ABSA
the pressure equipment safety authority

THE PRESSURE NEWS

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CAUTION

Previous issues of The Pressure News may contain information which is outdated or no longer valid. Please be cautious when using information from old articles.

DESIGN JUSTIFICATION BY PROOF TEST

The ASME Boiler and Pressure Vessel Code, and other design and construction codes, contain formulas that designers are required to use to determine the geometry of pressure equipment components required to resist internal pressure. Some such components have simple geometric shapes, and in many cases, the physics is well-understood—several reliable formulas exist to determine the required thickness of a cylinder subject to internal pressure, for instance, and are used to calculate the required thicknesses of piping, vessel shells, and other cylindrical parts. Similarly, specific formulas and design procedures are prescribed for spherical components, conical components, stayed ("tied-down") plates, and unstayed plates which are secured only at their edges.

These simple geometric shapes are preferred for the design of many types of equipment as they are versatile and their properties are easily predicted, although sometimes design requirements force the use of component geometry that can't be easily described mathematically, or which published codes and standards do not provide formulas for. Although designers have several options to prove that such equipment design is as safe as required by the code of construction, one of the simplest ways is by physically constructing it and subjecting it to a proof test.

A *proof test* is a test in which a piece of pressure equipment is subjected to a pressure sufficiently in excess of its working pressure in order to prove that the design will be safe for use in service. The test equipment is filled with a liquid, subjected to a pressure that has been calculated as required by the code of construction, and the equipment's behavior under pressure is then observed and documented. In the simplest type of test, a *burst test*, the equipment is pressurized to several times its required working pressure, and the test is considered successful if the equipment is able to withstand that pressure without bursting or otherwise releasing the contained liquid. Such a test is witnessed and documentation is signed off by an official witness, typically an Authorized Inspector representing the jurisdictional authority.

Although simple in principle, proof tests are actually quite complex and many considerations must be made in order for them to adequately justify the pressure design of the component and be conducted safely. Some important points are as follows:

- Proof tests can only be used to justify the design of a component (or portion of a component) which cannot be calculated in accordance with other code rules.
- Proof tests need to consider that the material used to fabricate the tested component could have been stronger than it was required to be, and such a component would then appear to be of a safer design than it actually is. This is accounted for by testing the actual strength of the material used to fabricate the test component, and then derating the test result to account for any excess material strength.

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- Some codes of construction permit proof tests which are based on *yielding* of the material—the point at which the part begins to exhibit irreversible damage, rather than the point at which it fails completely. Such a test can be carried out at a lower pressure than would be required for a burst test, but is only permitted for components made from materials for which such damage can be easily observed, known as "materials with a definitely determinable yield point.
- Although a pressure test conducted with a liquid is much safer than one conducted using a compressed gas, component failures during the test are considered routine and expected, and can be extremely hazardous. Significant precautions must be taken to protect personnel from flying debris and other test-related hazards.
- Proof tests are performed on non-production components in order to justify their *design*; they should not be confused with hydrostatic leak tests, which are typically required for *each produced component* in order to prove sound construction.
- Witnessing and reporting requirements can depend on the applicable code of construction and the type of proof test that is used. Generally, design surveyors expect documentation adequate to satisfy themselves that the applicable requirements of the code of construction have been met.

More information about proof testing, and in particular about requirements for test documentation, is available on our website: Proof Test Method and Report Documentation Guideline. ❖

Summary of Changes to AB-528: Reduced Supervision of Plants

Following is a summary of some of the most important changes to the recently published AB-528: Requirements for Reduced Supervision of Power Plants, Thermal Liquid Heating Systems, and Heating Plants, Edition 3, Revision 0:

- When an owner chooses to designate their plant as being under reduced supervision, they are now required to notify ABSA's Examination and Certification (E&C) Department of their change in level of supervision.
- It was clarified that plants that are under reduced supervision in accordance with Section 2.1(2) of the Power Engineers Regulation, are to use the tables given in the 'Schedule' portion of the regulation to determine the level of certification required for the competent operator. It is also now specified which certificates are required for supervision, and which certificates do not qualify.
- It was clarified that when a plant operating under reduced supervision has on-site supervision suspended, an automated call-out system is a suitable alternative to manual remote monitoring of the plant.
- A new section has been added to provide guidance in determining what operating experience a person can receive credit for while working in a plant that is under reduced supervision. ❖

The National Board's 100-Year Anniversary

ABSA would like to congratulate The National Board of Boiler and Pressure Vessel Inspectors this year as it celebrates its 100-year anniversary.

The National Board was formed in December of 1919 when a need was recognized to harmonize boiler manufacturing practices between American states. It was founded with the intention of becoming the ASME Boiler Code Committee's enforcement body, with the stated objectives of establishing "one code, one inspector, and one stamp."

Within several years, The National Board succeeded in establishing a common set of qualifications for inspectors, a system to permit manufacturers to stamp inspected boilers, and a central repository for filing manufacturers' data reports. Each of these programs is still in use today throughout the world.

The National Board will be celebrating its anniversary at its general meeting in early May, in Salt Lake City, Utah. For more information about this event, please visit The National Board's website at http://www.nationalboard.org. ❖

Power Engineering Exam Results

One of ABSA's functions is the administration and enforcement of Alberta's Power Engineers Regulation. In Alberta, as in other Canadian provinces, power engineering is a regulated profession: individuals who operate most types of boilers are required to meet certain qualification and experience requirements, depending on the size of the boiler they will be required to operate.

Boilers are devices that are designed to heat water, and are commonly used to produce heat for distribution in a building, or to produce steam that can be used to drive equipment or to generate electrical power. Although they have a simple function, the fact that water expands rapidly when it changes from a liquid to a gas makes them potentially hazardous. Inadequate maintenance, uncontrolled heating, inadequate water supply, or improper operation of a boiler can lead to an explosive loss of containment. Boiler explosions are rare but are often unexpectedly severe, and have historically been a cause of serious accidents aboard ships, in buildings, and at industrial plant sites.

One of ABSA's departments, Examination and Certification, is tasked with assessing the qualifications and experience of, and administering examinations and issuing certificates to power engineers on behalf of the Alberta government. Persons who wish to obtain or upgrade a power engineering certificate must provide evidence of their qualifications and experience, and apply to write examinations specific to the certificate class they need. Once they receive a passing grade of 65% on all applicable examinations and provide satisfactory evidence of their qualifications, they are issued a power engineering certificate and are entitled to operate the types of boilers permitted for their class of certificate.

Examinations offer a unique opportunity to assess the strength of a candidate's knowledge in the various subjects covered. In the coming months, ABSA will begin to provide a summary report outlining the subject-by-subject performance for all multiple choice examination candidates, whether they have passed or failed. In the case of a candidate who passes the exam, they will now be given an opportunity to see where they may still have a personal deficit in knowledge, and they will then be able to work on their own to fill that gap in order to perform their duties as safely and effectively as possible. In the past, these summary reports were available to unsuccessful examination candidates by request only, but in the future, all candidates will be given a summary report when their examination result letter is issued.

ABSA is constantly looking for ways to improve the delivery of our programs and services, whether it's in the administration of examinations, the delivery of seminars, in design registration, or inspection-based activities. We encourage constructive feedback from our stakeholders as we constantly strive to improve the level of public safety achieved in the province, and the level of satisfaction experienced by those who benefit from our services. We welcome feedback at any time, to whatever ABSA representative you have contact with in your day-to-day dealings with our organization, or through the ABSA website. ❖

Plant Registry for Ammonia Refrigeration Facilities

In October of 2017, ABSA launched a registry for power plants, heating plants, and thermal liquid heating systems, with the purpose of keeping better track of plants that are operating in the province. This internal database has served as an easily-accessible record of plant ratings and other information that can be used to help determine supervision requirements, and to help verify the experience records provided by power engineers when they apply certification.

As a part of ABSA's response to the tragic 2017 incident in which several people were killed by exposure to ammonia at an ice arena in Fernie, British Columbia, ABSA is now extending the scope of the plant registry to include ammonia refrigeration plants. ABSA safety codes officers will be identifying plants in the province that make use of ammonia as a refrigerant, and will be visiting sites and collecting the necessary information to include them in the plant registry.

Adding ammonia refrigeration plants to the registry will assist ABSA by making important information more readily available in the event of an incident. In particular, ABSA will have contact information available for both the owner and the operator, and will have convenient access to precise information about the refrigeration capacity and the geographical location of each plant. Having such information available will enable ABSA to contact owners and operators directly if there is ever a need to communicate safety issues related to ammonia refrigeration equipment. ❖

2019 ABSA Code Update Seminar

The 2019 calendar year will prove to be a busy year for those who are required to keep up to date with Alberta's adopted codes and standards, as more than a dozen new editions of major documents are expected to be published. Such publications include new editions of CSA B51, CSA B52, and CSA Z662, and this year, their five-year publication cycles are coinciding with the two-year publication cycle used for the ASME Boiler and Pressure Vessel Code. Needless to say, you might consider planning for this year's code update seminar to be an essential part of your continuing education.

The ABSA Code Update Seminar is held each year in October, and serves industry by providing timely information about changes to some of the most commonly used codes and standards that have been adopted by regulation. It should be noted that although a large number of new publications are expected this year, only the most relevant ones will be selected for presentation at the seminar due to time constraints.

This year's seminars have been scheduled for October 10th, 17th, and 23rd, in Edmonton, Calgary, and Red Deer, respectively.

Please refer to our online registration tool at https://seminars.absa.ca for further information and to register. ❖

Documents Issued by ABSA

The following documents issued by ABSA are available at http://www.absa.ca.

2018-12-21 – *IB18-021: Reference Syllabi for Power Engineer Examinations*, was issued to remove mention of the previous editions of AB-239 and AB-240, as the grace period for use of these editions was set to expire at the end of the calendar year.

2018-12-21 – *AB-528: Requirements for Reduced Supervision in Accordance With the Power Engineers Regulation, Edition 3, Revision 0*, was issued with clarifications to reduced supervision reporting requirements and the applicability of operating experience.

Other documents have been updated with editorial and other minor corrections only. ❖

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