

**Inspection & Servicing Requirements
for
In-Service Pressure Equipment
AB-506**

**Rev 6
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1.0 INTRODUCTION

This AB-506 *Pressure Equipment Inspection and Servicing Requirements* document has been issued by the Alberta Pressure Equipment Safety Administrator in accordance with the Pressure Equipment Safety Regulation to establish the integrity assessment and pressure relief valve servicing requirements that must be met for in-service pressure equipment.

**Dr K T Lau, PhD., P. Eng.
Chief Inspector and Administrator**

AB-506 has been significantly revised to include key requirements of the Pressure Equipment Safety Regulation (PESR) to reflect current industry practices, and to address safety issues that have been identified. It also incorporates applicable information that was previously covered in AB-514 and provides additional information to assist owners in ensuring the safe operation of their pressure equipment.

Please note that AB-514 has been withdrawn.

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 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, other industrial facilities, and public occupancy facilities, such as schools, 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 safe, cost-effective inspection and servicing requirements that are effective and practical for all sectors.

Maximum inspection and servicing intervals are assigned for specific types of equipment, through a progressive grading system. Provision is made in the grading system for owner-users who use practices such as risk-based engineering assessments to establish inspection strategies for their equipment and who have the appropriate organization structure, in-house resources, and processes to manage these programs.

The AB-506 was developed through close cooperation with owners and other stakeholders; their input has been invaluable in compiling this document. In particular, we would like to acknowledge the input from 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)

The American Petroleum Institute (API) Code 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 NB and API 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 relevant good engineering practices that are applicable to their specific industry sectors are used to supplement AB-506.

ABSA policy documents are living documents that 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:

Mike Poehlmann,
 Manager of Inspections
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2.0 DEFINITIONS

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 refers to the pressure equipment safety authority appointed by the Alberta government to act as the Alberta jurisdiction for administering the delivery of all safety programs under the Safety Codes Act as it applies to pressure equipment.

ABSA Safety Codes officer is an ABSA Inspector who holds the required Safety Codes Officer designation and designated powers under the *Safety Codes Act* and is competent to inspect the item of equipment.

Act means the Alberta Safety Codes Act and the regulations made under this Act that apply to pressure equipment.

Administrator shall mean the administrator in the pressure equipment discipline appointed under the Act.

Competent, in relation to a person, is defined as possessing the appropriate qualifications, knowledge, skills, and experience necessary to perform the work safely and in accordance with the Act.

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

Equipment records include design information, data reports, inspection plans, and integrity assessment, repair, and alteration records.

External inspection is 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 evaluation is a methodology whereby flaws and other deterioration/damage contained within piping systems are assessed in order to determine the structural integrity of the pressure equipment for continued service.

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

In-service Inspector (ISI) is 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 the inspection under their employer's ABSA-accepted quality management system.

Inspection interval is defined as the time period between thorough inspections.

IMS shall mean Integrity Management System, which is a system for ensuring that the pressure equipment is designed, constructed, installed, operated, maintained, and decommissioned in accordance with the PESR.

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

Inspector shall mean the ISI or ABSA Safety Codes Officer who is responsible for inspecting and certifying the item of pressure equipment.

Integrity assessment, as defined in the PESR, is 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. When the terms inspection and assessment are used in AB-506, they shall mean integrity assessment of in-service equipment under the PESR.

Integrity operating envelope/windows are 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 is an inspection performed from the inside of an item of pressure equipment using visual and/or NDE techniques.

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

NBIC ANSI/NB-23 – National Board Inspection Code

On-stream refers to a condition where the pressure equipment has not been prepared for an internal inspection.

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.

Owner-user 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).

Pressure equipment refers to a thermal liquid heating system and any containment for an expansible fluid under pressure, including, but not limited to, fittings, boilers, pressure vessels, and pressure piping systems, as defined in the regulations.

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 is defined as 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.

RBIP is an owner-user risk-based inspection program that meets *Risk-Based Inspection Requirements for Pressure Equipment (AB-505)* and has been reviewed and accepted by ABSA.

Thorough Inspection is 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, except as otherwise determined through an RBI assessment completed under an owner-user RBIP provided in accordance with AB-505, and
- a periodic 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.

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 DOCUMENTS

Documents issued by the Administrator

The AB-506 and the following documents have been issued by the Administrator to define the requirements that must be met for in-service pressure equipment under the PESR. When sections of the recognized industry standards — such as the NBIC and API Codes — are referenced in documents issued by the Administrator, the requirements in these sections must be met.

AB-505 Risk-Based Inspection Requirements for Pressure Equipment

This document defines 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 specifies quality system management 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 covers inspection and certification and other requirements for repairs and alterations to pressure equipment.

AB-515 Requirements for Inspection Companies

This 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 Document

IB02-002 Certification of In-Service Pressure Equipment Inspectors

The official versions of ABSA policy documents are posted on www.absa.ca.

Other Referenced Publications

ANSI/NB-23 – National Board Inspection Code

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 – 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

AS/NZS 3788-2006 – Australian/New Zealand Standard Pressure Equipment In-Service Inspection

ASME PCC-3-2007 – Inspection Planning Using Risk-Based Methods

CGSB Canadian General Standards Board - CAN/CGSB 48.9712-2006/ISO 9712: 2205 Nondestructive Testing, Qualification and Certification of Personnel

CSA B51-09 Boiler, Pressure Vessel and Pressure Piping Code

IP (Institute of Petroleum) – Pressure Vessel Examination, Model Code of Safe Practice (Part 12, 2nd edition, March, 1993)

SNT-TC-IA – Personnel Qualifications and Certification in Nondestructive Testing

Note: Unless otherwise identified, the latest accepted edition and addenda of these documents apply.

5.0 OWNER RESPONSIBILITIES

An effective integrity assessment (inspection) program is indispensable to the safe operation of pressure equipment. 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, and decommissioning.

The Pressure Equipment Safety Regulation (PESR) requires every owner to maintain an effective integrity management system for their pressure equipment and covers specific requirements that the owner must meet. (Note: the term “owner” under the Act includes lessee and person in charge (refer to section 2 Definitions).

These requirements are covered in the operations section of the PESR and include the following:

- the pressure equipment and pressure relief devices, pressure gauges and regulating or controlling devices on them are maintained in good working order and are operated safely;
- safe operating limits are established for the pressure equipment. This may require integrity operating envelope/windows to be established for the pressure equipment;
- the pressure equipment is operated within established safe operating limits;
- there are adequate and suitable instructions for the safe operation of the pressure equipment;
- the person operating the pressure equipment is competent;
- the pressure equipment has overpressure protection that is designed and maintained to ensure the maximum prescribed safe operating pressure limits are not exceeded;

- report to the Administrator of any unsafe condition, accident, or fire that occurs with respect to pressure equipment (refer to Section 35).

PESR 42 requires the owner to establish and maintain an integrity assessment program that is acceptable to the Administrator. PESR Section 41 lists the following items that must be included in an integrity assessment program:

- (a) maintaining an inventory of all the pressure equipment,*
- (b) assessing the pressure equipment in accordance with the integrity assessment requirements established by the Administrator,*
- (c) maintaining equipment records for each item of pressure equipment,*
- (d) maintaining records of maintenance, service and tests for pressure relief devices and other protective devices,*
- (e) assessing the integrity assessment, maintenance and operating history of the pressure equipment to ensure that the equipment is safe for continued operation, and*
- (f) any other matter required by the Administrator.*

To ensure the safe operation of their pressure equipment and to meet the requirements established in the PESR and AB-506, the owner must maintain an integrity management system and integrity assessment program that is appropriate for both their organization and the type of facility and equipment. For a small heating plant, simple work processes and limited documentation will normally suffice. Whereas, for a major petrochemical facility, a comprehensive pressure equipment integrity management system may be needed (in accordance with AB-512) that includes a formal risk-based inspection program and that is supported by a formal process safety management program and other safety management systems.

An owner may be required by the Administrator to hold a quality management system Certificate of Authorization Permit. These owners must provide an integrity management system that is documented and maintained in accordance with AB-512, and are termed “owner-users”.

Most items of process equipment installed in Alberta are inspected under an owner-user’s Certificate of Authorization Permit (CAP) or by inspection companies that hold a CAP authorizing them to provide integrity assessment services to owners. AB-515 covers the quality management system requirements for inspection companies. The flowchart shown in [Appendix A, page 32](#) establishes when an inspection company must hold a CAP.

Quality management system Certificate of Authorization Permits, required under the PESR, are issued by ABSA. Certificate holders who construct and repair pressure equipment, service pressure relief devices, or who provide integrity assessment services (inspection companies) are posted on absa.ca website.

All public occupancy equipment and other equipment that is not inspected under a CAP is inspected and certified by an ABSA Safety Codes Officer.

6.0 INTEGRITY ASSESSMENT PROGRAM

NBIC and API Codes and other referenced documents provide valuable information to assist owners and inspection organizations in maintaining an effective and efficient integrity assessment program.

Some basic responsibilities that the owner must meet in order to provide an integrity assessment program in accordance with the legislation 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 inspection company that holds the required Certificate of Authorization Permit (CAP) under the PESR (*Note: All public occupancy equipment is inspected by ABSA*). However, in all 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, NDE, construction, pressure relief valve servicing and repairs — 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 he/she 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.
- Ensure all changes that can impact the integrity of the pressure equipment are managed through an MOC process that is appropriate and practical for their organization.
- Maintain effective communication processes. The role of the operating personnel and the observations made by operators during their daily rounds are indispensable to an effective integrity assessment program. Effective, ongoing communication processes must be maintained between 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 and are promptly addressed.

7.0 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 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, 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. They 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 are identified with an Alberta A number (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, location and other status changes.

Information regarding the preparation and submission of the ESR is provided in Section 11.5 Inspection reports and Electronic Summary Reports.

8.0 INSPECTION ORGANIZATIONS

Integrity assessments must be performed by:

- An owner-user under a Certificate of Authorization Permit (CAP) issued by ABSA per Section 11(3) of the PESR. Document AB-512 covers integrity management system requirements that must be met by owner-users who are required to hold a CAP per 11(3).
- An inspection company that provides inspection services to owners under a Certificate of Authorization Permit (CAP) issued per PESR Section (11.2). AB-515 defines the requirements that inspection companies must meet in order to hold a CAP to perform integrity assessments.
- All public occupancy equipment, and equipment that is not inspected under an owner-user or inspection company CAP, is inspected by ABSA in accordance with the in-service safety programs that ABSA administers on behalf of the government of Alberta. ABSA's program activities include site assessments and audits to ensure that the requirements are met.

9.0 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.

Certificate of Competency and qualification requirements for in-service inspectors are covered in [Information Bulletin IB02- 002](#), which is posted on the ABSA website www.absa.ca.

A person who inspects and certifies boilers and pressure vessels under an owner-user or inspection company's CAP must hold the appropriate Alberta in-service Certificate of Competency. This person is referred to as an ISI (In-Service Inspector) in this document.

The scope of an in-service inspector's Certificate of Competency does not specifically include in-service inspection of pressure piping. A person who inspects and certifies in-service pressure piping must hold an Alberta in-service inspector Certificate of Competency, have appropriate documented training and experience for the type of piping that is to be inspected in accordance with their employer's registered quality management system. An ISI may only perform integrity assessments under the authorized scope of their employer's Alberta CAP (owner-user or inspection company).

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 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.

Persons who perform nondestructive examinations do not require an ISI (refer to Section 16).

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.

10.0 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 by the PESR. The Safety Codes Act Flowchart, that is included in AB-516, 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 when the item is imported into Alberta.

If the permit has terms and conditions, all terms and conditions must be met both prior to and during operation of the pressure equipment.

The owner must have suitable controls for ensuring the Certificate is retained and that the terms and conditions of the Certificate are met.

11.0 IN-SERVICE INSPECTION PROGRAM

NBIC and API codes cover in-service inspection information for pressure equipment. The applicable information contained in these documents and other relevant industry standards shall be followed for in-service inspection activities covered in AB-506.

API-510 and API-572 cover in-service inspection requirements for pressure vessels.

API-570 and API-574 cover in-service inspection requirements for pressure piping.

NBIC Part 2 covers requirements for in-service inspection of boilers, pressure vessels, and piping systems.

AS/NZS 3788-2006 Australian/New Zealand Standard Pressure Equipment In-Service Inspection also provides valuable information that can assist owners in establishing appropriate in-service inspection programs for their pressure equipment.

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 catastrophic events and other pressure equipment failures were the result of failures or leaks in the piping systems.

The applicable inspection principles covered in API-570, API-574, NBIC and other relevant codes and standards shall be used to determine the inspection requirements and inspection frequencies for pressure piping. Attention is also drawn to ASME B31.1 2007 Nonmandatory Appendix V, Recommended Practice for Operation, Maintenance, and Modification of Power Piping Systems.

The inspection organization's registered quality management system must include suitable processes to ensure that all required inspections and assessments are done in accordance with AB-506.

11.1 Installation Inspections

An inspection shall be performed after the equipment has been installed, and prior to commissioning, to verify that the equipment meets the Safety Codes Act and PESR and to initiate plant inspection records for the equipment. This inspection also provides an opportunity to collect desired baseline information and to take initial thickness readings at the designated corrosion monitoring locations, when required as part of the inspection plan.

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 and flanged, other mechanical connections are properly assembled, and that the equipment is clean and dry;
- 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).

All items that require a Certificate of Authorization Permit are inspected by an ABSA Safety Codes Officer prior to initial operation.

Equipment installed on process plants must be inspected at installation by an owner-user or an authorized inspection company acting on behalf of the owner.

Installation inspections shall be conducted by the Inspector, except as otherwise provided for in *Section 9 Qualifications of Persons Performing Inspections*.

11.2 Inspection Plans

Equipment plan information includes the following, as applicable:

- credible damage mechanisms (modes of deterioration) that could be expected to affect the specific equipment;
- the type and extent of NDE examinations and inspections required to detect and evaluate the damage mechanisms;
- 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 for the pressure vessel, 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.

Equipment plans must be prepared and validated within a short time frame — up to one year — after the installation inspection has been completed. Equipment 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 inspection company's documented quality system program. For major facilities, this may also require that the plan be approved by operations, engineering, the chief inspector and other key persons.

Inspection procedures and plans must be available to inspection personnel for the scope of inspection.

11.3 External Inspection

The external inspection comprises a detailed external visual inspection of the pressure equipment and verification of the pressure relief devices to identify items 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 13 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 or NBIC for the applicable piping service — or as otherwise established through an RBIP.

External inspections shall be conducted by the Inspector, except that persons who do not hold ISI may perform limited external inspections under the supervision of the ISI (refer to Section 9 *Qualifications of Persons Performing Inspections*).

11.4 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 and pressure vessels.

The thorough inspection shall include the following:

- an internal inspection or equivalent on-stream inspection per API-510, except as otherwise determined through an RBI assessment completed under an owner-user RBIP;
- 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; 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;
- the Inspector shall review and approve all thorough inspection and examination reports and results as well as RBI assessment results.

11.5 Inspection Reports and Electronic Summary Reports (ESR)

Detailed inspection reports must be kept on file by the inspection organization (refer to Section 7).

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 items they operate and that are subject to annual fees. The ESR is also used to update other vessel data as described in Section 7. Information provided to ABSA on the ESR is imported into ABSA's pressure equipment database. The database calculates the next inspection due date for the equipment from the date of the "thorough inspection" and the "assigned inspection interval" provided on the ESR.

It should be noted that equipment subject to annual fees represents only a small part of the total number of items that must be inspected to assure the integrity of pressure systems.

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 inspection company 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. Current pressure relief valve servicing and other information listed should also be updated, when this information is available. The completed ESR shall be certified by an ISI designated by the owner-user or inspection company.

The thorough inspection date that is reported on the ESR shall be the date of the internal inspection or on-stream equivalent inspection, unless the item is inspected under an owner-user's RBIP. (Section 2 establishes the definition of "thorough inspection")

For items that are inspected under an RBIP, the “inspection date” field on the ESR shall be used to report the date of the last RBI assessment. The assigned “inspection interval” field on the ESR shall be used to report the assigned RBI assessment interval. The assigned RBI assessment interval cannot exceed the maximum interval shown in [Table 1, page 29](#) for thorough inspections. *Note:* RBI assessment outputs may result in an actual internal inspection interval that exceeds the maximum thorough intervals shown for the type of equipment.

Owner-users must provide an updated ESR by the end of each calendar year. ESRs should also be submitted quarterly when there are a significant number of items that require updating.

Inspection companies who prepare an ESR for owners who do not have an owner-user CAP must submit a revised quarterly ESR when there is information for an item of equipment that requires updating.

12.0 INSPECTION INTERVALS

Requirements covered in this section, and the applicable information covered in AB-506, API-510, API-572, API-570, API-574, and NBIC, shall be used to determine appropriate inspection intervals for boilers, pressure vessels, and piping.

The progressive grading system described below shall be used for boilers, pressure vessels and piping, except that the progressive grading system does not apply for owner-users who use an RBIP to determine inspection requirements and inspection intervals for their pressure equipment. A thorough inspection interval, up to the maximum listed in Grade 3 of Table 1, may be assigned for this equipment at commissioning, as determined through the RBI process (refer to Section 13).

Table 1, identifies the maximum thorough inspection intervals that may be assigned to each grade for the types of equipment that are listed. The intervals and other information shown on Table 1, have been established based on industry and ABSA experience.

The intervals listed establish the maximum period of time that is allowed between the thorough inspections. The item shall be inspected by this date, unless it has been deferred or revised in accordance with Section 15 Inspection and Pressure Relief Valve Servicing Date Deferral and Revision, or through an RBIP assessment.

Suitable documentation must be kept to justify the basis for assigning inspection intervals. The applicable documentation and equipment records shall be approved and endorsed by an ISI designated by the employer and other competent persons identified in the owner-user’s quality management system.

12.1 Inspection Grade 1

The interval listed under Grade 1 is the maximum thorough inspection interval that can be assigned when the item is first commissioned.

The first thorough inspection conducted after commissioning is intended to provide confirmation that the inspection plans and strategies are appropriate, and also to identify any possible design or construction deficiencies.

Notwithstanding the above, the owner/inspection organization may assign an initial inspection interval — up to Grade 2 — if the conditions for known service are met (refer to Section 12.5).

ABSA assigns a nominal inspection interval for each 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 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.

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 commissioning inspection. An ABSA ESR is normally used for this purpose (refer to Section 11.5).

12.2 Inspection Grade (2)

The interval can be increased to Grade 2, after a thorough inspection(s) at the Grade 1 maximum interval has proved the interval can be safely increased.

12.3 Inspection Grade (3) (Owner-users only)

Owner-users may extend the thorough inspection interval to the maximum interval shown at Grade 3 if the item has successfully concluded a period of service at Grade 2 and a thorough inspection has proven that the interval can be safely increased to Grade 3.

Notwithstanding the above, owner-users who have the appropriate organization structure, work processes, and competent in-house inspection, corrosion, and other resources provided under their CAP, may establish a maximum inspection interval up to that listed for Grade 3, after a thorough inspection at the maximum Grade 1 interval has proven the interval can be increased to Grade 3. *Note:* This is not required for owner-users who maintain a RBIP (refer to section 13.0).

12.4 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 item'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 pressure 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.

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.

Owners must maintain an effective management of change system to ensure that any changes that can affect the integrity of the pressure equipment are promptly relayed to and addressed by the Inspector and other relevant personnel.

12.5 New Vessels In Known Service

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

- the pressure equipment 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.

13.0 RISK-BASED INSPECTION PROGRAMS

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.

Risk-Based Inspection (RBI) appropriately applied as part of an effective Integrity Management System (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.

RBI can be very beneficial. 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 establishes the mandatory requirements governing the application of RBI in Alberta. AB-505 references API-580 and provides additional information to ensure that RBI is appropriately applied.

RBIP is defined in AB-506 as an owner-users risk-based inspection program that meets *Risk-Based Inspection Requirements for Pressure Equipment (AB-505)* and has been reviewed and accepted by ABSA.

An RBIP may be used to determine the extent and frequency of inspections. This requires formal management processes, detailed development and planning, and involvement of experienced corrosion, materials, maintenance and process engineers/technologists, and operating personnel. 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. *Note:* The exception to the progressive grading system allowed for under an RBIP cannot be applied to pressure relief valves.

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.

14.0 FITNESS-FOR-SERVICE EVALUATIONS

Recommended Practice API-579 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. The criteria for accepting pits in accordance with API-510 and NBIC may be used without submitting the proposal to ABSA.

15.0 INSPECTION AND PRESSURE RELIEF VALVE SERVICING DATE DEFERRAL AND REVISION

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 15.0.

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

15.1 Interval Deferral

A deferral is appropriate when the current interval for a thorough inspection interval or pressure relief valve servicing interval is still considered to be correct, given the available data, but an extension of the inspection/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 organization's inspection program, and may also require approval from qualified engineering and other key persons per the owner-users 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.

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 CAP must obtain ABSA acceptance for any proposed deferral that exceeds 10 percent of the inspection/servicing interval or six months, whichever is less.

15.2 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 vessel/piping 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.

16.0 NONDESTRUCTIVE EXAMINATIONS (NDE)

Owners and inspection 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, flagging questionable readings, and 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.

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, as well as its limitations.

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 -1 A Level II certification in accordance with the

SNT-TC 1 A 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 inspection company 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.

17.0 PRESSURE RELIEF DEVICES

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 pressure-relief devices, 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 2 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.

17.1 Isolation Valves

The Administrator may accept the installation of block valves in pressure relief piping for pressure vessels if the owner meets the requirements of ASME Section VIII, Division 1 and 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 required for isolation or servicing of the pressure-relief device; and
- the associated training requirements of all people who work with the pressure equipment involved.

17.2 Maintenance of Pressure Relief Devices

PESR Section 39 states:

- adjustable parts of a pressure-relief device must be sealed at the time of servicing and remain sealed during operation;
- seals must be installed in a manner that prevents changing the adjustment of a pressure-relief device without breaking the seal;
- a pressure-relief device must be serviced at an interval acceptable to the Administrator;
- 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.

Online Visual Examination

A 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.

The scope of this 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 locked 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.

17.3 Pressure Relief Valve Servicing Intervals

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 12 shall be used to determine servicing interval for pressure relief valves.

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.

PRV's must be serviced by an organization that has a valid ABSA Certificate of Authorization Permit to service pressure-relief valves. 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 absa.ca website.

The owner must have appropriate 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 (pre-test). This is required for all process valves, unless the valve is extremely fouled and dirty or if a valve is in a hazardous service that may require neutralizing. When a valve is replaced it may still need to be assessed through pre-pop, dismantling etc. in order to establish a suitable interval for the 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 pre-pop test or is otherwise found to be in an inoperable condition.

Appendix B 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.

17.4 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 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.

18.0 REPAIRS AND ALTERATIONS OF IN-SERVICE PRESSURE EQUIPMENT

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

AB-513 has been issued by the Administrator to provide guidance on the application of requirements established in the (PESR). AB-513 provides detailed information on the inspection and certification requirements for repairs and alterations.

TABLE 1 MAXIMUM THOROUGH INSPECTION AND SERVICING INTERVALS

TYPE OF EQUIPMENT	MAXIMUM Thorough Inspection intervals (years) Boilers and Pressure Vessels			MAXIMUM Servicing Intervals PRVs (years)			Notes
	GRADE			GRADE			
	1	2	3 Certified OU Only	1	2	3 Certified OU only	
	Power Boilers						
Pressure Plant H.P. Boilers	1	2	3	3	3	4	6
Thermal Generating Station	1	2	3	4	4	4	6, 3
Waste Heat Boilers e.g. (Sulphur Boilers)	2	3	4	2	3	4	
Portable Boilers - Rig and Others	1	1	1	1	2	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 Boilers	2	3	3	2	3	3	6
Heating Boilers							
All types of heating boilers	3	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 Opening Closures	4	4	4	4	4	4	
Refrigeration Vessels Group A1	5	10	10	5	5	5	7
Refrigeration (other incl. Ammonia)	5	5	10	5	5	5	7
Ammonia Storage	5	5	10	5	5	6	
LPG and other non-corrosive Storage Vessels	5	10	10	5	5	6	
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 B51-09 Part 2						

TABLE 1 MAXIMUM THOROUGH INSPECTION AND SERVICING INTERVALS

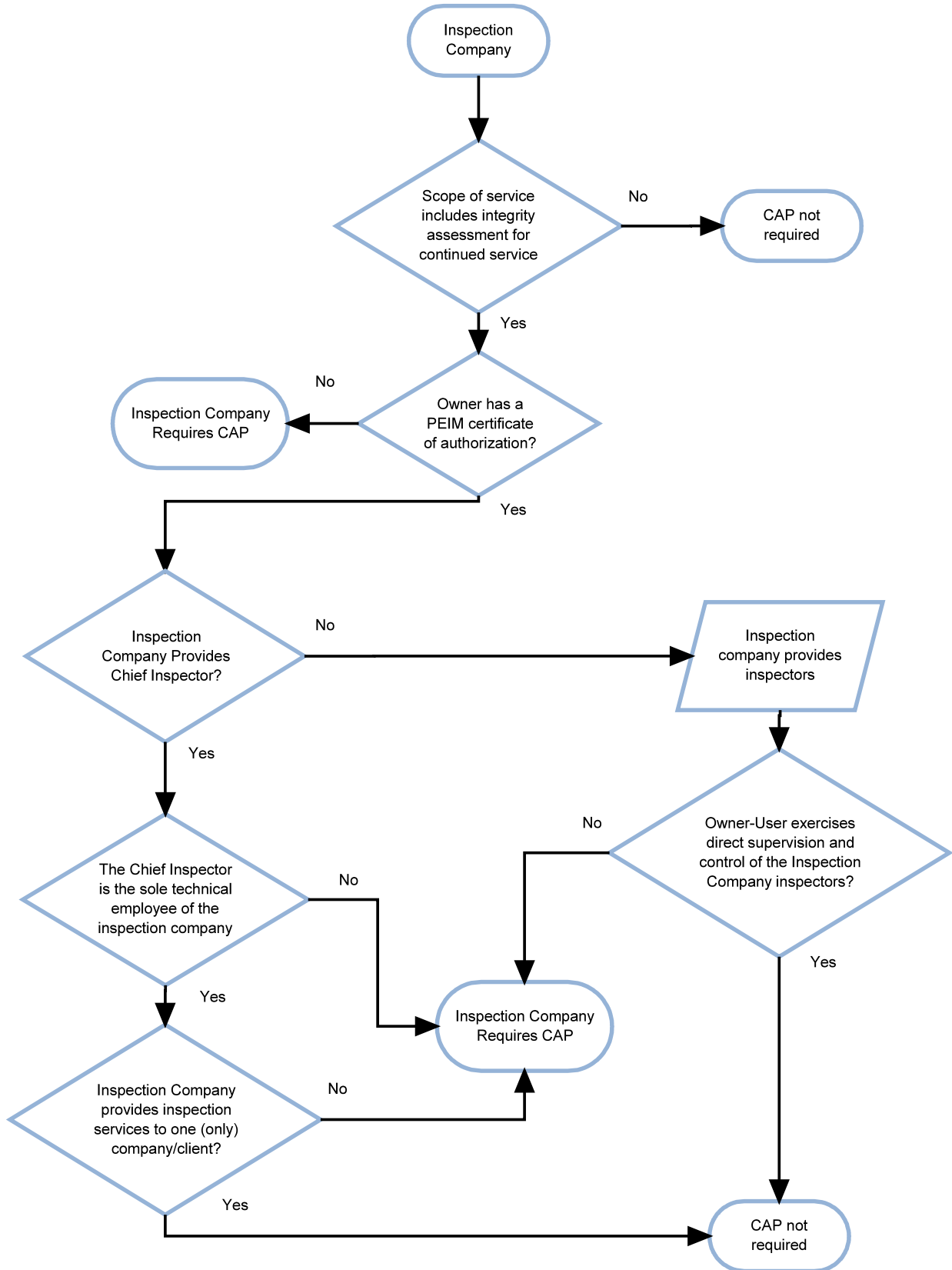
TYPE OF EQUIPMENT	MAXIMUM Thorough Inspection Intervals (Years) Boilers and Pressure Vessels			MAXIMUM Servicing Intervals PRVs			Notes
	GRADE			GRADE			
	1	2	3 Certified OU Only	1	2	3 Certified OU only	
Fired Process Heaters, separately fired superheaters and similar equipment	3	4	6	3	4	6	8, 5
Well-head vessels (separators etc.)	5	5	10	5	5	6	
Treaters, FWKO's Upstream	4	5	6	3	5	6	
Line Heaters Upstream	4	5	10	3	5	6	
Sweet Service Unfired vessels installed on upstream plants	5	5	10	3	5	6	
Sour Service vessels installed on upstream plants	4	4	6	3	4	6	
Compressor Bottles Vibrating service (upstream equipment)	4	4	6	3	4	6	
Unfired Process Vessels not listed elsewhere in this table	4	5	10	3	5	6	5, 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

Notes

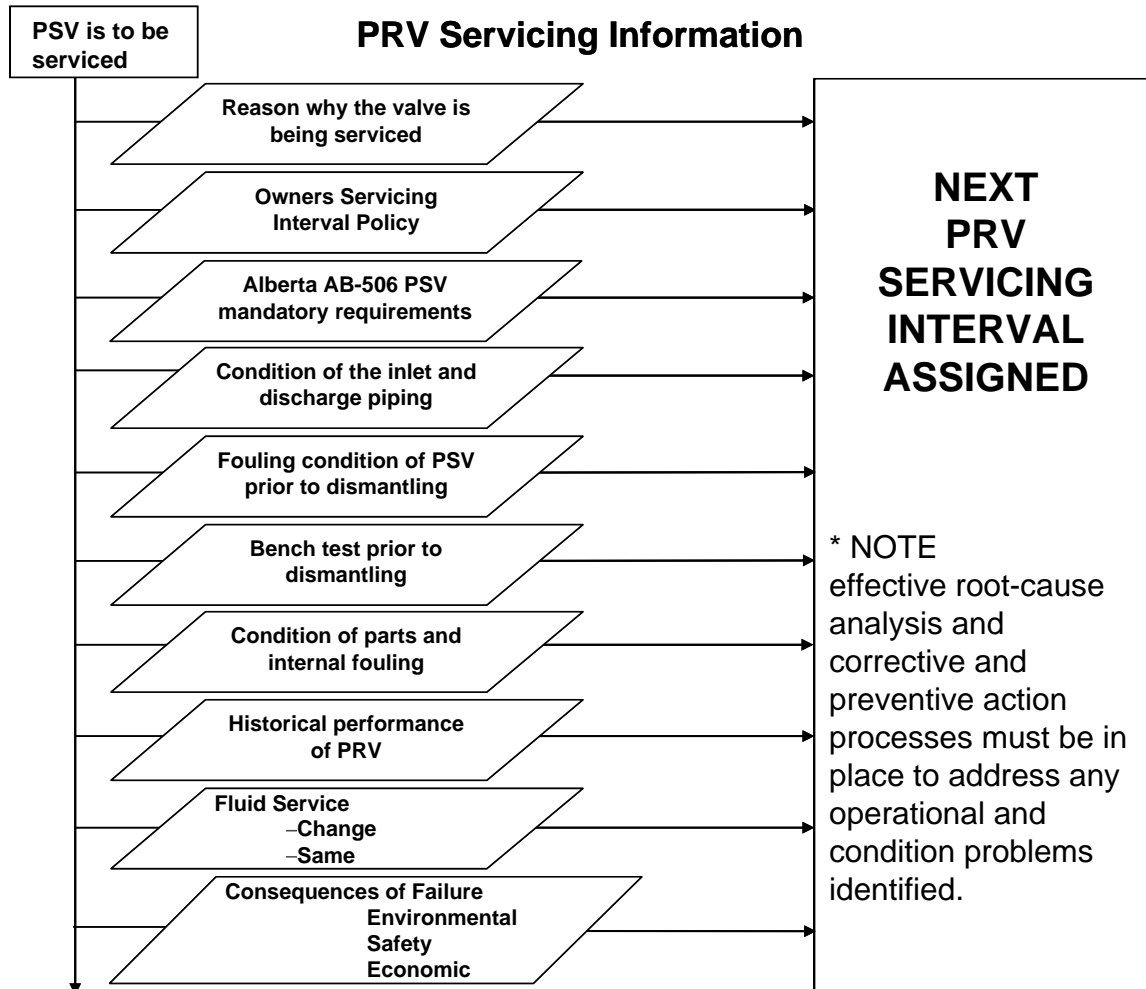
To be used in conjunction with Table 1

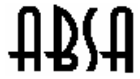
- 1 The Inspector may accept a satisfactory manual test or system test performed at the time of the thorough inspection instead of replacement or servicing for PSVs.
- 2 NBIC Part 2 covers recommendations for periodic manual and system tests that may be appropriate.
- 3 Assist-lift test at half the servicing 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.). Thorough inspection of vessels if insulation is removed.
- 5 Maintain suitable records for equipment that is designed for a specific period/cycle (e.g. fired process heaters and Div. 2 Vessels).
- 6 Grade 2 and 3 intervals for boilers are limited to those plants that have adequate water treatment, maintenance and operating systems.
- 7 Owner-users who have the appropriate organization structure work processes and competent in-house staff, and who maintain a formal PSV condition and interval assessment program under their owner-user CAP, 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.

Appendix A - Inspection Company Certificate of Authorization Permit Chart



Appendix B - Guide for Assigning PRV Servicing Intervals





Revision Log

Rev #	Date	Description
6	2009-05-29	Complete revision