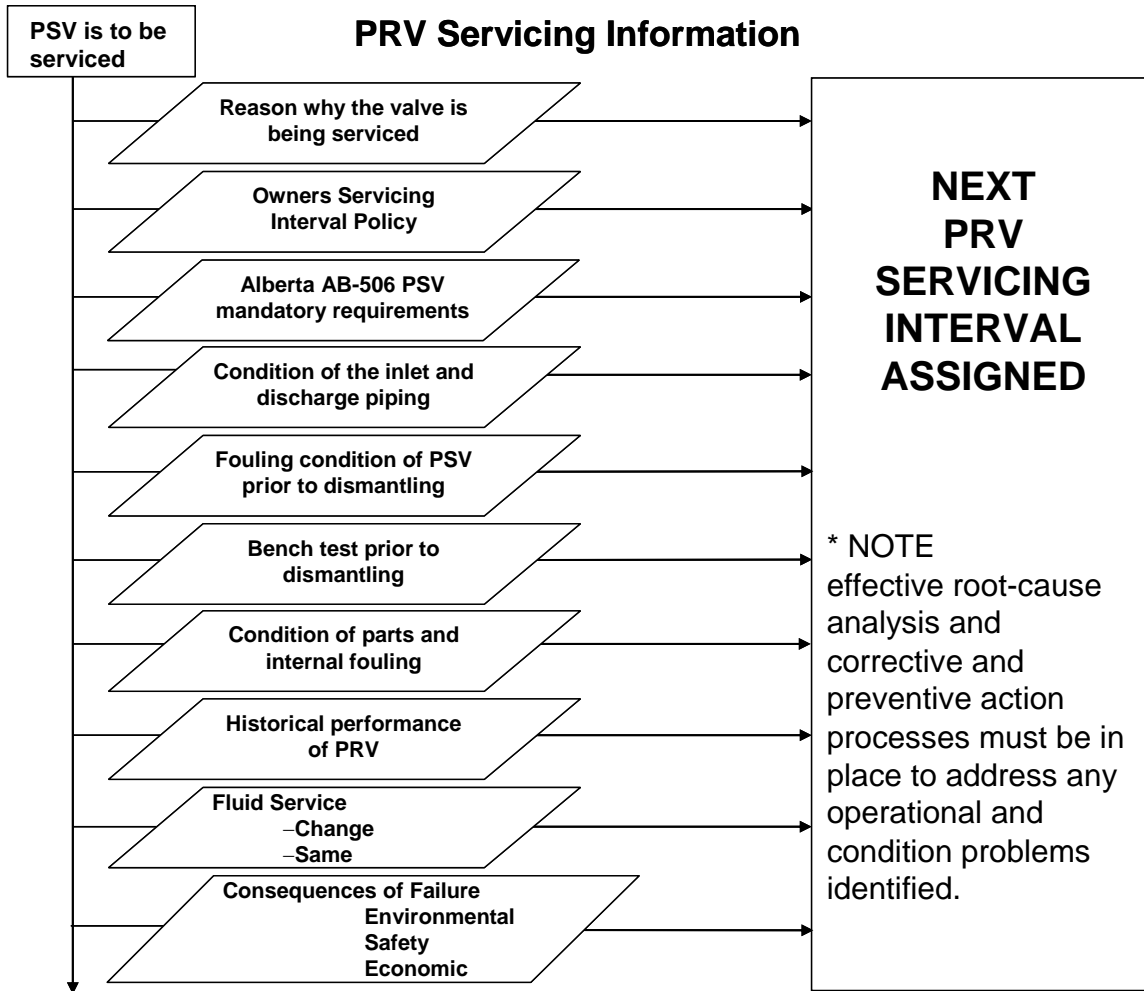
The Inspector shall conduct an inspection on a representative sample of vessels in that class or all vessels in that class. The external inspection shall be performed when an on-stream or internal inspection is performed, or at shorter intervals at the owners option.

An on-stream or internal inspection shall be conducted at least every 15 years or three quarters of the remaining corrosion-rate life, whichever is less.

Appendix C - Integrity Assessment Organization Certificate of Authorization Permit Chart



Appendix D - Guide for Assigning PRV Servicing Intervals





17.0 REVISION LOG

Edition	Rev #	Date	Description
1	0	2009-05-01	Issued with general revisions
2	0	2014-10-30	Issued with general revisions
2	1	2014-12-08	Editorial error page 30 "Changed CSA B51 2.5 yrs to 25 yrs"
2	2	2014-12-11	Editorial corrections as marked on pages 11, 30 and 33
2	2	2014-12-17	Editorial error page 13 "Section 9 to Section 8"
2	3	2015-02-18	Editorial error page 16 "Appendix B to Appendix A" and "Section 11.3 to Section 11.4"
2	4	2015-05-11	Editorial error page 26 "Appendix C" to "Appendix D"
2	5	2015-05-25	Editorial error page 25 "Section 12 to Section 11" and page 18 "Section 15.0 to 11.4"
2	6	2015-07-29	Editorial changes throughout, separated the items: LPG Plant Storage and Vessels in Propane Service in Table 1 and modified the title in Table 2
2	7	2015-08-26	Editorial change on Table 1 page 2 Removed "See Note 12"
3	0	2020-12-07	Issued with general revisions