

Thermal Liquid Heating System (TLHS) Requirements

AB-537

Edition 1, Revision 1 - Issued 2021-10-29



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FOREWORD

The Administrator has established that ABSA document AB-537 “Thermal Liquid Heating System Requirements” provides compliance guidance and specifies requirements that must be met for Thermal Liquid Heating System (TLHS) operating in Alberta.

The second reaffirmation of AB-537 is scheduled for 2022.

1.0 INTRODUCTION

The *Pressure Equipment Safety Regulation* (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.

AB-537 was developed to provide compliance guidance to owners of Thermal Liquid Heating Systems (TLHS). The PESR defines a TLHS as:

“means one or more thermal liquid heaters, and any connected piping system or vessel, in which a thermal liquid that is not pressurized by the application of a heat source is used as the heat transfer medium;”

Since all other types of pressure equipment contain an expansible fluid, and a TLHS does not, it may not always be thought of as pressure equipment. This has led to requirements being applied inconsistently. The addition of TLHS to Alberta legislation as pressure equipment in the 1970s was prompted by the inherent fire hazard associated with them being installed in buildings. As a result, the Safety Codes Act and regulations under the Act contain specific provisions related to this equipment.

The Pressure Equipment Exemption Order (PEEO) was amended effective January 1, 2020 to include a partial exemption for thermal liquid heating systems installed in chemical processing plants, natural gas processing plants or oil refineries that are fully vented or are provided with a pressurized gas cushion at pressure not greater than 103 kPa.

The partial exemption listed in the PEEO does not apply to any equipment installed at types of facilities other than the three listed in the paragraph above. For example, the exemption does not apply to TLHSs installed in public occupancy facilities, farms, pulp, paper & saw mills, concrete processing plants, utility power plants etc. would not be exempt from the requirements of PESR, PWR and PER.

In an effort to promote consistency, this compliance guidance document has been developed to address the requirements regarding design, fabrication, installation, operation and maintenance of TLHS.

This document is intended to provide guidance on the requirements to owners of Thermal Liquid Heating Systems (TLHS). This document provides guidance that may be used to determine if the pressure equipment may be classified as TLHS.

To ensure this document remains relevant and of value to Alberta stakeholders, it shall be reviewed periodically to confirm that it is aligned with current industry best practices and policies. Additionally it shall be revised whenever an urgent need is identified. Any suggestions for improvement are welcome. Please provide comments to:

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2.0 DEFINITIONS AND ACRONYMS

For the purpose of AB-537, the following definitions apply. Relevant definitions from the *Alberta Safety Codes Act (SCA)* and *Pressure Equipment Safety Regulation (PESR)* are also included in this section.

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

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

Act and Regulations – means the Alberta Safety Codes Act and the following regulations:

- Pressure Equipment Exemption Order (Alberta Regulation 56/2006),
- Pressure Equipment Safety Regulation (Alberta Regulation 49/2006),
- Power Engineers Regulation (Alberta Regulation 85/2003),
- Pressure Welders Regulation (Alberta Regulation 169/2002)

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.

API – American Petroleum Institute

ASME – American Society of Mechanical Engineers

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)]

Certification (or certify) – means to authenticate integrity assessment records by signature, or other means established in the employer's quality management system.

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

Note: competent includes working in accordance with this document.

CSA – Canadian Standards Association

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

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

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

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

Inspection – means the activities performed by an Authorized Inspector or an Owner's Inspector, to verify that all required examinations and testing have been completed for pressure piping, and to ensure all the documentation for material, fabrication, and examination conforms to the applicable requirements of the Code of construction and the engineering design.

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

Integrity Assessment Organization (formerly known as Authorized Inspection company) – an organization that conducts integrity assessments on behalf of pressure equipment owners under a Certificate of Authorization Permit (CAP) issued per PESR Section 11(2).

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)]

NBIC NB-23 – National Board Inspection 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 or who for the time being exercised the powers and authority of ownership. [SCA 1(1)(v)]

Owner's Inspector – the person responsible to the Owner for ensuring the requirements for inspection, examination, testing, and certification of the pressure piping are met.

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 – 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)]

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

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.

Repair – work necessary to restore an item of pressure equipment to a safe and satisfactory operating condition, provided that there is no deviation from the original registered design.

Note: “Original design” includes previously registered design alterations.

Repair Organization – means a repair company or an owner-user who performs the repair or alteration and holds an Alberta quality management Certificate of Authorization Permit as required by section 11 of the PESR for the scope of work to be undertaken.

Thermal Liquid – means a non-expansible fluid other than water or a mixture of water and glycol that is used as a heat transfer medium without vaporization at the maximum design temperature and atmospheric pressure.

Thermal Liquid Heating System – means one or more thermal liquid heaters, and any connected piping system or vessel, in which a thermal liquid that is not pressurized by the application of a heat source is used as the heat transfer medium. [PESR 1(1)(ff.1)]

3.0 GOVERNING LEGISLATION AND REQUIREMENTS

Legislation that governs the pressure equipment discipline includes the following:

- *Safety Codes Act*
- *Pressure Equipment Exemption Order* (Alberta Regulation 56/2006)
- *Pressure Equipment Safety Regulation* (Alberta Regulation 49/2006)
- *Power Engineers Regulation* (Alberta Regulation 85/2003)
- *Pressure Welders Regulation* (Alberta Regulation 169/2002)
- *Administrative Items Regulation* (Alberta Regulation 16/2004)

The following documents have been issued to define requirements under the Pressure Equipment Safety Regulation that must be met for in-service pressure equipment.

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

Specifies requirements for integrity assessments (in-service inspection) of pressure equipment and pressure relief valve servicing.

AB-512 Owner–User Pressure Equipment Integrity Management Requirements

Specifies quality management system requirements for owners who are required to hold a Certificate of Authorization Permit (CAP) under PESR section 11(3).

AB-513 Pressure Equipment Repair and Alteration Requirements

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

AB-515 Quality Management System Requirements for Integrity Assessment Organizations

Specifies the types of integrity assessment activities which are required to be carried out by an organization having Certificate of Authorization Permit, and when such a permit is required under PESR section 11(2). It also provides guidance as to the required content of a Quality Management System in order for it to be acceptable to the Administrator.

AB-518 Pressure Piping Construction Requirements

Specifies quality management system requirements for persons who construct pressure piping.

AB-519 Pressure Piping Alternative Test Methods Procedure Requirements

Specifies the quality management system and minimum procedure requirements for Owner-User organizations considering alternative pressure piping test methods under section 30(2) of the Pressure Equipment Safety Regulation (PESR).

AB-520 Finite Element Analysis (FEA) Requirements Regarding the Use of FEA to Support a Pressure Equipment Design Submission

Establishes the minimum documentation requirements that must be met when submitting an FEA design.

AB-521 Requirements for Engineered Pressure Enclosures

Defines the Alberta requirements that must be met for the design, fabrication, installation and removal of Engineered Pressure Enclosures.

AB-522 Standard Pneumatic Test Procedure Requirements for Piping Systems

Specifies requirements for establishing a standard pneumatic test procedure which is permitted to be used to test certain pressure piping systems, when the test procedure is established as a part of the testing organization's QMS and the test is carried out within the scope of a CAP.

AB-525 Overpressure Protection Requirements for Pressure Vessels and Pressure Piping

Defines Alberta requirements that must be met for systems that consist of pressure piping and/or pressure vessels where overpressure protection is provided by pressure relief valve (PRV), and/or other means of overpressure protection in lieu of a PRV.

AB-526 In-Service Pressure Equipment Inspector Certification Requirements

Sets forth the qualification and certification requirements for persons who conduct integrity assessments of pressure equipment installed in Alberta.

AB-532 Design Registration Requirements for Application-Specific Pneumatic Test Procedures

Specifies information that must be submitted with design registration documents when an application-specific pneumatic test is to be conducted in Alberta on a new or repaired pressure vessel or pressure piping system, or the test procedure for pressure piping system is not within the scope of AB-522.

AB-535 Requirements for Alteration Design Registration Based on Fitness-for-Service

Provides information to assist users when submitting alteration designs based on fitness-for-service evaluations/assessments.

AB-536 – Requirements for the Integrity Management of Grade 91 Steel Used Above Currently-Permitted Allowable Stresses

Provides information to assist users when conducting repairs/alterations to Grade P91 items of pressure equipment fabricated prior to the release of the 2019 ASME Boiler and Pressure Vessel (BPV) Code.

The following documents have been issued as guidance documents to assist stakeholders in meeting the requirements of the PESR.

AB-516 Pressure Equipment Safety Regulation User Guide

Provides 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-527 Guideline for the Competence Assessment of Inspectors

Who perform inspections under an Owner-User or Inspection Company Quality System Certificate of Authorization Permit.

AB-529 Pressure Equipment Exemption Order User Guide

Provides information to assist users in understanding the use of the exemptions allowed by the PEEO.

The following forms describe the responsibility of key activities within a Quality Management System:

- *AB-512a Owner-User Pressure Equipment Integrity Management System Scope and Responsibilities*. This form is used to define the responsibility for key activities under the Owner-User's program.
- *AB-515a Integrity Assessment Organization Authorized Scope Form*. This form is used to define the responsibility for key activities under the Integrity Assessment Organization's program.

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

4.0 REFERENCED CODES AND STANDARDS AND OTHER GOOD ENGINEERING PRACTICES

The adopted codes and standards, and other recognized and generally accepted good engineering standards that are cited in AB-537 are listed below. A full listing of the codes and standards declared in force is provided in PESR Section 6.

| | |
|-------------------------------|---|
| CSA B51 | <i>Boiler, pressure vessel, and pressure piping code</i> |
| ASME Section I | <i>Rules for Construction of Power Boilers</i> |
| ASME Section IV | <i>Rules for Construction of Heating Boilers</i> |
| ASME Section VIII Division 1 | <i>Rules for the Construction of Pressure Vessels</i> |
| ASME Section VIII Division 2 | <i>Alternative Rules</i> |
| ASME Section VIII Division 3 | <i>Alternative Rules for Construction of High Pressure Vessels</i> |
| ASME Section IX | <i>Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators</i> |
| ASME Code for Pressure Piping | B31 Codes |

The following documents are some generally accepted good engineering standards that are referred to in this document. However, they are not adopted directly by the regulation:

| | |
|-------------------------------|--|
| ASME PCC-2 | <i>Repair of Pressure Equipment and Piping</i> |
| National Board NB-23 | <i>National Board Inspection Code (Part 3)</i> |
| API 510 | <i>Pressure Vessel Inspection Code</i> |
| API 570 | <i>Piping Inspection Code</i> |
| API Recommended Practice 577 | <i>Welding Processes, Inspection, and Metallurgy</i> |
| API Standard 579-1/ASME FFS-1 | <i>Fitness-For-Service</i> |
| API Recommended Practice 582 | <i>Recommended Practice and Supplementary Welding Guidelines for the Chemical Oil and Gas Industries</i> |
| API Recommended Practice 2201 | <i>Safe Hot Tapping Practices in the Petroleum and Petrochemical Industries</i> |

5.0 GENERAL

Typical thermal liquid heating systems, based on the definition of TLHS,

Thermal Liquid Heating System - means one or more thermal liquid heaters, and any connected piping system or vessel, in which a thermal liquid that is not pressurized by the application of a heat source is used as the heat transfer medium.

TLHSs, vessels, connected piping and boilers are limited to those which contain the thermal fluid and do not include systems, containing some other fluid or gas that may be connected to the TLHS, but are simply utilizing the heat from the TLHS for another process. See figure 1a or 1b.

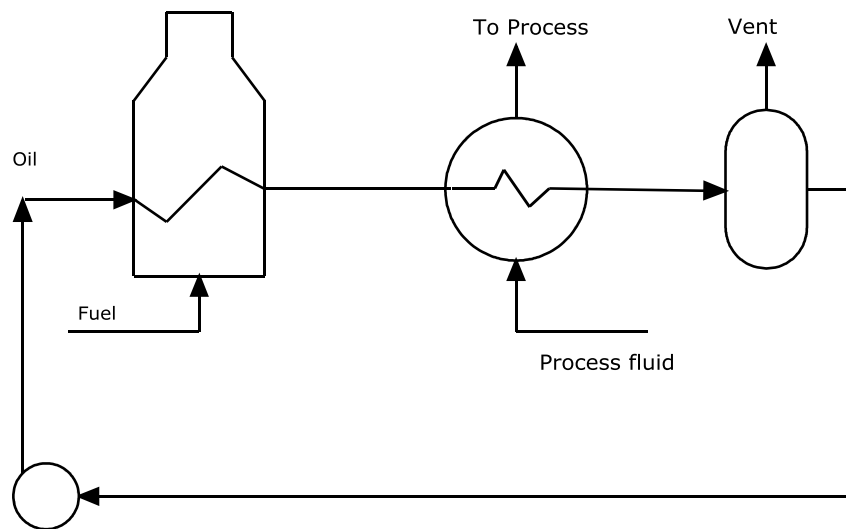


Figure 1a: Basic Thermal Liquid Heating System Schematic

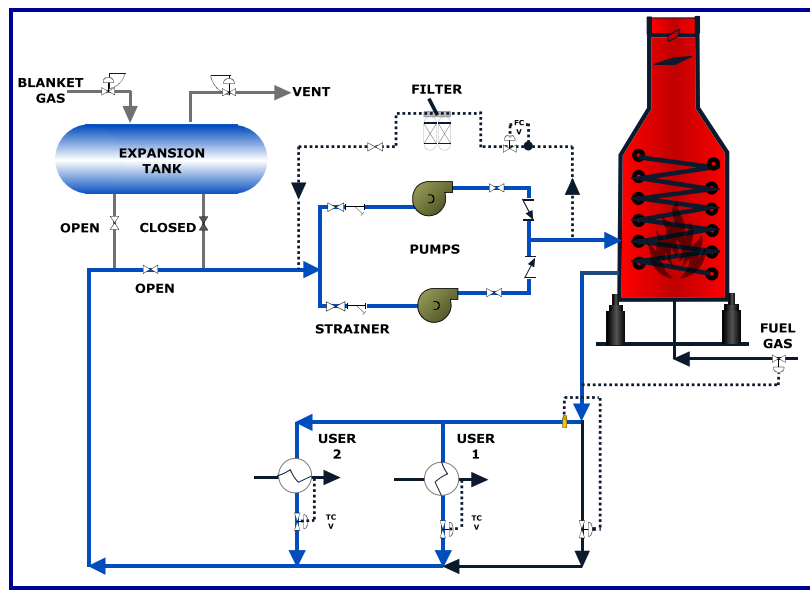


Figure 1b: Typical Thermal Liquid Heating System Schematic

The Safety Codes Act has established TLHSs to be type of pressure equipment.

SCA - 1(1)(y): “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”

TLHS is included in the SCA as a specific item of pressure equipment. As such, the TLHS shall meet all of the requirements of the PESR, for example:

- Section 14: Design
- Section 25: Construction or Manufacturing
- Section 26: Equipment Constructed Outside Alberta
- Section 27: Welding, Brazing and Other Joining Procedures
- Section 29: Manufacturer’s data report
- Section 33: Certificate of Inspection Permit
- Section 35: Unsafe Condition, Accident or Fire
- Section 36: Change of Ownership or Location
- Section 37: Responsibility of Owners
- Section 40: Repairs and Alterations
- Section 41: Integrity Assessment Programs

Additionally, the requirements in the following regulations are applicable to TLHSs:

- Power Engineers Regulation - Section 3: Supervision
- Pressure Welders Regulation

The flowchart in Figure 2 may be used to determine if the installation is a TLHS as defined by the PESR.

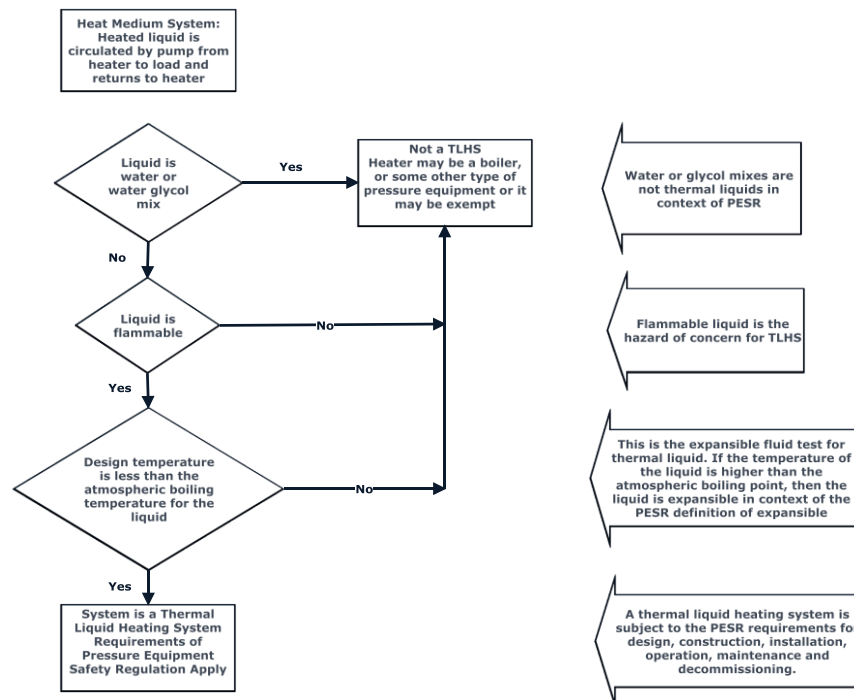


Figure 2: Determination of Thermal Liquid Heating System Flowchart

Once it has been determined the item is a TLHS, the following flowchart (Figure 3) may be used to determine if the exemption for TLHS applies.

TLHS exemptions

The following exemptions listed in the Pressure Equipment Exemption Order apply to TLHSs:

Pressure Equipment Exemption Order

2(2) *The Pressure Equipment Safety Regulation, the Pressure Welders Regulation and the Power Engineers Regulation do not apply to the following:*

(o) non-circulating thermal liquid heating systems

- If the TLHS in question does not meet this exemption, it is subject to the requirements of the PESR.
- An example of a non-circulating TLHS is a typical indirect-fired line heater in which a thermal liquid is the “bath” medium contained in a non-code shell. Process fluid is heated in tubes immersed in the bath. The thermal liquid contained in the shell does not circulate outside the shell.

Pressure Equipment Exemption Order

2.2 (1) *The Power Engineers Regulation (AR 85/2003) does not apply to a thermal liquid heating system in a chemical processing plant, natural gas processing plant or oil refinery.*

(2) *The Pressure Equipment Safety Regulation (AR 49/2006), except for sections 35, 37(b) to (g) and 41, does not apply to a thermal liquid heating system in a chemical processing plant, natural gas processing plant or oil refinery that*

a) is fully vented, or

b) has a pressure vessel, with a gas cushion, operating with one or more pressure relief devices with set pressure not exceeding 103 kilopascals and sized so that the operating pressure cannot exceed 103 kilopascals.

The following flowchart (Figure 3) may be used to determine if the exemption for TLHS in Alberta applies.

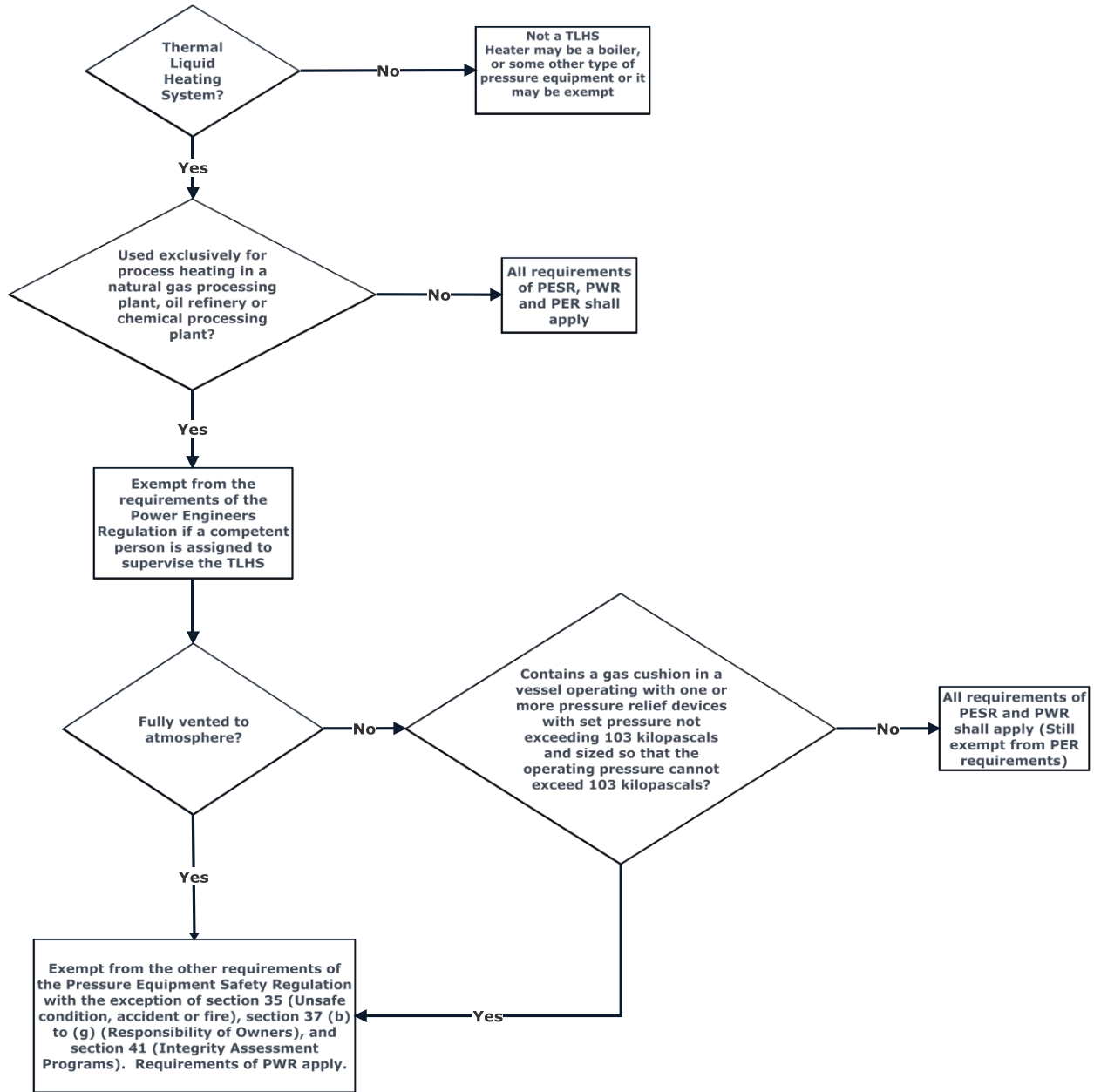


Figure 3: TLHS Exemption Flowchart

This document summarizes the requirements with regard to TLHSs in Alberta as stated in the PESR, PWR and PER. If all of the conditions of the TLHS partial exemption are met, the TLHS is:

- Exempt from the requirements of the Pressure Equipment Safety Regulation with the exception of section 35 (Unsafe condition, accident), section 37 (b) to (g) (Responsibility of Owners) and section 41 (Integrity assessment programs).
- *Exempt from the requirements of the Power Engineers Regulation if a competent person is assigned to supervise the TLHS (as required by PESR 37(g)).*
- *Not exempt from the Pressure Welders Regulation.*

Owners must be aware that this is only a partial exemption and still requires the owner to meet certain requirements. These requirements are detailed here for both scenarios, namely: normal TLHS installations; and installations where the “TLHS exemption” is applied.

6.0 EXISTING SYSTEMS

It is recognized that TLHSs may in place at many operating facilities in the province of Alberta.

- Existing systems that meet the criteria to qualify for the partial exemption as provided for in the PEEO Section 2.2 may continue to operate providing that PESR Section 37 (b) to (g) are met.
- Existing systems that do not meet the partial exemption provided in PEEO Section 2.2 are expected to be in full compliance with the regulations.

Regardless of the exemption category above, Owners may be required to demonstrate compliance to Section 37 to an ABSA SCO.

7.0 TLHS GUIDELINES (FOR SYSTEMS THAT ARE NOT EXEMPT)

For TLHS which **do not meet** the exemptions listed in Pressure Equipment Exemption Order, all of the requirements of the PESR apply. The following are highlights of some of the specific requirements (please note that this is not a comprehensive list):

| Table 1: Requirements for TLHS that is Not Exempt | |
|---|--|
| PESR Reference | Requirements |
| Section 14: Design | <ul style="list-style-type: none"> • Design registration of the entire TLHS is mandatory. • The design of the entire TLHS shall be registered as a unit. • The heater shall be designed to the ASME Boiler and Pressure Vessel Code. The design shall be in accordance with CSA B51-19, Clause 6.6 Thermal fluid heaters and piping. • The piping shall be designed to ASME B31.1 or B31.3. • Expansion/cushion tanks that are closed to the atmosphere shall be designed to the ASME Boiler and Pressure Vessel Code. • Pressure relief valves installed on the TLHS shall meet the requirements of ASME Section I Part PTFH. |

Table 1: Requirements for TLHS that is Not Exempt

| PESR Reference | Requirements |
|--|--|
| Section 25: Construction or Manufacturing | <ul style="list-style-type: none"> • The Manufacturer of the TLHS components (the heater, piping and vessels) shall hold the appropriate Certificate of Authorization Permit in accordance with the PESR, CSA B51 and the ASME Code as applicable. • The organization responsible for installation in Alberta shall hold the appropriate Certificate of Authorization Permit. |
| Section 26: Equipment Constructed Outside Alberta | <ul style="list-style-type: none"> • If a TLHS is constructed outside of Alberta and imported, it must be constructed in accordance with the registered design, the welding requirements of ASME section IX must be applied and it must be inspected and tested during construction in a similar fashion that it would be in Alberta. • The data reports shall be registered with the National Board. |
| Section 29: Manufacturer's Data Report | <ul style="list-style-type: none"> • Data reports shall be required for all components of the TLHS. • The data reports for items constructed outside of Canada shall be registered with the National Board • A final TLHS Certificate of Assembly shall be completed by the Owner. |
| Section 33: Certificate of Inspection Permit | <ul style="list-style-type: none"> • A TLHS must have a Certificate of Inspection Permit (CIP) issued by a safety codes officer prior to operation. As a TLHS includes any heaters, vessels and interconnected piping, one CIP would be issued for the TLHS. In public occupancy buildings, a safety codes officer would issue a CIP after he/she has completed the installation inspection. • TLHS equipment is to receive an installation inspection, by a safety codes officer, as required by the owner's integrity management system. |
| Section 35: Unsafe Condition, Accident or Fire | <ul style="list-style-type: none"> • Unsafe Condition, Accident or Fire shall be reported to ABSA per the information bulletin IB18-004 and treated as any other pressure equipment. |
| Section 36: Change of Ownership or Location | <ul style="list-style-type: none"> • TLHS components which are constructed to code and require registration shall require written notification (AB-10 or equivalent) when it is removed from service. • TLHS non-code components shall be documented per the Owners procedures in their Integrity Management System. |

Table 1: Requirements for TLHS that is Not Exempt

| PESR Reference | Requirements |
|---|---|
| <p>Section 37: Responsibility of Owners</p> | <ul style="list-style-type: none"> • The owner of a TLHS shall ensure that an effective integrity management system provides assurance that the entire pressure equipment facility is safe throughout its full life cycle, encompassing design, construction, installation, operation and decommissioning. • The owner shall ensure suitable controls and instruments are installed and maintained in good working order. • The owner shall establish safe operating limits for the TLHS based on the characteristics of the equipment and the specific fluids used in it. • The owner shall ensure the controls, instrumentation, safety devices and administrative controls are effective in keeping the system operating within the established safe operating limits. • The owner shall establish and document item specific operating instructions. • The Owner shall assign a competent person operate the TLHS and shall document this in the integrity management system. |
| <p>Section 40: Repairs and Alterations</p> | <ul style="list-style-type: none"> • Repairs and alterations to code constructed components shall be completed per the requirements of the AB-513 requirements document in order to maintain code. |
| <p>Section 41: Integrity Assessment Programs</p> | <ul style="list-style-type: none"> • TLHS are to be included in the owner’s integrity management system. They are to be inspected and maintained in a similar fashion to other pressure equipment. • The requirements are detailed in the AB-506 requirements document. |

7.1 Design Basis

As Table 1 describes the requirements for design registration, the actual design shall meet the requirements of CSA B51.

- In accordance with CSA B51-19, Clause 6.6 Thermal fluid heaters and piping, they shall be designed to:

6.6.2

Thermal fluid heaters in which the fluid is vaporized shall be designed in accordance with the requirements of Part PVG, Section I, of the ASME Code.

6.6.3

Liquid phase thermal fluid heaters shall be designed in accordance with the requirements of Section I or Section VIII, Division 1, of the ASME Code.

When liquid phase thermal fluid heaters are designed to Section VIII, Division 1, of the ASME Code, controls, instrumentation, provision for thermal expansion of the fluid, overpressure protection, and a means of adding fluid to the system shall meet the requirements of Part PTFH, Section I, of the ASME Code.

6.6.4

When thermal fluid heaters are designed and constructed in accordance with Section I of the ASME Code, heater external piping shall be designed and constructed to ASME B31.1 and shall meet the requirements of Part PTFH, Section I, of the ASME Code. Non-heater external piping shall be designed and constructed to either ASME B31.1 or ASME B31.3.

When thermal fluid heaters are designed to Section VIII, Division 1, of the ASME Code, piping used with thermal fluid heaters shall be designed to ASME B31.3.

7.2 Pressure Relief Valve Installation

Pressure relief valves installed on the TLHS shall meet the following criteria (*ASME Section I - PTFH-12.6*):

- 1) The pressure relief valve(s) shall be connected to the pressure vessel independent of any other connection, and shall be attached as close as possible without any unnecessary intervening pipe or fitting. The characteristics of the intervening piping system shall be such that the pressure drop shall not reduce the relieving capacity below that required nor adversely affect the proper operation of the pressure relief valve. Cast iron fittings shall not be used.
- 2) Every pressure relief valve shall be connected so as to stand in an upright position, with the spindle vertical.
- 3) The opening or connection between the pressure vessel and the pressure relief valve shall have at least the area of the valve inlet.
- 4) No valve of any description shall be placed between the required pressure relief valve or valves and the pressure vessel or on the discharge piping between the pressure relief valve and the atmosphere.

7.3 Power Engineer Supervision Requirements

Table 2 describes the references for Power Engineer Supervision Requirements in accordance with the PER.

| Table 2: Power Engineer Supervision Requirements | |
|--|--|
| PER Requirement | Supervision Requirements |
| Power Engineers Regulation - Section 3: Supervision | <ul style="list-style-type: none"> • PER Table 5 lists the Supervision requirements for TLHS. • As required by PESR Section 37(g) the person operating the pressure equipment is competent. • The owner shall assign competent persons to operate the TLHS. |

TLHS which are not exempted from the regulations require full supervision unless they are below the capacity specified in the Power Engineers Regulations

PER – (3)(2): Subsection (1) does not apply to a thermal liquid heating system that has a capacity not exceeding 250 kW.

8.0 TLHS EXEMPTION GUIDELINES

The following table 3 summarizes the guidelines to TLHS ***only when the PEEO 2.2 exemption is applicable.***

| Table 3: TLHS Exemption Guidelines | |
|--|---|
| PESR Reference | Partial Exemption requirements |
| Section 14: Design | <ul style="list-style-type: none"> • Design registration of the entire TLHS is not mandatory. If code-type equipment (heaters and tanks) is selected, it shall meet the requirements of the code of construction. Code-type equipment may be built to a registered design. |
| Section 25: Construction or Manufacturing | <ul style="list-style-type: none"> • <i>Only when the PEEO 2.2 exemption is applicable,</i> the owner may select a custom design, or construct to some other standard that is “non-code”. In this case the requirements for code construction would not be applicable. • Alternatively, an owner may decide to have the heater built to ASME Section I, and if so, the construction must conform to Section I. <ul style="list-style-type: none"> ○ The piping system may at the owner’s discretion be included as part of the pressure piping for the facility. |

Table 3: TLHS Exemption Guidelines

| PESR Reference | Partial Exemption requirements |
|---|---|
| <p>Section 26: Equipment Constructed Outside Alberta</p> | <ul style="list-style-type: none"> • Only when the PEEO 2.2 exemption is applicable, the owner may select a custom design, or construct to some other standard that is “non-code”. • Alternatively, the Owner may also choose to construct the TLHS outside of Alberta and decide to have the heater built to ASME Section I, and if so, the construction must conform to Section I. Data reports for items built to ASME I outside Canada must be registered with the National Board. |
| <p>Section 29: Manufacturer’s data report</p> | <ul style="list-style-type: none"> • Data reports shall be required for all components of the TLHS which are constructed to code. • The owner may choose to use certificates of compliance or data sheets for non-code construction. |
| <p>Section 33: Certificate of Inspection Permit</p> | <ul style="list-style-type: none"> • Only when the PEEO 2.2 exemption is applicable, exempt TLHS equipment built to Code may be assigned an A-number and receive an installation inspection, by an in-service inspector or safety codes officer, as required by the owner’s integrity management system or if requested by the Owner. • Certificate of Inspection Permits are, otherwise, not required. |
| <p>Section 35: Unsafe Condition, Accident or Fire</p> | <ul style="list-style-type: none"> • Unsafe Condition, Accident or Fire involving a TLHS shall be reported to ABSA and treated as any other pressure equipment |
| <p>Section 36: Change of Ownership or Location</p> | <ul style="list-style-type: none"> • TLHS non-code components shall be documented per the Owners procedures in their Integrity Management System. • TLHS components which have an A-number shall require written notification (AB-10 or equivalent) when it is removed from service. |

Table 3: TLHS Exemption Guidelines

| PESR Reference | Partial Exemption requirements |
|---|---|
| <p>Section 37: Responsibility of Owners</p> | <ul style="list-style-type: none"> • The owner of a TLHS shall ensure that an effective integrity management system provides assurance that the entire pressure equipment facility is safe throughout its full life cycle, encompassing design, construction, installation, operation and decommissioning. • The owner shall ensure suitable controls and instruments are installed and maintained in good working order. • The owner shall establish safe operating limits for the TLHS based on the characteristics of the equipment and the specific fluids used in it. • The owner shall ensure the controls, instrumentation, safety devices and administrative controls are effective in keeping the system operating within the established safe operating limits. • The owner shall establish and document item specific operating instructions. • The Owner shall assign a competent person operate the TLHS and shall document this in the integrity management system. |
| <p>Section 40: Repairs and Alterations</p> | <ul style="list-style-type: none"> • Repairs and alterations made to non-code components shall be documented per the Owners procedures in their Integrity Management System. • Repairs and alterations to code constructed components shall be completed per the requirements of the AB-513 document. |
| <p>Section 41: Integrity Assessment Programs</p> | <ul style="list-style-type: none"> • TLHS components which are constructed to code shall be included in the owner’s integrity management system. They are to be inspected and maintained in a similar fashion to other pressure equipment as specified in AB-506. • Inspection and maintenance of non-code components shall be documented per the Owners procedures in their Integrity Management System. |

9.0 TLHS EXEMPTION FOR SUPERVISION

For TLHS which meet the Pressure Equipment Exemption Order 2.2 (1):

2.2(1) The Power Engineers Regulation (AR 85/2003) does not apply to a thermal liquid heating system in a chemical processing plant, natural gas processing plant or oil refinery.

Table 4 describes the references for Power Engineer Supervision Requirements when the exemption order is met.

| Table 4: Power Engineer Supervision Requirements | |
|--|---|
| PER Requirement | Partial Exemption requirements |
| Power Engineers Regulation - Section 3: Supervision | <ul style="list-style-type: none"> As required by PESR Section 37(g) the person operating the pressure equipment is competent. The owner shall assign competent persons to operate the TLHS. The owner shall establish competency criteria to evaluate a person's competence to operate a particular TLHS. The owner shall maintain records of competency assessment. Supervision by power engineers is not mandatory. |

TLHS which are located in other industries (not listed in the exemption) require full supervision unless they are below the capacity specified in the Power Engineers Regulation

PER – (3)(2): Subsection (1) does not apply to a thermal liquid heating system that has a capacity not exceeding 250 kW.

TLHS not exceeding 250 kW, are not subject to the supervision requirements in PER. All requirements in the PESR are still applicable.

10.0 REVISION LOG

| Edition | Revision | Date | Description |
|----------------|-----------------|-------------|--|
| 1 | 0 | 2020-02-18 | New document |
| 1 | 1 | 2021-10-29 | Revised statement for stakeholder feedback |