# Owner-User Pressure Equipment Integrity Management Requirements

## AB-512

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# FOREWORD

As provided for under Sections 11, 12 and 13 of the Pressure Equipment Safety Regulation, the Administrator of Pressure Equipment Safety of Alberta under the Safety Codes Act, has established that this ABSA document AB-512 *Owner-User Pressure Equipment Integrity Management Requirements* specifies information required by the Administrator from an applicant; and specifies features of a quality management system for pressure equipment integrity management that may be acceptable to the Administrator.

This document is scheduled to be reaffirmed in 2025.

# 1.0 INTRODUCTION

This AB-512 Integrity Management Requirement (AB-512) document defines quality management system normative requirements that shall be addressed to achieve and maintain a pressure equipment integrity management system Certificate of Authorization Permit.

This AB-512 document cancels and replaces the previous ABSA documents that were issued to define integrity management requirements.

To ensure the safe operation and reliability of their pressure equipment and compliance with the Safety Codes Act, owners must have effective systems for managing the integrity of their pressure equipment throughout its full life cycle; from when it is designed, constructed and installed, throughout its service life (i.e. operation, maintenance, repairs, alterations, integrity assessments, etc.), and decommissioning. An effective Integrity Management System will also enable inspection (integrity assessment) and other resources to be optimized, reduce plant downtime, and ensure that there is appropriate control of all pressure equipment assets.

While the information in this document is intended to assist all owners in implementing effective integrity management systems for their pressure equipment, provision of a documented quality management system in accordance with the AB-512 is mandatory upon the Administrator's instructing an owner in writing that they shall hold a Quality Management System Certificate of Authorization Permit under the Safety Codes Act (i.e. Owner-User Certificate of Authorization Permit).

The Safety Codes Act and Pressure Equipment Safety Regulation (PESR) establishes requirements for formal registration of quality management systems and establishes the Administrator's authority to require owners to submit their Quality Management System for registration. Owners with a satisfactory Quality Management System, that is accepted and filed with ABSA, are issued an Alberta Quality Program Certificate of Authorization Permit for the scope of activities that are defined in the written description of their Quality Management System.

Certification requirements have been enforced through a phased-in approach. From owners operating a large amount of pressure equipment with a correspondingly greater pressure equipment risk, to owners that operate less pressure equipment with a lower overall risk. Enforcement of the certification requirement is completed on an individual basis when the Administrator decides that the risk associated with the owner's pressure equipment warrants formal submission of their Quality Management System, which may also be referred to as an Integrity Management System (IMS) as referenced in the PESR.

Pressure equipment for process applications installed in Alberta covers a broad range of facilities from major petrochemical plants, pulp mills, and power utilities to small oil and gas processing facilities and commercial and other applications. The extent of an

owner's Integrity Management System documentation needed to achieve an effective and practical Integrity Management System that meets the AB-512 will, therefore, vary considerably and must be suitable for the organization's structure and business practices.

The information in this AB-512 document and other referenced ABSA policy documents was developed, and is updated periodically, based on ongoing consultation with Alberta pressure equipment owners and other stakeholders and information from codes, standards and other published information. This process is designed to ensure that policy documents issued by ABSA, as the Alberta pressure equipment safety authority, reflect current best industry practices that are suitable for all industry sectors.

Policy documents (AB-500 Series) issued by the Administrator establish requirements that must be met to be in compliance with the Safety Codes Act. These AB-500 Series requirements documents e.g. as well as guideline documents e.g. are posted on ABSA's website www.absa.ca.

The company who has care and control of the pressure equipment is the organization that would normally be required to provide and maintain an IMS under the Safety Codes Act, and is also referred to as an owner-user in this document.

# 2.0 SCOPE

Part 1 of this document establishes the normative requirements that must be addressed in the written description of an owner-user's Integrity Management System, when it is required to be submitted to ABSA pursuant to the Act. Each sub-section within section 4.0 of this AB-512 document covers a fundamental integrity management component. Practical informative advice to assist owners to meet the requirements and implement an effective and efficient Integrity Management System and promote consistency in evaluating Integrity Management Systems is provided in Part 2, sub-sections within section 5.0 of this document.

# 3.0 DEFINITIONS and ACRONYMS

Refer to the Safety Codes Act and regulations for other relevant definitions.

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

***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)]

***Chief Inspector*** – means a person who meets the requirements to be in charge of an owner's pressure equipment integrity assessment program.

***Competent*** – in relation to a person, means possessing the appropriate qualifications, knowledge, skills and experience to perform the work safely and in accordance with the Act. [PESR 1(1)(i)]

*Note: competent includes working in accordance with this document.*

***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)]

***IMR –*** Integrity Management Requirement

***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)]

***ISO –*** International Organization for Standardization

***OPPSD –*** Overpressure Protection by System Design (see AB-525)

***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 power and authority of ownership. [SCA 1(1)(v)]

***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)]

***Safe Operating Limits*** – means limits established for critical process parameters, such as temperature, pressure, level, flow, or concentration, based on a combination of equipment design limits and the dynamics of the process.

***Safety Critical Equipment*** – means the pressure relief devices, regulating or controlling devices and systems that are required to ensure pressure equipment is operated within Safe Operating Limits and to prevent, mitigate, detect or respond to the effects of loss of containment or a sudden release of energy.

***Steam Pipelines*** – means steam pipelines used in the recovery of hydrocarbons from a reservoir or oil sands deposit as defined in the Alberta Energy Regulator (AER) Directive 077, Section 3.

# PART 1: REQUIREMENTS

## 4.0 INTEGRITY MANAGEMENT SYSTEM REQUIREMENTS (NORMATIVE)

**Requirements**

The Owner shall provide a written description of the quality management system used by the organization, in accordance with this AB-512 document, to maintain an effective Integrity Management System. The written description of the quality management system shall address the contents of each component/element within section 4.0 of the AB-512.

The written description of the Pressure Equipment Integrity Management System may be a stand-alone manual or may be incorporated into the organization's formal management system documentation.

### 4.1 Title Page

If a Pressure Equipment Integrity Management System (PEIMS) document (i.e. "manual") is the means the owner uses to provide a written description of the quality management system required by the Pressure Equipment Safety Regulation then the title page of the PEIMS document shall identify the information that follows. Alternatively, if the owner has incorporated AB-512 requirements into the organizations formal management system documentation, the written description of this quality management system shall be submitted along with an AB-512(b) checklist that will identify where the AB-512 requirements are contained, including the information to be addressed within the title page element.

- Title of the document that describes the organization's IMS.
- The name and corporate address of the organization.
- Identify the revision status of the document.

### 4.2 Scope and Application

The written description of this element shall:

- Include a Policy statement that identifies the key purpose of the quality management system and confirms compliance with the Safety Codes Act and, as applicable, AER Directive 077, Section 3, with respect to Steam Pipelines.
- Define the scope of the quality management system for pressure equipment assets that are owned and/or operated, and provide a brief description/identification of activities that will be included within the quality management system.
- Provide an overview of the organization and the type of facilities that are operated.
- List of major operating centers (facilities).

- Identify facilities under the scope of the IMS that are operated on behalf of other owners.
- Include a requirement, with assigned responsibility, to ensure that the AB-512(a) IMS Scope and Responsibility document that is on file with ABSA is kept current.

## 4.3 Table of Contents

The written description Table of Contents shall:

- Show a Table of Contents that lists the number and title of each section and its location in the written description of the quality management system.

## 4.4 Organization

The written description of this element shall include:

- A statement that management will ensure that responsibilities and authorities are defined and are communicated within the organization.
- Organization chart(s) that identify positions that are relevant to the pressure equipment integrity management system scope, with the reporting structure illustrated.
- A statement that all job descriptions, with defined roles and responsibilities for IMS activities, shall be maintained as required to ensure the IMS is effective. e.g.

## 4.5 Definitions of Terms and Acronyms

All terms and acronyms used in the written description of the quality management system shall be defined.

## 4.6 Statement of Authority and Responsibility

The written description of this element shall include:

- A statement that the written quality system covers the information specified in the AB-512 and accurately describes the Integrity Management System used by the company.
- A statement that the quality system has the full support of management who will ensure that adequate resources, including competent personnel, are provided to implement the program.
- Title of the person designated as the management representative to have overall responsibility for the Integrity Management System; with an explanation that this person, irrespective of other duties, has the defined authority and responsibility for the implementation of the Integrity Management System and has direct access to, and support from, top management to resolve any implementation barriers.
- Signature of senior (executive) management.

## 4.7 Management Responsibilities

The written description of this element shall confirm management's commitment to the IMS and describe key responsibilities pertaining to the IMS. It shall include:

**Planning**

- A statement that management will ensure that there is an appropriate planning process to assure effective development and maintenance of the IMS.

**Management Commitment**

- A statement and evidence that management is committed to the development and implementation of a successful Integrity Management System and to continually improve its effectiveness.
- Establish that top management will review the Integrity Management System at appropriate intervals to ensure its continued suitability and effectiveness, and that records of such reviews will be maintained.
- A statement that management shall ensure that appropriate communication processes are established within the organization to ensure compliance with the legislation and the effectiveness of the IMS. These processes shall include information on the legislation and issues that may impact the safety of the pressure equipment.
- A statement that the organization shall determine and provide adequate competent human resources and the necessary facilities and equipment to effectively implement the IMS.
- Establish that a documented contract or agreement shall be maintained for subcontracted activities that are key to the success of the IMS, to provide clear direction regarding the scope, responsibilities and requirements.

## 4.8 Quality System Documentation

The written description of this element shall establish that there will be a documented procedure for controlling the IMS written description (e.g. quality system manual), referenced procedures, process safety information, codes and standards, records and other documents relevant to the IMS and state that the aforementioned documents and records shall be maintained, relevant and current.

There will be documented controls to ensure that:

- The current issues of the appropriate documentation are available at all relevant locations and to all relevant persons.
- All changes of documents or amendments to documents are covered by the correct authorization and processed in a manner which will ensure timely availability at the appropriate location. This shall include ensuring that current versions of the quality manual are provided and accepted by ABSA.
- Superseded documents are removed from use throughout the organization or are appropriately identified as superseded documents.
- Other parties, as necessary, are notified of changes.
- The current revision status of documents is identified.
- Documents remain legible, readily identifiable and retrievable.

- Documents of external origin are identified and their distribution controlled.
- The controls needed for the identification, storage, protection, retrieval, retention time, and disposition of records are addressed.
- That all changes to documents are handled through an appropriate management of changes process.

Documents and records may be in hard copy or electronic format. Electronic systems must be able to readily reproduce a written copy, show the required authentication, and be protected from unauthorized alteration.

When documents are issued in electronic format, the system used to control these documents should be described and include the provision for documenting that key personnel have read and understand the contents of the documents issued.

The person who is responsible for approving and maintaining each essential document should be identified. If applicable, it should be established that the electronic version is the controlled copy and that any hard copy versions are uncontrolled documents.

## 4.9 Competency and Training

The written description of this element shall define the system for ensuring the required competence of personnel who perform work that can impact the effectiveness of the IMS.

Key activities that shall be controlled:

- Identification of experience, qualification and training requirements for individual jobs or positions that are critical to IMS implementation.
- Identification of the training programs or other training resources that are used for training.
- Process for ensuring that personnel, who operate pressure equipment, assess the integrity of in-service equipment or perform pressure welding, hold the appropriate Certificates of Competency as required under the Safety Codes Act and regulations.
- For all personnel who perform work that can impact upon the effectiveness of the IMS, there shall be documented evidence of assessment, re-assessment as applicable, and verification of competence.
- Ensuring that all persons operating pressure equipment are competent, and also qualified in accordance with the Power Engineers Regulation when supervision of boilers or thermal liquid heating systems is required by the Alberta Power Engineers Regulation.
- Ensuring that all of the requirements in the Power Engineers Regulation pertaining to reduced supervision are met, when reduced supervision is permitted by the regulation and adopted by the owner.

- Continuation of training to ensure the required level of competency is maintained, and to reflect any changes in legislation, technology, IMS best practices, etc.
- Records of job functions and training.

## 4.10 Design Control

The written description of this element shall describe the system for ensuring that Pressure Equipment and Steam Pipelines are designed in accordance with the requirements, and that the design addresses the service conditions and other process related requirements needed to prevent unintentional release of fluid contained in the pressure system.

Key activities that shall be covered:

- Ensuring that there is a design basis memorandum (DBM) or equivalent design scope documentation that identifies the design and operating conditions, the service requirements and other information needed to facilitate the safe design, construction, and inspection of the equipment.
- Verifying that personnel assigned to design engineering activities are competent and meet the applicable code experience and qualification requirements, where such requirements exist.
- Ensuring that an appropriate Process Hazard Analysis (PHA) is completed for new process facilities.
- Establishing and defining Safe Operating Limits for the pressure equipment.
- Identifying pressure relief devices, pressure gauges and regulating and controlling devices that are utilized to ensure pressure equipment is operated within established Safe Operating Limits as Safety Critical Equipment.
- Preparation, verification and approval of design documents and process safety information such as specifications, drawings, Piping and Instrumentation Diagrams (P & IDs), Process Flow Diagrams (PFDs), line lists or line designation tables, calculations, shutdown keys or control logic documentation, from the DBM.
- Ensuring that the latest code edition and addenda of the applicable construction codes and standards and other related documents are available to design personnel and are used for pressure equipment design.
- Ensuring that all design documents, including any revisions, have the required approval and that the latest revisions are available and are used.
- Ensuring that there is appropriate management of change processes in place for all design activities.
- Ensuring that overpressure protection is provided in accordance with the Pressure Equipment Safety Regulation and the requirements of AB-525.

- Ensuring that the design registration and other Safety Codes Act (SCA) requirements have been met.
- Ensuring that design information and alteration procedures for alterations to Steam Pipelines, boilers, pressure vessels, and thermal liquid heaters, including fitness for service evaluations when applicable, are submitted to ABSA Design Survey for acceptance prior to the start of work.
- Verifying that manufacturers and piping contractors are qualified and competent to construct pressure equipment in accordance with the design.
- Retaining all of the applicable engineering design documents and ensuring that drawings, such as PFDs and P & IDs, and other process safety information reflects the as built condition and is kept current.

## 4.11 Purchasing and Material Control

The written description of this element shall establish the system used to ensure that purchased materials and services, including rental equipment, for IMS activities conform to the Act and meet the specified purchase requirements.

Key Activities that shall be covered:

**Evaluation and selection of suppliers**

- Define the process used for selecting suppliers based on their ability to supply equipment, materials, and services in accordance with the Act and owner's requirements. Criteria for selection, evaluation and re-evaluation of suppliers shall be established. Records of evaluation results and any necessary changes to vendor approval arising from the evaluation shall be maintained.
- Maintain a current approved vendors list that is available to, and used by, all personnel involved with purchasing activities.

**Purchasing**

Ensure purchasing information for the product and services to be purchased includes, as applicable:

- Quality System Certification requirements.
- Identification of the applicable issues of the Codes and Standards to which the product must comply.
- Material specifications and other required information.
- Design registration (i.e. CRN) requirements for pressure equipment.
- The extent and type of service required.
- Owner's specified requirements.

### Contracts

Maintain a written contract or agreement that clearly defines the scope of services for inspection, design, NDE, and other services that can impact the effectiveness of the IMS.

Ensure that there are written contracts for all equipment that is operated on behalf of other owners and for rental equipment at site. These contracts shall define who will be responsible for the operation, maintenance, servicing pressure relief valves, inspection, repair, and other IMS activities.

### Control of Pressure Equipment and Materials at Site

Ensure that pressure equipment and materials received on site meet specified purchasing requirements and the applicable codes and specifications. The control features shall include:

- System for ensuring received equipment or materials conform to the correct specifications and quantity.
- System for identifying materials with the correct specification and other required information whenever material identification will not be retained to the point of use.
- System for identifying and disposing of non-conforming items.
- System for ensuring that the equipment or materials issued complies with the Code and the design specifications.

### Rental Equipment

Ensure that all rental pressure equipment operated on owner sites meets the requirements of the applicable regulations.

## 4.12 Construction and Installation

The written description of this element shall establish the methods used to ensure that pressure equipment and Steam Pipelines are constructed and installed in accordance with the regulatory requirements and the applicable Codes of Construction and meets the design requirements.

Key Activities that shall be covered:

- Coordination and control of pressure equipment manufacturers and organizations that install pressure equipment.
- Surveillance of contractor’s quality control systems.
- Determining need and extent of any source (shop) inspection.
- Verifying that contract organizations have the required capabilities and are approved vendors.
- Ensuring that the supplier is provided with the current versions of required specifications and drawings and the information is clearly defined and is understood by the supplier.

- Appointment of competent persons to act as the owner's Inspector for code pressure piping construction (refer to Training and Competency section).
- The process for reviewing and retaining completed project packages and the required data reports, and that Alberta Piping Construction data reports (AB-83) are provided and are completed correctly.
- Confirming that the pressure piping installation is in accordance with the Safety Codes Act.
- Verifying that the design has been registered in accordance with the Safety Codes Act and AER Directive 077, when applicable, and that Completion of Construction Declaration forms (AB-81), are provided to ABSA for registered piping designs.
- Notification to ABSA in order for ABSA to complete initial inspections and installation inspections, as applicable.
- Written procedures that meet ABSA requirements are maintained for new construction, repair and alteration of pressure equipment activities that are completed directly by the owner.

## 4.13 Control of Monitoring and Measuring Devices

The written description of this element shall define the procedure used to control, calibrate, and maintain monitoring and measuring devices that are used for pressure equipment testing, condition assessment, and for verifying or calibrating Safety Critical Equipment.

Key controls that shall be covered in the documented procedure include:

- Ensuring that each measuring device is calibrated or verified, at specified intervals or prior to use, against measurement standards traceable to international or national measurement standards. Where no such standards exist, the basis used for calibration or verification shall be recorded.
- Ensuring that each item of measuring equipment is identified to enable the calibration status to be determined.
- Control the issue of equipment to ensure that it is suitable for intended use, the calibration is current; and that it is examined for damage after use.
- Measures to ensure that verifications accepted based on equipment that is found to be out of calibration shall be assessed and re-verified as required using calibrated equipment.
- Ensuring that monitoring and measuring devices, which are owned or rented by subcontractors, meet calibration requirements.

## 4.14 Operation

The written description of this element shall define the system used to ensure that pressure equipment is operated safely in accordance with the Act.

Key activities that shall be covered are:

- Process for confirming that Safe Operating Limits have been defined for all pressure equipment, for updating Safe Operating Limits, and for ensuring the pressure equipment is operated within these limits.
- Ensuring there are adequate procedures to document critical tasks.
- Ensuring there are suitable instructions for the safe operation of the equipment.
- Ensuring that the required operating history for equipment is recorded and controlled to ensure the design limitations of the equipment are not exceeded. This shall include the means for recording the service cycles of items designed to ASME Section VIII, Division 2 or 3 code rules and other pressure equipment where service cycles are included in the equipment Safe Operating Limits.
- Maintaining a list of Safety Critical Equipment along with procedures to assure Safety Critical Equipment is maintained in good working order (refer to Overpressure Protection and Protective Devices section).
- Defining the responsibilities and role in the Integrity Management System of the chief power engineer whenever power plants, heating plants or thermal liquid heating systems are operated by the owner.
- Verifying that the operator's observations that may impact the integrity of the pressure equipment are communicated to the appropriate personnel and, when applicable, that the log book requirements of the Power Engineers Regulation are addressed.
- Notification to engineering and inspection personnel in accordance with incident reporting or MOC processes when equipment is operated outside of Safe Operating Limits.
- Ensuring that an appropriate documented operational readiness review or pre-start-up safety review is completed prior to start-up of new processes, and on existing processes that were shut down for any reason.

## 4.15 Management of Change (MOC)

The written description of this element shall include a Management of Change (MOC) system for permanent and temporary physical and operational changes to pressure equipment, Steam Pipelines, changes to procedures, standards and other IMS documentation and organizational changes to assure that the integrity of the pressure system is not adversely affected by such changes.

The MOC procedure shall be documented and include:

- Identification of what activities are subject to MOC and what are considered replacement in kind.
- The technical information to support the reason for the change.
- Completing an appropriate Process Hazard Analysis as part of the MOC procedure.
- Determining any impact the change may have on health and safety.
- A process to ensure the MOC procedure has been correctly applied.

- Duration of the change (e.g. permanent, or time limitations if temporary).
- A process to ensure that the required authorization for the change is obtained from all relevant disciplines.
- Training of operating and other personnel, whose job tasks will be affected by the change, prior to implementing the change.
- Updating of process safety information and procedures when the change results in a change in the processes described in the procedure(s).
- Updating of Safe Operating Limits.

## 4.16 Integrity Assessment Program

The written description of this element shall explain the system for ensuring that the required inspections and other integrity assessment activities are done, to assure the fitness-for-service of the pressure equipment and Steam Pipelines throughout its full life cycle and compliance with regulatory requirements.

**Key activities that shall be covered:**

**Assigning Resources**

Appointing the person who is responsible for the integrity assessment program and designating the individuals who will assume these responsibilities in this person's absence.

Ensuring that:

- All personnel and organizations assigned to integrity assessment activities, including contracted services, meet the requirements established by the Administrator.
- A written contract is maintained for all contract inspection and non-destructive examination activities.
- There is effective supervision of inspection personnel by competent individuals.
- Inspection personnel are free of any commercial, financial and other pressures that might affect their judgment or influence the results of inspections carried out (e.g. conflict of interest).

**Planning**

- Maintaining a suitable planning process to ensure that integrity assessment activities are done in accordance with requirements established by the Administrator, and are appropriate to ensure the safety and fitness for service of the equipment.

**Pressure Equipment Assets and Records**

- Establishing and maintaining an accurate inventory of all pressure equipment.

- Maintaining records of; design and manufacturing information, maintenance, inspection, servicing, tests, alteration or repair of each item of pressure equipment or system.
- Providing ABSA with required inventory information and other records as required under the Act.
- Providing the pressure equipment records to new owners when pressure equipment is sold or otherwise disposed of, as required under the Act.
- Notifying ABSA in writing when a boiler, pressure vessel, fired heater or thermal liquid heater is bought, sold, rented, relocated or otherwise disposed of, as required by the PESR. This shall include equipment that has been decommissioned for later use.
- Establishing a suitable system for retaining Certificate of Inspection Permits.

## Integrity Assessment

### Hazard Assessment

- Establishing suitable processes for identifying and controlling hazards at their facilities. This shall include visual assessment of the pressure system at each facility to identify mechanical integrity threats, the fluid service and other basic information needed to prepare appropriate inspection plans for the pressure equipment and ensure safety, fitness for service and compliance with the Act.
- Ensuring that appropriate assessments have been done at facilities that will be operated on behalf of other owners and when existing facilities are acquired.

### Inspection Procedures

- Developing and maintaining appropriate inspection procedures in accordance with requirements established by the Administrator, and ensuring these are available, understood, and used by personnel performing the applicable inspections.

### Inspection Plans and Strategies

- Ensuring that equipment specific inspection plans and strategies are established for pressure equipment and are approved by the Chief Inspector.

### Initial Inspection Prior to Entering Service

- Verifying that an inspection of each item of pressure equipment is completed after the equipment has been installed and prior to entering service.
- Ensuring that all ABSA inspections for issuance of Certificate of Inspection Permits required under the Safety Codes Act have been completed prior to the pressure equipment being placed in service.

**Periodic Integrity Assessment**

Ensuring that periodic assessments are completed in accordance with the requirements established by the Administrator and inspection plans, and ensure fitness for purpose of the pressure system. These shall include:

- External Inspections.
- Thorough (internal or equivalent) inspections.
- Corrosion surveys (UT Surveys etc.) and other condition monitoring activities needed to assure the continued safe operation of the equipment.
- Review and approval of UT and other monitoring results by a competent individual who holds the required in-service pressure equipment inspector certificate of competency .
- Review of Safety Critical Equipment calibration and maintenance records.
- Assigning appropriate inspection intervals in accordance with requirements set by the Administrator.
- Preparation and maintenance of detailed inspection reports for each item identified in the inspection plan.
- Certification of the report by an Alberta In-service pressure equipment Inspector and the Chief Inspector.
- Submission to ABSA of the inspection status summary reports, authenticated by the Chief Inspector. The submission shall be in a format and provided within a time period acceptable to the Administrator.

**Close Out of Inspection Findings**

- Ensuring that appropriate timely corrective action is taken for inspection findings and for other issues identified by integrity assessment activities that require follow-up.

## 4.17 Non-destructive Examinations and Testing

The written description of this element shall establish the system for ensuring that non-destructive examinations, metallurgical tests and other special processes affecting pressure equipment or used to assess the integrity of pressure equipment meet their intended purpose.

Key activities that shall be covered:

- Approval of special process contractors per requirements in the Purchasing and Material Control section of this AB-512 document.
- Ensuring written requirements are provided to contractors.
- Ensuring written procedures are developed and followed for special processes.
- Ensuring special NDE procedures are validated.
- Ensuring personnel qualification and certification requirements are verified.
- Coordination of contract activities.

- Ensuring that corrosion monitoring plans are developed by competent personnel and approved by the Chief Inspector, and that results are reported and are on file.
- Ensuring that competent personnel assess corrosion monitoring results and that results are verified promptly.

## 4.18 Repairs and Alterations

The written description of this element shall define the system used to ensure that repairs and alterations to items of pressure equipment, both of a temporary and permanent nature, are done in accordance with the Safety Codes Act and that the safety of the equipment will not be adversely affected.

Key activities that shall be covered:

**General requirements**

- Ensuring that work is done by organizations that have a valid Alberta Quality Program Certificate of Authorization and capabilities for the scope of work.
- Coordination of contract and in-house work.
- Ensuring that the repair/alteration organization is provided with all the technical and quality standards needed to develop the work procedure and complete the work in accordance with specified requirements and the Safety Codes Act.
- Ensuring that the repair and alteration procedure covers all required technical and quality standards for the service in which the item will be placed.
- Appropriate inspection and other competent resources are deployed to ensure the repair or alteration work is done safely and in accordance with the Act.
- Provision for documentation of the repair or alteration, including any design changes, repair and alteration procedures, reports and quality system records, to be retained on file.
- Ensuring that the equipment inspection plans for the item and system are reassessed and inspection requirements and intervals are revised as required.
- Providing controls to ensure that any hot taps and any Engineered Pressure Enclosures or devices installed to maintain the integrity of the pressure equipment and prevent leakage are suitable and meet the requirements of the Safety Codes Act.

**Specific requirements for boilers, pressure vessels, fired heater pressure coils, indirect fired heater coils, thermal liquid heating systems, boiler external piping and Steam Pipelines as applicable:**

- Ensuring that the repair/alteration procedure has prior approval from the company's Chief Inspector and, as applicable, ABSA.

- Ensuring that proposed alterations to pressure equipment and changes to Steam Pipeline designs are accepted by ABSA Design Survey.
- Provisions to ensure that an ABSA Safety Codes Officer (SCO) is notified of the work and that the SCO's prior acceptance of the procedure is obtained in accordance with the requirements established by the Administrator (refer to AB-513).
- Ensuring that repairs and alterations are inspected and certified by an ABSA SCO or a competent person who holds the appropriate Alberta In-service Pressure Equipment Inspector Certificate of Competency in accordance with the requirements established by the Administrator (refer to AB-513).
- Making certain that a copy of the Alberta Repair and Alteration Report AB-40 (or AB-83 when applicable) is retained on file and the original form is provided to ABSA in accordance with the requirements established by the Administrator (refer to AB-513).

**Specific requirements for pressure piping:**

- Ensuring that the inspections required under the applicable ASME B31 piping code are done by a competent owner's Inspector who meets the qualification and experience requirements of the code.
- Ensuring that pressure piping AB-83 form, certified by the owner's Inspector, is kept on file.
- Ensuring that the design for alterations and additions to piping systems and AB-81 forms are submitted to ABSA in accordance with Section 4.10 of this document when required by the Act.

## 4.19 Overpressure Protection and Protective Devices

The written description of this element shall define the key activities needed to ensure that pressure relief devices, other protective devices and Safety Critical Equipment are designed, installed, maintained in good working order and kept in service to ensure that the design and Safe Operating Limits of the pressure equipment system are not exceeded.

Key activities that shall be covered:

- Maintenance of the required design specifications for the relief devices (i.e. size, set, capacity, etc.).
- Ensuring that the over pressure protection for the pressure equipment and system is adequate.
- Ensuring that pressure relief devices are serviced in accordance with the requirements established by the Administrator and at intervals that are appropriate to ensure they will operate as designed.
- When the pressure system incorporates overpressure protection by system design the IMS shall document the equipment protected by OPPSD and shall specify the responsibilities and provisions the owner will implement to maintain and control OPPSD systems in accordance with AB-525.

- Ensuring that pressure relief devices are protected from damage during their removal, servicing and re-installation and that they are re-installed in their correct location.
- Ensuring that online external visual examinations of pressure-relief devices are carried out by competent personnel as required by AB-506.
- That servicing of pressure relief valves is done by an organization that has a valid Alberta Quality Program Certificate of Authorization for the scope of work and is an approved vendor. Refer to Section 4.11 of this document for purchasing control and AB-524 for Pressure Relief Device requirements.
- Ensuring that pressure relief system designs that have isolating valves in the path of pressure relief devices are approved by the Administrator prior to their installation.
- Maintaining a written implemented procedure, that has been accepted by ABSA, which meets ASME Section VIII, Division 1, Appendix M requirements for controlling isolating valves installed in the path of pressure relief devices.
- Maintaining records of the servicing and replacement of pressure relief devices.
- Assigning appropriate servicing intervals based on the servicing condition reports and other operating information.
- Establishing an appropriate preventative maintenance program for Safety Critical Equipment.
- Maintaining testing records for other protective devices and Safety Critical Equipment.

## 4.20 Internal Audits

The written description of this element shall describe the audit process used to determine the effectiveness of the IMS and to identify areas where the Integrity Management System can be improved.

An internal audit procedure shall be developed which shall include:

- Establishing an internal audit schedule that addresses all elements and requirements of this AB-512 document.
- Defining and documenting the audit criteria scope and frequency of the audits.
- Defining the methods and responsibilities for planning and conducting the audits.
- Producing documents used for conducting and reporting the audit findings and maintaining audit reports and other related documents.
- Ensuring timely action is taken for the audit findings.
- Defining the follow-up action to verify the success of the action taken with respect to audit findings.

The manager responsible for the area being audited shall ensure that actions are being taken without undue delay to eliminate detected non-conformities and their causes. Follow-up activities include the verification of the actions taken and documentation of the verification results.

## 4.21 Corrective and Preventative Actions

The written description of this element shall define the system used to ensure that issues that may negatively impact on the safety of the pressure equipment, result in non-compliance to the Safety Codes Act, or jeopardize Integrity Management System requirements, are investigated, corrected, and reported and suitable action is taken to prevent their recurrence.

Key Activities that shall be covered:

- To ensure that non-compliance with the Safety Codes Act or Integrity Management System requirements is reported to the appropriate authorities within the organization and ABSA when required.
- Provide for reports and other documents used to record issues that may negatively impact on the safety of pressure equipment and the remedial, corrective and preventative actions taken with respect to the identified issues. Documents shall include the required approvals of the Chief Inspector, other relevant personnel and, when applicable, ABSA.
- Tracking and controlling the completion of the remedial, corrective and preventative action.
- Review of non-compliance remedial actions, and corrective and/or preventative actions, to verify effectiveness and to determine any action needed to prevent a recurrence and improve effectiveness of the Integrity Management System.
- The owner shall establish performance metrics to support IMS objectives. The established IMS performance metrics shall be part of management review input.

## 4.22 Accidents and Incidents

The written description of this element shall define the system used to ensure that pressure equipment accidents and unsafe conditions and Steam Pipeline failures are reported to ABSA, as required by regulatory requirements and establish a formalized process for internal reporting of accidents, incidents and near-miss events, determining the root cause, and taking appropriate action to prevent its recurrence.

Key Activities that shall be covered:

- To ensure that accidents, incidents, failures and near-miss events are reported to the appropriate authorities within the organization and to ABSA, as required.
- Provide for reports and other documents used to record the events, and for the investigation of reported events to determine the root cause.

- Review of the accident, incident or near-miss events to determine, implement and track through completion, the action needed to prevent a recurrence.

# PART 2: GUIDELINES

## 5.0 GUIDELINES FOR DEVELOPING AND IMPLEMENTING AN EFFECTIVE OWNER-USER'S INTEGRITY MANAGEMENT SYSTEM (INFORMATIVE)

This section provides guidelines to assist owners in developing and maintaining an effective quality management system that is documented in accordance with the mandatory requirements established in Part 1 of this AB 512 integrity management system requirements document. The guidance information covered below has been developed based on Alberta industry and ABSA experience, and information covered in various industry publications.

The numbering of section headings within this guidance information corresponds to the relevant required element that is covered in Part 1 sub-section under 4.0.

As indicated with the AB-512 Introduction an owner-user is defined as 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).

The Safety Codes Act defines a quality management system as-all the documented, planned and systematic actions needed to ensure that this Act (includes PESR) is complied with. Part 3 of the Safety Codes Act, 39 (1) includes a provision to require an owner to have and maintain a quality management system in accordance with the regulations. The specific requirements for quality management systems are covered in sections 11, 12 and 13 of the PESR. These sections establish the Administrator's authority to require an owner to hold a quality management certification of authorization permit and the requirements for permit applications and permit holders duties.

The mandatory requirements established in section 4.0 of this AB 512 document defines the quality system requirements that an owner must meet when they are required to hold to hold a certificate of authorization permit. The AB-512 defines what must be addressed within the documented system that the owner must provide in order to demonstrate effective integrity management of their pressure plant throughout its full lifecycle, (from its design construction and installation, and throughout its operation and decommissioning).

**Application for an Owner-User Quality Management System Certificate of Authorization Permit**

PESR section 12(1) lists the information that must be provided when a certificate of authorization permit is required per PESR section 11.

12(1) An application to the Administrator, for a certificate of authorization permit, must be in a form satisfactory to the Administrator and must include the following:

(a) the scope of work to be undertaken pursuant to the permit (e.g. AB-29 application form and AB-512(a) form, plus Scope and Application element in written description of the quality management system);
(b) a written description of the quality management system (e.g. pressure equipment integrity management system manual or the owner's high level management system that addresses the Integrity Management Requirements suitably);
(c) a statement by a company officer committing to uphold the Quality Management System (e.g. pressure equipment integrity management system manual Statement of Authority per section 4.7 of AB-512, or equivalent statement integrated into the organizations high level management system quality policy);
(d) information with respect to the organization and procedures of the applicant (e.g. pressure equipment integrity management system manual Organization element and Organization Chart, and the organization's procedures that support the quality management system that will be referenced in the submitted written description);
(e) any other information required by the Administrator (e.g. the AB-512(b) document, which provides specific paragraph location references indicating how the organization has addressed the integrity management requirements).

The AB-29 Registration of Quality Program Application is the standard from that all applicants must provide, This covers information about the organization and includes the scope of work that will be will be done under the certificate of authorization permit.

The AB-512(a) Owner-User PEIMS Scope and Responsibilities form provides specific information regarding the scope of the PEIMS, responsible personnel, and includes a listing of the facilities that are owned or operated by the organization which will be covered under the scope of the certificate of authorization permit.

A written description of the quality management system must be provided that describes the system the owner uses to meet the requirements set forth in AB-512 section 4.0. The written description (e.g. quality manual) must contain a statement signed by a company officer committing to uphold the quality management system and includes other information listed in PESR section 12. Further information regarding the written description is provided below.

The AB-512(b) Integrity Management Requirements Checklist must be submitted along with the written description of the quality management system. This checklist assists ABSA to understand where the AB-512 required elements are covered and how they have been addressed.

## Written Description of the IMS Implementation Guidance

An owner who is required to hold a certificate of authorization permit per PESR 11 (3) shall provide a written description of the quality management system that identifies the manner in which the owner addresses each specific requirement listed in AB 512.

The written description may be contained within one manual that is just developed to address the AB-512 requirements, or the written description may be integrated into the organization's formal management system documentation. The organization's management system documentation may include a higher level tier 1 corporate document that describes the overall program and other documented management systems such as a formal process safety management system, the chemical industry's responsible care program and, ISO Quality standards (ISO-9001 quality management system, ISO 14001 environmental management systems and 18002 health and safety management system).

In each case the supporting procedures utilized by the owner to meet the AB-512 must be submitted along with the documented quality management system or PEIMS Manual. When the owner has a high level management system it is recommended that the written description of how integrity management requirements are addressed is integrated into the high level management system. Maintaining multiple overlapping quality management systems does not normally contribute to optimal pressure equipment safety practices within the organization. The AB-512(b) document that is completed and submitted along with the written description will assist ABSA to understand this integration into the owner's high level management system, or to understand how the PEIMS manual and company procedures have addressed the AB-512. When specific paragraph references are provided within the AB-512(b) checklist, the document serves as an effective road-map, describing how the AB-512 requirements are addressed.

The QMS that is developed, or integrated, to achieve compliance with the AB-512 establishes the owner-user's policy, commitment, and accountability to meet the specified requirements and describes the system to achieve and maintain an effective PEIMS. The written description may be scripted in any format and sequence that best suits the organization's operation, providing all AB-512 elements are addressed and are readily identifiable (e.g. through the AB-512(b) checklist to identify where they are addressed). When developing the written description the processes and procedures currently in use, such as within the organization's high level management system, should be identified and the required element descriptions integrated, as applicable.

ISO 10013 2001 - Guidelines for Quality Management System Documentation - provides guidelines to assist in developing the documentation needed to ensure an effective quality management system. The principles covered in the ISO standard 9000 series may also be of benefit.

The written description of the QMS must accurately describe the system used. It should be a working document to enable management, staff, corporate auditors, ABSA, and other interested parties to readily understand the IMS. It should also identify the manuals, procedures and other documents that describe the IMS processes, and also

explain the interaction between the IMS processes. Key personnel from within the organization, including senior management, those responsible for pressure equipment design, health and safety, environmental and pipeline integrity programs, and operations personnel, should be actively involved in the development and implementation of the IMS. This is necessary to ensure that the system will be practical, add value to the organization's business, and ensure that activities are aligned and not duplicated, as well as demonstrating compliance with the legislation.

The extent of documentation needed to meet the AB-512 will depend on the size of the organization, type, location, complexity of facilities, and if other quality management systems are implemented by the owner. It should be the minimum needed to provide a practical effective system that suits the organization's practices. Smaller organizations may find it appropriate to provide detailed descriptions of their work processes within a stand-alone PEIMS manual. As a general rule; however, including detailed procedures (e.g. the organization's MOC procedure) within the main text of the manual detracts from the readability of the manual. For this reason the forms or working documents which describe a detailed process, are usually referenced in the applicable manual sections and are maintained as separately controlled procedures, which may then be included as IMS manual appendices. A good practice is to avoid including ABSA documents in the IMS manual, because when ABSA revises the included document the manual then contains outdated or possibly incorrect information. Whenever necessary, best practice is to simply reference ABSA documents by the ABSA document number along with an ABSA web-site link, if applicable.

If procedures are maintained as separate documents, the written description content for each AB-512 element may then be limited to a brief explanation of the responsibilities and control features for the element. For each of the AB-512 element requirements it may be helpful to consider; why the element controls are necessary then how they are implemented, including who does what and when the actions are completed. The applicable reference documents or procedures that cover the detailed description of work processes would be identified within in the element written description.

Other documents that may be referenced could include; internal procedures and standards, health and safety manuals, quality control procedures that that address requirements for other related pressure equipment activities (e.g. pressure piping construction, repair and alteration, boiler and pressure vessel repair performance of work, pressure welder testing, etc.), process safety management manuals or procedures, and employee training manuals.

The primary purpose of procedures, work instructions and similar documents is to guide the individuals involved in the applicable activities. These documents must, therefore, be readily available at their point of use. They should be written with the reader in mind to clearly convey what is required to perform the applicable activities. The guidance documents may take the form of flow charts, tables, text, a combination of these or other means, which best suits the organization.

Electronic online document control systems provide an excellent method for controlling documents and for identifying and directing the reader to the documents that contain the detailed requirements.

## 5.1 Title Page

If a stand-alone Pressure Equipment Integrity Management System (PEIMS) manual is the means the owner uses to provide a written description of the quality management system, required by the PESR, then the title page of this document shall identify; the title of the document that describes the organization's IMS, the name and corporate address of the organization, and the revision status of the document.

## 5.2 Scope and Application

In conjunction with the AB-29 Application form and the AB-512a Scope and Responsibilities form, the text within the written description of the QMS that addresses QMS Scope and Application will provide greater detail regarding the organizations activities related to pressure equipment.

The written description for this element will include a policy statement (e.g. policy objectives) that establishes the key purpose of the manual. This policy statement should be included at the beginning of the scope section to provide the focus for all IMS activities, as in the following example:

> *This manual accurately describes the pressure equipment Integrity Management System used by (Name of Company) to:*
>
> > *Assure the safe operation of all facilities containing pressure equipment that are operated by (Name of Company) in Alberta.*
> > *Demonstrate compliance with the Safety Codes Act.*
> > *Optimize process online time and resources.*

The scope of the QMS should be defined and include a statement that the IMS covers the pressure equipment life-cycle controls for design, construction, installation, operation, maintenance, repair, alteration, in-service integrity assessment, and decommissioning of all pressure equipment under the Safety Codes Act and Steam Pipelines in accordance with Directive 077 requirements. As the QMS scope is further defined on the AB-512(a) form that is filed with ABSA, and as the personnel responsible for key QMS activities (e.g. Management Representative and Chief Inspector) may change it is required that the responsibility for ensuring the ongoing accuracy of the AB-512(a) form on file with ABSA is assigned and described within this written description element. The Scope and Application element shall also include a brief overview of the organization and the facilities operated to aid the reader in understanding the written description of the quality system. The overview should include:

- Head office location and main activities that are controlled through the head office.
- Location of main facilities and field control centres in Alberta. Include the name of organizations that have contracted the operation of their pressure equipment to the company.
- Describe the type of processing facilities that are operated by the company (e.g. upstream and midstream facilities, wellhead equipment,

collection batteries, compression installations, power generation plants, chemical plants, refineries, and petrochemical facilities).
- The approximate number of boilers and pressure vessels with an Alberta identification number (i.e. A-number) that are operated by the company.
- Scope of any formal ABSA accepted RBI program used and the corporate documents that apply.
- Scope of any quality control procedures that are implemented (e.g. QC procedures for mechanically assembled pressure piping/tubing construction, repair and alteration).
- Any subsidiary companies that may have their pressure equipment integrity management systems included in the parent company PEIMS.
- Other information that may assist the reader's understanding of the company.

## 5.3 Table of Contents

If a stand-alone PEIMS manual is the means the owner uses to provide a written description of the quality management system, required by the Pressure Equipment Safety Regulation, then the table of contents of this document shall identify the number and title of each section and its location within the written description of the IMS.

## 5.4 Organization

The written description of the QMS, as it pertains to the Organization element, shall include an organization chart that identifies senior management positions and relevant key company positions. The organization chart should include, and identify, the following positions that are important in the QMS implementation, as applicable:

- Top or Senior Management of the organization.
- The position, with the organization, that has been assigned responsibility for the QMS as Management Representative. Normally indicated by the (Management Representative) assignment shown below the position title.
- Person who coordinates contract integrity assessment activities (in-service inspections etc.), if other than the Chief inspector.
- Engineering Manager, Facility Engineer, Project Engineer, Designer.
- Operations Manager, Area Superintendent, Area Foreman, Operators.
- Chief Inspector and Inspection Personnel.
- Chief Power Engineer.
- Maintenance (Manager, Planner etc.).

High-level position responsibility summaries or a RACI chart for key positions that are responsible, accountable, consulted and informed with respect to pressure equipment integrity management activities may be included in this section, if desired.

The organization structure for in-house pressure equipment inspection activities should be illustrated, if applicable.

## 5.5 Definitions of Terms and Acronyms

All terms and acronyms used within the IMS written quality system should be defined. It is appropriate to use the applicable definitions that are provided in the Safety Codes Act, Pressure Equipment Safety Regulation and other ABSA requirements documents when they apply (e.g. pressure equipment, boiler, pressure piping system, pressure vessel, etc.).

## 5.6 Statement of Authority and Responsibility

If a stand-alone PEIMS manual is the means the owner uses to provide a written description of the quality management system, required by the Pressure Equipment Safety Regulation, then the Statement of Authority shall include the management commitments described by the AB-512 and shall be signed by top or senior (e.g. executive) management. As the appointment of the Management Representative is a key component within the Statement of Authority, the top/senior management signing the statement of authority must be able to make this Management Representative appointment (e.g. the Management Representative would not self-appoint to this role/responsibility).

If the submitted QMS is the Owner's main stream management system then the requirements contained in the AB-512 for Statement of Authority may be integrated into the main stream management system quality policy that is signed by top/senior management.

## 5.7 Management Responsibilities

Management commitment to pressure equipment safety, or process safety, is recognized as a cornerstone to excellence in these safety programs. [1]A workforce that is convinced the organization fully supports safety as a core value will tend to do the right things, in the right ways, at the right times – even when no one else is looking.

With this in mind, management's commitment to ensure the IMS is adequately supported and that processes are in place to assure the effective IMS implementation will be described in this section of the written quality system along with a commitment to review, enforce and continuously improve IMS effectiveness.

The management responsibilities that are described within this section are critical to IMS sustainment. Appropriate management actions will raise the profile of the IMS within the company, confirming the IMS as a system that is critical to safe and reliable operations and the company's success. Key accountabilities and

[1] Center for Chemical Process Safety, *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, New York, 2007.

responsibilities shall be assigned to leadership, which will ensure that adequate resources will be in place to guide the successful implementation, execution, sustainment and improvement of the IMS.

When the position responsibility summaries, or a RACI chart for key positions, are not incorporated within the Organization element it is common in many written descriptions that the Management Responsibilities section contains all the specific position/role based responsibilities that are identified in the other elements of the IMS. It may be helpful to compile all key responsibilities within this section to allow quick reference whenever required, quoting the section within the IMS where the responsibility is explained in detail. Where specific IMS responsibilities to provide key activities, services or to fulfill a specific role are subcontracted, company management have the responsibility to ensure the subcontracted services are clearly defined within the contract documents.

With regard to Management's specific responsibilities, job descriptions and documented performance reviews with performance measures that include key Integrity Management Systems and Health and Safety Program objectives, ensure that Integrity Management Systems and safety objectives are aligned with the corporate vision.

It is essential that the IMS include an effective planning process to assure pressure equipment safety goals are met and that resources are optimized and are deployed effectively. The effective planning process will normally document company goals associated with IMS implementation, which are developed with management involvement, that are generated each year based on the organization’s IMS Management Review process. The accountability and description of this planning process should be identified within this section. It may take some time for an organization to develop an Integrity Management System that fully meets all requirements established in the IMS document. It is therefore crucial that there are appropriate planning processes developed that define the actions and timelines (prioritized based on risk and compliance) for the elements that need completion/continuation of their development or improvement. For example, an organization that has recently developed a formal pressure equipment integrity management system may have compiled an inventory, developed an inspection work plan, and performed basic awareness training; however, at an early stage, they may not have completed all of the required pressure equipment integrity assessments, inspection plans and strategies, nor established a formal process for evaluating suppliers, conducting internal audits, completing all detailed training needs or fully implementing management of change.

PEIMS implementation plans should be updated at appropriate intervals and management shall be a part of developing and endorsing these plans. Where development of the IMS is needed to be in compliance with the AB512, these plans shall be shared with ABSA, feedback requested and once received, acted upon.

Pre-shutdown planning (often started shortly after the previous shutdown) enables integrity assessments, maintenance, and other activities to be aligned and optimized and down time to be reduced.

Audits that are completed to evaluate the effectiveness of the PEIMS and compliance to regulatory requirements shall be part of the Management Review input, along with applicable IMS performance metrics (e.g. IMS performance metrics may be known as key performance indicators in some organizations). Management Review outputs will consist of documented actions that will be taken to correct and improve on the audit findings as well as to maintain and improve upon IMS implementation as indicated by the IMS performance metrics.

Tracking to ensure compliance to the plan is essential to ensure suitability and effectiveness, and reporting of appropriate performance metrics to management is a vital component within the management review process. The effectiveness of IMS element implementation cannot be evaluated through casual observation. A disciplined assessment over time is needed to determine the true performance and effectiveness. The use of metrics, such as the frequency of exceeding Safe Operating Limits, not completing inspections when scheduled, relief valve servicing or Safety Critical Equipment testing/calibrations on time, not completing MOC's properly, the number of operators not completing scheduled training and so on, provides managers with the ability to track the performance of the IMS. The selection and number of key performance indicators is important to provide managers with the insight needed to ensure acceptable performance and proper planning. It is also important that the metrics are selected and changed when necessary, with the purpose of influencing IMS improvement. IMS improvement is not a visible goal when selected metrics are always at the top of their range.

To reinforce and sustain compliance key decisions affecting risk, such as to defer inspections or relief valve servicing should also require input and approval from senior management.

Where key accountabilities or IMS responsibilities are contracted, the contractual agreement needs to define the role in detail, including the boundaries of responsibility, communication and the scope and expectations for the role.

## 5.8 Quality System Documentation

The use of documents and maintenance of records is a necessary component of the quality system. Procedures, instructions, drawings, specifications, and manuals, tell users what should be done and how to do it. Completed forms and records tell users what and how it was done. The quality system documentation element establishes the processes used for controlling all documents relevant to the IMS to ensure safe and effective planning, operation and control of pressure equipment. It should describe the rationale for the framework of documents used to achieve the goals stated in each other element of the IMS.

Key documents that will be controlled and maintained current within the IMS should be listed and a description of how they will be managed, revised and

re-approved when required, and where they can be found should be identified. In some cases the document or record “owner” is assigned to facilitate document management.

It is essential that current issues of the appropriate IMS documentation are available at all relevant locations and to all relevant persons. For example, facility process safety related documentation (e.g. PFDs, P&IDs, line designation tables or line lists, applicable pipe and valve specifications, shutdown keys or control logic documentation, corrosion control documents and integrity operating window documentation) must be kept current and accessible for the company to ensure that accurate information is used when making decisions regarding operation, maintenance, inspection/integrity assessment and repair/alteration that can impact upon process and personal safety.

The key IMS documents, as applicable, typically include the following:

- PEIMS manual or main stream management system documentation (a current controlled copy of the QMS written description must be provided to ABSA and any revisions to the written description that affect the IMS must be accepted by ABSA prior to their implementation).
- IMS quality system referenced standards, procedures, work instructions and work practices.
- Design standards and specifications, codes and standards and other design documents that are used.
- Design drawings, design calculations, design data sheets and other project documents.
- Process flow diagrams (PFDs), piping and instrumentation diagrams (P&IDs), line designation tables or line lists, applicable pipe and valve specifications, shutdown keys or control system logic documentation, corrosion control documents and integrity operating window documentation, and other key facility process safety information.
- Process hazard analysis (e.g. HAZOP) documentation.
- Pressure equipment records (i.e. equipment records as defined in the PESR), pressure relief valve design data sheets.
- Pressure equipment inspection procedures, pressure equipment inspection and servicing work plans/schedules, pressure equipment inspection plans and strategies, inspection reports, relief valve servicing reports.
- NDE procedures and any other procedures supporting special processes identified within the IMS.
- Purchasing documents, such as approved vendor lists, vendor evaluation records, and contract documents for IMS services.
- Management of change records.
- Construction, repair or alteration of pressure equipment quality control documentation/records.
- IMS internal audit records, IMS planning documents, management review documentation and IMS performance metrics.
- Non-conformance and corrective/preventative action records.

- Other documents and records defined in the individual written description elements.

The document control section written description should also address record retention. For example, pressure equipment records should be retained for the life of the equipment.

Within the IMS written description it should also be explained that an owner who sells pressure equipment for subsequent operation as pressure equipment must ensure that all required equipment records including design information, data reports, inspection plans and integrity assessment, repair and alteration records are provided to the person who acquires the equipment as specified within PESR Section 36(3).

## 5.9 Competency and Training

Within the Competency and Training element the owner-user shall describe the system that is implemented to ensure the required competence of personnel who perform work that can impact the effectiveness of the IMS (e.g. designers, personnel procuring pressure equipment goods and services, receivers, operators, maintenance personnel, in-service and owner's inspectors, etc.). This can be achieved in many different ways and the system used may vary in complexity depending on such things as type of equipment and process being operated, size of organization, organizational structure, etc.

Some of the key deliverables of this section will include:

- Identifying key roles and activities within the IMS that may impact the effectiveness of the IMS. Depending on the complexity of the operation and the IMS the number of roles and activities will vary but should include all aspects of the IMS from design and engineering, purchasing and material control, construction and installation, integrity assessment and relief valve servicing, repair and alteration, monitoring and measuring devices, operation, non-destructive testing and examination, and management of change, as applicable.
- Determining the required training, certification, qualifications, and knowledge to establish competency for the key roles and activities performed in the IMS.
- Establishing a process for how competency will be achieved and measured (e.g. external training or internal training with applicable examinations, industry recognized certification, internal certification, interview and assessment by internal subject matter expert, task observation by internal subject matter expert, etc.).
- Initiating a process to demonstrate evidence of assessment, re-assessment as applicable, and validation/certification of competence.
- Identifying how continuation of training will be achieved to ensure the required level of competence is maintained, and to reflect changes in

legislation, technology, and IMS best practices (e.g. part of re-assessment process).

Additional guidance is available to aid in understanding and determining competence for inspectors that perform inspection activities under an Owner-User or Inspection Company quality system certificate of authorization permit, and this additional guidance can be found in AB-527 – Guideline for the Competence Assessment of Inspectors.

As there are required certifications for certain roles and activities identified in an IMS to meet the requirements of the Act and Regulations, these certification requirements, as applicable, need to be addressed in the IMS written description as well. For example, regarding personnel performing inspection and other pressure equipment integrity assessment activities the process shall ensure that the Chief Inspector and any other person who certifies pressure equipment as suitable for continued service have the required Alberta In-service Pressure Equipment Inspector Certificate of Competency (refer to ABSA IB13-009 bulletin and AB-526 In-Service Pressure Equipment Inspector Certification Requirements), and be competent to perform the specific pressure equipment integrity assessment.

Personnel who operate the pressure equipment (i.e. when boilers or thermal liquid heating systems are operated) shall have the required certification to supervise the equipment, as required by the Alberta Power Engineers Regulation. If the IMS scope includes personnel performing pressure welding activities, documentation shall be maintained to confirm that they meet the qualification and experience requirements defined in the applicable construction code and the Alberta Pressure Welders Regulation.

Documentation shall also be maintained to confirm training, experience and competency for personnel who act as the owner's Inspector for ASME B31 piping construction, repair and alteration. The documentation shall include evidence that these personnel also meet the required experience and qualifications defined in the piping construction code.

The training and competency processes must also be extended to all personnel performing any pressure equipment activity (i.e. piping construction, repair, PRD servicing "AB-524 Appendix C" etc.) and related quality control functions, , when these activities are within the owner's IMS scope.

For personnel performing pressure equipment design or subsequent changes to design requirements, documentation shall be maintained to confirm that they meet the qualification and experience requirements defined in the applicable construction code (e.g. ASME piping construction code B31.3, B31.1, etc. for piping design activities) and that these personnel are competent for the assigned activities.

With respect to the pressure equipment operator competency that is specified by PESR Section 37(g), there needs to be evidence of training and competency

assessment, re-assessment as applicable, and competency validation/certification. It is important to note that the Alberta Occupational Health and Safety Act indicates that it is the employer's duty to ensure that anyone operating equipment or managing or supervising its use should have received adequate training. Operator competency validation should be correlated to the adequate and suitable instructions for the safe operation of the pressure equipment that are required to be maintained by the owner, by PESR Section 37(f).

## 5.10 Design Control

The term Design Basis Memorandum (DBM), refers to the document used to identify the design and operating parameters, fluid service and any other information needed to ensure that equipment design will be safe for the intended service. For small upstream projects, this may simply comprise of well fluid analysis, shut-in well pressures, design pressures and temperatures and other basic information that is provided by facility personnel. Alternatively, for major projects the DBM may be comprised of several detailed documents that are produced by the project front end engineering design study.

ABSA's design review and registration is based on the information that is provided by the person who submits the design for registration. ABSA's design review is limited to verifying that the design meets requirements of the Act, Regulations, Requirements Documents (e.g. AB-525), CSA B51 and the minimum requirements of the Code of construction.

Registering the design with ABSA in no way relieves the person who submits the design, the designer, manufacturer, owner and other relevant parties, from the responsibility of ensuring that the design is suitable for the service in which the equipment is to be placed, and that it meets the aforementioned regulatory requirements defined in this section of the AB-512.

For all pressure equipment it is imperative that the equipment is operated within the parameters contained in the user's design specification, which is obtained from information in the DBM, and the equipment design. This is particularly important for equipment constructed to ASME Section VIII, Division 2, or 3, where the design factors are more exact.

The following should be considered and taken into account when designing pressure equipment:

- The expected working life (design life) of the equipment.
- The properties of the contained fluid.
- The design pressure and temperature, and other forces expected to be exerted on the system including external loads from attachments, thermal loads, and wind loading (e.g. reference ASME, Section VIII, Division 1, Paragraph UG-22 and ASME B31.3 Paragraph 301).
- All extreme operating conditions including start-up, shutdown and foreseeable fault or emergency conditions.

- Foreseeable changes in the design conditions.
- Conditions for standby operations.
- Protection against system failure using suitable measuring, control and protective devices as appropriate.
- Suitable materials for all component parts.
- Safe access for operation, maintenance and examination, including the fitting of access openings, safety devices or suitable guards, as appropriate.
- Potential degradation mechanisms and provision of suitable access or other provisions for detection of these mechanisms.

The pressure equipment Safe Operating Limits must be determined within the design process. In addition to mechanical design limits such as pressure and temperature, safe operating limits should be established considering materials of construction, dew points, dry points, heating and cooling rates, cyclic service, flow rates, injection points, pH, chloride levels, H2S content, amine strength, partial pressures, etc.

The exact nature and type of Safe Operating Limits which need to be specified will depend on the complexity of the process and the hazards of the particular system. For simple, low risk processes, establishing maximum safe operating pressure and temperature limits and the associated shutdown keys may suffice. Whereas, complex higher risk systems may need a wide range of conditions specified (e.g. maximum and minimum pressures and temperatures, volumes and flow rate of contents, operating times, heat input or coolant flow etc.). It is also important to consider the operating implications of a change of materials used in construction (specification breaks). In all cases the Safe Operating Limits should incorporate a suitable margin of safety and must consider the control range of the control system instrumentation. The IMS must channel any changes to specified Safe Operating Limits into the management of change process.

When assurance of pressure equipment operation within Safe Operating Limits will be influenced by the inclusion of overpressure protection by system design, the design requirements and specific additional IMS provisions included in AB-525 must be implemented.

Using engineering specifications based on proven designs is an effective way to ensure quality and safety in pressure equipment design. Engineering specifications can begin with reference to the codes and standards adopted under the PESR, but should also consider supplementing that information with lessons learned from experience and incident investigations. Owners should have systems in place to update engineering specifications when changes are made in the underlying codes and standards or from lessons learned through experience and incident investigations.

Methods for effective process hazard analysis (PHA) can range from a simple “what-if” analysis to the more complex hazard and operability study (HAZOP), failure modes and effect analysis (FMEA), or faulty tree analysis. Complex processes and system designs will warrant the use of more complex PHA

methods. A minimum frequency should also be established to revalidate the facility PHA. This frequency is influenced by the complexity of the process, level of risk, or the degree of change that may be anticipated or that may have occurred.

To ensure safe operation of the pressure equipment it is essential that the Safety Critical Equipment is identified by the facility design process, so personnel operating the equipment will maintain the identified equipment in a prioritized preventative manner such as is implemented for pressure relief valves, as opposed to a run-to-failure philosophy.

Within the pressure equipment design process best practice is to incorporate a quality assurance plan, which includes stakeholders, to evaluate pressure equipment designs throughout the different design phases and during construction and installation.

## 5.11 Purchasing and Material Control

Goods and services procurement controls that will be described within this IMS element includes: pressure equipment construction and repair organizations, organizations who service pressure relief valves, organizations who supply (design) engineering services, integrity assessment, or non-destructive examination services, and suppliers of basic pressure equipment materials (pipe, valves, pressure fittings, etc.), protective coatings and heat treatment.

Organizations who construct, repair or alter pressure equipment, service pressure relief valves, or conduct welders performance qualification tests, are also required to have a valid Alberta Quality Program Certificate of Authorization Permit issued by ABSA, for the scope of this work. A current listing of these Certificate holders is available on the ABSA website at www.absa.ca.

Criteria for selecting suppliers must be established and will depend on the criticality of the service or product, the history of the supplier's performance, and other factors. As such, the assessment that is necessary to complete supplier selection and product or service acceptance requires some or all of the following:

- Previous satisfactory product or demonstrated service.
- Verification audit by the owner-user.
- Verification done by other bodies such as ISO certification, other owner-users, and/or ABSA.
- Inspection at the supplier's facilities.
- Inspection of the product by the owner upon construction or delivery.
- Verification of the product or quality documentation provided by the supplier.

The procurement process must accurately convey requirements for the product or service to the supplier. This information will include, as applicable, the quality system certification requirements, identification of the applicable issues of the Codes and Standards to which the product must comply, material specifications

and other required information (e.g. design registration requirements for fittings), the extent and type of service required and owner's specified requirements.

When/if the included equipment or services are ordered verbally, the process used to ensure that the vendor is provided with the correct design specification information and other required ordering information and that the ordering information is relayed to the personnel who will be receiving the material, must be described.

The IMS should have provisions to ensure the adequacy of specified purchase requirements (e.g. the specification required by the original design) prior to their communication to the supplier. This is particularly important when replacement components or materials are purchased by operating or maintenance personnel.

When products or services are procured using a contract or master services agreement (e.g. relief valve servicing, inspection company services, rental pressure equipment) it is essential that the contract include the scope (i.e. extent and type of service) of the service details and clear direction regarding the owner's requirements and expectations. For rental pressure equipment it is particularly important that the owner indicate what must be provided by the supplier (e.g. equipment integrity records) in order for the rental equipment to be acceptable. The ongoing provisions for inspection and Safety Critical Equipment maintenance should be included in contracts as well.

Provisions for operating pressure equipment owned by others, if applicable, must also be addressed in the IMS. Because the Safety Codes Act establishes a joint responsibility for pressure equipment safety and integrity through the definition of Owner, if someone other than the asset owner has care and control of the pressure equipment it is important that the operating agreement or contract between the asset owner and the operator appropriately address the SCA requirements, including pressure equipment integrity. Those personnel in the owner's organization that have responsibility for pressure equipment integrity should, therefore, be involved and/or informed of all proposed operating arrangements and acquisitions to ensure that the required information is provided, and the required integrity assessments have been completed.

## 5.12 Construction and Installation

All manufacturers of pressure equipment must have a valid Alberta Quality Program Certificate of Authorization Permit for the scope of work, but this does not necessarily mean that they have the necessary capabilities to build the type of equipment that is required by the design. This should, therefore, be verified during the vendor approval process and the controls implemented to ensure that the user's requirements are incorporated in construction. For pressure equipment (e.g. pressure vessel) that is not constructed at site the extent and need for source (i.e. shop) inspections should be defined.

The written description of the IMS should describe the controls implemented by the owner to ensure that the supplier is provided with the current versions of

required specifications and design data and that the information is clearly defined and is understood by the supplier. For example, the owner should have provisions for defining welding procedure requirements and welding details when these are not specifically provided within the design information.

It should be noted that ABSA's construction inspection activities are limited to Code inspection of boilers, pressure vessels, fired heater pressure coils, thermal liquid heating systems, indirect fired heaters, and boiler external piping. ABSA does not inspect ASME B31 piping (except for boiler external piping), nor does it do detailed verifications of the location and orientation of nozzles, fittings, internals or the adequacy of coatings and paint, and other owner requirements that may exceed code requirements.

The criteria for determining the need and extent of the owner's inspections should be defined and will depend on factors such as the complexity and service of the equipment, and knowledge of the manufacturer's capabilities.

The owner is required to provide an owner's Inspector for the pressure piping construction, and Pressure Piping Construction and Test Data Reports (i.e. AB-83 forms) must be certified by the owner's Inspector.

It is important that the owner implement provisions for reviewing and retaining completed project quality control packages and the required data reports and to ensure that Alberta Piping Construction data reports (AB-83) are provided and are completed correctly. The process should not only include content verification but also include a verification of accuracy so that when the information might be necessary in the future, it will be useful.

Prior to commissioning it is necessary to have a "ready for operations" process that confirms all regulatory and owner requirements have been met (e.g. construction quality documents verified as above, Completion of Construction Declaration – AB-81 forms are completed by the person responsible for piping system construction and submitted to ABSA, ABSA installation inspections completed for all boilers and thermal liquid heating systems, ABSA initial inspections for all other pressure equipment that requires an Alberta identification number are completed, and the required Certificates of Inspection Permits have been received for all boilers, thermal liquid heating systems and pressure vessels, all owner installation inspections are completed and all construction deficiencies corrected) for new construction or MOC projects.

As indicated above, it is required that persons who construct, repair or alter pressure equipment and service pressure relief devices must have the appropriate Alberta Quality Program Certificate of Authorization. Therefore, if an owner wished to construct pressure piping/tubing (e.g. B31.3 process piping), the owner could implement and demonstrate the quality control procedures that are necessary to control this activity, such that the activity may be added to the scope of their owner-user Certificate of Authorization. The scope of pressure equipment construction, repair and alteration or relief valve servicing work, that is done directly by the owner, must be defined in the scope section of their IMS

manual and as applicable, procedures that meet the requirements established by ABSA must be developed and referenced or incorporated within the applicable element of the PEIMS written description. The separate quality control procedures would be audited in accordance with the ABSA audit requirements for the applicable activity.

## 5.13 Control of Monitoring and Measuring Devices

As it pertains to pressure equipment operation the controls to ensure accuracy of monitoring and measuring devices, which are controlled by either the owner or contractors, are to be described within this element in the IMS written description. For equipment controlled by contractors the IMS will describe the monitoring procedures that are implemented by the owner.

Examples of the monitoring and measuring devices that shall be controlled and calibrated are; equipment used for verifying the in-service condition of pressure equipment (i.e. NDE equipment such as MT yokes, ultrasonic flaw detectors and thickness measurement devices, ultraviolet light sources), hydrostatic test pressure gauges, mechanical measuring instruments, and the monitoring and measuring devices associated with the owner's Safety Critical Equipment.

Safety Critical Equipment includes the pressure relief devices, regulating or controlling devices and systems that are required to ensure pressure equipment is operated within Safe Operating Limits and to prevent, mitigate, detect or respond to the effects of loss of containment or a sudden release of energy. Some examples of safety critical equipment that would require periodic calibration and testing are safety instrumented systems that are required to mitigate specific risks that the basic process control system cannot adequately address. For instance, a temperature measuring device and the associated control instrumentation utilized to detect the temperature in a reactor pressure vessel that contains an exothermic reaction that is not self-limiting, and then initiate emergency control actions if the reactor temperature approaches the defined Safe Operating Limits. Another example of Safety Critical Equipment would be the equipment (e.g. High Integrity Pressure Protection System - HIPPS) associated with overpressure protection, when pressure equipment is protected from overpressure by system design. The equipment associated with the HIPPS will be designed with a Safety Integrity Level (SIL) rating that requires a specific calibration and testing regime to maintain.

Calibration refers to the checking, and adjustment if applicable, of devices so that its output faithfully corresponds to its input throughout a specified range. In order to calibrate a device, there must be some means of knowing the input and/or output quantities associated with the device under test. A substance or some measuring and test equipment (M&TE) that is used as a reference to compare against a device's response is called a calibration standard. The accuracy of calibration standards must also be verified periodically, typically against other calibration standards traceable to national standards.

For each of the examples of monitoring and measuring devices and Safety Critical Equipment, the process used to ensure that calibration standards traceable to national standards will be utilized to service and calibrate the devices/equipment would be described within this element of the IMS written description. Traceability is maintained by ensuring the serial number of the calibrating device is included in the calibration record for the device calibrated. Frequency of the calibration for the calibration standards may be described within this element of the IMS or in the owner's procedures if controlled by the pressure equipment owner or, when the calibration standards are controlled by contractors the frequency of calibration will be described within a contractor's procedures.

The owner's controls/processes to ensure all Safety Critical Equipment is serviced/calibrated, using applicable calibration standards, following the equipment manufacturers accepted procedures at an acceptable frequency will typically be described within the Overpressure Protection and Protective Devices element, under protective devices.

## 5.14 Operation

The exact nature and type of Safe Operating Limits which need to be specified will depend on the complexity and operating conditions of the particular system. The Safe Operating Limits, which are establishing during the pressure equipment design, must be confirmed and incorporated into the facility design and basic process control systems. It is important that the Management of Change consider safe operating limits when looking at any change in the process or experience with integrity of the pressure equipment. In many cases owners also develop integrity operating windows, which are a set of operating limits and operating parameters assigned to process variables that can affect the integrity and reliability of a process unit. A suitable method for recording and retaining information about Safe Operating Limits and any changes to them must be used, and be accessible to operations personnel. Examples may include a PLC control system shutdown key or an alarm register that houses information on the control system alarm set points and the reason for the set point. Trip point information may be housed in an instrumentation register that houses information for trip points and the reason for the trip. The process safety information that contains the Safe Operating Limits data (e.g. shutdown key or instrumentation register) must be maintained up-to-date. The IMS must channel any changes to specified limits into the management of change process.

A process to identify major accident hazards should be employed by the owner to determine what Safety Critical Equipment and processes should be in place to act as barriers against a significant process safety event. It is common that the facility, or unit, process hazard assessment (e.g. HAZOP) that is completed during the facility design stage is revalidated periodically during the life of the facility.

Operators should understand what major accidents hazards exist at their facility and should be trained to understand what Safety Critical Equipment and processes are in place to prevent the major accident hazards.

Identification of safety critical tasks should be performed where major accident hazards exist. Procedures should be developed to perform those tasks. These procedures should be usable, accessible and current and may include verification hold points. They must be revalidated on a regular basis. Examples of procedures could include complex system start-up, shutdown, emergency shutdown, abnormal system operation and procedures for temporary process connections. If there is a frequency associated with critical tasks, the activity should be tracked and documented to ensure the correct frequency is attained.

The owner must provide adequate and suitable instructions for the safe operation of their pressure equipment and define any action to be taken in the event of an emergency, and ensure that equipment is not operated except in accordance with these instructions. Typical documents include current operating manuals, OEM data books and other written procedures.

The owner must provide the operator the means to check operating conditions against the design limitations and Safe Operating Limits. This should include manually gathered data as well as real time information being generated by a control system. The owner must establish protocols for communication from pressure equipment operators to the applicable integrity and/or engineering personnel for observations that may impact upon the integrity of the equipment.

Process operating data should be archived in a fashion that ensures it is preserved for incident investigation and long term performance monitoring.

Processes to ensure critical communications are documented and distributed should be put in place, including hand over guidelines and log book usage. If facilities include boilers or thermal liquid heating systems there are specific log book requirements specified by the Alberta Power Engineers Regulation and ABSA IB14-008.

If pressure equipment is operated outside of Safe Operating Limits the owner must also establish controls to ensure the necessary notifications to integrity and/or engineering personnel and ABSA will occur, normally through the incident reporting or MOC processes.

The owner should maintain up to date registers of abnormal equipment conditions that can contribute to process safety events. Examples may include:

- Temporary connections to process.
- Temporary equipment installed.
- Temporary repairs to equipment (e.g. engineered pressure enclosures).
- Shutdowns bypassed.
- Alarms bypassed or inhibited.
- Car-sealed valves out of normal position.
- Emergency response equipment out of service.

Expectations around control of work and operating discipline should be outlined by management. Operational tasks should be performed in a deliberate and structured manner consistent with the risk. Error likely scenarios should be identified and barriers put in place to mitigate the result if an error is to occur. The management system should encourage the desirable behavior.

The owner should have a documented preventative maintenance program that describes how pressure equipment related monitoring and control devices are maintained in good working order (i.e. the required preventative maintenance program for Safety Critical Equipment). When operations personnel are responsible for this Safety Critical Equipment maintenance the expectations and requirements may be described in this IMS element. Alternatively, the details regarding the preventative maintenance system for safety critical devices and the information regarding the records of testing that are maintained may also be described under Protective Devices.

## 5.15 Management of Change (MOC)

Management of Change is a formal system to evaluate, authorize, and document changes before they are made and to ensure that the changes made do not adversely affect integrity or safety within the facility.

MOC is used to understand the overall impact to an operating system and to apply appropriate controls for eliminating or reducing identified risks to acceptable levels. Assigning accountability for identifying and controlling hazards associated with change is a key activity.

MOC applies to any permanent or temporary change during the design, construction, installation, operation, maintenance modification, and decommissioning of facilities or pressure components.

Examples of changes that will be subject to MOC procedures:

- Changes from the original design specifications of the equipment, including an addition or deletion to any existing facilities, equipment, systems, or the installation of new equipment, facilities or systems, and temporary changes such as installation of Engineered Pressure Enclosures.
- Changes to the process design.
- Changes in the operating conditions of the equipment that are outside the approved operating envelope (e.g. pressure, temperature, flow rates, process fluid composition, etc.).
- Material specification changes.
- Changes in the way critical activities such as engineering, operating, inspection and maintenance are done.
- A change in key personnel, including contract personnel.
- Change of organization structure or reporting structure.

It is common for management of change systems to incorporate the following considerations:

- Recognize who can initiate changes and who has authority to manage changes.
  a) It may be acceptable to allow anyone to initiate a change request in the effort to improve efficiency and effectiveness of operation; however, some owners may choose to have a filter and vetting process that is restricted to lead personnel to assess, describe appropriate detail and justification and then submit the change request to an MOC coordinator.
  b) It is important that a designated role is assigned with appropriate competency to apply the MOC process and to validate that the change is practical to achieve the desire outcome without having negative effects. The implemented practice will entail a variety of considerations including an evaluation of the impact to safety, design and process details, as well as cost to achieve the outcome.

- Ensure that a process hazard assessment is performed (also refer to the Alberta Occupational Health and Safety Code, Part 2).
  a) The process hazard assessment may vary from a simple “what-if” exercise to an extensive Hazard and Operability study, based on the complexity of the change. Best practice is that a PHA procedure is available.
  b) It is commonly recognized that many PHA types benefit from the input of a multidisciplinary team. As a minimum, it is recommended to identify key disciplines (e.g. safety, instrumentation, electrical, operations, corrosion, maintenance, engineering personnel, etc.) that are affected by the change and have their input to review, support and sign off the approval of the change being proposed.
  c) The PHA should challenge what possible negative effects may come from the change and ensure appropriate mitigation is included with the overall change. Common pressure equipment considerations include:
     i) Jurisdiction considerations applicable to change in service or ownership (AB-10) and design survey review and acceptance (repair/alteration).
     ii) Over pressure protection considerations, for process changes that may require the PRD set pressure or capacity to be re-evaluated. The integrity management system should have a method to record and verify approval when PRDs require to be reset, are replaced or are removed from service and inventory. Special consideration will be necessary, in accordance to AB-525, for changes that involve over pressure protection by system design.
     iii) Corrosion monitoring considerations apply for process changes (including process trials) that deviate from the

original design basis, corrosion control documents, or integrity operating windows. Parameters may need to be added or changed for related sampling (H2S, O2, C02, pH, MIC), probes and coupons, and or other condition monitoring locations.

iv) When a process change may affect the likelihood of pressure equipment deterioration it is essential that inspection personnel are involved in the change review.

v) Impact upon operating procedures and related operator training should be considered when evaluating changes. Failure to recognize the impact to procedures and training has been recognized as a casual factor for many pressure equipment incidents. Related procedures and training may also influence maintenance requirements, response to new high / low alarm limits, lock-out isolation procedures and safe work permitting requirements.

vi) Define the duration for the change to be in-effect. Temporary changes that are not intended for permanent and routine operation shall have a defined duration. Upon expiry of the defined duration follow-up action shall be initiated to either; remove the temporary change and return to original condition or, re-assess the application of the temporary change and define a new expiry term, or re-evaluate the change and the conditions under which the change may become permanent.

- Ensure all defined mitigation associated with the change is implemented prior to commissioning any change. It is recognized as good practice to establish a checklist of requirements to be signed off prior to allowing the change to come into effect. The checklist is commonly part of the pre-start up safety review. Deficiencies identified during the PSSR process need to be tracked to closure. PSSR requirements may include:

  a) Regulatory approvals are in place.
  b) Operator and or Maintenance procedures updated.
  c) Training provided and key personnel deemed competent.
  d) Preventative maintenance plans developed and distributed.
  e) Corrosion monitoring, inspection and or sampling requirements defined and distributed to appropriate personnel.

- Ensure all related training is completed, and the applicable documentation of the change has been updated for legacy reference.

  a) When the change impacts operating or maintenance procedures it will be necessary to address the necessary training to ensure personnel are aware of the change and its impact to their work.
  b) Consideration should address the method to ensure that applicable documentation like data reports, piping & instrumentation drawings, line designation tables, and critical

procedures reflect the current change and are as-built when applicable.

c) It is a recommended practice to have a method to reference and correlate approved changes to operating facilities to the process or facility design. For example, future specifications and design basis may benefit from incorporating current changes, providing the application and information related to the change can be confirmed.

The extent of the documentation required will vary considerably depending on the owner's facilities and equipment. In some cases owners have found it beneficial to refine their MOC procedures because over documentation, duplication and unnecessary complexity can compromise the overall effectiveness of the MOC process. Therefore, the documentation and process should be the minimum needed to assure the MOC process is effective and be built into existing work processes.

## 5.16 Integrity Assessment Program

All pressure equipment shall be included in the owner's pressure equipment integrity assessment program. The following provides an example of included equipment:

- Boilers and thermal liquid heating systems.
- Pressure vessels, fired heater pressure coils, and heat exchangers (most of these items will be inspected and reported on individually, except that some equipment such as small pressure vessels and other items that may have design registration as pressure fittings could be inspected as part of the pressure piping system).
- Pressure piping (specifically when its mechanical integrity is liable to be significantly reduced by corrosion, erosion, fatigue, or any other factors, and failure can give rise to danger) and pressure fittings.
- All protective pressure relief devices.
- Any of the above pressure equipment items that are rented or leased.

All of the pressure equipment installed at pressure plants equipment facilities, including mothballed equipment and equipment in storage, must be included in the integrity assessment program.

### Assigning Resources

To optimize resources and ensure that integrity assessment activities provide an appropriate level of control, operations, maintenance, engineering, health and safety and other related disciplines must be fully integrated and aligned with integrity assessment activities.

The owner will need to designate a competent person to be responsible for the integrity assessment program, who has the defined authority, responsibility and

resources to coordinate all in-house and outsourced integrity assessment and related activities.

Appropriate training and competency assessment processes must be in place for all persons performing integrity assessment activities. These activities include verifying and controlling pressure equipment inventories (assets), hazard assessments, operator activities that provide important input into equipment integrity assessment, in-service pressure equipment inspections, inspection and certification of pressure equipment repairs, installation inspections and related monitoring activities.

Personnel who inspect and certify installed pressure equipment and those who supervise in-service inspection staff shall hold the required Alberta in-service Pressure Equipment Inspector Certificate of Competency and be verified and certified as competent to perform the specific integrity assessment activities assigned.

The requirements established by the Administrator for In-Service Inspectors are defined in Information Bulletin IB13-009 and the In-Service Pressure Equipment Inspector Certification Requirements, AB-526, which are posted on the ABSA website.

### Planning

The IMS must include a work planning process for inspection and servicing activities to ensure that the required integrity assessments and servicing has been done to assure safe operation of the pressure equipment. This process will include all of the owners pressure equipment (i.e. not just the pressure equipment that is on registration and for which inspections must be reported to ABSA) and, as applicable and pursuant to operating agreements, pressure equipment that is owned by another organization but is operated by the owner-user. If inspection and servicing is to be completed by the asset owner, the organization operating the equipment should confirm these actions and if the inspection and servicing is completed by the operating organization then the applicable reports should be provided to the asset owner so they can update their equipment records and report the inspections to ABSA as required. It is common that the inspection and servicing work planning process is integrated with the owner's maintenance turn-around planning process. It is important that the planning process involve personnel responsible for the facility concerned and that the scheduled integrity assessment and servicing activities receive the commitment of facility management. As part of the planning process any inspections or relief valve servicing that will not be completed within the AB-506, Appendix A, Table 1 specified interval, needs to be identified and a documented risk-analysis based deferral or revision process initiated.

### Pressure Equipment Assets and Records

It is crucial that the owner maintains an accurate inventory of all pressure equipment to assure its' inclusion in the integrity assessment program, and to

comply with the regulatory requirements. Accordingly, validation of equipment inventories must be done by competent personnel who have the appropriate documented training and experience to ensure the process is effective.

The inventory information that needs to be maintained would normally include, as a minimum:

- Alberta identification number (A number) for all equipment that requires an Alberta Certificate of Inspection.
- Owner's unique equipment identification number.
- Equipment description.
- Equipment location of installation.
- Equipment nameplate information.

PESR Section 41 requirements related to records, and the PESR interpretation of equipment record must be considered when establishing the pressure equipment records that will be maintained.

### Hazard Assessment

Assessment of the pressure plant by competent personnel is a key activity in ensuring that the fluid service and other relevant data needed to develop a suitable inspection plan and strategy for the equipment is available.

From a facility perspective, in order to manage risks the hazards must first be identified and then the risks may be evaluated to determine if they are tolerable. The earlier in the facility life cycle that effective risk analysis is performed, the more cost effective that future safe operation of the process will be. Hence the requirement, within the AB-512 design element, for completion of the applicable PHA to identify the applicable pressure equipment integrity hazards and risks. It should be noted that the need for work site hazard assessment, elimination and control is also referenced within Part 2 of the Alberta Occupational Health and Safety (OH&S) Code. The understanding of risk developed from the PHA process forms the basis for establishing most of the other process safety management activities for the facility. The policies implemented by most owners (e.g. in compliance with OH&S Code requirements) will also specify the frequency at which facility PHAs will be revalidated. This typically involves updating the original study to reflect any facility changes since the last revalidation.

### Inspection Procedures

Within the owner-users IMS the owner must establish and maintain appropriate inspection procedures that shall be used by inspection personnel. Inspection procedures will detail the owner's safety, technical and reporting requirements specific to the type of pressure equipment that will be inspected (e.g. safety protocols, details of inspection requirements with checklist when applicable, specific reporting requirements as well as measurements and photographs that must be provided).

### Initial Inspection Prior to Entering Service

The scope of the installation inspection for boilers and pressure vessels, as a minimum, should include:

- Verification that the correct Manufacturer's Data Report is available.
- Verification that the design has been registered with ABSA.
- Verification that the nameplate information is correct, per the Manufacturer's Data Report.
- An external examination for visible damage, and to ensure the equipment has been installed correctly.
- Verification that the installed overpressure relief devices are in accordance with the pressure system design (e.g. set pressure and capacity as per relief valve design data sheet) and also meet code requirements (e.g. have the required code markings and capacity when prescribed by the code, and are installed in accordance with code requirements).
- Verification that AB-525 requirements are met, particularly when overpressure protection for pressure vessels and pressure piping is provided by the system design.
- Verification that ABSA installation inspections have been completed for all boilers and thermal liquid heating systems.
- Verification that pressure equipment is identified with an Alberta identification number (i.e. A-number) and that an Alberta Certificate of Inspection Permit has been issued for the equipment (unless otherwise exempt per the Safety Codes Act, PESR or PEEO). Pressure equipment that is constructed outside of Alberta will require an ABSA initial inspection to issue the Alberta identification number and Certificate of Inspection Permit.
- Confirming that the related pressure piping has been installed in accordance with the applicable construction codes and the Safety Codes Act (e.g. correctly completed AB-83 form and AB-81 form when applicable).

In many cases the installation inspection process will also include baseline thickness readings, at the locations of future corrosion monitoring, in order to normalize the data for future corrosion monitoring.

### Inspection Plans and Strategies

Equipment specific inspection plans and strategies for new equipment should be prepared within a reasonable period of time after the installation inspection (not to exceed 12 months). Existing inspection plans should be reviewed at appropriate intervals, and updated as required based on inspection results, advances in technology, and other information.

As required by AB-506 the equipment specific inspection plan and strategy, or supporting documents, includes, but is not limited to the following information:

- The credible damage mechanisms (modes of deterioration) that could be expected to affect the specific equipment.
- Primary areas of degradation and expected rate/susceptibility.
- The type and extent of examinations and inspection techniques required to detect and evaluate the damage mechanisms.
- Corrosion monitoring plans, such as thickness measurement surveys, and locations for corrosion monitoring (although it is good practice to assess systems instead of individual pieces of pressure equipment, consideration must be given to include a representative sampling of components and corrosion zones in the inspection plan).
- Preparatory work to enable the required examinations and inspections to be done effectively and safely.
- Date of the next external and thorough inspection (i.e. inspection intervals for the pressure equipment) and dates for other inspections or monitoring that are part of the inspection plan.
- Servicing and testing of pressure relief devices and other protective devices (reference AB-524) and the date of next servicing/testing.

In addition to the information provided within AB-506 paragraph 11.2 it is recommended that the information provided in the EEMUA Publication 231-Ed. 2, under "Written Scheme of Examination" is reviewed as background for the preparation of inspection plans and strategies, to ensure the most effective information is conveyed to inspectors performing inspections.

**Periodic Integrity Assessment**

The inspection and servicing requirements that must be met in Alberta are defined in the Inspection and Servicing Requirements for In-Service Pressure Equipment document AB-506, which is posted on the ABSA website. This document covers the requirements for inspection practices and procedures, specific inspection requirements and maximum inspection and servicing intervals.

The AB-506 document references the relevant sections of recognized international standards that must be followed, such as, the American Petroleum Institute Code API 510 Inspection of Pressure Vessels, API 570 Piping Inspection Code, and the National Board Inspection Code NB23.

Factors that must be considered in conjunction with the inspection plan and strategy information, in determining the frequency and type of inspection include:

- Safety record and previous history (operating and maintenance) of the system.
- Any generic information about the particular system.
- The current condition and expected remaining life of the equipment.
- The expected operating conditions and the required response if the operating conditions change.
- The fluids in the system.

- The standard of technical supervision, operation, maintenance and inspection in the owner's organization.
- The effectiveness of any on-stream monitoring and the required response if the on-stream monitoring indicates a change.

It is common practice to record the fluid service corrosion circuits on the piping and instrumentation diagrams or process flow diagrams, or to prepare simple block process diagrams which show the corrosion circuits and location of the equipment and overpressure relief devices.

If the owner wishes to implement Risk Based Inspection within the IMS, the ABSA document titled Risk-Based Inspection Program Requirements for Pressure Equipment (AB-505), specifies the requirements that must be met. When the organization has implemented a formal, ABSA accepted, Risk-Based Inspection (RBI) process to determine inspection requirements and intervals, these requirements and intervals are used instead of the progressive time based grading system established in AB-506.

### Close Out of Inspection Findings

Within the owner-users integrity assessment program there must be an effective process implemented for identifying, reporting, dispositioning and tracking the resolution of inspection findings or integrity assessment issues that are discovered.

### Reporting of Thorough Inspections

AB-506 includes the requirement that owner-users, and inspection companies acting on behalf of owners that do not have a registered IMS, submit an Electronic Summary Report (ESR) to ABSA to report the thorough inspections or thorough RBI assessments that have been completed for all of the pressure equipment items they operate that are subject to annual registration. The updated ESR must be provided by the end of January for the preceding calendar year, or on a quarterly basis if there are inspections, RBI assessments or record corrections to report.

## 5.17 Non-destructive Examinations and Testing

To ensure the continued safe operation of the pressure equipment, it is crucial that non-destructive examinations and other corrosion monitoring activities are suitable for detecting any problems before they adversely affect the integrity of the equipment. Competent resources must be assigned to ensure that:

- Corrosion monitoring activities are effective.
- The non-destructive examination methods chosen are capable of identifying the potential defects.
- That the examinations are done at the correct locations and intervals to enable such defects to be identified before they adversely affect the integrity of the equipment.

- Results must be reviewed upon completion of the examination by competent persons to flag any findings that may indicate potential problems and to identify any follow-up action needed (there must also be provision to ensure that any such follow-up action is completed in a timely manner).

Non-destructive examinations and testing are crucial in providing quantitative data to support fit-for purpose integrity assessments. The integrity management system should address four key aspects of NDE to ensure trustworthy results:

- Method of NDE service provider selection and qualification.
  a) Qualification of the related service provider will be dependent on the scope of services to be required. It is most important to ensure the service provider has applicable written procedures, appropriate equipment, and personnel with the necessary qualifications and certifications.
  b) It should be identified who will be responsible for, and how a NDE and testing services will be qualified prior to performing the activity. Owners may require a formal audit qualification process, administered by a Supply Chain Management team, to establish pre-approved service providers. Alternatively, pre-qualified service providers may be select on an as-needed basis. It is commonly recognized that in-service pressure equipment inspectors will have related training and competency to support the selection of a qualified service provider for NDE and testing.
  c) The qualification process should address how the written procedures for performing NDE and testing are qualified to provide the desired detection and sensitivity. Owners should address how procedures for specialized NDE processes (non-routine or specific to individual equipment or damage mechanism) will be qualified and or validated. For critical applications or specialized NDE processes, it is recognized as good practice to have comparable standards fabricated with known defects to qualify the procedure and demonstrate competency of the NDE technician.
- Written instructions.
  a) Ultimately NDE and testing shall support the overall integrity assessment of pressure equipment. Personnel who assign NDE and testing must be familiar with present or potential types of damage mechanisms associated to the process equipment. All planned NDE and testing should be assigned at the required interval to ensure performance in a timely manner to support safe and reliable operation.
  b) NDE and testing should be traceable to the component and repeatable to the extent to provide validation and a comparison or rate of deterioration. Written instructions shall assign the method, the extent of NDE and testing for each method and location, and the acceptance criteria, when applicable. By reviewing and referencing the NDE and testing procedure prior to assigning the

required application, the responsible person can ensure that essential procedure variables and limitations align with the examination scope. Access, surface preparation, material and environment temperatures and lighting are common variables that need to be coordinated in the preparation for NDE and testing. At all times safety considerations shall be communicated related to the NDE and testing.

c) Written instruction should establish the reporting requirements and the level of qualification required to certify the examination findings. At all times, NDE and testing that is required for repairs or alterations shall be performed to the requirements of the applicable code of construction and be controlled by the holder of a Certificate of Authorization Permit for the repair/alteration scope.

- In-process validation.
  a) Although organizations performing NDE and testing services are qualified, ongoing surveillance is required to ensure individuals are qualified, certified and competent to perform the scope of work assigned, and are following the specified procedure using calibrated equipment. Additionally, the reported examination findings need to be reviewed to ensure the scope of work was completed and documented in accordance with code requirements and the written instructions provided.
- Response to examination findings.
  a) The integrity management system should assign requirements to have findings evaluated by competent individuals and initiate timely responsive action accordingly. Timely response shall ensure that corrective action is initiated immediately if findings are below recognized Safe Operating Limits, or prior to anticipated deterioration progressing below Safe Operating Limits. Response may include repair, fitness for service evaluation, de-rate the pressure equipment, and or adjust the inspection and examination intervals.
  b) It is recommended as good practice that responsive action be extended to evaluate the implications to:
     i) Similar service equipment and or areas where representative sampling is applied.
     ii) Process monitoring and defining Integrity Operating Windows.
     iii) Design specification review and basis for design life.

Although these NDE requirements are written from the perspective of integrity assessment, many Owners are also manufacturers as they can have piping fabrication or performance of repairs etc. within their scope, as such the controls for NDE in these instances should be included and be in accordance with the applicable code requirements.

## 5.18 Repairs and Alterations

Pressure equipment repairs and alterations must be completed in accordance with the AB-513 requirements document.

The organization assigned to perform repairs or alterations must be approved in accordance with the purchasing element of the IMS and have a valid Alberta Certificate of Authorization Permit for the applicable repair/alteration activities.

The owner must ensure that competent personnel (e.g. Chief inspector) approve all proposed repair or alteration procedures on the owner's behalf. This approval will ensure that all service requirements are taken into account so that the integrity of the item is retained. Special provisions for welding and other material related requirements may need to be covered in the repair/alteration procedure to ensure it is suitable for the fluid service. Also, if original Code of Construction requirements, such as heat treatment and hydrostatic testing are not possible the repair/alteration procedure will require specialized input. There may be additional factors involved in the repair or alteration that need to be taken into account, such as the equipment location and weather conditions.

The cause for the repair must be determined and reconciled against the equipment inspection plan and strategy, and the inspection plan damage mechanisms, methods, requirements and intervals must be revised, as required.

ABSA must be notified of all proposed repairs or alterations to boilers, boiler external piping, pressure vessels, fired heater pressure coils and thermal liquid heating systems prior to undertaking any repair/alteration work.

All repairs or alterations to boilers, boiler external piping, pressure vessels, fired heater pressure coils and thermal liquid heating systems that are done at a contractor's facility must be inspected and certified by an ABSA SCO. If the owner has qualified (i.e. IBPVI or IPVI certified, as applicable to the equipment classification) and competent personnel to inspect and certify repairs at their facilities, the IMS may specify a scope of Owner-Certified Repairs as described within AB-513. In all cases the Repair and Alteration Reports (AB-40) for all A-numbered equipment must be submitted to ABSA.

All alterations to boilers, boiler external piping, pressure vessels, fired heater pressure coils and thermal liquid heating systems, except as specifically exempted within AB-513, must be submitted to and registered by ABSA Design Survey.

Hot taps and temporary leak sealing enclosures or devices should only be used when other options are not possible, and comprehensive controls must be applied for such installations to ensure that the safety of the equipment is not adversely affected. Justification, and detailed documentation to support any proposed hot taps and leak sealing enclosure installations, must be provided to ABSA Design Survey and their acceptance for such designs/procedures must be obtained before the work is started.

Suitable procedures (e.g. temporary MOC) must be in place to track and control temporary Engineered Pressure Enclosures to ensure their timely removal, and any applicable repair of the affected pressure equipment.

Repairs and alterations to pressure piping systems (excluding boiler external piping) will be inspected and certified by a competent owner's Inspector on behalf of the owner. Pressure piping system alterations that exceed 500 liters aggregate volume shall be submitted to ABSA Design Survey for registration, except as permitted by AB-513, 8.6.3.

For replacement in kind of isolated (i.e. individual components at any occurrence, as opposed to an entire piping system) mechanically assembled pressure piping components (e.g. threaded valve, threaded elbow, compression tubing valve) the owner's IMS may include a procedure, developed in accordance with the AB-523 guideline, that will permit the limited replacement in kind activities within the PEIMS. In such circumstances the owner-users Certificate of Authorization Permit would not include additional construction, repair or alteration scope.

If an owner-user determines that they need to construct, repair or alter pressure equipment (i.e. beyond the limited AB-523 replacement in kind scope), as opposed to contracting these activities to an organization with the applicable Certificate of Authorization Permit scope, then the owner-user must develop the applicable quality control procedures, train personnel in these procedures and then demonstrate procedure implementation to ABSA, normally during a scheduled PEIMS certification or periodic audit, in order for the pressure equipment construction, repair and alteration scope to be added to the owner-users Certificate of Authorization Permit.

## 5.19 Overpressure Protection and Protective Devices

There are a number of AB-500 series requirement documents that need to be referenced to satisfy the requirements outlined in this element of the integrity management requirements.

AB-506 – Pressure Equipment Inspection Service and Requirements document, establishes requirements for assigning maximum servicing intervals and other installation requirements for pressure relief devices installed in Alberta. Key items in AB-506 include:

- All devices associated with overpressure protection, including devices associated with OPPSD systems, (maintenance of Safety Critical Equipment is addressed under protective devices and the calibration of the instrumentation used for verification is addressed in control of monitoring and measuring devices element) must be maintained by competent persons using documented work practices.
- A management system meeting the requirements of ASME Section VIII, Division 1, appendix M and that is acceptable to the

Administrator must be in place to manage isolating valves in the relief paths.
- A documented online visual inspection of PRVs is required after re-installation and at a maximum 5 year interval to verify that the valve is correctly installed.
- Appropriate documented work processes, methodology, and assessments must be in place to optimize the PRV servicing interval (typically the servicing interval is based on device cleanliness and mechanical condition, and valves that do not perform, or would not have performed, as required either in the field or when tested should have a root cause failure analysis conducted and the interval adjusted accordingly) in accordance with the AB-506, Appendix A.

AB-506, Appendix D also provides a guide for assigning PRV servicing intervals.

AB-524 – Pressure Relief Devices Requirements defines the requirements for pressure relief device activities performed under a valid Certificate of Authorization Permit. Key items in AB-524 include:

- A Certificate of Authorization Permit is required to manufacture, assemble, repair, set or seal PRDs.
- Defines the elements that must be incorporated into a PRD QMS.
- Defines requirements for testing steam valves – Sections I, IV and VIII.
- Defines training requirements for technicians and trainers.

AB-525 – Overpressure Protection Requirements for Pressure Vessels and Pressure Piping details the requirements that must be met to satisfy the PESR. Key items in AB-525 include:

- Defines the requirements for design registrations for the various types of overpressure protection (note that the owner's acceptance is required if applying to use any type of overpressure protection other than a PRV).
- Lists the cases where PRVs are mandatory.
- Provides details in addition to AB-506 on the installation of valves in relieving paths.
- Provides details on the monitoring systems that must be in place when using OPPSD.
- Defines the requirements of an owner's IMS/PEIMS when using OPPSD.
- Defines the requirements that an Owner must meet when documenting existing OPPSD systems.

API Recommended Practice 576 –"Inspection of Pressure Relieving Device", provides detailed recommendations for the inspection and control of pressure relieving devices at user's facilities. This document includes a cautionary note that it should not be construed as a code of rules or regulations.

The owner's controls/processes to ensure all Safety Critical Equipment is tested or calibrated at an acceptable frequency would normally be described within the Overpressure Protection and Protective Devices element, under protective devices. It is required that an appropriate preventative maintenance system is implemented for all Safety Critical Equipment. The AB-512 also stipulates that the owner is to maintain testing records for protective devices and Safety Critical Equipment.

## 5.20 Internal Audits

ISO 19011: (Latest version) provides guidelines for auditing management systems that will assist organizations to ensure that their auditing processes are effective.

Internal audit is intended to evaluate whether the PEIMS is performing as intended. The written description of internal audits should describe the system for scheduling, staffing, effectively completing and documenting the evaluation of all PEIMS elements and the systems for managing the resolution of all audit findings and corrective/preventative actions.

The internal audit will assess implementation status of PEIMS elements against the established requirements (i.e. AB-512) as stipulated within the IMS written description, normally directed by the use of a written checklist or protocol. As a guide ABSA provides the AB-512(c) checklist as an example internal audit protocol.

## 5.21 Corrective and Preventative Actions

Issues and non-conformance involving pressure equipment and/or the IMS implementation must be reported, investigated, and the appropriate remedial, corrective and/or preventative action taken to assure pressure equipment safety.

Best practice is to implement an integrated corrective action tracking system/database to monitor all relevant safety and pressure equipment safety action items, including recommendations (i.e. remedial, corrective and preventative action) from incident reports, risk analysis, reported nonconformity, emergency exercises, audits, etc. Such systems normally allow the assignment of responsibility for actions and the notification of overdue actions, to responsible personnel and often their supervisors.

The owner must have a documented process, which is followed when nonconformity is identified. This process should include reference to how the nonconformity resolution is tracked to closure and determined to be effective. Risk ranking of the pressure equipment issue or nonconformity prior to completion of the remedial, corrective and preventative action is a common practice, which may also influence the extent of management notification or sign-off required.

If a proposed disposition with respect to a pressure equipment Safety Codes Act nonconformity includes continued operation of the pressure equipment with the identified nonconformity it is required that ABSA accept the proposed disposition.

The integrity management requirements specify that the owner must establish performance metrics to support achieving IMS objectives, as part of Management Review input. For guidance on possible performance metrics owners should review the available information on process safety metrics (i.e. API RP 754 and CCPS Process Safety Leading and Lagging Metrics) and Appendix I in the publication titled “Guidelines for Process Safety Metrics” published by the Center for Chemical Process Safety Copyright©2010 American Institute of Chemical Engineers, Inc. Appendix I provides a listing of potential process safety metrics in each of the risk based process safety elements, which will enable organizations to select metrics based on evolving IMS improvement objectives.

## 5.22 Accidents and Incidents

The Safety Codes Act Section 59, PESR Section 35 and Information Bulletin IB18-004 Rev. 1 establish the requirements for reporting accidents, unsafe conditions and fires to ABSA (for additional details refer to the ABSA web site at www.absa.ca).

Items that should be considered when preparing the description of the accident and incident IMS element include:

- Who must be notified within the owner’s organization, including contract Chief Inspector if applicable.
- Who notifies ABSA and when.
- Who has ABSA’s contact lists and where are they kept.
- Ensuring the pressure equipment accident/unsafe condition reporting requirements are integrated into the owner’s documented HSE reporting policy and procedures.
- How is the accident/incident scene controlled, and that the scene is not disturbed unless advised by an ABSA Safety Codes Officer.
- When is the initial report provided to ABSA, and who is responsible for the initial report.
- Who is responsible for submitting the final report with recommendations and corrective actions to ABSA.
- Ensuring that the information required in the Act is specified in any reports submitted to ABSA.

Accidents that must be reported include:

- All accidents involving pressure equipment (boiler, pressure vessel, pressure piping system, steam pipelines, pressure fittings, or a thermal liquid heating system) that result in damage to property or injury to, or death of a person.

- Accidents not caused by pressure equipment, but having some impact on pressure equipment, such as fires that impact upon pressure equipment.

Accident investigations should follow a structured process and strive to understand the root cause. If human error is determined to be the cause, the underlying reason why the error has occurred should be understood (e.g. did the individual fail to perform the task or was the task performed incorrectly). The owner should have a system in place that tracks all follow up actions to closure. Actions should be aimed at preventing re-occurrence and reducing error likely scenarios.

Pressure equipment unsafe condition reporting requirements are explained on the ABSA web site. The owner (or designate) of pressure equipment must promptly report any “unsafe condition” to ABSA. Reporting unsafe conditions is a requirement under the Safety Codes Act.

Other Safety Codes Act non-compliance issues that need to be reported to an ABSA Safety Codes Officer include:

- Pressure equipment designs, for in-service equipment, which are not registered in Alberta.
- Construction servicing or repair activities done by an organization that does not have the required Alberta Quality Program Certificate of Authorization Permit.
- Inspection and servicing intervals assigned that exceed the maximum interval established in the AB-506 requirements document and that are not covered by approved deferrals (i.e. deferrals that exceed 12 months require ABSA acceptance).
- Discovery of defeated safety system interlocks or emergency shutdown systems (e.g. equipment critical for operation of pressure equipment within Safe Operating Limits) found in an un-operable condition.
- Pressure equipment relief devices set above the maximum allowable working pressure of the protected equipment (i.e. Safety Codes Act Nonconformity).

**When alternative reporting as permitted by IB18-004 Rev. 1 will be used, the process shall be clearly described in the PEIMS quality management system and satisfactorily demonstrated during a PEIMS audit.**

# 6.0 Revision Log

| Edition # | Revision # | Date | Description |
|---|---|---|---|
| 1st edition issued on 2005-11-08 | | | |
| 2 | | 2015-06-25 | 2nd Edition issued |
| 3 | | 2020-08-19 | Formatting updated to current standard & added editorials for clarification |
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