

Safety Under Pressure

**A public discussion paper on new
Regulations for Steam, Pressure and
Refrigeration Equipment**



March 2017

Overview:

The Government of Manitoba is developing a new regulation for steam, pressure and refrigeration equipment. Work in this area is being led by the Manitoba Office of the Fire Commissioner (OFC), which is the agency responsible for the administration and enforcement of legislation and regulations governing steam, pressure, and refrigeration equipment. The goals of the new regulation are to:

- Ensure the safety of all Manitobans that work with or come into contact with boilers, pressure vessels, and refrigeration equipment.
- Reduce red tape and administrative burden on the steam, pressure and refrigeration industries, as well as on building or plant owners.
- Ensure that any fees charged related to permits, inspections or licences under the new regulation better reflect the costs of the services provided.
- Reflect the significant technological advancements that have occurred in the steam and pressure and refrigeration industries over the last 30 years.

Changes are being proposed in the following key areas:

1. Reviewing and updating adopted codes and standards for steam, pressure and refrigeration equipment.
2. Updating and modernizing pressure welding requirements.
3. Aligning Manitoba's inspection and licensing requirements for steam traction engines with other western Canadian jurisdictions.
4. Implementing a system of risk-based inspections for steam, pressure and refrigeration equipment.
5. Implementing voluntary owner-user programs for steam and pressure equipment.
6. Changing the requirements for the inspection of pressure piping systems under the ASME B31.9 Code for Pressure Piping.
7. Providing authority for the OFC to require plans and designs for boilers, pressure vessels, and pressure piping to be reviewed and stamped by a professional engineer.

How did we get here?

The OFC has been consulting with industry and public stakeholders across Manitoba since October 2015 to identify changes that are needed to the way that steam, pressure and refrigeration equipment are regulated in Manitoba.

This consultation process is part of a larger review of Manitoba's technical equipment safety regulations that is being conducted for the new *Technical Safety Act*.

The *Technical Safety Act* was passed by the Manitoba Legislature on June 30, 2015, and replaces six separate equipment safety Acts, including:

- *The Steam and Pressure Plants Act*
- *The Power Engineers Act*
- *The Elevator Act*
- *The Gas and Oil Burner Act*
- *The Amusements Act (Part II)*
- *The Electricians' Licence Act*

Part of the process for implementing the new Act will involve the repeal and replacement of regulations under each of the former Acts, including the Steam and Pressure Plants Regulation under *The Steam and Pressure Plants Act*.

The Steam and Pressure Plants Act and Regulation and *The Power Engineers Act* and Regulation work together to establish a safety partnership that covers the use, design, construction, installation, and repair of steam, pressure and refrigeration equipment in Manitoba. *The Steam and Pressure Plants Act* and Regulation establish standards and safety requirements for steam, pressure and refrigeration equipment, while *The Power Engineers Act* and Regulation establish supervisory and monitoring requirements to ensure that regulated equipment is operated safely.

Examples of equipment and processes falling within the scope of this regulatory review include:

- high and low pressure boilers
- refrigeration plants – including ice rinks
- steam heating plants
- pressure vessels – including compressed natural gas containers, liquefied petroleum gas tanks, unfired pressure vessels, etc.
- boiler and pressure vessel fittings
- pressure piping
- pressure welding

Why we want your input

Steam and pressure equipment is used to heat buildings and provide a supply of hot water in settings ranging from schools and apartment buildings to heavy industrial factories. However, every piece of steam and pressure equipment poses a potential hazard to public safety because of the stored energy they contain. If a boiler or pressure vessel ruptures, cracks or fails suddenly, the release of this stored energy can cause an explosion, which places lives and property at serious risk.

Refrigeration plants provide large-scale cooling in a variety of industrial and commercial settings, including public ice rinks. The types of substances used to keep refrigeration plants cool are known as refrigerants. If not used properly and safely, refrigerants may pose safety and health risks for operators and members of the public.

The goal of the review of the Steam, Pressure and Refrigeration Plants Regulation is to continue to ensure that this equipment is being used safely.

Several options are being considered that would potentially change the way steam, pressure and refrigeration equipment are regulated in Manitoba. These options are presented within this document for your review and feedback.

Proposed Changes in a new Steam, Pressure and Refrigeration Equipment Regulation

1. Reviewing and updating adopted codes and standards for steam, pressure and refrigeration equipment

Codes and standards have been developed for steam, pressure and refrigeration equipment by organizations like the American Society of Mechanical Engineers (ASME), the American National Standards Institute (ANSI), and the CSA Group (CSA) to help define best practices for products, services and processes. Codes and standards are adopted by governments to help ensure safety for businesses and members of the public.

Under the current Steam and Pressure Plants Regulation, Manitoba adopts a large number of codes and standards for boilers, pressure vessels, refrigeration plants, and pressure piping. However, at this time, a number of these codes and standards are outdated, discontinued, or no longer being used in Manitoba.

What we are proposing: *Updating and clarifying the codes and standards for pressure equipment in the new Regulation by removing outdated or unused codes and standards*

(listed below), as well as formally adopting the ANSI/NB-23 National Board Inspection Code 2015.

In the new Regulation, Manitoba will continue to adopt the following codes and standards for boilers, pressure equipment, refrigeration equipment, and pressure piping:

- ASME Sections I, II, IV, V, VIII, IX, & X (2015 versions)
- ASME CSD-1-2012 Controls and Safety Devices for Automatically Fired Boilers
- ASME B31.1, B31.3, B31.5 and B31.9 (most recent editions)
- ANSI CGA G-2.1 2014 Safety Requirements for the Storage and Handling of Anhydrous Ammonia
- CSA B51-14 Boiler, Pressure Vessel and Pressure piping code
- CSA B52-13 Mechanical Refrigeration Code

The following codes and standards currently adopted in the Steam and Pressure Plants Regulation will not be adopted in the new regulation:

- ASME Sections III & XI and CSA Standards N285, N286, N287, N289 and N290 Series Nuclear Codes – relating to the construction of nuclear facilities and nuclear power piping, as standards for nuclear facilities and equipment are set and enforced by the Federal Government.
- ASME Definitions of Boilers and Pressure Vessels (Document 1) – this document is out of date.
- ASME B31.4, B31.6, B31.7, & B31.8 and CSA Z662-15 Code for Oil and Gas Pipeline Systems – relating to liquid petroleum transport piping, chemical process piping, and gas transmission systems, as this equipment is regulated and inspected by the Petroleum Branch of Growth, Enterprise and Trade in Manitoba.
- CSA Z305.1 Standards for Non flammable Medical Gas Piping Systems – This standard has been withdrawn and a new standard for medical gas piping is already referenced in the National Building Code.
- ASME Sections VI & VII – These sections establish recommended best practices for the maintenance of pressure equipment, and are voluntary standards.

The ANSI/NB-23 National Board Inspection Code 2015 establishes standards to maintain the integrity of pressure equipment, including rules for installation, inspection, repair and alteration. At this time, Manitoba adopts and enforces this Code indirectly through a reference in the CSA B51 Code. Moving forward, we are proposing to formalize this requirement by adopting the ANSI/NB-23 Code directly in the Regulation. This will help to ensure industry is aware of, and complies with, the requirements set out in this Code.

The OFC will also be conducting a review to determine whether to accept international standards as equivalent to adopted codes and standards for steam, pressure and refrigeration equipment.

In addition, in the new Regulation, Manitoba will no longer be automatically adopting newer versions and updates of codes and standards. Instead, the OFC will work with

industry to develop a process to adopt newer codes and standards for pressure equipment in a timely manner, as they become available.

Benefits from updating and clarifying codes and standards for pressure equipment will include:

- Removing out-of-date and unused codes and standards or standards enforced by other government entities.
- Adopting fewer total codes, standards and specifications for pressure equipment. This reduces red tape while still ensuring that pressure equipment is used safely.

2. Updating and modernizing pressure welding requirements

Testing of pressure welding processes

In Manitoba, any person who performs welding processes on the following types of equipment must hold a valid Manitoba pressure welder's licence:

- Boilers and all other pressures vessels
- Piping in steam and hot water heating and process systems
- Compressed air systems
- Refrigeration systems
- Chemical handling systems
- Natural gas, propane and fuel oil delivery systems

In order to obtain a pressure welder's licence, candidates are required to have a certain amount of practical experience and pass a performance and qualification test as per Section IX of the ASME Boiler and Pressure Vessel Code.

All pressure welders who have never held a pressure welder's licence before are required to demonstrate proficiency in Shielded Metal Arc Welding (SMAW) using a combined F3/F4 welding process. This test is done using a 4 inch pipe coupon. Once they have completed their test on the F3/F4 process, welders can apply to test on any additional welding processes that they will use in their work (eg, SMAW, MIG, TIG, Flux Core Arc, etc.). Pressure welders must complete a performance and qualification test for each type of welding that they want to do every year.

The requirement for all pressure welders to complete an initial test using the F3/F4 welding process has created issues for welders employed by fabrication shops that use semi-automatic or fully-automatic welding procedures in their work. Testing these welders using a manual welding process, when they may only do machine-assisted welding processes in their work, creates unnecessary red-tape and may prevent a qualified welder from being able to do his or her job.

What we are proposing: *Allowing pressure welders that only do welding for a specific employer using semi-automatic or fully-automatic welding processes to obtain a restricted pressure welder's licence. In order to achieve a restricted licence, a welder would be required to demonstrate proficiency in the semi-automatic or fully-automatic*

welding process that they use in their work instead of the F3/F4 combined welding process that is required for a non-restricted licence.

Pressure welders other than those that meet the criteria above will continue to be required to complete an initial test using the F3/F4 welding process, as required under the current licensing model.

In addition, Manitoba is currently the only jurisdiction in western Canada that does pressure welding qualification testing using a 4 inch pipe coupon. British Columbia, Alberta and Saskatchewan all test pressure welders using a 6 inch pipe coupon.

What we are proposing: *Moving from testing pressure welders on the current F3/F4 welding process using a 4 inch pipe coupon, to testing pressure welders using a 6 inch pipe coupon.*

This change will make pressure welding testing standards equivalent across all four western Canadian provinces, and make it easier for a pressure welder from one western jurisdiction to qualify and find work in another.

Timelines for requalification testing

Currently, in Manitoba, all pressure welders must take a performance and qualification test (discussed above) for each welding process that they want to do every year in order to continue to be eligible to do pressure welding work.

We heard from stakeholders that requiring requalification testing every year creates a burden on both pressure welders and industry. Requiring annual licence renewals is also inconsistent with many other Canadian jurisdictions.

What we are proposing: *Extending the timeframe between required requalification testing to 2 years, from 1 year.*

Location of pressure welder testing

Most practical welder testing in Manitoba is done at the provincial testing facility located in Winnipeg. Third parties are not permitted to conduct welder testing at any other facilities in the Province.

This has created issues for pressure welders because the OFC may not always be able to accommodate requests for specific dates, times, and places for testing to occur. In addition, travelling to the facility in Winnipeg may create an additional hardship for welders working in other areas of Manitoba.

What we are proposing: *Allowing for third party pressure welding testing at other testing facilities. The OFC will approve and audit all third party testing processes and facilities, and will continue to issue all pressure welding licences.*

Once a third party testing facility has been approved, administrative procedures will be reviewed to ensure that testing and licensing processes are as convenient as possible.

Prequalified Welding Procedures

A Welding Procedure Specification (WPS) is a formal written document that describes welding procedures and provides direction to welders for making sound and quality welds that meet code requirements. WPS documents are developed for each welding type used and for each metal alloy.

A number of these “prequalified” weld procedures have been developed for use in the pressure welding industry and can be purchased directly from the American Welding Society (AWS). These procedures have been tested to ensure good quality and repeatable welds, and have been safety qualified through a destructive test of a sample weld.

At this time, the OFC uses the same process to approve prequalified welding procedures as it does for welding procedures developed in-house. Currently, the OFC conducts a comprehensive review of all welding procedures submitted that requires a business to contract with an independent laboratory to complete a destructive test of a sample weld. In the case of prequalified welding procedures, the requirement for a destructive test by an independent laboratory is repetitive, as this testing has already been completed and certified by the AWS.

What we are proposing: *Recognizing AWS Standard Weld Procedures without a comprehensive review as long as they are registered for use with the OFC.*

This will recognize the testing and certification of these procedures by the AWS, and reduce red tape for businesses that choose to use prequalified welding procedures.

Some of the benefits of making the proposed changes to pressure welding requirements may include:

- Initial performance and qualification testing requirements will more accurately assess the skills of pressure welders that use semi-automatic and fully-automatic welding procedures to do the work they do every day.
- Aligning Manitoba’s pressure welding qualification testing requirements with the three western Canadian provinces.
- Reduce red tape and administrative burden on pressure welders by allowing them to do requalification testing every 2 years, instead of annually.
- Make it easier and more convenient for pressure welders to arrange for requalification testing, especially for welders working outside of Winnipeg.

- Reduce red tape for businesses that choose to use prequalified welding procedures instead of developing welding procedures in-house.

3. Aligning Manitoba's inspection and licensing requirements for steam traction engines with other western Canadian jurisdictions

Steam traction engines, also known as historical steam boilers, are steam boilers built before 1955 that have been preserved and restored for demonstration, parades, or educational purposes. These may include steam tractors, traction engines, hobby steam boilers, and steam locomotives.

Like any other boiler, historical steam boilers can pose safety risks if they are not operated and maintained properly. As a result, a person wanting to operate a steam traction engine in Manitoba must hold a valid Steam Traction Engine Class Power Engineer's Certificate, and historical steam equipment must be inspected annually.

Many historical steam boilers are portable devices, and collectors often travel with their equipment to other Provinces to attend fairs and agricultural shows. However, at this time, inspection and operating licence requirements for historical steam boilers vary across jurisdictions. Having to obtain several licences and arrange for inspections in each Province creates red tape and additional expense for equipment operators.

What we are proposing: *Working with British Columbia, Alberta and Saskatchewan to align inspection and licensing requirements for steam traction engines across all four western Canadian jurisdictions.*

The benefits of aligning Manitoba's inspection and licensing requirements for steam traction engines with other western Canadian jurisdictions include:

- Making it easier for owners and hobbyists to travel with and operate their equipment throughout western Canada.
- Reduces red tape and costs associated with having to have equipment inspected multiple times per year, and with requiring operators to hold multiple provincial operating licences.

In addition, Government is considering interim amendments to the existing Steam and Pressure Plants Regulation to clarify inspection requirements for steam traction equipment.

4. Implementing a system of risk-based inspections for steam, pressure and refrigeration equipment

Currently, in Manitoba, boilers and refrigeration plants must be inspected every year and pressure vessels must be inspected every two years. These inspection intervals are inconsistent with other Canadian jurisdictions. Compared with provinces like Ontario, Alberta and Saskatchewan, Manitoba is inspecting certain types of pressure equipment

like refrigeration plants, pressure vessels, and some heating boilers much more frequently.

As well, at this time, all boiler and pressure vessels of the same type are required to be inspected at the same frequency. However, the age, condition, and the number of modern safety controls can vary significantly even among similar equipment. This may result in some equipment being inspected too frequently, while other equipment is not inspected often enough.

What we are proposing: *Implementing a risk-based inspection program for boilers and pressure equipment in Manitoba that would specify the maximum time between inspections. Proposed inspection intervals are consistent with averages for other Western Canadian jurisdictions.*

Under the program, maximum inspection intervals for boilers and pressure equipment would be established that range from 1 year to 10 years. These maximum intervals will be established in the new Regulation.

Similar to the process used in Alberta, inspection intervals for individual pieces of equipment will be determined through a risk assessment process that would consider the following factors:

- The type of equipment
- The age of the equipment
- The condition of the equipment
- The Codes and Standards that apply to the equipment
- If the equipment includes modern safety controls

The risk assessment process will be used to establish two different “grades” for each equipment type. Grade 1 is the standard rating and will apply initially to all equipment. After an acceptable number of periodic inspections under the Grade 1 rating, the equipment may be assigned a modified inspection interval under Grade 2.

Generally, equipment will be inspected at the maximum interval unless issues are identified with the equipment related to the factors listed above. For example, equipment that is old or poorly maintained may be inspected at frequencies less than the maximum interval.

Proposed maximum inspection intervals (in years) for different equipment types are specified in the table below:

Equipment type	Category	Grade 1	Grade 2
Power Boilers		1	2
Heating Boilers		2	3
Heating Boilers	Coil or Finned Tube Design	2	4
Pressure Vessels		5	5
Pressure Vessels	Deaerator	5	5
Pressure Vessels	Noncorrosive, LPG, C1-C4*, cryogenic service	5	10
Pressure Vessels	Designed to ASME Section VIII – Div 2	3	5
Pressure Vessels	Exploration and Production – Low Risk**	5	10
Pressure Vessels	Exploration and Production – High Risk**	3	5
Pressure Vessels	Equipped with Quick Opening Closures	4	4
Pressure Vessels	Portable / Temporary Vessels	5	5
Pressure Vessels	Air Receivers	5	5
Refrigeration		2	5
Refrigeration	Class A1 Refrigerant	3	5
Refrigeration	Class B2 Refrigerant and those required to have Class T Machinery Rooms	1	5
Piping***		5	10
All	Change in Ownership or Location	1	1
All	Change in service	1	1

* C1-C4 includes the hydrocarbon gases methane, ethane, propane, butane and their combinations including natural gas.

** High risk vs. Low Risk determination to be developed based on Alberta standards set out in ABSA Document AB-506.

*** Intervals of piping inspection based upon consequences of failure.

The benefits of moving to a risk-based inspection model will be that:

- Owners and operators of well-maintained lower risk equipment will see their inspection frequency decrease, resulting in less red tape and reduced inspection costs.
- The OFC will be better able to focus its resources on higher risk equipment.
- Provides closer consistency of inspection intervals with other Canadian jurisdictions.

5. Implementing voluntary owner-user programs for steam and pressure equipment

In recent years, a number of Canadian jurisdictions, including Alberta, Saskatchewan and Ontario, have moved from a system where Provincial inspectors were responsible for conducting all inspections of boilers and pressure equipment, to recognizing inspections of this equipment done by owners under an owner/user program.

In these jurisdictions, owners are required to put a system in place to monitor and evaluate the condition of their own equipment through the equipment's service life cycle. Requirements for these programs typically include:

- Requirements for companies with more than a certain number of boilers or pressure vessels to employ their own inspector(s) that conduct inspections on behalf of the provincial authority. Some jurisdictions also allow companies to contract with third parties for inspections of their equipment.
- Requirements for each company to develop a risk-based inspection model for their own equipment, which is reviewed by the provincial authority.
- Establishing recognized criteria for inspectors under an owner-user program.
- Data and compliance reporting requirements for companies to submit to the provincial authority.

During the consultation process for the new Regulation, we heard from industry that there is interest in the OFC implementing owner-user programs in Manitoba.

What we are proposing: *Implementing voluntary owner-user programs for steam and pressure equipment under the new Regulation.*

The OFC would still maintain the responsibility to monitor the inspection of equipment for businesses operating under owner-user programs; however these inspections would be done on an audit basis only.

More details on specific owner-user program requirements will be provided to equipment owners closer to the date when new Regulation comes into effect. Interested equipment owners may also have the opportunity to work with the OFC on the development and evaluation of a pilot program prior to the full owner-user program roll-out.

Benefits of establishing a voluntary owner-user program for boilers and pressure vessel in Manitoba would be:

- Recognizing that owners have a vested interest in the continued, safe operation of their equipment.
- Reduced red tape and costs to industry over the equipment lifecycle. For example, businesses would be able to control the timing and frequency of their owner equipment inspections, which would allow for inspections to occur during regular shut-down periods, resulting in less lost operating time.

6. Changing the requirements for the installation of pressure piping systems under the ASME 31.9 Code for Pressure Piping

Pressure piping used for heating distribution, potable water, and compressed air in buildings is manufactured to the ASME B31.9 Building Service Piping standard.

At this time, the OFC provides oversight in the installation of this piping in Manitoba. Building owners or contractors are required to submit pressure piping drawings for design registration, and then have the option to request the OFC to conduct a physical examination of the piping before the equipment is used. Under the B31.9 Code, approved contractors have the authority to complete the physical examination and complete the construction data form in cooperation with the equipment owner. An OFC examination is not required.

Piping built to this standard is traditionally considered “low risk,” and most other Canadian jurisdictions do not conduct physical inspections or testing of this equipment. In these jurisdictions, the responsibility for inspection and examination has been delegated to the owner and the fabricating contractor.

What we are proposing: *Continuing to require design review of ASME B31.9 Building Service piping, however, owners or a person responsible to the owner will be required to inspect their own work for ASME B31.9 piping.*

The benefits of this proposed change would include:

- Better aligning Manitoba’s requirements for this equipment with other Canadian jurisdictions.
- Continued oversight of pressure piping design registrations will ensure that this equipment is designed according to adopted standards and that good engineering practices are followed.
- Empowering equipment owners and fabricating contractors to take responsibility for the physical examination of low risk pressure piping installations.

7. Providing authority for the OFC to require plans and designs for boilers, pressure vessels, and pressure piping to be reviewed and stamped by a professional engineer

Regulated boilers, pressure vessels and pressure piping are required to be manufactured and installed in accordance with adopted codes and standards. These codes and standards include pre-engineered specifications for items such as the types of materials that can be used in construction and calculations for determining safe operating pressures.

However, certain types of modern boilers and pressure vessels are increasingly becoming too specialized and complex to be adequately addressed through pre-engineered specifications. In these circumstances, review by a certified professional engineer is needed in order to ensure that this equipment is being designed and installed safely, and in accordance with good engineering practices.

Currently, in Manitoba, all pressure piping designs under the ASME B31 Pressure Piping Codes and the CSA B52 Mechanical Refrigeration Code must be reviewed and stamped by a professional engineer in order to be registered. However, a professional engineer's review and stamp is not required for other boiler and pressure vessel designs.

Some jurisdictions, such as Ontario, require all steam and pressure equipment plans and designs to be stamped by a professional engineer, however, other jurisdictions such as British Columbia and Saskatchewan only require professional engineer stamps for specified types of equipment. Manitoba's proposed approach outlined below is similar to Alberta, which provides for the authority having jurisdiction to require an engineer's stamp at their discretion.

What we are proposing: *Providing authority for the OFC to require design registrations of boilers, pressure vessels and refrigeration equipment to be reviewed and stamped by a professional engineer. The OFC may require a professional engineer's stamp in circumstances where the size, complexity, or any other design factor may give rise to additional safety concerns. A professional engineer's stamp will also be required for all "alterations" to pressure equipment as defined in the National Board NB-23 Standard.*

This change is likely to have a very minimal impact to Manitoba companies designing and manufacturing pressure equipment, as these companies already work with professional engineers in the design of their equipment. However, this change will allow for an additional level of oversight for pressure equipment designed and manufactured outside of Manitoba, and for larger and more complex equipment designed and manufactured in Manitoba.

The benefits of these new requirements will include:

- Continuing to ensure the safety of pressure equipment in Manitoba by providing consistent oversight across the equipment lifecycle.
- Ensuring that all alterations on pressure equipment are done in accordance with good engineering practices and that all altered equipment is still safe to operate.
- Providing the option for the OFC to require additional oversight for large or complex boiler and pressure vessel designs.

Share your views:

We encourage written comments about the proposed changes discussed in this paper. Your feedback will help to ensure that a new steam, pressure and refrigeration equipment regulation meets the needs of both the public, as well as industry stakeholders.

Please submit your comments by June 1, 2017 to the e-mail or mailing address below. The Government of Manitoba will consider each submission carefully, and all input received will guide any changes that will be brought forward for consideration.

Submissions:

Please send your submissions via e-mail to: firecomm@gov.mb.ca (please include "Steam, Pressure and Refrigeration Equipment Review" in the subject line.)

Or by mail to:

Steam, Pressure and Refrigeration Equipment Review
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