the pressure equipment safety authority

THE PRESSURE NEWS

Volume 10, Issue 3, September 2005

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REMINDER

Annual Code Update Seminar

October 4, 2005 - Edmonton
October 6, 2005 - Calgary

Have you plan to attend the seminar? The deadline for registration is coming close. Please visit ABSA's web site for more information regarding the seminar:

http://www.absa.ca/TrainingNews.aspx

INFORMATION BULLETIN NO. IB02-002 REV. 1

Directive

Certification of In-Service Pressure Equipment Inspectors

This directive was issued on August 2, 2005. It is effective immediately and supersedes IB02-002 that was issued on February 12, 2003.

Key changes incorporated in the IB02-002 Rev. 1 Directive are:

- The term "Inspector Certification Examination" is used instead of "Pressure Equipment Safety Legislation Examination" and the term "accepted quality management system" is used instead of the term "accepted owner-user program".
- Provision has been made to allow candidates who have successfully challenged the National Board Commission Examination, but who do not meet the experience requirements for boiler inspection, to be only issued an Alberta In-Service Pressure Vessel Inspector Certificate of Competency.

Information bulletin No IB02-002 Rev. 1 is posted on our website, www.absa.ca.

NEW "SEARCH BY DATE" FEATURE ON ABSA'S WEB SITE

ABSA has used the ABSA Web site, www.absa.ca, and the newsletter, The Pressure News, as the main channels for dynamic communication with the stakeholders.

As ABSA is committed to providing more and better services to our stakeholders, more new features have been added to our Web site. After the new E-News and Information Service and a unique powerful search engine were provided when this upgraded Web site was launched at the beginning of this year, we have now provided a new "Search by Date" function, an online training survey and an electronic newsletter format for The Pressure News.

Using the "Search Tips" Web page, users can make excellent use of this "Search by Date" feature to retrieve all the documents **posted** or **revised** on a certain date or in a period of time. Regulation updates, revised ABSA forms or revised Web pages will be captured in a single search.

The online training survey can be accessed from the Training Survey icon on the home page. We value your input and suggestions regarding pressure equipment safety training and we will make every effort to address your needs in our future training seminars.

As we are no longer providing the hard copy version of The Pressure News, the new electronic newsletter format allows users to read the articles in any order and eliminates the trouble of navigating to different pages limited by a physical page size.

ABSA publishes useful information regarding pressure equipment safety on our Web site. Please subscribe to our E-News and Information Service for notification of new postings by e-mail and visit our Web site on a regular basis. ❖

ABSA is Now Conducting an Online Training Survey

ABSA is currently conducting a survey to assess the need for specialized training seminars or courses in Alberta to assist the pressure equipment industry.

Your feedback, as a member of the industry, is very important to us in determining how ABSA can best work with our stakeholders to promote pressure equipment safety.

The survey asks for your comments regarding your specific needs for training in Quality Control or Quality Management Systems, Pressure Equipment Safety Legislation, In-Service Pressure Equipment Integrity Assessment Programs, and Accident Investigation.

Please visit http://www.absa.ca/TrainingSurvey.aspx, or click the Training Survey icon on our homepage at www.absa.ca to participate in the survey. ❖

Isolation Valves in a Pressure Relief Path

Pressure relief devices (PRD's) are critical for the safe operation of pressure equipment as they provide the means of protecting the equipment from overpressure. Clearly then, anything that would interfere with their operation is undesirable. However, in some instances, the installation of isolation (block) valves in the inlet or discharge piping of a PRD used to protect pressure vessels is sometimes considered necessary for operational considerations. This practice has become common in some parts of the pressure equipment industry. However several recent incidents involving overpressure of equipment warrant a review of the requirements for this practice.

Block valves are **not** permitted in the piping of ASME Section I or Section IV boilers. ASME Section VIII does not permit block valves except under the conditions outlined in Appendix M. Paragraph M-4 states that the provision of these block valves is "… sometimes necessary to the continuous operation of processing equipment of such a complex nature that the shutdown of any part of it is not feasible." The appendix also states that it provides these rules for general information only, as the jurisdiction (ABSA) has authority over the installation and operation of pressure vessels.

ABSA may accept the installation of block valves in pressure relief piping for pressure vessels if the owner meets the requirements of Appendix M and submits the relevant design and rationale to ABSA. The owner must have an auditable management system that establishes procedures and training requirements for the control of such valves. This management system must be available for review by ABSA at all sites where block valves are installed in the pressure relief path. A typical management system would include:

- a description of where block valves would be installed
- who would be responsible for the system
- how the valves would be locked or sealed in the proper position
- how the valves would be periodically checked
- the procedure required for isolation or servicing of the PRD
- the associated training requirements of all people who work with the pressure equipment involved.

Ask yourself two questions. Is my pressure equipment of such a complex nature as indicated in Paragraph M-4? Do I have an auditable management system in place for control of block valves? If the answer to either question is no, then you should not be considering using block valves in pressure relief piping. ❖

Failure of 16" Suction Scrubber during Hydrostatic Testing

Recently, a newly constructed 16" suction scrubber was damaged beyond economic repair at a fabrication shop during hydrostatic testing. The employee involved had started pressuring the suction scrubber when he was interrupted by the noon hour bell. He stated during the investigation that he shut off the pump and left the hydrostatic test bay for lunch. Sometime during the next 30 minutes a loud bang was heard by employees in the rest area and upon investigation it was found that the scrubber had burst resulting in a 24" outwardly protruding longitudinal tear along its seamless shell. The bursting caused the vessel to be thrown off its stands and the pressure gauge and piping tree was found lying in another area of the shop. Luckily, there were no people near the vessel or in the shop area at the time of the failure, and aside from about $9,000.00 damage there were no injuries to personnel caused by this accident.

Accidents like this can serve to remind us of the dangers faced when performing routine hydrostatic tests. Staff performing repetitive tasks can often be lulled into complacency. We fail to re-assess the hazards associated with the same task performed without incident time after time. The investigation of this incident showed that the risks were not fully assessed prior to the failure. Perhaps if a pump switch of the momentary type requiring continuous operator supervision had been installed the accident would not have occurred. Maybe overpressure protection, such as a pressure relief valve set to relieve just above the hydrostatic test pressure could have prevented the failure.

This accident should remind the rest of us to always **stop**, **think**, and **act** to remove the potential risks associated with tasks that become all too familiar to us because of routine and repetition. It is a warning to us that we may not be lucky the next time. ❖

Requirements for Boiler External Piping on ASME Section I Power Boilers

Piping and fittings installed as boiler external piping (BEP) have shown inconsistencies. Many inquiries and questions have been forwarded to ABSA, asking for some clarification on this topic. This article is to provide some clarity and guidance to what BEP is, what code requirements must be met, and how they are applied.

Boiler external piping on ASME Section I Power Boilers must follow the ASME B31.1 Power Piping code.

ASME B31.1 covers boiler external piping in steam boilers rated above 103 kPa (15 psig) and high temperature, high pressure water boilers rated at pressures exceeding 1100 kPag (160 psig) or temperatures exceeding 121ºC (250ºF). ASME Section IV, Heating Boilers does not address BEP.

The term Boiler External Piping defines any piping and valves designated within the BEP zone, from the boiler to the designated valve or valves. These code jurisdictional limits are presented in ASME Section I, Fig. PG-58.31 and Fig. PG-58.3.2 and ASME B31.1, Fig. 100.1.2 A, B and C. Aside from the general design requirements described in ASME B31.1 Chapter II, Part 2, Design, the detailed design requirements for specific piping systems are described in Chapter II, Part 6, Systems. Paragraph 122 of B31.1, breaks BEP into four parts, Steam, Feedwater, Blowoff and Drain Piping. Each of these systems has specific requirements and details on the code minimum requirements are identified in Paragraph 122 of ASME B31.1.

A common inquiry or question is: what are the required pressure ratings for the fittings and valves to meet code? The design pressure ratings of piping, fittings and valves on feedwater, blowdown and drain piping on BEP, are all similar. All three systems require that the minimum design pressure be the lesser of 125 percent of the maximum allowable working pressure (MAWP) of the boiler, or 225 psig above the MAWP.

Note that paragraph 122.1.7 has very specific requirements for the pressure-temperature ratings for valves and fittings in specific piping systems, e.g. feedwater and blowdown. These requirements vary depending on the boiler MAWP, the system and the material of which the valve or other fitting is manufactured and are too lengthy to repeat here. Designers and plant maintenance personnel should be knowledgeable of the requirements of this paragraph as they relate to their specific situation.

On steam BEP, the design pressure is to be not less than the lowest set pressure at which any drum pressure safety valve (PSV) is set to blow. In this case, it is good practice to use the MAWP of the boiler so that piping, fittings and valves would not be required to be upgraded if the PSV were ever reset to a higher pressure (not exceeding the MAWP of the boiler).

In all cases, the temperature ratings and service requirements of the valves, piping and fittings must also be suitable for the service. The requirements for materials must be met and these are described in Chapter III "Materials", paragraphs 123 & 124 and Mandatory Appendix A of ASME B31.1. Also, all fittings for use in Alberta must have a Canadian Registration Number for Alberta. Finally, the use of one common model and rating of fittings for use on all BEP systems may be beneficial for interchangeability.

All piping and valves downstream or upstream of the limit of the BEP are defined as non-boiler external piping, in which case ASME B31, Pressure Piping, has jurisdiction. Therefore, either ASME B31.1 or ASME B31.3 piping may be used. The requirements for specific systems of non-BEP are listed in each of the separate systems in ASME B31.1 Chapter II Part 6 if applicable, and are also detailed in Paragraph 122.2.

We hope this article helps in providing some guidance regarding which section of the code needs to be addressed for BEP questions and concerns. Construction and repairs done to BEP systems following code requirements will minimize potential accidents and potential rework . If further interpretation or help is needed in this area, please contact your local ABSA AI. ❖

The Number One Defense Against Section IV Boiler Ruptures

The safety relief valve is the most important control valve on a boiler. Under the Safety Codes Act and Regulations it is the responsibility of the owner to ensure that the safety valves are maintained in good working order.

All Section IV boiler safety valves are required to be in the vertical position and must be able to release the boiler's entire load at the boiler's maximum operating pressure. If a safety relief valve opens and fails to reseat or cannot be opened using the hand lifting lever on the valve, the valve must be serviced or replaced.

According to ASME Section IV rules, the safety relief valve must:

- have the ASME "HV" or "V" symbol on the nameplate,
- be capable of relieving the full output of the boiler without a pressure rise of more than 10% above the set pressure of the safety relief valve,
- be set at or below the MAWP of the boiler,
- be at least NPS ¾ but no larger than NPS 4½,

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- have no intervening valves in the inlet or outlet piping,
- be spring loaded and the spring must be designed so that the full-lift spring compression is no greater than 80% the nominal solid deflection,
- have a lifting device and a mechanical connection between the lifting device and the disk, which allows lifting of the disk from the seat a distance of at least 1/16 " with no pressure on the boiler.

There are many possible causes for a safety relief valve to open, e.g. the expansion tank may be full, the automatic feed valve may have failed allowing higher than normal pressure to enter the system, or the safety relief valve may be set too low.

Remember, the safety relief valve is the number one defense against Section IV boiler failure from over-pressure. ❖

References:
ASME Section IV - Article 4, Pressure Relieving Devices
ABSA – Safe Operation and Care of Heating Boilers

Field Hydrostatic Testing: Buyer Beware

It is the intention of every designer to perform a proper, safe pressure vessel design. However, there are items which do not always get addressed. An example of such a possible oversight is the design for the supports of the vessel.

In the case of saddles, the majority of designs that have been submitted use the Zick Analysis published in September 1951, with or without the refinement of Appendix B, a later addendum to the original Zick paper. This analysis, when properly used, has been accepted as a reasonable approach for saddle calculations. The problem arises, however, when the designer or some software programs do not take into account the full weight of water in the vessel's corroded condition. The argument presented is that the manufacturer only performs a hydrostatic test in the fabrication shop. At this time, the vessel is new and uncorroded. The end result of not checking for a hydro in the fully corroded condition is that the owner may overstress the equipment when the equipment is field hydrostatic tested near the end of its service life. At this time the saddle will not be adequate and the allowable stresses as dictated by the analysis will be exceeded. This usually occurs in the circumferential stress at the horn of the saddle.

There is currently no requirement to design to a fully corroded condition with the vessel full of water. While the majority of responsible designers will take this into account, some software programs don't automatically do so. It is, therefore, up to the end user to specify this in the design specifications, e.g. by noting that the vessel and its supports must be designed to withstand a hydrostatic test with a 100% full water load in the corroded condition.

Some vessels will never be field tested in this manner and hence will not bear the loads described. However, as the vessel approaches the end of its service life, hydrotesting may become necessary after repairs or alterations.

Please note that this situation is not isolated to saddles; it may also be a problem with any support. It is ultimately the responsibility of the end user to know what kind of conditions the pressure equipment may experience and the types of environment it may encounter. Conveying this message to the designer of the equipment will ensure a safe and reliable service life.

Addressing this design detail can be as simple as increasing the contact angle of the saddle and the wear pad. Another solution is to relocate the saddles and optimize the Zick design factors and thus reduce stresses. As we can see, the remedies are often fairly inexpensive if considerations are made prior to fabrication.

This will serve as a reminder to the end user to be specific in defining design conditions when purchasing pressure equipment. It is imperative that the designer be aware of the limitations of his or her software programs. Because we strive for safe pressure equipment construction and usage, we should always make sure the worst case scenarios are taken into consideration and that designs properly address these situations. ❖

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