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UPDATE

Boilers and Pressure Vessels Edition

Message from the Director

By Roy Martin, Director of Boilers and Pressure Vessels and Operating Engineers

Since joining the Technical Standards and Safety Authority (TSSA) as the Director of Boilers and Pressure Vessels and Operating Engineers (BPV/OE) Safety Program in November 2006, I have been impressed by this organization's dedication to public safety. The notable expertise of our inspectors, engineers and essential support staff, accompanied by an undeniable passion for safety, allow TSSA to continue making advances in delivery, efficiency, and industry-based partnerships.

It is not surprising, then, that organizational excellence is one of TSSA's priorities. But what does that mean to you? It means the mobilization of all TSSA resources – human, financial and physical – through innovation, smart processes and efficient structures, resulting in the highest standards of service and value.

...TSSA continues to make advances in safety services delivery, operational efficiency, development of a more risk-informed approach, and a proactive stance on industry-based partnerships.

While the BPV/OE Safety Program has not yet reached its potential, I would like to highlight some recent achievements worth celebrating. With first phase completion of our business process re-engineering plan, we have thoroughly examined all deliverable outputs (design approvals, inspections, welding and brazing procedures, etc.) to best align resources in the most efficient, appropriate manner. This means closing the loop in some processes, such as reallocating time-consuming administrative duties so an inspector may respond more promptly to customer needs. In the second stage of the plan, we will develop and implement the revised detailed processes. Upon completion, the BPV/OE Safety Program will be even more responsive to its customer base and better aligned with another strategic priority – customer relationship excellence.

Managing all interactions in a professional, informative, safety-focused manner, TSSA recognizes that safe behaviour is best influenced through effective communication and positive relations. Whether through proactive communication materials such as the risk-based material 'How Safe is Your Plant?', the recent

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In this ISSUE

INCIDENT REVIEW:

A proactive look at pressure equipment safety

By Cathy Turylo, Engineering Manager, Boilers and Pressure Vessels

Manual Shut-off Valves

A recent ammonia release incident was caused by an unusual style of manual shut-off valve. In this situation, a small separate wrench was required to close the valve and due to the valve's location, the wrench could not be turned a full 360 degrees. After struggling to close the valve, the attendant proceeded with routine maintenance starting with disconnecting part of the piping – but the shut-off valve was fully open. Ammonia discharged and an immediate evacuation was ordered. Fortunately there were no injuries.

Designers and installers should consider the following for manual shut-off valves:

- A valve indicator showing whether the valve is open or closed is a good safety measure.
- Care should be taken in selecting reasonable access to the valve. Awkward locations can confuse personnel as to which direction the valve is being rotated.
- Consider providing a means for venting spaces which, for operational or maintenance reasons, need to be isolated and disconnected. This may include a pressure gauge and a vent valve discharging to a safe location.

Rooftop Vents

A pressure vessel containing a flammable fluid/vapour mix recently over-pressurized due to an irregular upset condition. The over-pressure protection device functioned as expected by design, relieving pressure and restoring the system to the appropriate level. The venting system, however, became the cause of the incident.

Discharge from the over-pressure protection device vented through a rooftop vent, which was not effective: when the discharge released, it was sucked back into a rooftop air intake. The air intake fan blades were not functioning properly, and they set off periodic sparks, triggering an explosion. Fortunately there were no injuries though significant property damage was sustained.

Careful consideration for the design, location and function of rooftop vents is essential, particularly regarding the relative locations of air intake for habitable spaces as well as air compressors. Periodic evaluation is also a prudent measure of safety.

Process Safety Accidents Can Be Prevented

From the Baker Panel Report, www.bp.com/bakerpanelreport

March 23, 2005 marks the date of a catastrophic process accident at the British Petroleum (BP) Texas City refinery. It is considered one of the most serious US workplace disasters in 20 years. Fifteen people died and over 170 were injured. As a result, the BP US Refineries Independent Review Panel was created under the direction of Chairman James Baker, former US Secretary of State.

In January 2007, the review panel issued their report reviewing BP's corporate safety culture, safety management systems and corporate safety oversight at five US refineries – not just the Texas City facility. Although the report is directed at BP, it has been written for a wider audience.

The panel's opening statement carries a straight-forward message: "process safety accidents can be prevented". Although BP had emphasized personal safety, there was an inadequate understanding of process safety and associated risks. One of the panel's recommendations was to take the lessons learned from this tragedy, together with the panel's report, to transform BP into a recognized industry leader in process safety management.

The report is dedicated to the survivors of this tragedy and to the memory of those who lost their lives. Please circulate the website reference: www.bp.com/bakerpanel/report

REFRIGERATION AND AIR CONDITIONING Requirements

By Tony Scholl, Technical Services Specialist, Boilers and Pressure Vessels

THE DATE TO COMPLY WITH ONTARIO BOILERS AND PRESSURE VESSELS REGULATION 220/01 FOR THE INSTALLATION AND REPAIR OF REFRIGERATION AND AIR CONDITIONING (RAC) SYSTEMS OCCURRED ON JULY 1, 2007.

TSSA's mandate includes the *Technical Standards and Safety Act, 2000* (the Act) and referenced regulations. The scope of *Ontario Regulation 220/01* (the Regulation) includes pressure piping systems that exceed a capacity of three tons (11 kW) of refrigeration. The Regulation also provides requirements for welding and brazing qualifications that apply to pressure piping systems. These requirements were in place when the Act was proclaimed in 2001.

Regulation requirements apply to owners, users and other organizations that own, install or repair pressure piping systems that exceed 3 tons (11 kW) refrigeration capacity or 5 tons (18 kW) air conditioning capacity.

Commencing July 1, 2007, owners and users of Refrigeration and Air Conditioning Systems (RAC) systems within the scope of the Regulation have a responsibility to ensure the installation or repair of these systems is performed by organizations that have been issued a TSSA certificate of authorization. There are some exceptions. A TSSA certificate of authorization is not required for RAC system installations that do not involve welding or brazing (i.e. self-contained systems), nor for systems with a discharge (high side) pressure of 15 psi or less, regardless of their capacity.

The Regulation itself provides requirements, but also adopts other existing technical standards published by organizations including the Canadian Standards Association (CSA), and the American Society of Mechanical Engineers (ASME).

The objective of these standards is to provide uniform rules for the construction, installation, inspection, testing and repair of pressure retaining equipment such as RAC systems. The scope of the standards includes requirements for quality control, design, materials, brazing, inspection, over-pressure protection, testing and documentation. Conformance to these requirements will ensure that a minimum level of public safety is provided throughout the useful life of the pressure retaining equipment.

The standards that apply to RAC systems include, but are not limited to, *CSA B51 Boilers, Pressure Vessels and Pressure Piping Code, CSA B52 Mechanical Refrigeration Code, ASME B31.5 Refrigeration Piping* and *ASME Section IX Welding and Brazing Qualifications.* These standards, in turn, reference other publications for items such as pressure vessels, refrigerants, components, tubing, fittings and filler metal specifications.

These codes and standards are not handbooks and cannot replace education, experience or general engineering knowledge. In order to comply with these standards, it is necessary for organizations to become familiar with and understand the requirements as they apply to the various types of systems, classes of refrigerants, types of occupancy and methods of construction.

In order to comply with these requirements, owners, users, contractors and others need to assess the type of RAC equipment that they own, install or repair. If the capacity of this equipment exceeds 3 tons (11 kW) refrigeration capacity or 5 tons (18 kW) air conditioning capacity, then it may be under the scope of the Regulation, and a TSSA certificate of authorization will be required for an organization to install or repair this equipment.

To date, approximately 200 companies have obtained a TSSA Certificate of Authorization for RAC systems.

It is a requirement to apply for and obtain a TSSA certificate of authorization if you intend to install or repair RAC systems regulated by TSSA.

For further information, please see TSSA Safety Bulletin SB06-01 Refrigeration Piping Fabrication, Installation, Repair or Alteration posted on www.tssa.org.

Highlights of Changes in CSA N285.0-06 Edition

By Brian Chan, Engineer Specialist, Boilers and Pressure Vessels

The following major areas were updated from the previous Canadian Standards Association (CSA) N285.0-95 edition: Scope (Clause 1), Definitions (Clause 3), Significant Changes to Reconciliation Statements (Clause 14) and Annexes, formerly Appendices (Annex A to Annex H).

Scope (Clause 1)

This section referred to all phases and aspects of pressure boundary work at CANDU nuclear power plants. Reference to CSA N287 Series of Standards was removed. Site license conditions and/or other agreements with the Canadian Nuclear Safety Commission will dictate the ASME code edition/addenda as well as CSA standards and edition that may be used.

Definitions (Clause 3)

There have been many new or revised definitions in the new edition: Act, Agent, Authorized Inspection Agency, CANDU nuclear power plant, certificate of compliance, certified, certified material test report, classification, component, data report, fabrication, fitting, installation, item, licensee's verifier, material, material organization, NPS, nuclear facility, nuclear substance, plant, piping, process system, refurbished item, regulatory authority, repair, replacement item, safety related system and subassembly.

The following are typically new and revised definitions.

'**Agent**', defined as a person or organization that is authorized to act on behalf of the Licensee. An agent can be an organization having the certification of authorization from the Professional Engineers Ontario (for design) or TSSA (for design, fabrication and installation) for the Licensee.

The '**Licensee's Verifier**', defined as a person designated by the Licensee or his or her agent, who is qualified under this standard to inspect and to countersign data reports for inspected items. This replaces the owner's appointed representative and purchaser's appointed representative of the previous standard. Annex H provided qualification, training criteria and documentation for the Licensee's Verifier.

'**Material Organization**', defined as an organization or person that performs or contracts to perform, for its own use or for that of another, activities associated with the manufacturer or supply of materials for use in Class 1, 1C, 2, 2C, 3, 3C, or 4 systems or components. This activity is provided by a certificate holder (either ASME or TSSA).

Given the dynamic nature of the CANDU industry, which is rapidly moving forward, definitions are under constant change to serve the nuclear industry and users of the standards.

Repairs, replacements, and modifications (Clause 14)

Significant changes and improvements were introduced in the area of modifications to existing systems. Reconciliation statements (Figure 16 to Figure 23) were provided for modifications to either system (Class 1, 2, 3 or 6) or components (Class 1C, 2C, 3C, 4 or 6) that will and will not be subject to re-registration. This area can be improved and reconciliation statements can be consolidated and reduced for clarity and efficiency.

Annexes

There are eight annexes — two are 'normative' and mandatory, and six are 'informative' and non-mandatory. Classification (Annex A) and Registration (Annex F) are mandatory, while the rest serve as informative.

Annex A provides information and guideline on classification. For example, tritium concentration was lowered from 10 Ci/kg to 2 Ci/kg for Class 3 system. It is a good idea for the user to verify the licensed condition before applying the rules of classification exemption (A.1.6.3) and registration exemption (A.1.6.4).

Annex F provides information on registration exemptions on Class 6 components and fittings, and items exempt from registration (from the provincial exemption). Verification of licensed condition before use is advised.

Users of this standard are urged to review the new edition. Queries or questions may arise during use, which can be pursued with other experienced users or TSSA staff. Inquiries or requests for interpretation can additionally be sent to the CSA Standard Committee for clarification.

REGISTRATION of Generic Designs of Pressure Vessels

To minimize the number of registered drawings by manufacturers, TSSA accepts generic designs. Typically, manufacturers of air receivers, refrigeration vessels, and propane vessels apply for generic designs.

The following apply to generic designs:

- design conditions: maximum allowable working pressure, design temperature, minimum design metal temperature and corrosion allowance must be fixed;
- vessel diameter, head and shell thickness must be fixed (maximum and minimum length to be shown on the drawing);
- materials of construction must be specified: reasonable substitutions must be identified on the drawing (e.g. SA-106 Grade B for SA-53 Grade B; SA-516 Grade 70 for SA-285 Grade C);
- all nozzles (including optional nozzles) must be identified on the drawing;
- only one type of dished head; for vessels with a diameter up to and including 24" OD, optional flat heads or flanged ends with blind flanges are acceptable;
- nozzle quantities and positions shall be preferably fixed; for variable position nozzles, the center-to-center distance between any two nozzles may be shown in tables (please note requirements of ASME VIII/1 UG-36 (c)(3) for clusters of three or more nozzles);
- options for nozzle outboard ends (e.g. flanged, beveled for welding, threaded, grooved, etc.) are acceptable and shall be shown on the drawing;
- impact test requirements, post weld heat treatment, holding temperature and holding time must be identified in the drawing;
- radiography or other code-required non-destructive examination must be specified;
- bills of materials must identify all pressure boundary materials and materials welded to pressure retaining parts;
- vessels may be shown as being optionally supported - horizontally or vertically; and
- all applicable code requirements must be shown to have been met.

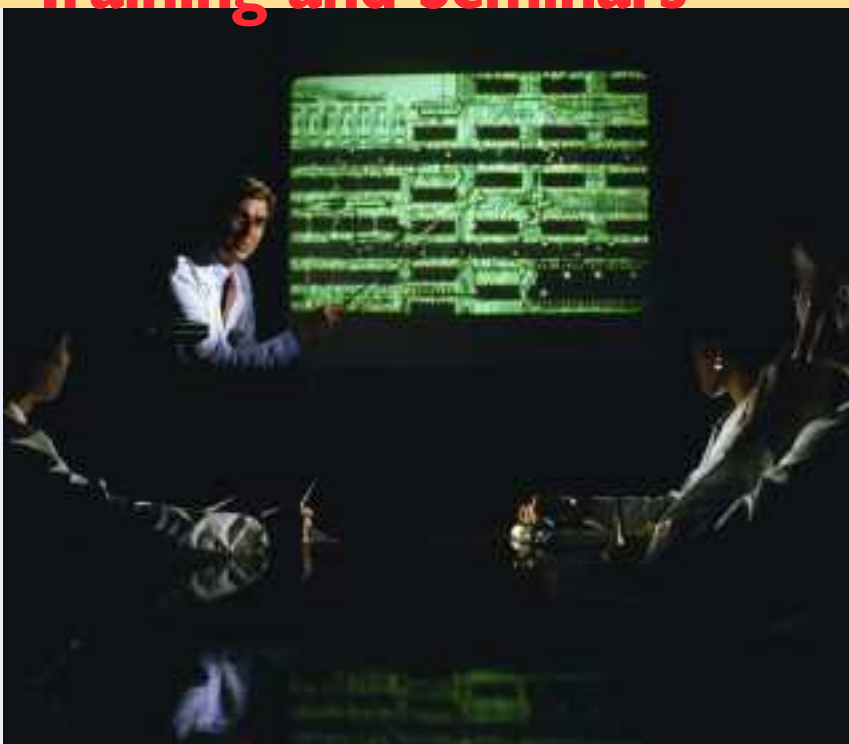
Customer Inquiries for Training and Seminars

By Frank Musuta, Technical Specialist, Boilers and Pressure Vessels

TSSA provides a variety of public safety education programs, and several customers have recently requested tailored training. In order to help in this regard, the TSSA website will be modified to allow requests for specific types of technical training or seminars.

Customers will be encouraged to send requests to TSSA for training in different areas, so training can be tailored to meet more individualistic needs. We hope this change will result in superior communication and service for TSSA customers.

If you have any questions or suggestions, please contact Frank Musuta, Technical Specialist at: 416-734-3510 or fmusuta@tssa.org.



OWNER/USER SERIES: Expansions, New Buildings and Modifications to Existing Installations

By Roya Hatami, Design Review Engineer, Boilers and Pressure Vessels

TSSA is quite often asked by owners or users regarding its policies and requirements in the following cases:

- modifications to piping systems;
- repairs or alterations to existing boilers or pressure vessels; and
- installation of new boilers or pressure vessels

The information listed below can be helpful in determining what needs to be done and/or submitted to TSSA.

Modifications to Piping Systems

Design registration is required for modifications of an existing piping system. There are exceptions however to this requirement for piping systems with a 'P' number (as they are systems that have been registered with TSSA). If there are no changes to parameters such as the code of construction, design pressure and temperature, service fluid or materials, and no changes involving the energy source, the over pressure protection or calculations and analysis, then design registration is not required for the piping modification. TSSA's Safety Information Bulletin SB00-2 posted on TSSA's website provides more detail regarding piping system modification submissions. To register a modification, two copies of the flow diagram and technical information, similar to that required for piping registration including design code, design pressure and temperature, need to be submitted.

All modifications to piping systems are subject to inspection by TSSA. A valid certificate of authorization for piping installation or assembly is also required for the company performing work. The certificate of authorization is issued by TSSA based on review of a written quality program manual and an implementation audit for this activity. Detailed instructions for obtaining a certificate of authorization can be found on the TSSA website.

Repairs or Alterations to Existing Boilers or Pressure Vessels

Repairs and alterations of boilers and pressure vessels are two different activities, and are defined separately in *Ontario Regulation 220/01*.

Alteration: Any change in the item described on the original manufacturer's data report that requires a change of design calculations or otherwise affects the pressure-containing capability of a boiler or pressure vessel.

Repair: Any work necessary to restore a boiler or pressure vessel to a safe and satisfactory operating condition that does not result in a deviation from the original design.

A valid certificate of authorization for repairs and alterations from TSSA is required for the company performing work. Inspection is also required for both repairs and alterations. Repairs can be inspected by the insurer of the boiler or pressure vessel or by a TSSA inspector; however, alterations require design registration and inspection by the TSSA inspector.

To register an alteration, two copies of the drawing (stamped by a registered or licensed professional engineer in Ontario), and the manufacturer's data report and the relevant ASME calculations based on the original design stress values are required. Depending on the actual condition of the boiler or pressure vessel, inspection reports and non-destructive examination reports may also be necessary.

Installation of New Boilers or Pressure Vessels

Designs of new boilers and pressure vessels to be installed in Ontario require registration by TSSA. When designs are registered, a Canadian Registration Number (CRN) is issued. Typically the manufacturer submits their design for registration. The CRN is stamped on the nameplate of the boiler or pressure vessel and is also identified on the manufacturer's data report. Guidelines for obtaining a CRN for boilers and pressure vessels manufactured in Canada or outside Canada are posted on the TSSA website.

An installation inspection is also required by TSSA inspectors for any newly installed boiler or pressure vessel in Ontario. Once the inspection is successfully completed, a certificate of inspection is issued to the owner or user.

Minimum Thickness of Alloy Steel Plate for Heating Boiler Plain Type Furnaces (ASME SECT IV)

By Stephen Lam, Mechanical Engineer, Boilers and Pressure Vessels

In accordance with ASME SECT IV, HG-312.1(a), the minimum thickness of plain type furnaces that are complete cylinders under external pressure shall not be less than 1/4". No material specification is mentioned.

However per HF-301.1(d), reprinted below, furnace walls made of SA-240 type 316 Ti, 316L, 439 (UNS S43035), and UNS S43932 plates with thicknesses less than 1/4" can be used.

It is the intent of HF-301.1(d) to waive the minimum 1/4" requirement in HG-312.1(a) for SA-240 type 316 Ti, 316L, 439 (UNS S43035), and UNS S43932 materials, although it does not explicitly say so. TSSA has requested the ASME SECT IV subcommittee to revise HF-301.1(d) as follows to make it clearer:

"Alloy steel plate of Specification SA-240 type 316Ti, 316L, 439 (UNS S43035), and UNS S43932, with a thickness less than that permitted by HF-301.1(a), HF-301.1(b) and HG-312.1(a), may be used when all of the following requirements are met."

HF-301.1(d), 2004 ASME Boiler and Pressure Vessel Code Section IV A06

"Alloy steel plate of Specification SA-240 type 316Ti, 316L, 439 (UNS S43035), and UNS S43932, with a

thickness less than that permitted by HF-301.1(a) and HF-301.1(b), may be used when all of the following requirements are met:

- the operating service shall be limited to closed hot water heating systems at a maximum pressure of 80 psi (550 kPa);
- the cylindrical parts for combustion chamber and pressure vessel shall be limited to a maximum of 38 in. (950 mm) outside diameter;
- the material thickness shall not be less than 3⁄32 in. (2.5 mm) (actual thickness) for combustion chamber design; and
- the material thickness shall not be less than 0.0394 in. (1 mm) (actual thickness) for secondary flue gas heat exchange surfaces."

Message from the Director *continued from page 1*

'Owner/User' series (page 6) identifying pertinent building regulations, or working to enhance pressure equipment safety (page 2), TSSA's primary focus is safety. When safety and compliance are taken seriously, operations run smoothly and time-consuming re-inspections are avoided.

Effective communication is also a two way process, involving an exchange of ideas and information. Industry advisory councils for Boilers and Pressure Vessels and Operating Engineers, field advisory committees, regional inspectors and TSSA's Customer Contact Centre all provide industry and individuals with a valuable means of open dialogue. The Customer Contact Centre is in fact celebrating its second year of effective communication and customer relations, and has been recognized by our customers for providing ready answers to inquiries, resolving issues efficiently and effectively, and conducting root-cause analysis to improve business processes, communication and service delivery.

As TSSA continues to evolve, I welcome your feedback on how effectively the BPV/OE Safety Program meets its commitments and responsibilities. While progress has been made over the past year, improvement opportunities will continue to exist. I look forward to working together with all our industry partners toward a safe, successful future.

For updates and further information check out TSSA's website

www.tssa.org

TSSA UPDATE
Boilers and Pressure Vessels Edition

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

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