



the pressure equipment safety authority

**Pressure Equipment
Repair and Alteration
Requirements**

(AB-513)

**Issued 2007-01-30
Revision 1**



Table of Contents

1.0	INTRODUCTION	1
2.0	DEFINITIONS	1
3.0	GENERAL	2
3.1	Repair and Alteration Standards	2
3.2	Quality Program Requirements	3
3.3	Welding and Brazing Procedures	3
3.4	Welders	3
4.0	SPECIFIC REQUIREMENTS FOR PRESSURE PIPING AND FITTINGS	4
5.0	SPECIFIC REQUIREMENTS FOR BOILERS AND PRESSURE VESSELS	4
5.1	Authorization for Repairs and Alterations	4
5.2	Condition of the Item to be Altered or Repaired	4
5.3	Preparation of Repair/Alteration Procedures	5
5.4	Submission of Alteration/Repair Procedures to ABSA	5
5.5	Inspection and Test Plan (ITP)	6
5.6	Inspection and Certification	6
5.6.1	Qualifications of Inspectors	7
5.6.2	Inspectors Duties.....	7
5.6.3	Routine Repairs.....	8
5.6.4	Boilers and Pressure Vessels Repair/Alteration Report, AB-40	9
5.6.5	Repair/Alteration Nameplate	10
APPENDIX 1	11
	Sample Nameplate for Repairs and Alterations	11
APPENDIX 2	12
	Owner and ABSA Responsibilities for Reviewing Procedures and Certification of Repairs and Alterations	12

1.0 INTRODUCTION

AB-513 covers requirements for repairs and alterations of pressure equipment under the Safety Codes Act. It incorporates the relevant requirements that were previously contained in AB-504 “*Repair and Alteration Matrix*”. AB-504 has been withdrawn.

Repairs and alterations in this document refer to repairs and alterations to pressure equipment after all new construction inspection, stamping and certifications on the required Code Data Reports have been completed.

The Alberta Safety Codes Act and regulations govern pressure equipment safety in Alberta. The Pressure Equipment Safety Regulation (PESR) establishes requirements under the Safety Codes Act that must be met by persons who own, operate, design, construct, install, repair, alter or maintain pressure equipment or provide related services.

PESR Section 40 covers specific requirements for repairs and alterations. Note that per the Safety Codes Act Section 1(g), the term “construction” includes repairs and alterations. Therefore, all applicable requirements established in regulations for construction such as registration of welding procedures and designs and the requirements of the pressure welders regulations, also apply for repairs and alterations.

AB-513 has been approved by the Administrator to provide guidance on the application of the requirements for repairs and alterations established in the Pressure Equipment Safety Regulation (PESR). It supplements the ABSA Pressure Equipment Safety Regulation User Guide, AB-516, which has been issued to assist stakeholders in meeting the requirements of the PESR and to assure the safe operation of their pressure equipment.

The official versions of AB-513, AB-516 and other ABSA policy documents are posted on www.absa.ca.

ABSA, the pressure equipment safety authority, administers the Alberta pressure equipment safety programs and has the authority to enforce the pressure equipment safety legislation under the Safety Codes Act.

2.0 DEFINITIONS

Pressure Equipment means a thermal liquid heating system and any containment for an expansible fluid under pressure, including, but not limited to, fittings, boilers, pressure vessels and pressure piping systems, as defined in the regulations. (Refer Safety Codes Act)

Boilers and pressure vessels - For ease of reading this document, the term boilers and pressure vessels shall also include fired-heater pressure coils, indirect fired heater coils and thermal fluid heaters.

Inspector means an ABSA Safety Codes Officer or a person who holds the required Alberta In-service Pressure Equipment Certificate of competency and qualifications as defined in AB-513.

Repair is defined as any work necessary to restore pressure equipment to a safe and satisfactory operating condition, provided there is no deviation from the original design.

Certification means that all the applicable inspection and certification requirements covered in this document have been completed and the AB-40 has been certified by the Inspector.

Routine Repair - This term applies only to describe repairs that meet all the conditions defined in 5.6.3 of AB-513.

Alteration is defined as any change in the item described on the original Manufacturer's Data Report that affects the pressure-containing capability of the pressure retaining item. Non-physical changes such as a change in the maximum allowable working pressure (internal or external) or design temperature of a pressure retaining item is an alteration. A reduction in minimum design metal temperature is also an alteration.

3.0 GENERAL

3.1 Repair and Alteration Standards

Repairs and alterations shall conform, in-so-far as possible, to the section and edition of the ASME Code most applicable to the work planned. This may be the original Code of construction or a later Code edition for the performance of work (normally the latest Code edition and addenda is used in Alberta). However, the allowable stresses and other applicable design information from the original Code of construction shall be used.

The American Petroleum Institute (API) 510 and 570 Codes and The National Board Inspection Code, NB-23, provide valuable information to assist organizations in ensuring that every repaired and altered item of pressure equipment is restored to a condition that is suitable for its safe operation at the approved design conditions.

The American Petroleum Institute and The National Board of Boiler and Pressure Inspectors publications are widely used as guides by industry. However, they are not adopted directly as regulations in Alberta. The application of these Codes is established through reference in the ABSA policy documents, such as the AB-513 document, that are approved by the Administrator.

Construction, inspection and certification standards applied for repairs and alterations must be at least equivalent to those established in the Code of construction. In fact, repairs and alterations often require more attention because there are additional factors that may need to be taken into account. These include:

- access, isolation, fit-up, support and other difficulties when work is done at an operating facility;

- contamination of base metal;
- fluid service, environmental, and other welding considerations;
- welded repairs may accelerate the problem, e.g. repairs to H₂S equipment;
- post weld heat treatment may not be possible;
- method may be unique so personnel may not have been exposed to the techniques involved;
- the time element is often critical, in view of the considerable cost that may be incurred when a plant is shut down;
- weather conditions etc;
- pressure testing may be impractical.

3.2 Quality Program Requirements

PESR Section 40(1) establishes that all organizations doing repairs and alterations in Alberta must have the required Alberta quality management system Certificate of Authorization permit. The organization also must have the competence for the scope of work.

Organizations that repair and alter ASME Section VIII Division 2 vessels must also hold a valid ASME Division 2 Certificate of Authorization.

PESR Sections 11, 12 and 13 cover requirements for quality management systems and Certificate of Authorization permits.

A current directory of Alberta quality system permit holders and their authorized scope is posted on ABSA's website www.absa.ca.

PESR Section 40(7) covers requirements for accepting repairs and alterations that are done in another jurisdiction.

3.3 Welding and Brazing Procedures

All welding, brazing and other joining procedures used for repairs and alterations shall be registered with ABSA in accordance with the PESR. Supplementary welding procedure requirements and welding data shall also be developed, as required to ensure the integrity of the welded item under the operating conditions. Some additional welding considerations and welding procedure requirements are identified in API-510 and NB-23 and other technical publications.

3.4 Welders

Welders and welding operators must have valid Alberta performance qualification cards for the welding procedures to be used.

4.0 SPECIFIC REQUIREMENTS FOR PRESSURE PIPING AND FITTINGS

Repairs and alterations of piping systems and fittings shall be documented and certified as provided for in the repair/alteration organization's quality system manual filed with ABSA. The Piping Construction and Test Data Report, AB-83, is used to document repairs and alterations to piping systems.

Certification of pressure piping repairs and alterations by an ABSA Safety Codes Officer only applies when the piping is classed as boiler external piping as defined in ASME B31.1.

Note pressure piping listed under PESR Section 4, *partial exemptions*, is exempt from the specific requirements defined in this AB-513 document. However, the owner is responsible to ensure that any repairs done to such piping conform to the original Code of construction.

5.0 SPECIFIC REQUIREMENTS FOR BOILERS AND PRESSURE VESSELS

5.1 Authorization for Repairs and Alterations

PESR Section 40(3) states that no repair shall be undertaken without prior agreement of a Safety Codes Officer and 40(6) establishes that the owner is responsible for notifying a Safety Codes Officer of repairs and alterations.

The owner must therefore ensure that an ABSA Safety Codes Officer is notified reasonably in advance of each repair and alteration, and has accepted the scope of repair and alteration prior to the start of work. This applies to all repairs and alterations to boilers and pressure vessels, including those that are inspected and certified by an owner under the scope of their quality management Certificate of Authorization permit(refer 5.6), except as otherwise provided for below.

Prior notification to ABSA is not required for owners who have demonstrated that they have the in-house competence and documented work processes to certify designated repairs under their Certificate of Authorization permit without notifying an ABSA Inspector. The types of repairs that do not require ABSA's notification are documented in the owner's quality manual filed with ABSA, or in a controlled document that is referenced in the manual.

NOTE: Appendix 2 illustrates conditions for notification and responsibilities for inspection and certification of repairs and alterations.

5.2 Condition of the Item to be Altered or Repaired

To assure the item will be safe for operation, the condition of all components of the item to be repaired or altered must be known when the work scope is established.

The Inspector may require an in-service inspection, non-destructive examinations or other tests to be done in order to verify the extent of the defect and to verify the condition of the item that is to be repaired or altered.

5.3 Preparation of Repair/Alteration Procedures

The repair or alteration organization shall prepare a procedure for each item to be repaired or altered. This shall describe the step-by-step repair/alteration method to be used, and shall identify all the information needed to ensure the repaired or altered item is safe for operation at the approved design conditions.

For a simple repair, the AB-40, supplemented by a sketch showing the weld details and other required information, may be suitable for documenting the repair method. Whereas for more complex work, detailed drawings, specifications, calculations, detailed procedures and other information may be needed. To assure the in-service integrity of the equipment being repaired or altered, the owner's prior approval of the work scope and detailed procedure is required. This is needed so that the owner can ensure that the procedure is suitable for the service considerations and meets the owner's requirements. Information that may need to be addressed includes: cleaning requirements, bake-out, special welding requirements, material specifications, heat treatment, NDE, coatings, etc.

It is also important that the owner is made aware of the proposed repair so that he can determine the root cause that prompted the work. This may then require that piping and other equipment in the system are re-evaluated, equipment in-service inspection and test plans are updated, and design, operational and maintenance work processes are changed.

Some owners have developed standard procedures for typical repairs. These can be a valuable tool to assist in ensuring that all applicable factors are taken into consideration when preparing the repair plan. However, the owner must still assign competent persons to approve each individual repair scope to ensure that the proposed procedure is appropriate and all the required information is available to ensure the mechanical integrity of the repaired item.

5.4 Submission of Alteration/Repair Procedures to ABSA

Alteration is defined as any change in the item described on the original Manufacturer's Data Report that affects the pressure-containing capability of the pressure retaining item. Non-physical changes such as a change in the maximum allowable working pressure (internal or external) or design temperature of a pressure retaining item is an alteration. A reduction in minimum design metal temperature is also an alteration.

The allowable stresses of the original Code of Construction shall be used for all alterations including re-rating.

All alterations shall be submitted to Design Survey for registration as required by Section 40(4) of the PESR, except that the following changes to equipment, other than ASME Section VIII Division 2 and 3 vessels, may be classed as repairs:

1. The addition of nozzles identical to existing nozzles, or for which reinforcement calculations are not required, located not less than 2.5 times the sum of their corroded inside diameter from an existing nozzle.
2. The addition of non-load bearing attachments to pressure retaining items when post weld heat treatment is not required.

All repair procedures to Division 2 and 3 vessels, and any other repair procedure that the Safety Codes Officer considers needs formal assessment, shall be submitted to the Safety Codes Officer for acceptance prior to the start of work. This is provided for in Section 40(5) of the PESR.

5.5 Inspection and Test Plan (ITP)

The organization doing the repair or alteration must prepare an inspection and test plan (travel sheet) for each item that is to be repaired or altered. This shall list in sequence all the examinations, inspections, and tests needed to ensure that all the repair and alteration procedure elements are completed.

The ITP shall include provision to enable the owner's and ABSA's Inspectors to designate their inspection and hold points for the activities they need to witness, and to document their acceptance of the repair or alteration procedure prior to the start of work.

5.6 Inspection and Certification

The repair or alteration organization is responsible for completing all required examinations and tests in accordance with their Certificate of Authorization permit and AB-513. To ensure the in-service integrity of the repaired/altered item, the repair/alteration must also be inspected and certified by an ABSA Safety Codes Officer, or an owner's inspector, as provided for below.

ABSA Safety Codes Officers are responsible for inspecting and certifying:

- all alterations;
- all repairs that are done at repair organization facilities;
- all repairs not inspected and certified under owner-user programs;
- all repairs and alterations to ASME Section VIII, Div. 2 & 3 vessels.

Owner's Inspection and Certification

Owners may be authorized to inspect and certify certain repairs under the scope of their Certificate of Authorization permit. This authorization is limited to repairs not

listed above that are completed at their plant sites. The types of repairs that may be inspected and certified by the owner are identified in the owner's quality management system manual provided under their Certificate of Authorization permit. Notification to an ABSA Safety Codes Officer is still required for every proposed repair and alteration, except as otherwise provided for in Section 5.1 of AB-513.

Inspection and certification by ABSA in no way alleviates the owner's responsibility for determining the need for additional inspection and assigning a competent owner's inspector to ensure fitness for purpose.

Appendix 2 illustrates the scope of inspection and certification that can be done by owners under their Certificate of Authorization permit.

5.6.1 Qualifications of Inspectors

Owner-user Inspectors who perform inspection and certification of repairs must hold an Alberta in-service inspector certification for the type of equipment. They must also have appropriate documented training and experience in the applicable Codes of construction, welding and other relevant activities to ensure that they are competent for the scope of repair

ABSA Inspectors who inspect repairs and alterations to boilers and pressure vessels must have the appropriate Alberta Safety Codes Officer designation, training, experience and competence for the scope of work.

5.6.2 Inspectors Duties

Inspectors who certify repairs and alterations for boilers and pressure vessels must complete all the applicable inspections identified in the new construction Code used for the repair/alteration and any additional verifications that are needed to ensure that the repair/alteration procedure (plan) items are met. These include:

- monitoring the repair/alteration organization's quality system;
- reviewing the repair/alteration procedure (plan) to confirm that it is suitable for the scope of work, and documenting acceptance of this review;
- ensuring the repair organization's ITP lists all the steps, examinations, inspections, and tests needed for the work scope and is used in accordance with the repair organization's quality system manual;
- documenting completion of each required inspection by initial and date on the repair organization's inspection and test plan (travel sheet);
- verifying welding procedure requirements and monitoring that they are followed;
- ensuring welders are qualified for the procedure under the Safety Codes Act;
- ensuring the correct material is used for the work;
- performing visual examinations;
- verifying that the required nondestructive examinations have been done;
- verifying that required heat treatment has been done;

- verifying that any pressure tests and alternative examination and tests have been done, per the accepted repair or alteration procedure;
- verifying and certifying the AB-40, Repair and Alteration Report (refer to 5.6.4).

5.6.3 Routine Repairs

This section is intended only for situations when it is not practical for the Inspector to visit the repair site within the proposed work schedule and the Inspector has determined that he/she can certify the work without completing the in-process examinations identified above. These provisions shall only be applied when the Inspector has determined:

- the scope of the repair is within the routine repair categories listed below;
- the repair organization has the required competence to complete the repair without the Inspector's in-process involvement;
- the repair procedure is acceptable;
- the service and design conditions are suitable to allow routine repair provisions to be applied;
- post weld heat treatment or preheat or controlled deposition method alternatives to PWHT are not required by the original construction Code or service conditions.

Routine Repair Categories

- Welded repair or replacement of tubes or pipe not over 5 inches NPS and their attachments. This exemption does not apply to nozzles.
- The addition or repair of non-load bearing attachments to pressure-retaining parts where post-weld heat treatment is not required.
- Weld build-up of wasted areas in shells and heads not exceeding 100 sq. inches in area, and not exceeding 25% of the nominal wall thickness or ½ inch in thickness, whichever is less.
- Corrosion weld overlay not exceeding 100 sq. inches.

Certification of Routine Repairs

The Inspector is responsible for all inspection and certification activities. For routine repairs only, the Inspector's certification may be limited to a satisfactory review of documentation by the Inspector. This shall include reviewing the repair procedure, ITP (travel sheet), AB-40 and any other relevant documents. If this review is satisfactory, the Inspector shall then certify the AB-40, and ensure that the notation "routine repair" is shown in the remarks section of the AB-40.

5.6.4 Boilers and Pressure Vessels Repair/Alteration Report, AB-40

Boilers and Pressure Vessels Repair/Alteration Report AB-40 shall be used to document and certify each repair and alteration. AB-40a is a Guide for Preparing the AB-40. These forms are available on ABSA's website at www.absa.ca.

An AB-40 must be submitted to ABSA for every repair or alteration of boilers and pressure vessels done in Alberta, within 10 days of the completion of the repair.

When the item is to be installed in Alberta, but the repair/alteration has been completed outside of Alberta, the appropriate Canadian provincial form, or National Board R1 Report of Repair / R2 Report of Alterations, shall be submitted to ABSA.

Repair/alteration reports are kept at ABSA's Edmonton office, filed by 'A' number or by owner name when there is no 'A' number.

5.6.5 Repair/Alteration Nameplate

Repair, alteration and rerate nameplates shall include the information shown in Appendix 1.

An alteration nameplate shall be attached to the altered item for all alterations.

Repair nameplates are generally not required for items that are installed in Alberta as this repair history is available through our equipment records and the repair/alteration reports that ABSA keeps on file. Owners are also required to maintain current records for all repairs or alterations of their equipment.

Repair nameplates may be required by the owner, or when the ABSA Inspector considers this necessary (e.g. for out of province equipment) and when there has been extensive repair work done at shop facilities.

APPENDIX 1
Sample Nameplate for Repairs and Alterations

(The following information must be shown when a nameplate is required. This nameplate shall be applied adjacent to the original boiler or pressure vessel manufacturer's stamping.)

		by		
(Identify "Repaired", "Altered, or "Rerated" as applicable)			(Show Name of Organization doing work)	
MAWP _____	at	_____	TEMP.	Indicate Units
MDMT _____	at	_____	pressure	
CRN _____		_____	Date work completed.	

NOTE: Markings shall be produced by casting, etching, embossing, debossing, stamping or engraving. Letters and numbers must be at least 5/32" high.

APPENDIX 2 Owner and ABSA Responsibilities for Reviewing Procedures and Certification of Repairs and Alterations

