ABSA THE PRESSURE NEWS

Alberta Boilers Safety Association

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CUSTOMER SURVEY

At ABSA we understand that our customers are essential to pressure equipment safety and the future success of our organization. We strive for a reputation of providing competent professional service in a timely manner and at a reasonable cost.

One of the ways we assess our progress toward this goal is to periodically survey the people who do business with us. In August of this year we retained the services of a reputable research firm who randomly selected 1,200 clients from our data base and sent them a questionnaire to complete.

The response rate from those sent a survey was excellent with over 40% of the questionnaires returned. We would like to thank all those who took the time to complete the survey. Your participation is valued and your help will provide ABSA with essential information to improve the way we serve you.

THE ASME CODE 1999 ADDENDA AND DESIGN FACTOR OF 3.5

As reported in the Pressure News of June 1999, the 1999 Addenda of the ASME Code, as expected, incorporated ASME Code Cases 2278, 2284 and 2290 into the main text of the Code. This allows for maximum allowable design stresses based on a factor of 3.5 instead of the traditional design factor of 4.0 when tensile stress is the only consideration in establishing the maximum allowable stresses.

For a discussion on how the addenda may be used in Alberta, please review Information Bulletin No. IB99-001 which is posted on our website *www.albertaboilers.com.* You may download a copy of the bulletin from the website. If necessary, you may also obtain a copy of this bulletin from the ABSA office nearest you.

Among other topics, changes to the ASME Code with the 1999 Addenda will be discussed in detail during the coming ABSA Pressure Equipment Design Seminars. See right hand column, this page.

DESIGN SEMINAR

October 19 - Calgary
October 21 - Edmonton

One-day ABSA design seminars will be held in Calgary on October 19, 1999 and in Edmonton on October 21, 1999. The seminars target design and related personnel from pressure vessel manufacturers, owners/users, contract companies and the EPC community.

Topics to be presented include changes to the ASME Boiler and Pressure Vessel Code with the 1999 Addenda, including the use of the 3.5 Design Factor; the latest developments in the CSA B51 Code and others, common design inadequacies, the European Pressure Equipment Directive which will be effective November 29, 1999 and the Chinese Quality Licensing System. There will also be a general discussion session at the end of seminar.

Again, as in other seminars and workshops organized by ABSA, you are requested to submit any questions that may involve some research time on any topic in the program to :

webmaster@albertaboilers.com

or in writing to Mr. B. McWhirter, at ABSA's office in Edmonton at least one week before the seminar.

Due to limited seating, we would suggest a maximum of 2 attendees per company. Seat allocation will be made on a first-come, first-served basis. You may obtain further information and the application form from your nearest ABSA office. The deadline for registration is October 12 for Calgary, October 14 for Edmonton.

Have you visited us yet on the Internet? - www.albertaboilers.com

CSA B51 AND ASME
(IV) SOME OTHER TECHNICAL REQUIREMENTS

This series of articles would not be complete without noting some other different technically related requirements between the CSA Boiler, Pressure Vessel and Pressure Piping Code and the ASME Boiler and Pressure Vessel Code in addition to the issues discussed in the last three articles in the past issues of the Pressure News.

MANWAYS

For "Inspection Openings" of a size commonly termed "manholes", ASME Section I allows for a minimum circular opening to be not less than 15 in. (381 mm) in diameter or, if the opening is elliptical, not less than 12 in. x 16 in. (305 mm x 406 mm). Manholes are seldom used in Section IV heating boilers. But if they were required, similar to ASME Section VIII (Divisions 1 and 2), manholes may be 15 in. in diameter or, if elliptical, 11 in. x 15 in. or 10 in. x 16 in. (254 mm x 406 mm). However, CSA B51, Clauses 6.3.5 for boilers and 7.3 for pressure vessels require that manholes be a minimum of 406 mm (16 in) in inside diameter or an oval with minimum inside dimensions of 305 mm x 406 mm (12 in x 16 in).

IMPACT TESTING

In Section VIII Division 1 of the ASME Code, impact testing consideration has to be given to all materials through a series of evaluations. An example of this is the requirements of UG-84. However, there are a number of exemptions through which impact testing may be waived. The most common one is the exemption through meeting all the conditions of paragraph UG20(f) for P-1 Group Nos. 1 and 2 materials when the minimum design metal temperature is no colder than - 20° F (- 29° C). Under paragraph UCS-66, exemption from impact testing for carbon and low alloy steel is possible for minimum design metal temperatures as low as -155° F (-104° C). In that case, only a fraction (35% for the ASME Code Section VIII Division 1 with 1999 Addenda) of maximum allowable design stress may be used for the design.

CSA B51 generally references the ASME Code requirements for the construction of pressure vessels. However, in addition to the ASME Code requirements, impact testing is required for carbon steel used for the construction of pressure vessels at a minimum design metal temperature below - 46° C (- 50° F) (see Clause 7.1.2). This requirement parallels that of ASME B31.3 but is more stringent than ASME Section VIII, Division 1 and must be followed for Canadian pressure vessels.

CAST IRON BOILERS

For "Cast Iron Steam and Hot-Water Boilers", CSA B51 Clause 6.7 requires that the maximum allowable working pressure shall be not more than 1/6 of the lowest hydrostatic proof test pressure at which any particular cast section failed. ASME Section IV uses a factor of 1/5 to derive the maximum allowable working pressure that must be further de-rated by the ratio of the specified minimum tensile strength to the average tensile strength of the associated test bars produced for the test. It is interesting to note that ASME Section VIII Division 1 provides for an even higher factor. Paragraph UCI-101 requires that the maximum working pressure of cast iron vessels or vessel parts, based on testing one of them to destruction, be limited to 1/(6.67) of the destruction test pressure. This allowable working pressure is also de-rated by a ratio of the specified minimum tensile strength of the material to the average tensile strength of test specimens produced for the test. It should also be noted that UCI-101 further assumes that failure will occur in bendng.

LOW-WATER CUT-OFFS

CSA B51 has very specific requirements (Clause 6.3.2.1) that "every steam boiler not under continuous attendance by a certified operator shall be equipped with a low-water fuel cut-off device that serves no other purpose". In addition, "this device shall be installed so that it cannot be rendered inoperative" and "the installation shall be such that it can be tested under operational conditions". These requirements are additional to the ASME Code.

REPAIRS & ALTERATIONS

As mentioned in the first article of this series, different from the ASME Code, the scope of the CSA B51 also include repairs, alterations, installations, re-qualification and other things in addition to new construction. It is worth noting that the National Board Inspection Code, NB-23, is the code referenced for guidance in repair or alteration procedures as well as the "R" certificate of authorization as generally being deemed a satisfactory quality control system.

MISCELLANEOUS

Just to conclude on an interesting item, an age limit is provided for lap-seam riveted boilers in the CSA B51 Code. Beyond that date, the factor of safety is to be increased annually. It is indicative of the origin of the boiler and pressure vessel code as well as an example of the wide-ranging issues addressed by this Code.

CONCLUSION

We have tried to summarize some of the more significant differences between the CSA B51 Code and the ASME Boiler and Pressure Vessel Code. We again want to note that this series of articles does not reflect the opinions of the CSA B51 Technical Committee or the ASME Boiler and Pressure Vessel Committee. Readers are encouraged to go through the Codes carefully to ascertain the requirements of each.

WARNING
Oil Battery Operation

A recent incident in an oil battery involved the rupture of a fired "treater" which was used to separate oil from water and gas. In the same incident, a fatality occurred. The root cause of the incident is still under investigation. Plant operators are asked to ensure safe operation of pressure equipment.

The operation of the plants is to be reviewed and, in particular, immediate action shall be taken to ensure that:

1. all pressure equipment in the plant, including treaters, is subject to periodic inspection to demonstrate good working order and condition and to ensure that inspection of all pressure equipment is up to date;
2. pressure relief valves are set at a pressure no higher than allowed by the pressure equipment the valves are intended to protect and these valves are serviced periodically by authorized service companies;
3. the pressure relief valves are properly sized to protect against overpressure, taking into account site-specific operating conditions;
4. automatic emergency shutdown controls are in place to reduce the odds of a system overpressure occurring;
5. proper, current, site-specific operating procedures are maintained so that the pressure equipment can be operated in accordance with the engineering requirements of the processes concerned; and,
6. employees are fully trained and knowledgeable of the operational requirements of the equipment and processes.

For items #1 and #2 above, plant operators may contact a Safety Codes Officer of the Alberta Boilers Safety Association office nearest them should there be any questions relative to the periodic inspection/ service requirements and frequencies for the pressure equipment in your plant.

ALERT
Mechanical Clamp Failure in High Pressure Steam Service

A catastrophic failure of a mechanical clamp assembly was observed in a 10 inch schedule 160 steam line with a MAWP 17,500 KPa MAWP and 355°C design at an oilfield steam injection facility in Saskatchewan. Fortunately, staff at the facility observed steam leakage at the joint assembly and had taken the immediate necessary action to shut down the steam generator. Failure occurred approximately thirty seconds after steam generator shutdown. Staff members were sufficiently remote from the failure site.

It was reported that "*Subsequent investigation points to the root cause of failure being an inadvertent and inappropriate material substitution. The external clamp involved in the failure was found to be A182 F304. Metallurgical analysis of the failure has indicated a failure mechanism of chloride induced stress corrosion cracking, resulting in brittle failure of the 304 stainless steel clamp. Significant chloride accumulation associated with leakage, occurred on areas of the under surface of the clamp, which in combination with relatively high temperature and stress levels, created the conditions for catastrophic brittle failure to occur*".

We understand such mechanical flange/clamp assemblies are in fairly widespread use in oil field steam injection facilities. ABSA is investigating if similar inadvertent and inappropriate material substitution might have occurred in our Province. Owners and operators are urged to review their facilities to prevent similar occurrences.

It must be remembered that materials used in pressure equipment must be as specified in the registered designs. Substitution of materials constitutes a change of design and must be carefully evaluated. Material selections are tied to operating environment, stress levels and other critical design considerations. Inappropriate substitution of materials with different material specifications, even though sometimes of a more expensive or supposedly "better" or "stronger" grade, may result in catastrophic failure which not only can be expensive but may also cause injuries or fatalities. Accordingly, proper material identification and material control must be an integral part of normal plant operating procedure and an in-service equipment inspection quality control program.

We wish to acknowledge the assistance of the Saskatchewan Boiler and Pressure Vessel Safety Unit, and in particular, Mr. N. Surtees, Executive Director of Saskatchewan Protection Services, for providing us with the information on this incident.

BURIAL OF PROPANE STORAGE TANKS

Burial of propane storage tanks in residential, commercial or industrial locations is not generally allowed unless the following requirements are met:

1. the requirements of the Safety Codes Act for design registration and on-going inspection;
2. the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII Division 1 for vessel design;
3. the requirements of CSA B51 Boiler, Pressure Vessel and Pressure Piping Code, Clause 7.2.6;
4. the requirements of CGA B149.2 Propane Installation Code Section 11.8 Installation of Underground Tanks; and
5. the tank must be uncovered at least once every five years for a complete external inspection.

Requests to locate the tank below ground, the justification for burying the tank, and a written commitment to expose the vessel for inspection, along with other required documentation, are to be submitted to the Design Survey Section of ABSA for review.

IMPACT TESTING DECISION CHARTS

A series of five decision charts have been developed by ABSA staff to augment the understanding and application of ASME Section VIII, Division 1, Subsection C, Part UCS, impact testing requirements. The decision charts are part of a presentation that was made by Mr. L. Bolt, AIS of ABSA Southern Region, at the ABSA Quality Control and Pressure Vessel Fabrication Workshops recently held in Calgary and Edmonton. The presentation paper will be available for downloading from the ABSA web site in the near future.

The presentation material contains the impact testing decision charts, and a selection of the **most common** problems, misconceptions and oversights with regard to impact testing as applied to pressure vessel construction to the ASME Code, Section VIII, Division 1, CSA B51 Part 1, and Alberta requirements. The presentation was found very useful by the workshop participants. You are encouraged to visit the ABSA website for this useful information.

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