

Requirements for Engineered Pressure Enclosures

AB-521

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FOREWORD

As provided for under Section 40(4) of the Pressure Equipment Safety Regulation, the Administrator in the pressure equipment discipline has issued an Information Bulletin to establish that ABSA document AB-521, “*Requirements for Engineered Pressure Enclosures*” specifies requirements for the design, fabrication, installation, and removal of Engineered Pressure Enclosures (EPEs) in Alberta, and requirements for registration of enclosure designs and of associated procedures.

This document also contains provisions for a streamlined acceptance process, allowing collective pre-registration of enclosure designs when their use is limited to certain applications. It also includes Annex A that establishes the requirements for documenting and implementing the Quality Plan for development and acceptance of an RRIMR procedure.

The next reaffirmation of the AB-521 is scheduled for 2024.

1.0 INTRODUCTION

AB-521 applies to EPEs typically used in pressure piping systems that are subject to the Pressure Equipment Safety Regulation (PESR). In addition, AB-521 allows the limited use of EPEs for pressure vessels subject to the PESR.

The PESR establishes requirements that must be met by persons who own, operate, design, construct, install, repair, alter or maintain pressure equipment or provide related services to ensure that the pressure equipment is safe for operation.

This ABSA requirements document was developed through close cooperation with plant owners, EPE manufacturers, other Jurisdictions and other stakeholders. Their input has been invaluable in compiling this document.

ABSA requirement documents are periodically reviewed to ensure that they are aligned with current industry practice. We would welcome any suggestions you have to improve this document.

Please provide your comments to:

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2.0 SCOPE

From time to time, industries experience leaks on pressure equipment when it may be impractical to shut down immediately for repair. An EPE (also called on-line leak sealing or leak box) provides a means of temporarily containing certain leaks until the equipment can be properly repaired. The pressure equipment owner is responsible for determining if the use of an EPE is appropriate for any given leak and if the installation of an EPE can be safely performed.

The Codes and Standards referenced in the PESR and CSA-B51 do not give rules for EPEs. This document was developed in close cooperation between ABSA, industry and other Canadian Regulatory Authorities to provide guidance and consistency. The intention of this document is to provide rules for the use of EPEs to seal leaking pressure equipment and to provide reinforcement to pressure equipment degraded by local corrosion or erosion.

If there is a conflict between other ABSA documents for the design or construction or installation of EPEs in pressure equipment and this document, this document shall prevail.

Caution: This document does not provide all the necessary information required to perform leak sealing of pressurized equipment. It is the responsibility of the owner, or any other organization that designs, manufactures or installs an EPE, to ensure that all of the necessary engineering, installation and safety requirements are addressed for any given installation.

3.0 DEFINITIONS AND ACRONYMS

For the purpose of AB-521, the following definitions and acronyms apply:

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

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

ABSA Design Surveyor – is an ABSA Safety Codes Officer (SCO) who holds the required Safety Codes Officer designation and designated powers under the Safety Codes Act and is competent to assess that the design of pressure equipment complies with the Alberta Regulations and Code of construction requirements.

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)

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

Alteration – means any change to an item of pressure equipment as described in the original manufacturer's data report that requires a change of design calculations or otherwise affects the pressure-containing capability of the item of pressure equipment. [PESR 1(1)(d)]

Non-physical changes such as a change in the maximum allowable working pressure or design temperature of a boiler or pressure vessel pressure retaining item are considered alterations, as are reductions, such as reduction in minimum temperature.

ASME Code – means the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code or Pressure Piping Code declared in force applicable to the equipment. [PESR 1(1)(e)]

BEP – means boiler external piping as defined in the ASME B31.1, Power Piping Code

Boiler – means a vessel in which steam or other vapour can be generated under pressure or in which a liquid can be put under pressure by the direct application of a heat source. [PESR 1(1)(f)]

Category D Fluid Service – Fluid service as defined in the ASME B31.3, Process Piping Code

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

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

Engineered Pressure Enclosure (EPE) – is an enclosure used for containing a leak or reinforcing existing pressure equipment for a limited time until a proper repair or alteration is carried out.

Fitting – means a valve, gauge, regulating or controlling device, flange, pipe fitting or any other appurtenance that is attached to, or forms part of, a boiler, pressure vessel, fired-heater pressure coil, thermal liquid heating system or pressure piping system. [PESR 1(1)(n)]

General Engineering Requirements (GER) Form – means a form that provides general engineering requirements for design and construction of an EPE.

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)]

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

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

MDMT – Minimum Design Metal Temperature

MOP – Maximum Operating Pressure

MOT – Maximum Operating Temperature

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

Nonboiler External Piping – means piping as defined in the ASME B31.1, Power Piping Code

Normal Fluid Service – Fluid service as defined in the ASME B31.3, Process Piping Code

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

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

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

PESR – means Pressure Equipment Safety Regulation, Alberta Regulation 49/2006

Piping Design Pressure – is the design pressure value of the piping system as listed in the line designation table that is registered with ABSA and it represents the pressure used in the design of a pressure piping component together with the coincident design metal temperature, for the purpose of determining the minimum permissible thickness or physical characteristics of the different zones of the pressure piping. When applicable, static head shall be added to the design pressure to determine the thickness of any specific zone of the pressure piping.

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

Pressure Piping System – means pipes, tubes, conduits, fittings, gaskets, bolting and other components that make up a system for the conveyance of an expansible fluid under pressure and may also control the flow of that fluid. [PESR 1(1)(aa)]

For the purpose of this document, pressure piping system refers to the piping and piping system constructed to ASME B31 Piping Codes or CSA Z662 Pipeline codes.

Pressure Vessel – means a vessel used for containing, storing, distributing, processing or otherwise handling an expansible fluid under pressure. [PESR 1(1)(cc)]

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

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

Quality Management System (QMS) – means all the documented, planned and systematic actions needed to ensure that this Act is complied with. [SCA 1(1)(aa)]

QP – means Quality Plan Requirements.

QP Process Manager – means a person of authority in the PEIM system who has the ownership and control of the Quality Plan Process. (Example: Chief Inspector, Quality Control Manager, and Engineering Manager).

Recognized Procedure Reviewer (RPR) – means a person that has the responsibility to administer the Quality Plan on behalf of the owner-user.

RRIMR – is a procedure that includes Risk assessment, Root cause analysis, Installation procedure, Maintenance & monitoring and Removal confirmation date applicable to EPE.

WPS - means a Welding Procedure Specification meeting the requirements of ASME Section IX Code.

4.0 REFERENCE PUBLICATIONS

Legislation that governs the pressure equipment discipline includes the following:

1. *Safety Codes Act (RSA 2000, Chapter S-1)*
2. *Pressure Equipment Exemption Order (Alberta Regulation 56/2006)*
3. *Pressure Equipment Safety Regulation (Alberta Regulation 49/2006)*
4. *Power Engineers Regulation (Alberta Regulation 85/2003)*
5. *Pressure Welders Regulation (Alberta Regulation 169/2002)*
6. *Administrative Items Regulation (Alberta Regulation 16/2004)*

The following documents have been accepted by the Administrator as requirements under the Pressure Equipment Safety Regulation and must be met for all pressure equipment including Engineered Pressure Enclosures (EPE).

AB-512 - Owner User Pressure Equipment Integrity Management Requirements

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

AB-512a - Owner-User Scope and Responsibilities form

This form is used to define the responsibility for key activities under the owner-user's program.

AB-513 - Pressure Equipment Repair and Alteration Requirements

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

AB-516 - The Pressure Equipment Safety Regulation User Guide

Even though AB-516 is not a requirement document, it provides valuable information and guidance to assist stakeholders in meeting the requirements of the *Pressure Equipment Safety Regulation* and in assuring the safe operation of their pressure equipment.

AB-524 - Pressure Relief Devices Requirements

This applies to manufacture, assembly, selection & sizing, inspections, repairs, servicing, setting & sealing and installation of Pressure Relief Devices in Alberta.

AB-96 - General Engineering Requirements for Design & Construction of Pressure Piping Systems.

This form is used for documenting the information for the pressure piping system design and construction under the Safety Codes Act and its Regulations.

IB10-006 - ABSA Requirements for Steam Pipelines.

This Directive applies to steam pipelines within the scope of AER Directive 077, Part B, Section 3.1.

The official versions of ABSA requirements documents (e.g. AB-512), ABSA forms (e.g. AB-96), ABSA guideline documents (e.g. AB-516), Information Bulletins issued by the Administrator and other valuable information are posted on the ABSA website: www.absa.ca.

Adopted codes and standards, and other recognized and generally accepted good engineering standards that are referenced in AB-521 are listed below.

Adopted codes and standards

ASME BPVC, Section I *Rules for Construction of Power Boilers*
ASME BPVC, Section VIII, Div. 1 *Rules for the Construction of Pressure Vessels*
ASME BPVC, Section IX *Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators*
CSA B51 *Boiler, pressure vessel, and pressure piping code*
ASME B31.1 *Power Piping Code*
ASME B31.3 *Process Piping Code*
CSA Z662 *Oil and Gas Pipeline Systems*

A full listing of the codes and standards that are declared in force (adopted) is provided in Section 6 of the PESR.

Recognized and generally accepted good engineering standards

The following documents provide information that may help in the development of appropriate EPE design and RRIMR for leak sealing activities. The information has been developed within various industries and may not address the use of a specific application. It is the owner's responsibility to perform a complete evaluation of leaking pressure equipment, risk assessment, root cause analysis etc., before commencement of any design, construction and installation of an EPE.

- (1) ASME PCC-2, Repair of Pressure Equipment and Piping, Part 2 - Article 2.4
- (2) EPRI (USA) NP-6523-D On-Line Leak Sealing
- (3) Health and Safety Executive (UK) - Leak Sealing Repair Clamps advisory
- (4) Health and Safety Executive (UK) - Weldless repair of safety critical piping systems
- (5) NRC Inspection Manual, Part 9900, On-Line Leak Sealing Guidelines.
- (6) EEMUA (UK)-Category Mechanical, Ref. No.199, On - Line Leak Sealing of Piping - Guide to Safety Considerations
- (7) API-579-1/ASME FFS-1, Fitness-For-Service

5.0 REQUIREMENTS FOR THE USE OF EPE

The requirements of this document shall be followed by anyone planning to construct and install an EPE on pressure equipment. EPEs are typically used in pressure piping systems to contain a leak or reinforce a pressure piping component that has been degraded or damaged by service-induced deterioration mechanisms. In specific cases, an EPE may be used on a pressure vessel (see section 7.0 of this document). When installed on pressure equipment, the EPE is considered to be “pressure equipment”, as defined in the Safety Codes Act.

The use of an EPE to contain a leak or to reinforce a degraded or damaged pressure retaining component is considered to be a temporary alteration of pressure equipment. Installed EPEs shall remain in place only until the degraded or damaged pressure retaining component can be properly and permanently repaired or replaced. Corrective action to properly and permanently repair or replace damaged pressure equipment should be taken in accordance with this document.

The use of EPEs to contain leaks in pressure equipment may introduce new damage mechanisms in the area under the EPE which may significantly degrade, damage, crack, corrode or cause the pressure equipment to fail catastrophically. In addition, the use of an EPE may develop operating and residual stresses due to constrained differential expansion. It is the owner’s responsibility to assess and address the impact of damage mechanisms, failure modes and possible addition of operating and residual stresses when an EPE is used.

An EPE may be used to stop leaks or reinforce any type of pressure equipment except:

- Boilers,
- Boiler proper and/or boiler proper piping,
- BEP - except for specific cases that are allowed in Section 5.1.2.7 of this document,
- ASME Section VIII, Division 1 vessels - except for specific cases that are allowed in Section 7.0 of this document,
- ASME Section VIII, Division 2 and 3 vessels,
- Any pressure equipment in public occupancy,
- Any pressure relief device or flanged joints connecting a pressure relief device, and
- Any pressure equipment having a crack where crack propagation cannot be eliminated. Refer to PCC-2.

5.1 Registration Requirements

The use of an EPE requires registration, achieved through a two step process:

- a) EPE fitting design registration; and
- b) RRIMR procedure registration

The EPE design registration and RRIMR registration shall be obtained prior to starting any work. A submitter of an EPE design is responsible to communicate to the owner any applicable conditions and/or limitations of design registration.

Application for EPE fitting design registration and RRIMR registration may be submitted together as one submission, or they may be submitted separately.

For complex designs and projects, an ABSA Safety Codes Officer may require the involvement of a professional engineer in accordance with Section 9 of the PESR.

5.1.1 Fittings Design Registration Requirements

EPE fitting designs require design registration in accordance with the PESR. This requirement applies to the EPE fitting pressure boundary, as well as anything attached to the pressure boundary.

EPE fitting design shall be submitted to ABSA for review and registration in one of the following two formats:

- Individual fitting design submission, or
- Catalogue (For scope and limitations, refer to Table 1).

TABLE 1: Acceptable Scope for EPE Catalogues

Maximum Nominal Pipe Size:	24
Maximum pressure-temperature rating	Flange class 600 per ASME B16.5 Standard
Temperature Range:	-20 to 650 °F
Material P. No.:	P. No. 1 and P. No. 8
Type of EPE construction	Bolted type EPE (not welded to the main run)
EPE designs to be used with the following types of damage:	<ol style="list-style-type: none"> 1. Straight line piping enclosures (for pinhole leaks in straight piping) 2. Flange clamp enclosures for piping flange joints (gasket leaks) 3. Enclosures on standard elbows, tees, weld-o-lets, couplings, and similar branch connections (for pinhole leaks) 4. Valve stem packing enclosures 5. Enclosures for pinhole leaks in bonnets 6. Potential future leak due to internal or external local corrosion or local erosion of local thin area (LTA) in a straight pipe, elbows, tees, weld-o-lets, couplings, and similar branch connections

The scope and limitations shown in Table 1 apply to design registration of catalogues only. Any other EPE design, which is outside of the scope

presented in Table 1, shall be registered individually on a case-by-case basis.

5.1.1.1 EPE Fitting Registration Requirements

All EPE fitting designs (individual or catalogues) must be submitted to ABSA's Design Survey department for review and registration. For more information about the design registration requirements, refer to:

- Sections 14, 17 and 20 of the PESR (AR 49/2006):
http://www.gp.alberta.ca/documents/Regs/2006_049.pdf
- Clauses 4.1 and 4.2 of the CSA B51
- Guidelines posted on ABSA website for design registration of fittings: <http://www.absa.ca/design-registration/fitting-design/>

5.1.2 RRIMR Registration Requirements

The purpose of the review and registration of an RRIMR is to confirm the owner has completed the necessary steps to install an EPE safely. After the review of an RRIMR is completed, and if this RRIMR is found acceptable for registration, the installation procedure and General Engineering Requirements (GER) form (AB-270 or submitter's form) will be registered. The risk assessment summary, root cause analysis, maintenance and monitoring procedure, and removal date will be kept in the file as supporting documents to the registered installation procedure.

The RRIMR procedure may be prepared and submitted for registration as one of the following:

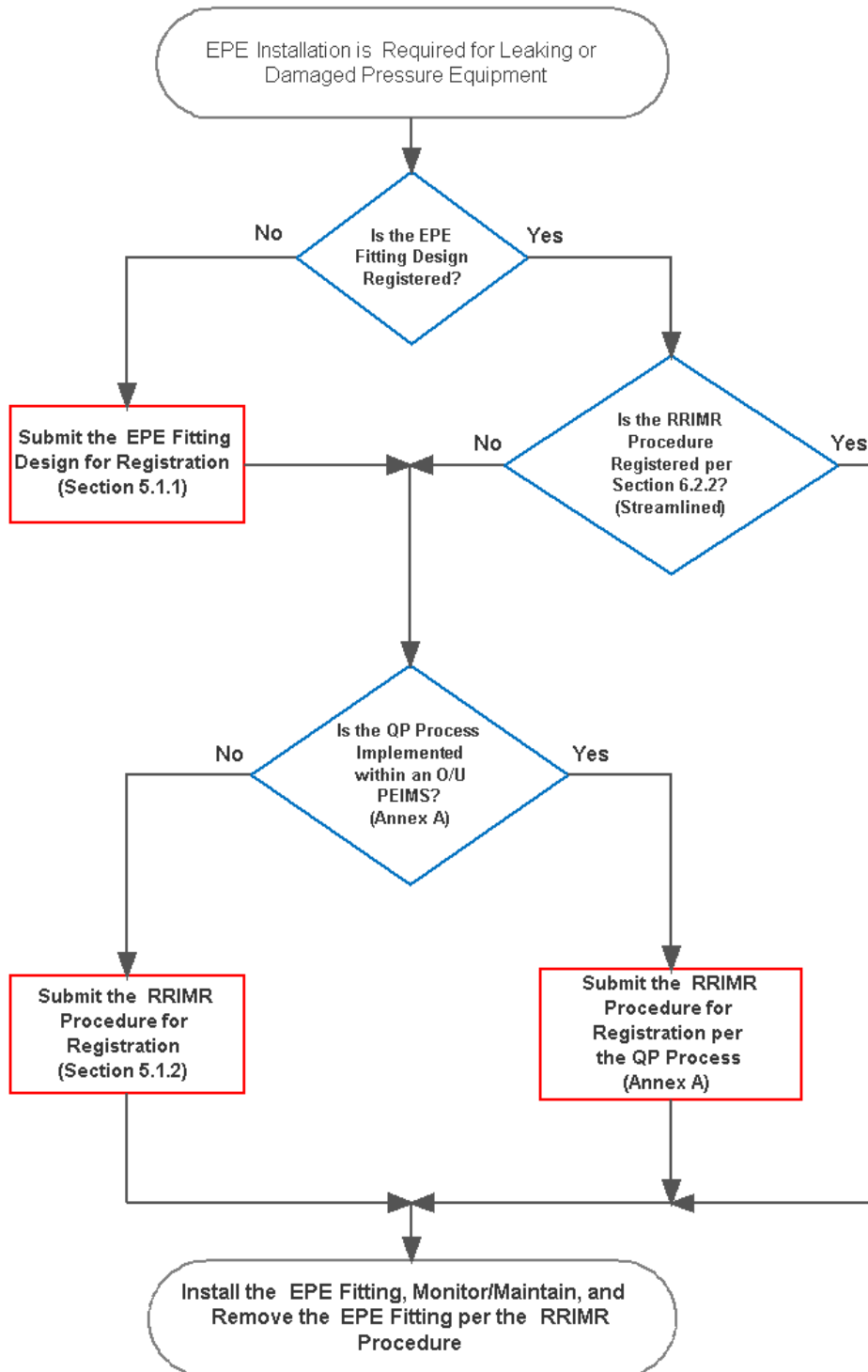
- a) On a case-by-case basis refer to section 5.1.2.1 through 5.1.2.10.
 - i. This applies to a single installation and does not need to meet the scope and limitations shown in Tables 1 and 2 of this document;
- b) As part of the streamlined acceptance process refer to section 6.0.
 - i. It must meet the scope and limitations of Tables 1 and 2 and the requirements specified in section 6.0 of this document;
- c) As per Annex A: Quality Plan Requirements for an Alberta Owner-User RRIMR Procedure Submission
 - i. Annex A provides a methodology to register the RRIMR procedure using the concepts of the QP. This QP was developed by ABSA and Alberta Owner-Users with the objective to minimize delays in the RRIMR procedure registration and still meet the requirements of AB-521.

- ii. An Alberta Owner-User (AQP-8000 series) that chooses to implement the QP may do so under a valid PEIM.

Note: the Owner-User is required to declare, on the AB-270 or equivalent form, if the registered EPE fitting and submitted RRIMR procedure comply with the requirements of Tables 1 and 2.

For a general overview of the AB-521 registration process for fitting designs and RRIMR procedures, refer to the Flowchart below.

Flowchart



Note: An EPE fitting (sec. 5.1.1) and RRIMR procedure (5.1.2) may be submitted together, in a single submission, for registration on a case-by-case basis.

Qualified engineering personnel designated by the owner shall conduct an engineering assessment to evaluate the nature and extent of the defect before they consider the use of an EPE. If the owner accepts the risk and approves the use of an EPE, then the RRIMR procedure must be submitted to ABSA's Design Survey Department for review and registration. As a minimum, the RRIMR procedure submission for registration shall include:

- General Engineering Requirements (GER) form (AB-270 or submitter's form), - see Section 5.1.2.1,
- Risk assessment summary (prepared by the owner or owner's agent),
- Root cause analysis summary (prepared by the owner or owner's agent),
- Installation procedure with details (prepared by the fitting manufacturer, the installer, or the owner or owner's agent),
- Maintenance and monitoring summary (prepared by the owner or owner's agent), and
- Removal date (provided by the owner or owner's agent).

A contingency plan shall be in place in case the EPE fails catastrophically. As a part of design registration process, the ABSA SCO may require a copy of the owner's contingency plan to be included in RRIMR submission for registration.

CAUTIONS:

- There is a possibility that the damage mechanism will not be eliminated by installing an EPE, and the damage mechanism (for example: corrosion, vibration, etc.) may continue to occur under the installed EPE. In this case, the EPE mitigates the damage (not the damage mechanism) and provides a temporary means of keeping the pressurized fluid inside the pressure equipment.
- Installation of an EPE may introduce new damage mechanisms on pressure equipment. Some of the examples are: piping deformation due to the additional weight of the EPE; piping external corrosion due to the fluid leaking into the EPE cavity; or crack propagation inside/outside the EPE. Additionally, when using a clamp to stop a leak at a flange joint, existing bolting and flanges may be damaged.
- The owner of pressure equipment is responsible for ensuring that the use of an EPE is appropriate for the application and the EPE can be safely installed.
- The decision by the owner to apply a leak sealing process to any given leak shall only be done after proper evaluation of the situation by competent leak seal design and application personnel. Failure to do so may have the potential to cause fatal injury and/or substantial damage to the pressure equipment and/or property.
- Installation of the EPE can be hazardous. The owner and installer must implement necessary safety measures before, during, and

after installation of an EPE, including the contingency plan in case the EPE catastrophically fails during installation. All steps of the EPE installation process must be reviewed by all parties involved.

- The personnel that install an EPE must analyze, understand and accept the risk before the start of work.
- Protective equipment required for personnel performing leak sealing shall be clearly identified and provided by the owner or installer (contractor), as applicable.
- Frequent re-injection of sealant to the EPE may be an indicator of continued deterioration of the underlying material, requiring further examination. Evaluation for continued use is required. A suitable and sufficient risk assessment of the conditions in which the EPE has been employed shall be carried out before making any further decision to re-inject new sealant. The injection pressure shall not exceed the internal design pressure of the EPE nor the maximum external pressure of the pressure equipment to be covered by an EPE.
- All other legislated requirements such as the Occupational Health and Safety Regulations shall be followed for leak sealing activities.

5.1.2.1 General Engineering Requirements (GER) form for the Use of EPEs

A General Engineering Requirements (GER) form shall be provided with each application for registration of the RRIMR procedure. This form shall be used for documenting the information related to the design, construction, installation procedure, maintenance, monitoring, and removal of the EPE.

The submitter of an RRIMR procedure may use form AB-270 – *General Engineering Requirements for the Use of EPEs*. ABSA document AB-270a provides guidance for completing AB-270.

As an alternative approach, the submitter may consider providing the required information on their own form. In this case, the submitter's GER form shall include the most relevant information, not only for the EPE fitting, but for the RRIMR as well. As a minimum, the submitter's GER form shall include:

- a) Owner's name,
- b) Plant location and address,
- c) Code of construction including the relevant edition which the pressure piping system is compliant with,
- d) BEP information, as a minimum, the line list, location of the EPE installation, P&ID that shows the EPE location, etc.,

- e) Engineered Pressure Enclosure location of installation, as minimum, the Line Number from the registered Line List document where the EPE will be installed.
- f) Pipe size,
- g) Pipe Schedule/Thickness,
- h) Piping fluid service (e.g. category D, Normal service),
- i) Service fluid conveyed by the pressure piping,
- j) Pressure piping design pressure,
- k) Pressure piping design temperature,
- l) Pressure piping material specifications
- m) Pressure piping MDMT (when applicable),
- n) Pressure piping MOP,
- o) Pressure piping MOT,
- p) Pressure piping and EPE corrosion allowances,
- q) Pressure piping flange class,
- r) Details of the type of pressure piping damage (pinhole, flange gasket leak, thinning, crack, etc.),
- s) Pressure piping drawing(s) of the piping damage. The drawing(s) to include the size, location and orientation of the piping damage.
- t) EPE's design registration number^(note 1),
- u) EPE type (i.e. bolted, welded),
- v) Applicable loads on the EPE (for more details see ASME PCC-2, Article 2.4, paragraphs 1(f), 3.8 and 3.9),
- w) EPE weight,
- x) References to the following owner-user document(s)^(note 2) shall be provided:
 - i. Risk assessment summary document number and revision number,
 - ii. Root cause summary document number and revision number (the summary shall include the most probable cause of leak),
 - iii. Maintenance & monitoring summary document number and revision number,
 - iv. Removal date – Owner-user's commitment in writing,
- y) Reference to the detailed EPE installation procedure^(note 3),
- z) References to NDE reports (when applicable),
- aa) Integrity assessment,
- bb) Are the EPE fitting and submitted RRIMR procedure in compliance with the requirements of Tables 1 and 2?
- cc) Any other information that owner or EPE installer considers necessary to describe the RRIMR procedure and to determine its suitability for the intended service,
- dd) A section that will provide, for the EPE installer representative for RRIMR:
 - i. print name;
 - ii. signature;

- iii. job title;
 - iv. date;
 - v. print telephone number, and e-mail address.
- ee) A section that will provide, for the owner representative for RRIMR:
- i. print name;
 - ii. signature;
 - iii. job title;
 - iv. date;
 - v. print telephone number, and e-mail address.
- ff) A section that will provide, for the owner representative for GER:
- i. print name;
 - ii. signature;
 - iii. job title;
 - iv. date;
 - v. print telephone number, and e-mail address.

Note 1: If EPE fitting design has not been registered at the time of RRIMR procedure submission, then the submitter shall either include the EPE design with the RRIMR procedure or provide reference to the EPE design submission tracking number.

Note 2: The GER form (AB-270 or submitter's form) and the four documents requested in 5.1.2.1(x) above (in bold letters) shall be included in the RRIMR procedure submission. The four documents may be combined into one document. Please note that the GER form must refer to the owner document(s) or letter(s). These document(s) or letter(s) shall have document number(s) and revision number(s).

Note 3: The EPE manufacturer, the installer or the owner shall provide a detailed installation procedure with a document number and revision number.

5.1.2.2 Risk Assessment

The owner must assess and accept the risk related to installation and maintenance of an EPE while the equipment is still under pressure, and the risk associated with the removal of the EPE. The risk assessment shall address the potential to introduce new failure modes or additional stresses when an EPE is used to seal off the leak in pressure equipment (see Section 5.0).

The result of the risk assessment and a statement that the owner accepts the risk related to installation, maintenance and removal of

EPE shall be provided in the summary document signed by the owner's representative.

5.1.2.3 Root Cause

The owner must assess the damage on pressure equipment and perform necessary inspection, examination (e.g. LPI, MPI, UT, RT) and analysis to determine the root cause and the scope of damage. This information shall be provided in the root cause summary document signed by the owner's representative.

The result of the root cause analysis and risk assessment analysis should help the owner to decide if an EPE can be used to mitigate the damage and provide a temporary means of keeping the product inside the pressure equipment. At this stage, the owner shall start planning an acceptable permanent repair of damaged pressure equipment that will eliminate the damage mechanism after the EPE is removed.

The owner may consider using one of the approaches specified below in lieu of the root cause summary document, if the following requirements are met:

- For LTAs with or without leaks, the owner shall know, manage and monitor the damage/deterioration mechanisms and keep records of the deterioration rates (e.g. corrosion or erosion). The owner shall use these records to justify that the LTA was caused by these damaging/deterioration mechanisms.
- For progressive gasket deterioration over time, the owner shall demonstrate that the gasket leaks are exclusively caused by uneven pressure forces distribution at the joint, torque loss, lack of flange flatness, or flange face damage (such as scratches, gouges, pits, dents).
- For weld or material defects causing pinholes (e.g. entrapped gases inside the weld or casting), the owner shall demonstrate that the integrity of the material surrounding the pinhole is not compromised.

If any of the above three cases are used by the owner, the RRIMR procedure submission for registration shall include details of the approach used, and this document shall be signed by the owner's representative.

5.1.2.4 Installation Procedure

The manufacturer of an EPE, installer of an EPE or the owner shall assign responsibilities and submit the detailed installation

procedure for registration. The installation procedure must be signed by a representative of the company installing the EPE.

If the owner has their PEIMS registered with ABSA and if the PEIMS includes the appropriate RRIMR procedure, then the RRIMR procedure may be used for installation of an EPE fitting under the streamlined acceptance process. If the owner chooses to use the streamlined acceptance process, the requirements specified in Section 6.0 of this document shall be satisfied.

If an owner has their PEIMS registered with ABSA, but their PEIMS does not include the RRIMR procedure, then the streamlined acceptance process cannot be used and the RRIMR procedure must be submitted for registration on a case-by-case basis.

5.1.2.5 Maintenance and Monitoring

The owner must provide a detailed description of the maintenance and monitoring plan that will be implemented while the EPE is attached to the pressure equipment.

5.1.2.6 Removal of the EPE from the Piping System

The owner is responsible to:

- provide EPE removal date in the RRIMR procedure in accordance with this document, and
- remove the EPE on or before the stipulated date.

The removal of an EPE shall occur during the first shutdown following its installation with a maximum time in service to be limited to:

- 2 years from installation for leak types identified in Table 2
or
- 1 year for all other leak types not listed in Table 2.

The EPE may only remain in place longer than specified above (but no longer than the next scheduled turnaround) if the PEIMS includes RRIMR that addresses procedures for handling an EPE longer than specified in this section.

Additional evaluation of the enclosed pressure equipment (bolting, etc.) may be necessary after an EPE is removed.

5.1.2.7 Specific Requirements for EPEs Installed in Boiler External Piping (BEP)

The use of EPE to contain leaks in BEP is limited to:

- Gasket leaks in flange joints located in BEP vent and drain lines;
- Pinhole leaks in BEP vent or drain lines or their welds;
- Valve stem packing leaks (for valves located in BEP vent or drain lines);
- pinhole leaks in bonnets of valves located in BEP vent or drain lines; and
- Potential future leaks in BEP vent or drain lines due to internal or external local corrosion or local erosion (LTA)^(note 6).

Except for vent and drain lines, EPEs shall not be used on any other BEP (e.g. main steam line, boiler feed water line, safety valve connections, etc.).

5.1.2.8 Specific Requirements for EPEs Installed over Cracks

It is important to understand that cracks can form on pressure equipment due to improper design and unforeseen loading or damage mechanisms. The crack may or may not be stable based on the initiation and orientation of the crack. The owner is responsible to evaluate the crack stability. If the damage mechanism cannot be mitigated, then crack propagation is likely to happen.

To seal leaks due to cracks, the RRIMR procedure shall include, as a minimum:

- the crack location and description, including crack orientation
- the crack dimensions (length, width, depth, and crack profile),
- the root cause analysis, which must address the conditions that led to the crack formation,
- measures that will result in the elimination of crack propagation^(note 4) so that the crack will not grow during the planned service life of the EPE, and
- fitness-for-service assessment (level 3) stamped by a Professional Engineer.

Note 4: If the crack propagation cannot be eliminated, the EPE shall not be used, and the pressure equipment containing the crack shall be properly repaired.

5.1.2.9 Specific Requirements for EPE's Installed over Local Thin Area

An EPE may be used to prevent possible fluid leaks when thinned portions of a pipe or pipe fittings are discovered, due to erosion or corrosion damage.

The owner is responsible to determine if the use of EPE is appropriate for pressure equipment with Local Thin Area (LTA) and if the installation of an EPE can be safely operated and removed in case of subsequent leaking. The owner shall evaluate the damage mechanisms and extent of the LTA before an EPE is considered. If the owner accepts the risk and approves the use of an EPE on pressure equipment with LTA, the requirements of this document, including the specific requirements of 5.1.2.9, shall be satisfied.

In this document, LTA considers local metal loss on the surface (inside or outside) of the pressure equipment where the length of an area of metal loss is of the same order of magnitude as the width.

The maximum dimensions of LTA that may be enclosed by an EPE that is treated under the streamlined acceptance process shall be in accordance with Mandatory Appendix 32 of ASME BPVC, Section VIII, Division 1. For example: The depth of the LTA, the projected circumferential length of LTA in a cylindrical shell (C), and the projected axial length of LTA in a cylindrical shell (L) shall be as per Section VIII-1, Appendix 32, paragraphs 32-4 and 32-5. Applications with LTAs that do not meet these criteria will be treated on a case-by-case basis.

If an EPE is planned to be installed on an LTA, then the RRIMR procedure shall include the following specific requirements:

- The LTA size, orientation, depth and location.
- The EPE shall meet the limitations of Tables 1 and 2 of this document if treated under the streamlined acceptance process.
- The EPE shall be sufficiently sized to extend onto the undamaged area of the component with LTA.
- The owner shall demonstrate that the EPE is designed to contain leaks and to reinforce degraded pressure equipment with LTA as applicable for the installation.
- The owner must perform a structural analysis, as required.
- The contingency plan shall be provided to address how the owner would mitigate the leak in the area enclosed by an EPE. The contingency plan shall address either:
 - The immediate repair or replacement of the leaking component, or

- The safe temporary operation until the leaking pressure equipment is properly repaired or replaced.

Until the proper, permanent repair is done, it is the owner's responsibility to maintain records of:

- The LTA size, orientation, depth and location;
- Any action taken to mitigate the leak in the area enclosed by an EPE.

5.1.2.10 Other Requirements and Limitations

The following requirements and limitations shall be considered when an EPE is used:

- Weldability of the EPE and piping components shall be examined before the installation of an EPE. The materials shall be of weldable quality acceptable to the owner. The materials and proposed welding processes must comply with:
 - ASME Section IX,
 - the applicable Code of construction, and
 - the applicable qualified WPS.
- Possibility of environmental cracking and other deteriorating mechanisms shall be evaluated before an EPE material is chosen (e.g. impact of H₂S service on an EPE material). Only materials acceptable to the owner and the code of construction shall be used.
- Impact of corrosion and other mechanisms of deterioration on enclosed components (i.e. bolting, flanges) shall be considered. These components must be inspected after the EPE is removed. The components, which deteriorated while enclosed under an EPE, must be repaired or replaced as a part of permanent repair.
- Design, fabrication, examination, and testing requirements specified in ASME PCC-2, Article 2.4 shall be considered for all types of EPE's.
- Impact of the service fluid on sealant shall be considered. According to ASME PCC-2, Article 2.4, paragraph 1(e), the annular space between the EPE and the repaired component can be left empty, filled, or lined with sealant compounds. The sealant to be applied inside the EPE must be acceptable to the owner for the design temperature and the process fluid.
- The structural support must be considered before the installation of the EPE.
- The EPE may only be used for areas where the structural integrity of the pressure equipment can be ensured and will

not be compromised both during the leak sealing process and after its completion.

- Where custom repair clamps are provided on piping, additional structural restraint (such as gripper clamps) shall be provided unless a full and complete documented engineering assessment, in accordance with the requirements described here, demonstrates that it is not necessary.
- The owner shall define if heat tracing and insulation is required in order to prevent freezing. Potential future corrosion under the insulation (CUI) shall be considered.
- The owner shall consider in-service monitoring of the EPE application.

5.2 Quality Control Program and Quality Management System Requirements

5.2.1 Requirements for the EPE Fitting Manufacturers

Alberta-based fitting manufacturers must have a Quality Management System Certificate of Authorization Permit issued in accordance with the PESR. Manufacturers outside Alberta must conform to Clause 4 of the CSA B51.

5.2.2 Requirements for the EPE Fitting Installers

The fitting installers must have a Quality Management System Certificate of Authorization Permit in accordance with the PESR. The scope of the QMS for the fitting installers shall include, as minimum, repairs/alterations or piping modification program. This information shall be reflected in their Certificate of Authorization Permit.

5.2.3 Requirements for Installation of EPE

During installation of the EPE, the installer shall implement all processes and activities specified in the registered RRIMR. For piping, the installer of an EPE shall document the scope of work on the Pressure Piping Construction Data Report acceptable to ABSA (use the AB-83 form). The installer, as well as the owner's inspector, shall sign the AB-83 form.

For EPE installations in BEP, the ABSA SCO must be involved before any work is commenced. The installer of an EPE in BEP shall document the scope of work on the Pressure Piping Construction Data Report acceptable to ABSA (in Alberta, use the AB-83 form or appropriate ASME Data Report). The installer and ABSA SCO shall sign the AB-83 form. If an ASME Data Report is used, the Authorized Inspector shall sign off the Data Report.

After the installation of an EPE is completed, a copy of the signed Pressure Piping Construction Data Report shall be submitted to the owner. The owner must keep the record until the EPE is removed and the damaged pressure equipment is permanently repaired or replaced.

See section 7.0 of this document if an EPE is installed on a pressure vessel.

5.3 Safety

The owner and installer shall take the necessary precautions to avoid unnecessary risks by performing the risk assessment and all necessary actions before installing an EPE, or when working around degraded pressure equipment. The owner and installer may use guidelines from other published documents, such as paragraph 2.4 in Article 2.4 of ASME PCC-2.

5.4 Removal of EPE

The owner is responsible to remove the EPE on or before the stipulated removal date, as per section 5.1.2.6. After the EPE removal, and before the proper permanent repair, the owner must inspect and evaluate the condition of the pressure equipment to ensure that the existing piping and piping components are still adequate for the intended service. If any pressure components are found to be degraded, they must be repaired or replaced at the time of the permanent repair.

If the repair on piping or piping components requires welding after the EPE removal, the scope of the repair shall be documented on the Pressure Piping Construction Data Report acceptable to ABSA (use the AB-83 form for repairs done in Alberta).

5.5 Record Keeping Requirements for EPE Installations

The owner must keep the record of any EPE installation until the EPE is removed and the piping or piping component is repaired or replaced. The records of EPE installations shall be available during ABSA audits. In addition, each installation record shall include:

- Risk Assessment
- Root Cause Analysis
- Installation Procedure
- Maintenance and Monitoring
- Removal confirmation date by the owner

6.0 THE STREAMLINED ACCEPTANCE PROCESS

The streamlined acceptance process is intended for owners that have a Pressure Equipment Integrity Management System (PEIMS) Certificate of Authorization Permit

issued in accordance with Section 11(3) of the PESR. These owners may include standardized RRIMR procedures in their PEIMS and register them with ABSA prior to the installation of EPEs. This process establishes prior authorization for EPE installations that use pre-registered EPE fittings and RRIMR procedures.

The scope of the streamlined acceptance process is defined in Section 6.1 of this document, and the requirements to register RRIMR procedures are specified in Section 6.2.2.

An owner, that has RRIMR procedures included in their PEIMS registered with ABSA, may opt to use the streamlined acceptance process. This will:

- Allow the use of fitting catalogues previously registered per section 5.1.1;
- Minimize errors, activities and delays in the registration of the RRIMR procedure;
- Expedite the installation of a registered EPE when the owner must act quickly to seal the leak in pressure equipment;
- Promote consistency in installing, monitoring and removing EPEs; and
- Promote consistency in maintaining records.

6.1 Streamlined Acceptance Process Scope

The scope of the streamlined acceptance process is limited to the use of:

- Fittings with sizes, materials and design conditions listed in Table 1, and
- RRIMR procedures that allow sealing off specific types of leaks in pressure piping systems described in Table 2.

TABLE 2: Specific Types of Piping and Leaks for Streamlined Acceptance Process

Type of Piping Systems	Pressure piping system shall be either: 7. Process Piping or 8. Nonboiler external piping
Type of Fluids	Fluid service shall be either: 9. category 'D' fluid service or 10. normal fluid service
Types of Damage	Leak due to: - gasket failure in the flange joint - pinhole in a weld, pipe, or piping component - damage in a valve stem packing ^(note 5) - pinhole in valve bonnet - Potential future leak due to internal or external local corrosion or local erosion (LTA) ^(note 6)

Note 5: This activity pertains only to the use of EPEs to stop leaks in valve stem packings. The scope of the AB-521 document does not include the use of drilling and tapping a stuffing-box to inject compound in. However, the

injection activity of the stuffing-box requires the owner to complete a risk and integrity assessment (including all testing), determine the proper compound selection, and determine the maximum permitted injection pressure to avoid damaging the valve's stuffing-box or valve's components (e.g. body). Also, the owner must take full responsibility for the injection process including the fact that the valve will have limited operability after the injection of the compound.

Note 6: The specific requirements of 5.1.2.9 shall be satisfied. Paragraph 5.1.2.9 also provides the information for maximum dimensions of an LTA that may be enclosed by an EPE under the streamlined acceptance process.

6.2 Registration of EPE and RRIMR Requirements in the Streamlined Acceptance Process

6.2.1 EPE Fittings registration for the Streamlined Acceptance Process

Refer to section 5.1.1 of this document for fitting registration requirements. We encourage manufacturers to register catalogues in advance. This will minimize delays in the implementation of the streamlined acceptance process for the EPE installation.

The owner may have fitting catalogues registered in accordance with 5.1.1, if the owner meets the requirements of 5.2.1 of this document.

6.2.2 RRIMR Procedure Registration for the Streamlined Acceptance Process

The owner must have a PEIMS registered by ABSA that addresses all of the requirements for RRIMR procedures specified in Sections 5.1.2, 5.2.2, 5.3, 5.4 and 6.1 of this document. When the RRIMR procedure included in the owner's PEIMS is used for installation of EPEs, the registration of an individual RRIMR procedure is not required.

7.0 SPECIFIC REQUIREMENTS FOR EPE'S INSTALLED ON PRESSURE VESSELS

Because of the potential to introduce new failure modes or additional stresses (see Section 5.0), the use of EPE installed on pressure vessels is limited to:

- Gasket leaks in a flange joint located between nozzle and attached piping flanges;
- Pinhole leaks in a nozzle or nozzle welds; and
- Potential future leaks in the nozzle due to internal or external local corrosion or local erosion (LTA) ^(note 6).

Except for leaks in nozzles addressed above, the EPE shall not be used in the shell, heads, or any other pressure vessel parts (such as body flanges). The EPEs shall not be installed in any part of a pressure vessel due to cracks.

If an EPE is to be installed on a vessel nozzle, the installation shall be treated as a vessel alteration and must be registered on a case-by-case basis. It will require a fitting design registration in accordance with 5.1.1 and an application for RRIMR procedure registration in accordance with Section 5.1.2 of this document. The submission must comply with all other requirements specified in section 5.0 of this document, including technical justification acceptable to ABSA, of why the vessel cannot be properly repaired.

In addition to submitting the AB-270 form, any other information about the vessel itself and the scope of repair/alteration shall be provided in a form acceptable to ABSA (for example: ABSA form AB-230). This additional information shall be provided with the RRIMR procedure submission.

The installation of the temporary EPE on the pressure vessel requires the use of an alteration report form acceptable to ABSA to document the EPE installation (ABSA form AB-40). ABSA's SCO must be involved in this type of alteration before any work is commenced on the pressure vessel, and the ABSA SCO shall sign off the alteration report (i.e. ABSA form AB-40).

After the EPE has been removed, and before any further work is commenced, the pressure vessel must be inspected by the owner and the ABSA SCO. This may result in additional inspection, testing and analysis to determine the condition of the pressure vessel. The existing leak and/or damaged pressure component shall be addressed by a proper permanent repair or alteration procedure which the owner is responsible to submit to ABSA for review and acceptance. The procedure shall be documented on a repair/alteration report (e.g. ABSA form AB-40) and be signed off by the ABSA SCO.

Copies of all reports (after an EPE is installed, after it is removed, and the vessel repaired) shall be submitted to ABSA.

ANNEX A: QUALITY PLAN REQUIREMENTS FOR AN ALBERTA OWNER-USER RRIMR PROCEDURE SUBMISSION

A-1.0 INTRODUCTION

This annex outlines the requirements for documenting and implementing the Quality Plan for development of an RRIMR procedure.

The RRIMR QP Annex “A” was developed by ABSA and Alberta Owner-Users to introduce an audit-based process of registration for an RRIMR procedure. This is to be achieved through the development and implementation of quality assurance processes as part of the Owner-User PEIM system.

The RRIMR QP neither replaces the Streamlined Acceptance Process, described in section 6.0 of this document, nor exempts the requirements of AB-521. The goal is to leverage the Owner-User PEIM system, that utilizes a process approach, and introduce an audit based RRIMR validation in lieu of individual registration of an RRIMR procedure.

A-2.0 OBJECTIVE

The RRIMR QP objectives are to:

- a) Increase safety and reduce potential risks by providing for effective and timely installation of a registered EPE.
- b) Establish consistency in maintaining EPE and RRIMR documents and records.
- c) Promote an efficient and effective practice for installing, monitoring, and removing EPEs.
- d) Ensure the EPE and the RRIMR procedure meets the requirements of the PESR, the applicable AB-500 series documents, the construction codes, and owner specifications.

A-3.0 SCOPE

The owner user shall define the scope of the RRIMR QP for the combination of pressure equipment assets and damages that are to be considered for application of the RRIMR QP.

The following scope and limitations are applicable for RRIMR QPs:

- a) RRIMR QPs may be used in context for installation of:
 - i. EPEs on pressure piping systems.
 - ii. EPEs on Boiler External Piping (BEP) as limited to provisions in clause 5.1.2.7 of AB-521.

- b) RRIMR QPs shall not be used in context for installation of:
 - i. EPEs on pressure vessels as described in clause 7.0 of AB-521. Full design review and registration is required for such RRIMRs.
 - ii. EPEs on boilers. Installation of EPE on boilers is not within the scope of AB-521.
 - iii. EPEs over cracks as described in clause 5.1.2.8 of AB-521. Full design review and registration is required for such RRIMRs.
 - iv. EPEs in combination with use of FFS.

A-4.0 ELIGIBILITY

An Alberta-based Owner-User that meets all the following criteria is eligible to participate:

- a) Holds an Alberta Owner-User PEIM system (AQP-8000 series).
- b) Has developed and implemented procedures as part of their PEIM system that addresses the requirements of this (AB-521) document.
- c) Has demonstrated effectiveness of the RRIMR QP.

A-5.0 RRIMR QP AND PEIM SYSTEM

The written description of the Alberta Owner-User PEIM system (AQP-8000 series) is not described in this annex, however, shall be evaluated to ensure that it includes and is in conformity with all applicable requirements of AB-521.

An Alberta Owner-User PEIM system (AQP-8000 series) and the developed RRIMR QP procedures shall be documented, implemented, and demonstrated to be effective in realization of an RRIMR and safe use of an EPE.

The written description of the RRIMR QP may be:

- a) Integrated into the Alberta Owner-User PEIM system (AQP-8000 series) documentation, or
- b) A supplement that is referenced in and controlled under the previously accepted Alberta Owner-User PEIM system (AQP-8000 series).

A-6.0 OWNER-USER RESPONSIBILITIES AND PROVISIONS

The Owner-User is responsible for:

- a) Identifying, defining, developing (as needed and as necessary), and documenting the required processes and procedures for appropriate and compliant RRIMR realization.

- b) Reviewing its PEIM system procedures against the RRIMR QP requirements to ensure there are no identified gaps that may lead to non-compliance.
- c) Ensuring that all pertinent documentation and records, are maintained, and are provided to ABSA upon request.
- d) Providing evidence to ABSA, of the RRIMR QP effectiveness.
- e) Providing full cooperation with ABSA for the purpose of auditing:
 - i. the RRIMR QP,
 - ii. specific RRIMRs, as selected by the auditor, and
 - iii. the corrective actions of any audit findings.
- f) Submitting the completed RRIMR and AB-270 form (or equivalent) to ABSA Design Survey no later than the date that the EPE is installed.
- g) Submitting to ABSA Design Survey any subsequently revised RRIMRs.
- h) Designating a management representative to have overall responsibility for the implementation and effectiveness of the RRIMR QP.
- i) Report to ABSA's SCO any relevant and pertinent information that may affect:
 - i. the RRIMR,
 - ii. the safety/integrity of the installed EPE, and,
 - iii. the safety/integrity of the subject pressure equipment.

Note: this may be related but not limited to a change in the operating conditions or any information or indications from the monitoring / inspection process etc.

The Owner-User may:

- a) Use all existing procedures - as part of their PEIM system, if appropriate.
- b) Revise and update their procedures as necessary to meet the RRIMR QP requirements.
- c) Structure the RRIMR QP realization process in a manner that fits the Owner-User's needs and business.
- d) Use any previously registered RRIMR procedures that were developed within the framework of its PEIM system, as evidence of the RRIMR QP effectiveness.
- e) Request, develop and propose a plan for initial demonstration of effectiveness of the RRIMR QP.
- f) Designate other personnel that is verified and documented as competent to perform duties and/or processes, in part or in whole, as needed for the effective delivery of the RRIMR QP.

A-7.0 MINIMUM RRIMR QP REQUIREMENTS

All procedures that form the body of the RRIMR QP shall be in full conformity with all applicable elements of the AB-521 and AB-512 documents.

As a minimum, the following process and procedures shall be identified and incorporated in the RRIMR QP:

- a) MOC for the use of the EPE and development of the RRIMR.
- b) EPE review and acceptance.
- c) Completion and submission procedure for the “General Engineering Requirements (GER)” form (AB-270 or submitter’s form).
- d) Risk assessment, when prepared by the owner.
- e) Risk assessment review and acceptance when prepared by an owner’s agent.
- f) Root cause analysis and the damage mechanism identification, when prepared by the owner.
- g) Review and acceptance for the root cause analysis and damage mechanism identification, when prepared by an owner’s agent.
- h) Development or review, acceptance, and implementation of the EPE installation procedure.
- i) Development or review, acceptance, and implementation, of the EPE inspection, maintenance, and monitoring plan.
- j) Determination of the EPE removal date and safe execution of the EPE removal on or before the determined removal date.
- k) Development and implementation of a contingency plan.
- l) Training, evaluation, acceptance, and documentation of the competency for all personnel involved in the RRIMR QP and EPE installation.
- m) Development and implementation of appropriate corrective and preventative actions.
- n) Document and record maintenance, relevant to the affected pressure equipment, the RRIMR, and the EPE.
- o) Any other process and procedure identified by the Owner-User.

A-8.0 EPE AND RRIMR FOR EXTENDED SERVICE LIFE

It is the owner–user responsibility to ensure for safe use and extension of the design and service life of an EPE longer than specified in Par.5.1.2.6 of AB-521.

Owner-user that considers an EPE for extended service shall ensure that their PEIM System includes:

- a) procedures that addresses EPE and RRIMR re-evaluation, and
- b) has effectively implemented RRIMR QP

An EPE may be considered for extended service life limited to the EPE and RRIMR that are within the scope of the owner-user RRIMR QP.

Time limit for the extended service life shall be not longer than the following options:

- a) 2 years from the reevaluation of the EPE for leak types identified in Table 2 or

- b) 1 year from reevaluation of the EPE for all other leak types not listed in Table 2 or
- c) Not longer than the maximum design and service life of the EPE.

All of the activities and requirements referenced below shall be completed prior to the initially stipulated date of removal and commencing with the extended service life of the EPE:

- a) The installed EPE and affected pressure equipment shall be subject to detailed inspection and re-evaluation.
 - i. The owner user shall ensure that the affected pressure equipment may be safely used and meet the AB-521 requirements, for the extended service life of the EPE.
 - ii. Detailed pertinent information related to the inspection and re-evaluation shall be documented and maintained.
- b) When applicable, the maximum design and service life of the EPE as installed on the affected pressure equipment shall be established by applying engineering analysis.
 - i. All pertinent information related to the establishing maximum design and service life shall be documented and maintained.
- c) The EPE must be removed on or before the expiry of the extended service life, and the affected pressure equipment shall be permanently repaired, altered or removed from service.
- d) Detailed maintenance and monitoring and plan shall be developed, documented, and effectively implemented.
 - i. Records of the maintenance and monitoring shall be maintained.
- e) A detailed Action Plan and/or Mitigation procedure regarding the damage mechanism shall be developed, documented and implemented.
 - i. The Action Plan shall address the planned activities for continual re-evaluating the damage mechanism, monitoring deterioration, and other pertinent activities.
 - ii. When mitigation of the damage mechanism is to be implemented, a detailed Mitigation Procedure shall be developed that documents all planned activities for eliminating or reducing the effects of the damage mechanism to acceptable levels to ensure safe extended service life of the installed EPE and the affected pressure equipment.
- f) A contingency plan for safe management of unexpected safety situations and credible risk scenarios shall be developed or evaluated, documented and implemented that may be:
 - i. A developed EPE specific Contingency Plan.
 - ii. Evaluated and accepted existing emergency operating procedure(s).

- g) The RRIMR procedure shall be re-evaluated and revised for the extended service life of the EPE. Detailed pertinent information related to the RRIMR re-evaluation and revision shall be documented and maintained.
- h) New AB-270, for the extended service life, shall be completed and submitted to ABSA.

Note: Maximum design and service life is the maximum time period for which an EPE may be safely used while in conformity with the AB-521, registered design and the RRIMR.

A-9.0 APPLICATION AND RECOGNITION PROCESS

An Owner-User that elects to participate in the RRIMR QP shall ensure that its PEIM system address the requirements specified in this annex, and all other applicable elements of the AB-521 document. When all requirements are addressed in the PEIM system, the Owner-User may apply to ABSA for participation in the RRIMR QP.

A-9.1 Application Process

Pursuant to application for participation in the RRIMR QP the Owner-User shall, as minimum, provide the following documents to ABSA:

- a) When the RRIMR QP is fully integrated in the PEIM system, provide:
 - i. The completed self-evaluation and application form AB-521a.
- b) When the RRIMR QP is controlled as a supplement to the PEIM system, provide:
 - i. The completed self-evaluation and application form AB-521a.
 - ii. A controlled copy of the written description of the RRIMR QP (i.e. the supplement to the PEIM system).
 - iii. A detailed plan for the initial demonstration of effectiveness of the RRIMR QP.
 - iv. Other relevant documents, as identified by the Owner-User or as requested by ABSA.
 - v. A controlled copy of the written description of the PEIM system, if specifically requested by ABSA.

A-9.2 Recognition Process

- a) The provided documentation shall be examined by a Design Survey SCO to conclude that the RRIMR QP is effective. The Design Survey SCO may consent with the application and may issue a Letter of Recognition to the Owner-User.

- b) When the provided documentation is incomplete or the SCO may not reasonably ascertain that the RRIMR QP is effective, the ABSA SCO may request:
 - i. Additional information or documentation.
 - ii. Initial demonstration of effectiveness of the RRIMR QP.
- c) When requested by the Owner-user or an ABSA SCO, the initial demonstration of effectiveness of the RRIMR shall ascertain that the required procedures per Clause 6 of this annex are implemented, effective and controlled by the PEIM system.
- d) When the Owner-user developed plan is proposed for initial demonstration, the plan is subject to acceptance by an ABSA SCO.

A-10.0 RRIMR QP AUDIT AND LETTER OF RECOGNITION

- a) The RRIMR QP shall be internally audited in accordance with the Owner-User PEIM system.
- b) The RRIMR QP shall be audited by an ABSA SCO pursuant to application for participation and initial demonstration of its effectiveness.
- c) The RRIMR QP may be audited by an ABSA SCO during a PEIM system renewal, surveillance audit, or other scheduled ABSA audit.
- d) When an ABSA SCO is satisfied that the RRIMR QP is effective, the SCO may issue a Letter of Recognition.

Note: The Letter of Recognition is a letter issued by a Design Survey SCO to the Owner-User, declaring that ABSA Design Survey has audited, ascertained, and recognized that the RRIMR QP is effective and may be considered for addition in the PEIM System Scope.

- e) The Letter of Recognition may be used in the context of updating or renewing the scope of the PEIM System.
- f) The Letter of Recognition and the RRIMR QP expires when any of the conditions below are applicable:
 - i. On the date the Owner User AQP expires.
 - ii. On request by ABSA.
 - iii. On request from the Owner -User.
- g) ABSA Design Survey may rescind the Letter of Recognition and may refuse to extend recognition of the RRIMR QP if its effectiveness cannot be ascertained.

8.0 REVISION LOG

Edition #	Revision #	Date	Description
1 st Edition	Rev.0	2016-02-02	New issuance
	Rev.1	2017-02-21	Revision includes changes that are marked with vertical line right of the revised text and editorial changes that are not marked.
	Rev. 2	2018-02-21	Reaffirmation
2 nd Edition	Rev. 0	2019-07-02	Added Flowchart & Annex A. Content & editorial updates throughout.
	Rev. 1	2021-03-30	Revision includes rewrite of Annex A and addition of form AB-521a