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UPDATE

Boilers and Pressure Vessels Edition

IS PRESSURE EQUIPMENT IN ONTARIO SAFE?

TSSA AND THE PRESSURE EQUIPMENT INDUSTRY WORK VERY HARD TO ENSURE THE SAFEST EQUIPMENT FOR INDUSTRIAL AND COMMERCIAL USE. ONTARIO'S SAFETY LAWS FOR PRESSURE EQUIPMENT ARE AMONG THE MOST EFFECTIVE IN NORTH AMERICA. THERE ARE SEVERAL SAFEGUARDS IN PLACE FOR THE LIFE CYCLE OF EQUIPMENT AND PLANTS COVERING DESIGN, FABRICATION, INSTALLATION AND OPERATION. ANYONE MANUFACTURING, INSTALLING OR REPAIRING AS WELL AS OWNING OR OPERATING EQUIPMENT HAVE RESPONSIBILITIES TO ENSURE THESE SAFEGUARDS ARE MET.

Our technical staff have extensive experience 'under pressure'.

Do you know what your obligations are as an owner or user of industrial and commercial pressure equipment in Ontario?

Ontario's *Boilers and Pressure Vessels Regulation (Ontario Regulation #220/01)* and *Operating Engineers Regulation (Ontario Regulation #219/01)* place responsibilities on owners and users of pressure equipment to ensure the equipment is maintained in a safe working condition and operated safely. This means successfully completing all requirements for the life cycle of the equipment for design, fabrication, installation, and operation.

Who is responsible at TSSA for pressure equipment?

- Staff of TSSA's Boilers and Pressure Vessels / Operating Engineers Safety Program is responsible for industrial and commercial pressure equipment in Ontario in accordance with the *Ontario Boilers and Pressure Vessels Regulation and Operating Engineer's Regulation.*

Design

- Owners, users, their designated agents, manufacturers and contractors are responsible for registering designs of pressure equipment with TSSA.
- TSSA conducts an independent design review for code compliance.
- Registration numbers are issued by TSSA for accepted designs.
- The boiler, pressure vessel, fitting and piping designs are required to be registered before fabrication or installation.
- TSSA also provides an optional service for registering designs or weld procedures in other provinces and territories in Canada.

Fabrication and Installation

- Owners, users, manufacturers and contractors are responsible for contacting TSSA prior to fabrication or installation to arrange inspections.
- For new equipment, we inspect boilers and pressure vessels during fabrication at authorized facilities.
- TSSA also inspects piping installations during construction.
- Owners, users or their representatives are responsible for purchasing equipment fabricated by authorized manufacturers.
- TSSA reviews and audits quality systems of manufacturers of pressure equipment and contractors who construct piping systems.
- Authorization certificates are issued by TSSA to manufacturers, repair organizations and piping contractors successfully completing the quality system audit.

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In this ISSUE

INCIDENT REVIEW:
A proactive look at pressure equipment safety

By Cathy Turylo, Engineering Manager

IN 2005, NO INCIDENTS RESULTING IN SERIOUS INJURIES OR FATALITIES WERE REPORTED IN OUR INDUSTRY SECTOR FOR ONTARIO. NOW THAT'S A NUMBER TO CELEBRATE. IN THIS ISSUE OF OUR NEWSLETTER, WE HONOUR THAT NUMBER BY TAKING A PROACTIVE LOOK AT TWO PRESSURE EQUIPMENT FAILURES THAT MERIT CONSIDERATION IN DESIGN, OPERATION AND MAINTENANCE PROGRAMS.

Refractory Material Failure

In 2005, cracking of the refractory liner of a processed-vessel caused burn through of the outer shell. Significant damage to the vessel shell occurred as a result of this incident; however, there were no injuries reported. The potential risk for failure still exists in this type of vessel.

Root cause for this incident is unknown but items for consideration in refractory lined vessels include:

- internal inspection of the refractory for cracking or other indications of failure as part of a routine maintenance program;
- infrared camera inspection could pick up a "hot spot" or a potential area that is failing due to exposure to radiant heat;
- verify any changes in operating conditions (pressures, temperatures) or chemical composition that are part of the design scope for the refractory construction; and
- assess burner configuration and maintenance for proper combustion and avoidance of flame impingement on the refractory.

Water Hammer

Water hammer is a wave of increased pressure traveling through condensate / water in a steam / water piping system caused by sudden stoppage or change in the fluid flow.

An expansion joint in steam service ruptured as a result of a water hammer. The anchor and support system was insufficient to handle the forces due to a water hammer that caused excessive lateral and tangential movements of the expansion joint.

Consider the following for minimizing waterhammer damage:

- the effectiveness of water/condensate drainage from the system to minimize waterhammer potential, including number, location and capacity of the drains and appropriate slope on piping systems and location of steam traps;
- equipment operation procedures to prevent conditions that allow waterhammer to occur, specifically during cold start-up; and
- design analysis conducted for support system expansion bends and expansion joint movement to preclude expansion stress events.

Confined space

By Cathy Turylo, Engineering Manager and
Brian Jeans, Workplace Health and Safety Advisor

A recent accident in Quebec serves as a grim reminder of the potential safety hazards in confined spaces. A welder working inside a tank where argon was used as a shielding gas fell unconscious inside the tank. Two colleagues entered the tank to rescue the welder and also lost consciousness. All three died from argon asphyxiation.

At the time of writing this article, it is not known whether the shut off valve had not been completely closed or if there was a leak. What we can point out is that although argon is an inert gas, it is a simple asphyxiant that creates an oxygen-deficient atmosphere.

What is even more sobering is that multiple casualties in confined space accidents are common. Let's be vigilant.

The last edition of TSSA ***Update*** highlighted revised confined space regulations under the Occupational Health and Safety Act, 1990 (Ontario Ministry of Labour) that came into effect on September 30th, 2006. Among other things, there have been enhancements to develop written hazard assessments, develop specific plans, and provide related training. More information is available through the Ministry of Labour.

In order for TSSA staff to fulfill inspection services that require entry into a confined space such as a boiler or pressure vessel, the site must be in compliance with the Occupational Health and Safety requirements for confined space entry. As an owner or user, please note the following as a minimum that will be requested by TSSA:

- A hazard assessment of the specific confined space.
- Plan specific training on the confined space to be entered.
- A competent person to act as an attendant for the inspector.
- Prior notification of specialized personal protective equipment.
- Written rescue procedures with personnel available as well as rescue equipment such as harnesses. This equipment must be regularly inspected.

To facilitate inspections in confined spaces by TSSA, please ensure the above requirements are addressed. For more information about the Occupational Heath and Safety Act and Regulations, please refer to www.labour.gov.on.ca.

TSSA extends its public safety influence

By Rick Mile, Operations Manager

MOST PEOPLE ARE UNAWARE THAT TSSA POSITIVELY IMPACTS PUBLIC SAFETY IN OTHER AREAS BEYOND ITS CURRENT MANDATE. BUILDING ON OUR STRENGTHS AND CORE COMPETENCIES, TSSA HAS DEVELOPED ADDITIONAL COMPLEMENTARY BUSINESSES IN A NUMBER OF ITS PROGRAMS.

One example is the Boilers and Pressure Vessels Program involvement in ensuring safety of boilers, pressure vessels and other pressure equipment in federally regulated facilities.

Since TSSA's inception in 1997, the program has been delivering inspection and engineering services under contract to the Canadian Nuclear Safety Commission (CNSC) to ensure the safety of pressure retaining systems and components in all CANDU nuclear power plants in Ontario. The combined efforts of TSSA engineers and inspectors involved in design reviews and inspections, during the life cycle of pressure equipment, assist in ensuring continued safe plant operations.

Recently TSSA successfully completed the first year of a multi-year contract with Public Works and Government Service Canada (PWGSC) to inspect all the boilers and pressure vessels at federally regulated facilities in Ontario. TSSA's knowledgeable and experienced boilers and pressure vessels inspectors conducted thousands of such inspections under the Canada Labour Code at facilities that include, but are not limited to, armed forces bases. These periodic inspections identified potential safety concerns in pressure equipment that allowed for corrective actions to be implemented in order to protect workers and the public.

The pressure equipment safety record in Ontario continues to be very good due to the continued due diligence, efforts and effective partnerships and cooperation between regulators, end-users and industry.

Refrigeration pressure piping program

By Tony Scholl, Technical Services Specialist

TSSA continues to move forward toward implementation of the refrigeration pressure piping Certificate of Authorization program in Ontario.

The TSSA Certificate of Authorization program establishes minimum quality control program requirements that organizations must comply with when installing or repairing refrigeration pressure piping systems.

The requirements apply to organizations that install or repair refrigeration piping systems over three tons capacity. In order to comply with the program, organizations were requested to apply for a TSSA Certificate of Authorization by June 30, 2006.

TSSA has continued to participate in refrigeration contractor rollout seminars by recently completing eleven seminars with the Heating, Refrigeration and Air Conditioning Institute of Canada, and the Ontario Refrigeration and Air Conditioning Contractors Association. The scope of the seminars included explaining the requirements of the TSSA program, and how to establish and implement a quality control program.

The quality control program requirements are derived from the codes and standards adopted by TSSA, which include *CSA B52 Mechanical Refrigeration Code* and *ASME B31.5 Refrigeration Piping Code*.

These codes and standards establish the minimum requirements for the design, construction, installation and inspection of refrigeration pressure piping systems. Compliance with these codes and standards will minimize the risk to public safety.

Compliance with the program is mandated by December 31, 2006.

Portable air receiver usage

By Larry Calvert, Senior Technical Manager

Background

An air receiver is a pressure vessel specifically designed and constructed to store compressed air. An example of an air receiver is the portable air receiver sometimes referred to as an "air tank" available at locations such as hardware stores for home use. The air receiver may, or may not, include an air compressor mounted directly on the vessel.

These vessels can be extremely dangerous if not used correctly because of the stored energy created when air is compressed. There have been many instances of injuries and fatalities resulting from air receivers that were not properly designed, constructed, operated or maintained.

The Ontario *Technical Standards and Safety Act, 2000, Boilers and Pressure Vessels Regulation* and Canadian Standard CSA B51, *Boiler, Pressure Vessel and Pressure Piping Code* provide requirements for the proper design and construction of air receivers. Regulatory authorities adopt the Code across Canada as part of the pressure-equipment regulations governing the design, construction, operation and use of pressure vessels.

THESE VESSELS CAN BE EXTREMELY DANGEROUS IF NOT USED CORRECTLY BECAUSE OF THE STORED ENERGY CREATED WHEN AIR IS COMPRESSED.

Details

Before using an air receiver, ensure the manufacturer's operating and maintenance instructions are available and are followed.

When using an air receiver:

- the pressure relief valve, which protects the air receiver from being over-pressurized, must be periodically inspected and tested, or replaced (see TSSA's Safety Bulletin SB00-19 for guidance on service intervals);
- the air receiver must be drained periodically to get rid of condensation, which forms inside the air receiver over time, resulting in reduced internal corrosion and permitting more efficient operation of the air receiver; and
- if lubricating oil is required for the compressor, only oil meeting the air compressor manufacturer's specifications should be used; there have been reported instances of explosions when incorrect lubricating oil was used.

BEFORE USING AN AIR RECEIVER, ENSURE THE MANUFACTURER'S OPERATING AND MAINTENANCE INSTRUCTIONS ARE AVAILABLE AND ARE FOLLOWED.

In some jurisdictions, small portable air receivers below a certain size may be exempt from any legal requirements, which may result in some small air receivers not being manufactured in full compliance with the CSA B51 requirements. The manufacturer marks some of these small air receivers with an expiry date. This marking indicates that the user should not pressurize the air receivers after the specified expiry date.

IF THE MANUFACTURER'S INSTRUCTIONS ARE FOLLOWED, PROPERLY DESIGNED, CONSTRUCTED, OPERATED AND MAINTAINED AIR RECEIVERS SHOULD HAVE A LONG SERVICE LIFE.

If the manufacturer's instructions are followed, properly designed, constructed, operated and maintained air receivers should have a long service life.

For further information, visit www.tssa.org, under Boilers and Pressure Vessels' Safety Advisories, CSA's Safety Bulletin - Use of Air Receivers and Propane Cylinders.

What is in a nameplate? (PART 4)

By Gabriela Deleanu, Technical Leader, Boilers and Pressure Vessels Safety Program

CANADIAN REGISTRATION NUMBERS (CRNS) AND MARKINGS FOR PIPING SYSTEMS

Requirements for piping systems installed in Ontario include design, registration and inspection by a TSSA Authorized Inspector (AI). The piping contractor/installer is required to have a Certificate of Authorization for piping.

Design Registration

CRNs for piping systems are based on review and acceptance of the design.

The CRN format for piping systems is:
PXXXXX, (so-called P-Number), where

XXXXX is a five-digit number.

The P-Number is valid for the specific site (facility in which the piping system was designed and installed).

When a similar flow diagram where the service (excluding lethal and flammable service), design pressure and temperature, pipe materials and components are the same, the design may be registered as standard piping. The CRN format for standard piping registrations regarding non-site specific designs is:

P-STDXXXXX, where

XXXXX is a five-digit number.

Revision and Addendum to CRNs

Piping CRN revisions are issued for revised designs (revisions of the designs before or during the installation of the piping system, not modifications of an existing piping system). The format for a revision is **PXXXXXR1** (or **R2**, etc.)

Modifications to an existing piping system that require registration are registered as addendum to existing CRNs. The format for an addendum is **PXXXXXADD1** (or **ADD2**, etc.).

Modifications that require registration include: changes to the code of construction; service fluid; design pressure and temperature; pipe material, size or thickness; fitting materials and rating or class; non-destructive examination, requirements for post weld heat treatment; addition of a source of energy (i.e. pump, compressor, boiler); changes to overpressure protection arrangement; and whenever new calculations and/or analysis are required. Please see the Safety Information Bulletin SB-00-2 which addresses requirements for Modifications/Alterations to Registered Conventional Piping Designs on TSSA's website at http://www.tssa.org/regulated/boilers.

Inspection

Inspection is required for shop-fabricated items and for site installations. The Piping Systems Installation and Test Data Report (posted on TSSA's website) have to be completed and signed by the piping system manufacturer/installer and the AI.

Additional information, such as guidelines for piping registration, exemptions for piping systems services requiring registration and inspection, as well as Safety Information Bulletin SB00-7, are posted on the TSSA's website.

CANADIAN REGISTRATION NUMBERS (CRNS) ISSUED FIRST BY OTHER CANADIAN PROVINCES

By Caslav Dinic, Senior Engineer

Each jurisdiction in Canada allots CRNs for pressure vessels and fittings, using a sequential system. Each number after its sequential part includes a decimal and number representing the province in which the number is issued. When a design is registered in any province, then subsequently registered in another, additional digits or letters identifying such provinces are added after the digit or letter representing the original registering province.

Each jurisdiction has its own database, using many of the same numbers issued by other provinces with only one difference in the first number after the decimal representing the original jurisdiction in which the CRN was issued. Theoretically, it is possible to have the same 13 numbers, and it, therefore, is important to maintain the first digit after the decimal representing the original jurisdiction.

The following two vessels have completely different designs:

Vessel number A1234.25 was issued first in Alberta and then in Ontario.

Vessel number A1234.52 was issued in Ontario first and then in Alberta.

If a design is registered in all provinces and territories, the CRN may be shortened to include the designation of first registration plus the letter "C".

Example: A1234.5C, which means it was initially registered in Ontario, then in all other provinces and territories.

Numbers can be shorten but always keep the first digit after the decimal point and 5 for Ontario:

A1234.61245 can be A1234.65
A1234.5167 can be A1234.5
A1234.5C can be A1234.5
A1234.7C can be A1234.75

Items previously registered as pressure vessels in a province other than Ontario, and defined as a fitting in Ontario, will be registered with the same CRN issued, plus the suffix "5FITG". For these items, periodic inspection is not required in Ontario.

Single fillet welds

By Stephen Lam, Mechanical Engineer, Boilers and Pressure Vessels Safety Program

Here are a few relevant rules for the attachment of small connections to boilers and pressure vessels using single fillet welds deposited from the outside.

Unlike ASME Section VIII DIV 1 and ASME Section IV, ASME Section I does not permit the attachment of small connections by single fillet welds deposited from the outside.

It is interesting to note that the sizes of single fillet welds determined by the code rules of ASME Section VIII DIV 1 and ASME Section IV can be quite different. The weld sizes dictated by the various code paragraphs in these ASME code sections are summarized in Table 1.

For ASME Section IV, according to HW-731.7(a) and HLW-431.5(b), the throat size of the fillet weld is 1 1/4 tmin (see Figure 1). This means that the leg size for a 3" – 3000# NPT coupling with 3/8" thick wall on a 3/8" thick boiler will be 1.25 tmin /0.7 = 1.79 tmin = 1.79 x 0.375" = 0.67" or 11/16".

To illustrate the remarkable differences in the size of the weld determined for ASME Section VIII DIV1 and ASME Section IV, the sizes of single fillet welds required for 2", 2 1/2", and 3" - 3000# NPT couplings on a 3/8" thick shell are listed in Table 2. Care must then be taken when sizing the single fillet welds for ASME Section IV designs to avoid the grave consequence of code non-compliance.

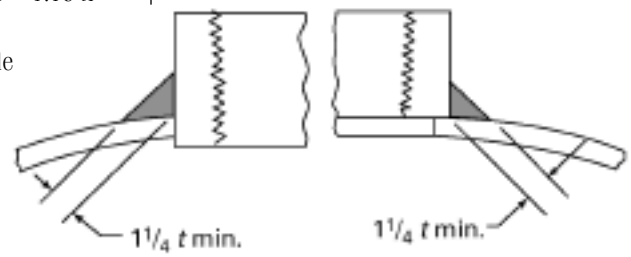


Figure 1
tmin is the smaller of 3/4" or the thickness of the thinner of the parts joined

TABLE 1: SINGLE FILLET WELD DEPOSITED FROM THE OUTSIDE FOR SMALL CONNECTIONS (ASME SECT VIII DIV 1 & SECT IV)

CODE SECT / PARAGRAPH	CONNECTION TYPE	SIZE LIMITATION	MAX. OPENING IN VESSEL	VESSEL WALL THICKNESS	MAX. PRESSURE	SINGLE FILLET WELD SIZE	FIGURE
"SECT IV HW-731.6(b)"	flange-type fittings	not exceeding NPS 3	pipe OD + 3/4"	3/8" max.	160 psi	leg = 3/32" min.	FIG. HW-731(w-4)
"SECT IV HLW-431.5(c)"	flange-type fittings	not exceeding NPS 2	pipe OD + 3/4"	3/8" max.	160 psi	leg = 3/32" min.	FIG. HLW-431.5(z)
"SECT VIII DIV 1 UW-16(f)(5)"	flange-type fittings	not exceeding NPS 2	pipe OD + 3/4"	3/8" max.	350 psi	leg = 3/32" min.	FIG. UW-16.2(p)
"SECT IV HW-731.7(a)"	fittings, nozzles, equivalent bolting pads	not exceeding NPS 3	--	3/8" max.	160 psi	throat = 1 1/4 tmin	FIG. HW-731(o) to (t)
"SECT IV HW-731.7(d)"	fittings, nozzles	not exceeding NPS 1 1/2	--	3/8" max.	160 psi	throat = 0.7 t, but leg not less than 3/32"	FIG. HW-731(t-1) & (t-2)
"SECT IV HW-731.8"	watertube	not exceeding 3 1/2" OD	tube OD + 1/32"	--	160 psi	throat = tc	FIG. HW-731(z)
"SECT IV HLW-431.5(b)"	internally threaded fittings, equivalent bolting pads	not exceeding NPS 4	--	--	160 psi	throat = 1 1/4 tmin	FIG. HLW-431.5(b) to (h) & (j) to (l)
"SECT IV HLW-431.5(b)"	fittings, studded pads which are not subject to a bending load and which will be plugged, such as those for thermostats, anode rods, drain valves, cleanouts, and heating elements	--	5 3/8" max., but not greater than 1/2 vessel diameter	3/8" max.	160 psi	throat = tmin	FIG. HLW-431.5(y)
"SECT VIII DIV 1 UW-16(f)(3)(a)"	fittings, bolting pads	not exceeding NPS 3	pipe OD + 3/4", but not greater than 1/2 vessel diameter	3/8" max.	--	throat = larger of (a) minimum nozzle neck thickness required by UG-45; or (b) that necessary to satisfy the requirements of UW-18	FIG. UW-16.2

Notes:
(1) Unthreaded pipes and flanged nozzles are not classified as fittings.
(2) tmin - the smaller of 3/4" or the thickness of the thinner of the parts joined
(3) tc - not less than the smaller of 1/4" or 0.7 tmin
(4) HW - requirements for heating boilers constructed of wrought materials fabricated by welding
(5) HLW - requirements for potable-water heaters
(6) UW - requirements for pressure vessels fabricated by welding

TABLE 2

SIZES OF SINGLE FILLET WELD DEPOSITED FROM THE OUTSIDE FOR 3000# NPT COUPLINGS

		SINGLE FILLET WELD LEG SIZE	
COUPLING SIZE	COUPLING WALL THK	SECT VIII DIV 1	SECT IV
2"	0.3125"	1/4"	9/16"
2 1/2"	0.375"	5/16"	11/16"
3"	0.375"	5/16"	11/16"

PULLING TOGETHER
for a pipeline project

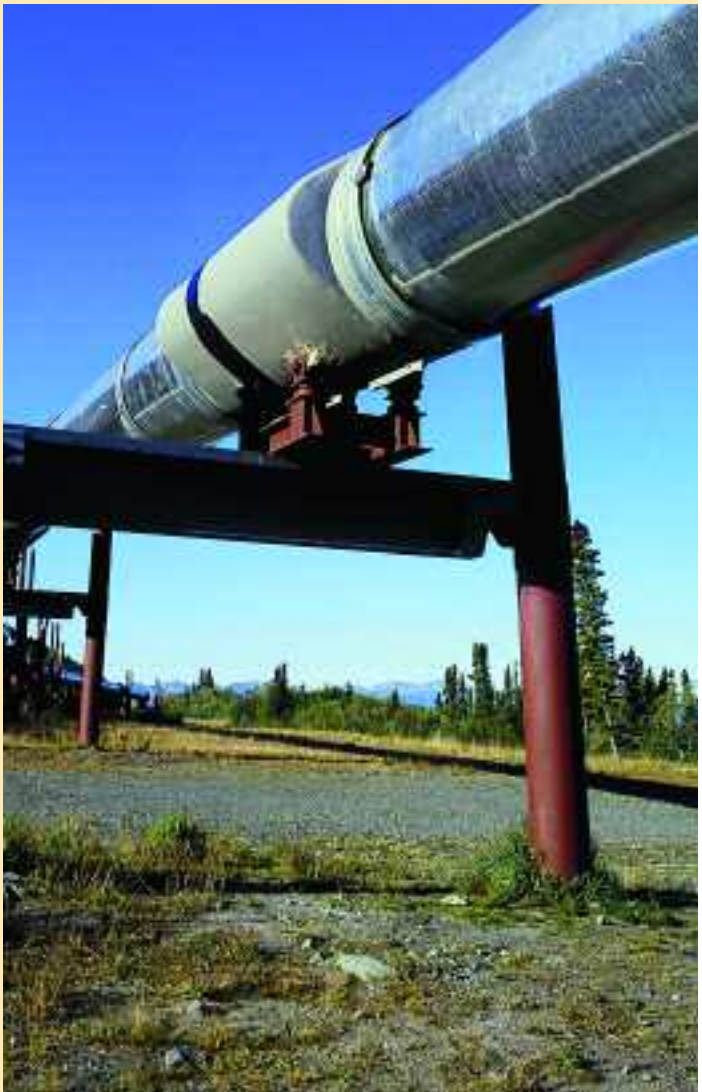
In a coordinated effort to avert a potential energy crisis for North American industry, TSSA played a pivotal role in an emergency hydrogen feed to Air Products, a global leader in energy and industrial markets, giving it the gas as it were.

After Hurricane Katrina knocked out Air Products' largest hydrogen production facility in New Orleans, another hydrogen facility was needed and fast. Air Products' Sarnia plant was the key – but with its normal feedstock supplier out of commission, a new, emergency pipeline was needed.

Meetings were organized with Sarnia's MIG Engineering firm, various local industries and TSSA. Within 24 hours, new feedstock sources were located at Imperial Oil and Suncor, yet some eight kilometres from the plant.

"A tremendous amount of planning and coordination was involved in finding out-of-service pipelines and temporary easements for new pipe," said Marty Raaymakers, Senior Manager of MIG Engineering. "It all had to be done quickly but safely, according to TSSA standards."

With the cooperation of government and industry, the MIG-designed and TSSA-approved pipeline was completed in just 11 days – a remarkable, even award-winning feat. Upon completion, Sarnia's MIG Engineering received a prestigious 'award of excellence' by the Consulting Engineers of Ontario.



Publication of the new CSA Standard N285.0-06:

GENERAL REQUIREMENTS FOR PRESSURE RETAINING SYSTEMS AND COMPONENTS IN CANDU NUCLEAR POWER PLANTS

By Brian Chan, Nuclear Mechanical Engineer

The new, long-awaited nuclear national standard is finally published, superseding previous editions published in 1995, 1991 and 1981. It is excellent news for the nuclear industry with the present increase in nuclear activities, and complements the recent announcement by the Ontario Government for refurbishment and possible new construction of nuclear power plants to ensuring a steady supply of electricity for Ontario's growth and prosperity.

The new standard includes revised definitions, language and agency references aligned with the current regulatory framework under the *Nuclear Safety and Control Act of Canada* and associated Regulations. In addition, all regulatory requirements contained in the standard have been removed to allow easier reference of CSA N285.0 by regulatory agencies. This standard is one in a series of standards that provides rules for the design, fabrication, installation, and inspection of pressure-retaining systems and components in CANDU nuclear power plants.

TSSA under contract with the federal nuclear regulator, Canadian Nuclear Safety Commission, provides design registration and inspection services for work carried out at the federal regulated license facilities in Ontario. Depending on the license requirements and the condition, activities may be carried out with the new or previous nuclear standard, such as CSA N285.0-95.

IS PRESSURE EQUIPMENT IN ONTARIO SAFE?

continued from page 1

Weld and Brazing Procedures and Welders/Brazers

- Owners, users, their designated agents, subcontractors, fabricators and manufacturers are responsible for using registered weld and brazing procedures and qualified welders/brazers.
- Weld and brazing procedures are reviewed by TSSA for compliance with codes and standards.
- Registration numbers are issued for accepted weld and brazing procedures.
- TSSA tests welders and brazers, using weld and brazing procedures registered with TSSA by employers or training institutions.
- Certificates are issued to welders and brazers who have successfully completed the tests.
- Contact your local inspector or TSSA's office to get your welders and brazers tested.

Operation

- Owners and users are responsible for ensuring equipment has valid certificates of inspection for operation and have the appropriately qualified staff to operate equipment.
- TSSA inspects uninsured boilers and pressure vessels at specified intervals. Note: For insured equipment, contact your insurance company.
- TSSA conducts boilers and pressure vessel repair inspections.
- TSSA carries out all boiler and pressure vessel alteration inspections.
- TSSA registers and issues certificates to operating plants in Ontario.
- Plants are registered according to equipment capacity.
- TSSA conducts periodic inspections of operating plants.

Operating Engineers/Operators

- TSSA administers and invigilates examinations for Operating Engineers, Compressor Operators and Refrigeration Operators.
- Certificates are issued upon successful completion of examinations and practical experience.
- Certificates of Qualification issued to Operating Engineers by TSSA permit movement to other jurisdictions who are members of the Standardization of Power Engineers Examination Committee (SOPEEC).
- Course materials are available at TSSA, please contact TSSA's office.

TSSA UPDATE
Boilers and Pressure Vessels Edition

We welcome your comments and story ideas for future editions of this newsletter. Please contact:

TSSA UPDATE (Boilers and Pressure Vessels Edition)
3300 Bloor St. West, 14th Floor, Centre Tower,
Toronto ON M8X 2X4
Email: customerservices@tssa.org **Fax:** (416) 231-1626

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UPDATE EXTRA

Boilers and Pressure Vessels Edition

Bringing a boiler into service after lay-up must be performed by the required certified engineer in attended plants or a person who is responsible and knowledgeable in unattended plants. While the boiler fit-out guide is primarily intended for low pressure steam and low temperature water plants, it also generally applies to high pressure steam or high temperature water plants. It is essential that, in such boiler installations, careful attention be applied to any additional technical equipment or systems, and the specific manufacture requirements. It is also essential that safe, effective knowledge and care be applied to the specific requirements of the high pressure steam or high temperature water, energy, process or service systems served by such boiler installations.

A guide to boiler fit-out for operation

LOW TEMPERATURE HOT WATER BOILERS

- Ensure all people who may be affected by the boiler's hot water system are appropriately informed of its impending operation and that a means of reporting system faults is in place.
- Ensure all boiler and system lockouts have been removed in conformance with the lockout procedure.
- It is essential that all system piping, valves, filters and related equipment are maintained, clean, secure, safe and correctly adjusted to receive their respective fuel and water.
- Ensure hot water system make-up is available and the make-up system is functional.
- Ensure the combustion air supply to the boiler room is open and clear.
- Ensure sufficient fuel is available, the fuel system is functional and that any oil fuel fill cap is in place and lock secured.
- If gas fired, ensure the main gas valve shutoff key (wrench) is in a known and secure position outside of the boiler room.
- Ensure expansion tank gauge glass, if supplied, is open, clear and reading correctly.
- Read the plant's previous log entries and ensure any required repairs or adjustments have been completed. Ensure fireside and waterside have been cleaned and inspected as required, and clear of any foreign items.
- Ensure TSSA or insurer certificate of inspection and TSSA plant registration are current and posted if applicable.
- Inspect safety relief valve to ensure certification, test tags and set pressure are in place and correct, and ensure servicing has been performed at least on a two-year schedule.
- Ensure all boiler and system pressure as well as temperature gauges and meters are in place and set for operation. Correct calibration should be confirmed.
- Confirm that all control system status lights are functional.
- Ensure all boiler operating and required guarded controls are in place and set for operation with the correct pressure, temperature and level settings.
- Inspect boiler and combustion system to ensure all components are in place and in a secure, safe condition. Make sure stack and damper are clear, and combustion spaces are clear and clean of oil. Ensure all valves, mechanical, electrical and related auxiliary systems are in the correct setting and condition for operation, and hand and manhole covers/plugs are correctly in place and tight. Ensure that all hand and manhole gaskets are the appropriate type and correctly set.
- Ensure gas and/or oil fuel burners have been inspected and adjusted as required and within a frequency that conforms to the manufacturer's recommendations. Ensure flame view ports and flame scanner are clear and clean.
- Boiler and related water systems must be filled to the appropriate expansion tank level with chemically treated water.
- Start circulating pumps and systems, and ensure pressures and air venting systems are correct and functional.
- Review the manufacturer's recommendations for boiler and combustion systems operation.
- When assessed as safe, commence operation of fuel burner/combustion system on a low fire rate, observing correct combustion system operation. Related purge, ignition and firing sequences must be observed to be correct.
- Observe flame condition and ensure combustion to be stable and clean.
- Fire boiler in a low heat gain manner as per the manufacturer's instructions and to ensure no boiler waterside thermal shock.
- Gradually, in the manufacturer's required time period, raise boiler temperature to approximately 180°F, retighten all hand and manhole covers/plugs. NEVER TIGHTEN A HAND OR MANHOLE COVER/PLUG WHEN THE BOILER IS AT OR ABOVE 212°F.
- Ensure hot water circulating system is operating correctly. Monitor system and expansion tank for correct level and pressure, and ensure air vents are functioning.
- Gradually bring boiler and system up to operating temperature and observe correct operation of automatic firing system, temperature cutout controls and related alarms.
- Ensure the water system's pipe expansion areas are functioning correctly and safely during the system's warm-through period.
- When boiler has reached operating temperature, function test the high temperature cutout and related operating, and guarded controls and alarms.
- Test blow the safety relief valve to ensure correct operation, pressure setting and blow-down.
- Inspect boiler and related auxiliary systems to ensure correct operation and ensure they are free of any leaks.
- In unattended and guarded plants, do not leave the boiler location until you are sure it is safely and effectively operating on automatic control. Ensure all systems and related operating and guarded controls and alarms are functioning correctly.
- In guarded attended plants, test remote from plant alarms and/or pager systems to ensure all remote from plant areas attended by the shift engineer are receiving boiler alarm signals.
- Ensure all hot water systems are inspected for safe and effective operation and are free of leaks.
- Ensure plant log conforms to the Regulation and is completed to correctly reflect the required boiler and system start up information.
- Within eight hours of boiler and water system operation, confirm water analysis and adjust chemical treatment as required.

LOW PRESSURE STEAM BOILERS

> Ensure all people who may be affected by the boiler's steam system are appropriately informed of its impending operation and that a means of reporting system faults is in place.

> Ensure all boilers and system lockouts have been removed in conformance with the lockout procedure.

> It is essential that all system piping, valves, steam traps, filters and related equipment are maintained, clean, secure, safe and correctly adjusted to receive their respective fuel, water, steam and condensate.

> Ensure boiler feed water is available and the feed system is functional.

> Ensure the combustion air supply to the boiler room is open and clear.

> Ensure sufficient fuel is available, the fuel system is functional and that any oil fuel fill cap is in place and lock secured.

> If gas fired, ensure the main gas valve shutoff key (wrench) is in a known and secure position outside of the boiler room.

> Ensure the blow down tank (if supplied) is in operating condition and that hand and/or manhole covers are in place and tight. Make sure the manual drain is closed and all vents are open and clear.

> Read the plant's previous log entries and ensure any required repairs or adjustments have been completed, and both fireside and waterside have been cleaned and inspected as required, and clear of any foreign items.

> Ensure TSSA or insurer certificate of inspection and TSSA plant registration are current and posted if applicable.

> Inspect safety relief valve to ensure certification, test tags and set pressure are in place and correct, and ensure servicing has been performed at least on a five-year schedule.

> Ensure all boiler and system pressure as well as temperature gauges and meters are in place and set for operation. Correct calibration should be confirmed.

> Confirm that all control system status lights are functional.

> Ensure all boiler operating and required guarded controls are in place and set for operation with the correct pressure, temperature and level settings.

> Ensure gauge glass protection shield is correctly applied to tubular gauge glasses and that gauge glass is clean.

> Inspect boiler and combustion system to ensure all components are in place and in a secure and safe condition. Make sure stack and damper are clear, and combustion spaces are clear and clean of oil. Ensure all valves, mechanical, electrical and related auxiliary systems are in the correct setting and condition for operation, and hand and manhole covers/plugs are correctly in place and tight. Ensure that all hand and manhole gaskets are the appropriate type and correctly set.

> Ensure gas and or oil fuel burners have been inspected and adjusted as required and within a frequency that conforms to the manufacturer's recommendations. Ensure flame view ports and flame scanner are clear and clean.

> Boiler must be filled to the appropriate cold-start water level with chemically treated water and a steam-space atmospheric vent must be open.

> Blow down gauge glass and column to ensure it is clear and that water level moves freely within the gauge glass.

> Review the manufacturer's recommendations for boiler and combustion systems operation.

> When assessed as safe, commence operation of fuel burner/combustion system on a low fire rate, observing correct combustion system operation. Related purge, ignition and firing sequences must be observed to be correct.

> Observe flame condition and ensure combustion is stable and clean.

> Fire boiler in a low heat gain manner as per the manufacturer's instructions and to ensure no boiler waterside thermal shock.

> Gradually, in the manufacturer's required time period, raise boiler temperature to steam generation. Before steam generation, and at approximately 180°F, retighten all hand and manhole covers/plugs. NEVER TIGHTEN A HAND OR MANHOLE COVER/PLUG WHEN THE BOILER IS UNDER STEAM PRESSURE.

> Close steam vent when steam is venting and boiler is clear of air.

> Ensure feed water supply system is operating correctly.

> When boiler registers steam pressure, blow gauge glass and column to ensure correct water level and a live glass. If supplied, test blow try cocks.

> Gradually bring boiler up to operating pressure and observe correct operation of automatic firing system and pressure cutout controls and related alarms.

> When boiler has reached operating pressure, function test high water, low water and high pressure cutout, operating and guarded controls and related alarms.

> Test blow the safety relief valve to ensure correct operation, pressure setting and blow down.

> Inspect boiler and related auxiliary systems to ensure correct operation and to be free of any leaks.

> Connecting boiler to steam system must be done with care to ensure effective system warm-through and the avoidance and danger of water hammer.

> Ensure the steam system's pipe expansion areas are functioning correctly and safely during the system's warm-through period.

> In unattended and guarded plants, do not leave the boiler location until you are sure it is safely and effectively operating on automatic control, and that all systems and related operating and guarded controls and alarms are functioning correctly.

> In guarded attended plants, test remote from plant alarms and/or pager systems to ensure all remote from plant areas attended by the shift engineer are receiving boiler alarm signals.

> Ensure all steam and condensate systems are inspected for safe and effective operation and free of leaks.

> Ensure plant log conforms to the Regulation and is completed to correctly reflect the required boiler and systems start up information.

> Within eight hours of boiler and steam system operation, confirm water analysis and adjust chemical treatment as required.

John W. B. Coulter, CET Tech CEI, Manager & Chief Officer, Operating Engineers Program Safety