WINTER 2012

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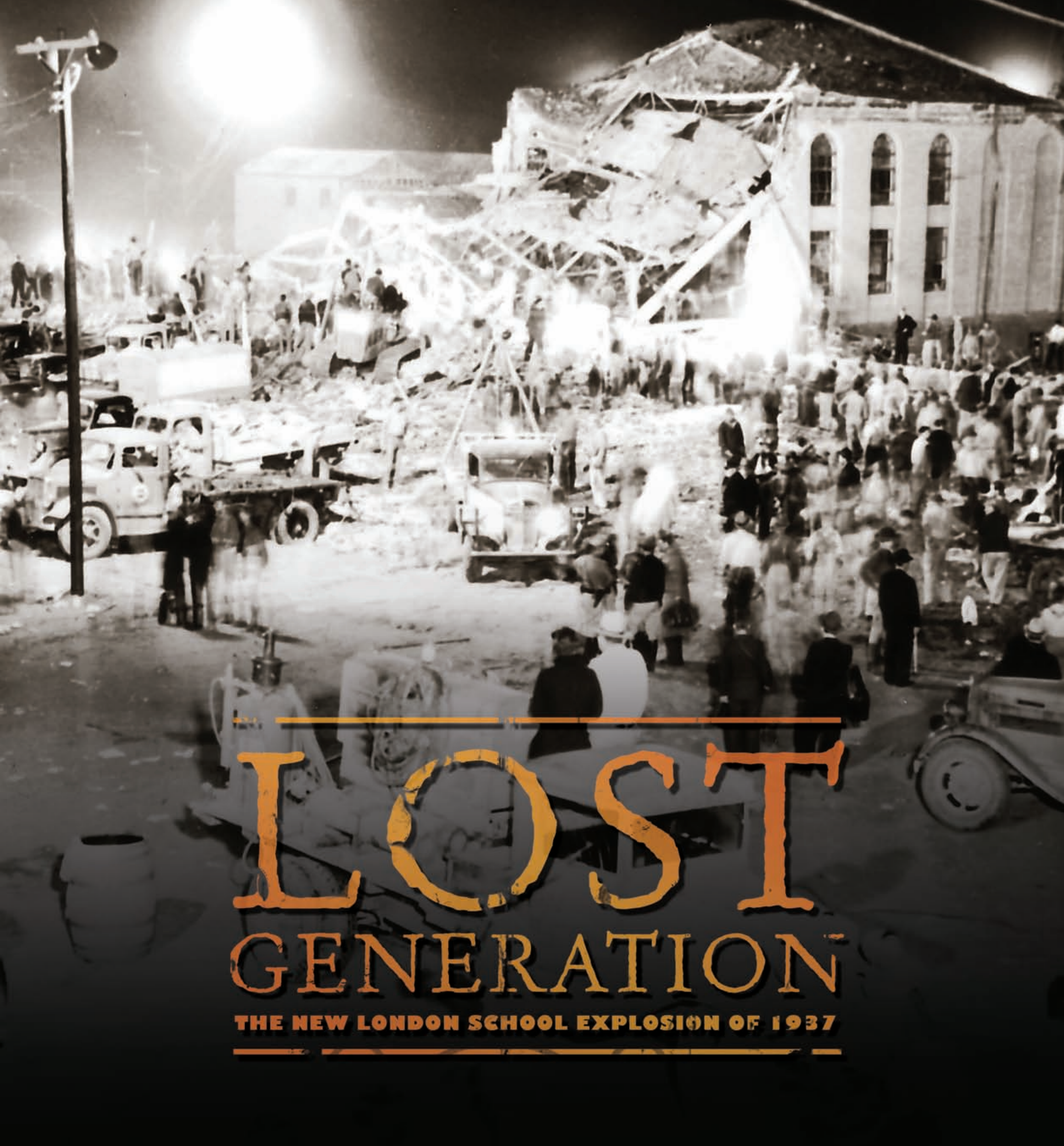
TECHNICAL JOURNAL OF THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS



LOST GENERATION

THE NEW LONDON SCHOOL EXPLOSION OF 1937

The National Board of Boiler and Pressure Vessel Inspectors was organized for the purpose of promoting greater safety by securing concerted action and maintaining uniformity in the construction, installation, inspection, and repair of boilers and other pressure vessels and their appurtenances, thereby ensuring acceptance and interchangeability among jurisdictional authorities empowered to ensure adherence to code construction and repair of boilers and pressure vessels.

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A young victim of the tragedy is cared for by one of many medical personnel who converged on the small Texas community of New London.
Photo courtesy of New London Museum.

COVER STORY

FEATURES

On the Cover:
The *BULLETIN* remembers the tragic 1937 New London School gas explosion and its significance to safety 75 years later. *Cover* ***Photo courtesy of New London Museum.***

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The Lost Generation of New London, Texas

BY DAVID A. DOUIN, EXECUTIVE DIRECTOR

March 18 will mark the 75th anniversary of what is – without question – the most devastating natural gas explosion in US history: The New London School Explosion of 1937.

Despite its notoriety, this accident is one of our industry's least-known catastrophes. Time has relegated the accidental slaughter of 294 innocent victims, mostly young children, to the bin of the forgotten and forsaken. I only learned of this explosion 10 years ago while researching another accident.

The New London tragedy is far from trivial. And that is why the National Board has chosen to focus the winter *BULLETIN* cover story on the horrible events that traumatized this East Texas community like no other. (Some of those who experienced the terrible misfortune never spoke of it. For the rest of their lives.)

This is a story that must be told. And retold again and again. For it is only through the continual remembrance of these tragic events we as an industry can humanize the critical importance of pressure equipment safety.

Replete with rare post-explosion photos, this chilling article describing the events leading to and following the conclusion of what had been an uneventful Texas school day will not be soon forgotten by readers.

Our narrative beginning on page 14 is excerpted from the forthcoming book *BLOWBACK* (releasing later this year), which will feature untold stories, little or unknown facts, rare photos, and anecdotes covering nearly two millennia of pressure equipment history.

So important were the events of March 18, 1937, we have invited R. Miles Toler, director of the New London Museum in New London, Texas, to address our General Session at the 81st General Meeting (see page 31).

Mr. Toler is included on an excellent roster of industry professionals making presentations at this year's May 14 – 18 event at the Gaylord Opryland Resort and Convention Center in Nashville. Among the list of distinguished speakers: ASME Council on Standards and Certification Senior Vice President Kenneth R. Balkey, P.E.; consultant Carl Spaeder; California Principal Safety Engineer Don Cook and ZURICH Regional Risk Engineering Manager Tim Zoltowski; and Oak Ridge National Laboratory Mechanical Engineer John P. Swezy Jr.

This year's General Meeting theme, *SAFETY PROFESSIONALS: Devoting Our Lives to Protecting Yours*, is intended to recognize those who have devoted countless hours accumulating experience, education, and the discipline required of truly dedicated safety specialists.

Further complementing our General Meeting program will be another legend who will deliver remarks during our always exciting Opening Session: astronaut Gene Cernan, the last man to walk on the moon.

In addition, the 81st General Meeting will also conduct another great guest program. Outings will include a tour of country star homes on Monday afternoon. A city highlights tour followed by a visit to the renowned Carnton Plantation in Franklin is on Tuesday (featuring a private tour/lecture by Robert Hicks, author of the *New York Times* bestseller *The Widow of the South*). The Wednesday all-day getaway is so special we called it the "*You'll Be Sorry If You Miss This Tour*" tour. Departing promptly at 9 a.m., participants will receive a backstage tour of the Opryland theatre before everyone heads to Fontanel Mansion for a special lunch and opportunity to explore the spectacular 27,000-square-foot log home formally owned and occupied by country superstar Barbara Mandrell and husband Ken Dudney.

Important note: Wednesday Night Banquet entertainment in May will be 180 degrees from what many of you are used to. Instead of traditional song, we are bringing in the highly entertaining international juggling duo, Raspyni Brothers.

As we approach March 18, please remember the victims of the New London School explosion with your thoughts and prayers.

And during the General Meeting, kindly remember the efforts of those safety professionals who work tirelessly in preventing the causes of needless tragedy. If you are a safety professional, congratulations. You are devoting your life's work caring for the well-being of others.

And it's now time to receive a little recognition of your own.

You'll find it in Nashville.

See you there!

National Board *Synopsis* Update

The National Board has completed its annual jurisdictional authorities survey for the purpose of updating the 2011 *SYNOPSIS OF BOILER AND PRESSURE VESSEL LAWS, RULES, AND REGULATIONS*. Jurisdictions reporting amendments are individually listed below followed by the *SYNOPSIS* sections in which the adjustment(s) occurred.

Please be reminded:

- *SYNOPSIS* data is subject to change without notice. Consequently, users should directly consult appropriate jurisdiction officials regarding any actions having significant financial, legal, or safety ramifications.
- All data on the National Board Web site is updated to reflect changes in the following categories:

STATES

Alabama – *Rules for Construction and Stamping;* **Arizona** – *Miscellaneous;* **Arkansas** – *State Fees;* **Colorado** – *State Department, Date of Law Passage, Rules for Construction and Stamping,* and *Certificate of Inspection;* **Connecticut** – *State Department, Date of Law Passage,* and *Rules for Construction and Stamping;* **Delaware** – *Empowerment, Rules for Construction and Stamping, Inspections Required, Insurance Inspection Requirements, Certificate of Inspection, State Fees, Miscellaneous, Date of Law Passage,* and *Objects Subject to Rules for Construction and Stamping;* **Florida** – *Miscellaneous;* **Illinois** – *Date of Law Passage;* **Indiana** – *Rules for Construction and Stamping;* **Iowa** – *State Department* and *Rules for Construction and Stamping;* **Kansas** – *State Department* and *Date of Law Passage;* **Kentucky** – *State Department;* **Massachusetts** – *State Department, Rules for Construction and Stamping,* and *Objects Subject to Rules for Inspection and Stamping;* **Michigan** – *State Department, Empowerment, Rules for Construction and Stamping,* and *Objects Subject to Rules for Construction and Stamping;* **Minnesota** – *Date of Law Passage, Objects Subject to Rules for Construction and Stamping, Miscellaneous,* and *Inspections Required;* **Mississippi** – *State Department;* **Montana** – *State Department, Miscellaneous,* and *Rules for Construction and Stamping;* **Nebraska** – *State Department;* **Nevada** – *Rules for Construction and Stamping;* **New York** – *State Department;* **North Carolina** – *Date of Law Passage, Rules for Construction and Stamping,* and *Objects Subject to Rules for Construction and Stamping;* **North Dakota** – *Date of Law Passage, Insurance Inspection Requirements,* and *Miscellaneous;* **Ohio** – *Date of Law Passage, Rules for Construction and Stamping,* and *Miscellaneous;* **Oklahoma** – *Certificate of Inspection;* **Oregon** – *Rules for Construction and Stamping* and *Objects Subject to Rules for Construction and Stamping;* **Pennsylvania** – *Rules for Construction and Stamping, State Fees, State Department, Insurance Inspection Requirements,* and *Miscellaneous;* **South Dakota** – *State Department;* **Washington** – *State Department* and *Rules for Construction and Stamping;* **West Virginia** – *State Department;* **Wisconsin** – *State Department, Empowerment,* and *Date of Law Passage;* **Wyoming** – *State Department.*

CITIES

Albuquerque – *Rules for Construction and Stamping, Certificate of Inspection,* and *Inspections Required;* **Detroit** – *Municipal Fees;* **Los Angeles** – *Date of Law Passage* and *Certificate of Inspection;* **Miami** – *Municipal Department;* **Seattle** – *Municipal Department, Inspections Required, Insurance Inspection Requirements,* and *Miscellaneous;* **Spokane** – *Date of Law Passage;* **Washington, D.C.** – *Municipal Department.*

COMMONWEALTH OF PUERTO RICO – *Inspections Required* and *Commonwealth Fees.*

PROVINCES

Alberta – *Date of Law Passage* and *Rules for Construction and Stamping;* **British Columbia** – *Provincial Department, Date of Law Passage, Rules for Construction and Stamping, Objects Subject to Rules for Construction and Stamping, Inspections Required,* and *Miscellaneous;* **New Brunswick** – *Rules for Construction and Stamping* and *Provincial Fees;* **Nova Scotia** – *Provincial Department;* **Prince Edward Island** – *Provincial Department;* **Quebec** – *Provincial Department, Rules for Construction and Stamping,* and *Provincial Fees;* **Saskatchewan** – *Provincial Department.*

NO CHANGES

STATES: California, Georgia, Hawaii, Louisiana, Maine, Missouri, New Jersey, Rhode Island, Texas, Vermont.

CITIES: Buffalo, Chicago, Milwaukee, Omaha.

PROVINCES/ TERRITORIES: Newfoundland & Labrador, Northwest Territories.

A Key Challenge for ASME Standards & Certification

Managing for Global Relevance

By Joseph Wendler, P.E.

Last in a two-part series highlighting the relationship between the National Board and ASME.

As noted in Executive Director David Douin's column in the summer 2010 *BULLETIN*, and Board Chairman Jack Given's interview in the fall 2011 *BULLETIN*, a significant trend for both ASME and the National Board is an increase in global interest in their respective standards and conformity assessment programs. This holds particularly true for energy-related industries, such as the building and operation of power plants and the development of oil and gas infrastructure and services, where the value of safety and quality is universally recognized.

In my previous article, I outlined ways in which ASME and the National Board are connected. The focus of this article is to examine specific trends in global growth, understand the drivers for globalization, and to look at ways ASME is managing global growth. In doing so, stakeholders of the National Board may gain insight regarding how the two organizations can continue to work together to successfully manage these challenges.

Growth Statistics and Drivers for Global Growth

In a way, it can be said ASME's entrance into the realm of globalization was by force, rather than by design. The story of ASME Standards & Certification's international growth began in 1970, when the US Department of Justice filed an antitrust suit against ASME and the National Board for not providing consistent access to boiler and pressure vessel accreditation systems to manufacturers based outside the US and Canada. Although the unavailability of ASME's services world-wide was not intentional, it was determined the limitation of these services precluded foreign manufacturers from gaining access to the US market, and therefore posed a restraint of trade. Consequently, in 1972 ASME entered into a consent decree to ensure its conformity assessment marks were available to all manufacturers, domestic and foreign, on a consistent basis. Likewise, the consent decree also created an agreement that vessels manufactured in foreign countries and imported into the US had to be registered with the National Board. Thus, it became apparent ASME needed to think about its standards and conformity assessment operations on a larger scale – and globalization has been a continuing focus ever since.

One measure of ASME's effectiveness in meeting the challenges of globalization is the steady growth in the number of countries in which organizations certified by ASME are located. The first ASME certificate to be issued outside of North America was awarded on November 15, 1972 (a distinction belonging to De Dietrich & Cie., of Alsace, France). Since that time, ASME's Boiler and Pressure Vessel and Nuclear Component certifications have expanded its reach to over 75 countries (see Figure 1).

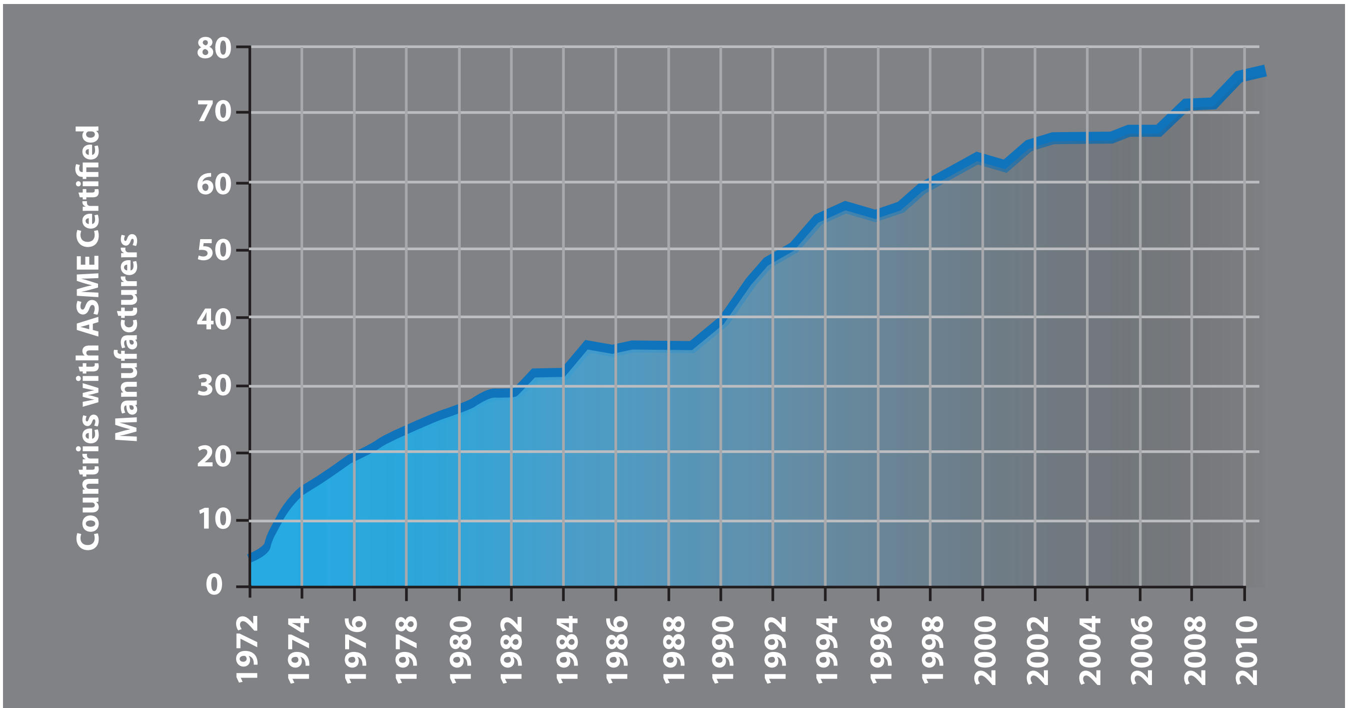


Figure 1. Countries with Manufacturers having ASME Boiler and Pressure Vessel and Nuclear Certifications

Another metric is the total number of ASME-certified manufacturers of boilers, pressure vessels, and components, which currently stands at over 6,200. As noted in Figure 2, while the market for certified manufacturers within the US is holding steady, significant growth is occurring elsewhere. A key milestone was reached in 2010, when the number of international certificate holders surpassed domestic ones.

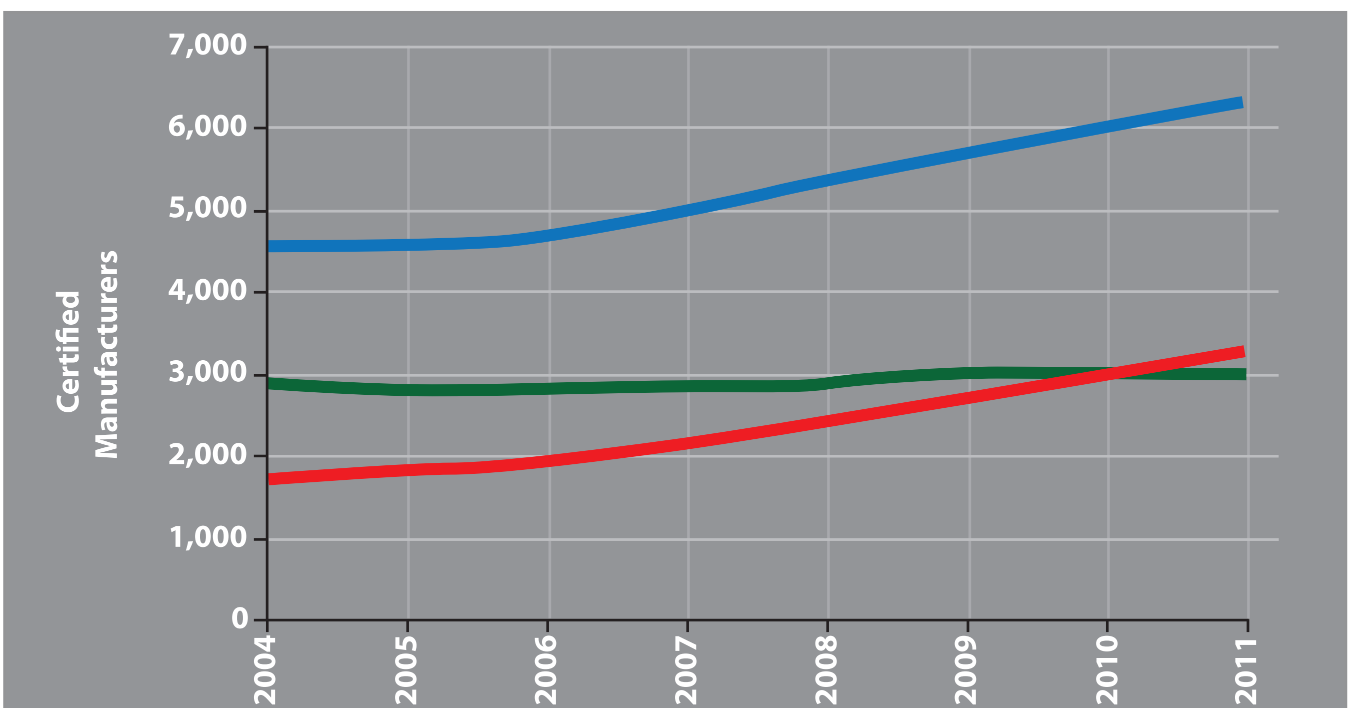


Figure 2. Number of Manufacturers with ASME Boiler and Pressure Vessel and Nuclear Certifications

Further examination of the data reveals which markets, in particular, are increasingly using ASME's conformity assessment programs. Figure 3 shows the growth of ASME certificate holders in China and India. Lastly, one can also look at growth in the number of individuals who participate in ASME's standards developing committees. Since ASME began tracking global participation data in 2007, the number of international volunteers serving on its standards development committees has increased over 5% annually. At present, over 13% of ASME's Standards & Certification volunteers now reside in 40 countries outside the US.

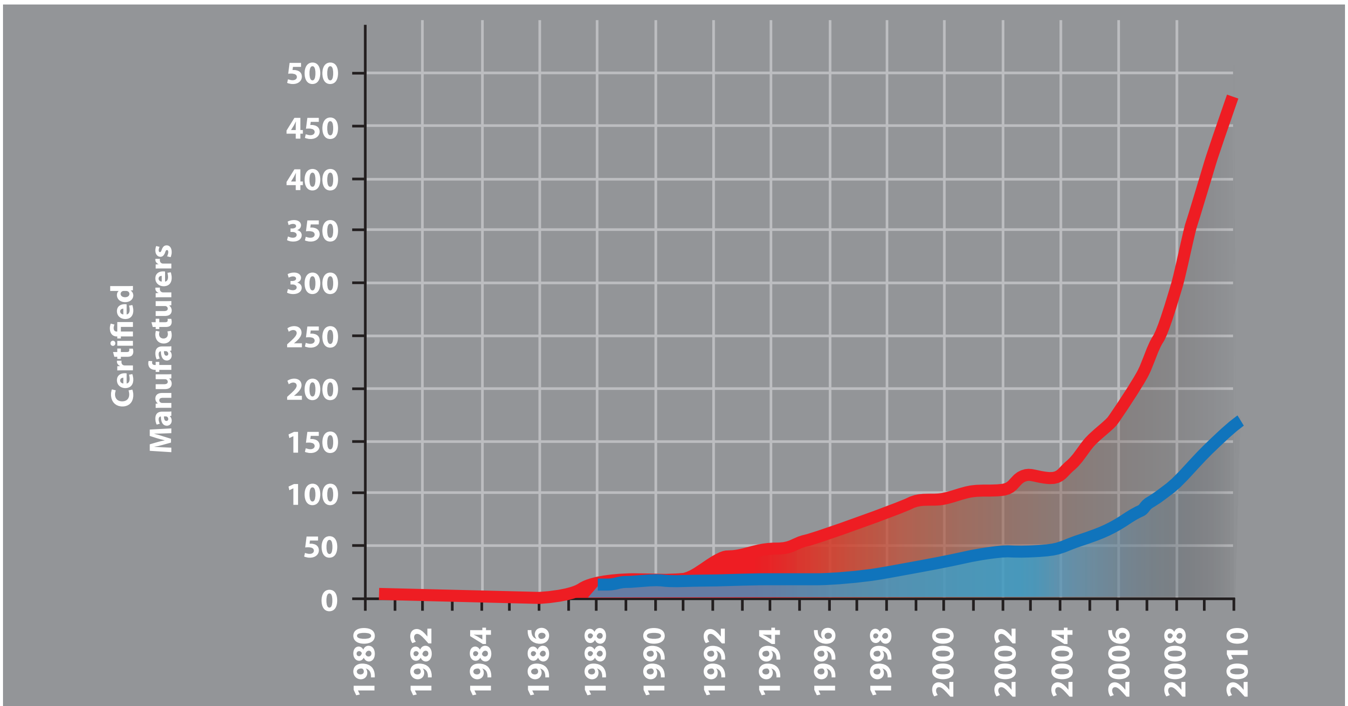


Figure 3. Number of Manufacturers with ASME Boiler and Pressure Vessel and Nuclear Certifications in China and India

So what are the drivers for this growth? Perhaps most important, the increasing global population – and in particular the growing expectations of developing regions for access to energy – yields an increased demand for energy-providing goods and services. Underscoring this point, according to data from the International Trade Center, machinery (including products like nuclear reactors and boilers) is among the top traded commodities today and accounts for over $1.7 trillion (and roughly 11%) of global trade each year.

Another driver is in mergers and acquisitions. Many businesses – particularly manufacturers – are choosing to locate operations in countries having a lower cost of production or located closer to their end market. A company with headquarters in the US may build a factory in China, and then export subassemblies not only back into the US, but to other parts of the world as well. (With globalization, the very concept of what constitutes a foreign company versus a domestic company, and an export versus an import, can get somewhat fuzzy.) But regardless of the precise dynamics of international mergers, acquisitions, and trade flows, one thing is evident: compliance with different standards for different markets drives up costs for producers and consumers alike, and the call for global convergence in standards is loud and clear.

Managing Growth

To be sure, growth in emerging economies is beyond any single entity's control – and globalization obviously isn't a phenomenon limited to industries served by ASME's and the National Board's products and services. However, in the areas of standards and conformity assessment, one of the challenges both organizations face is how to rapidly address local and regional needs, including incorporation of technological advances and "lessons learned," while maintaining levels of quality and technical rigor instrumental to our collective success.

Given the complexity and continuous evolution of industrial and political landscapes, ASME's objective is not to be the only standard used around the world, rather it is to ensure our standards are accepted as equivalent to any relevant local or national standards and as a means of satisfying local regulatory requirements (or simply accepted "as is"). Consequently, ASME's strategy is to identify materially-affected stakeholders and work cooperatively to achieve technical alignment, while advocating for the ability of industries and governments to select standards that best meet their needs, regardless of geographic market.

One strategic priority, therefore, is making it more convenient for people to participate in ASME's standards development activities, irrespective of their nationality or preferred language. To this end, ASME has created several participation mechanisms (in addition to its traditional constituency of individual experts) which include delegates, contributing members, international interest review groups, and the formation of working groups conducting ASME committee business locally and in their native language. Examples of these international working groups include one addressing gas pipelines in India and another on nuclear power plant construction in China.

Participants in the first operating meeting of the ASME China International Working Group on Section III Nuclear Components, Shanghai, July 2011.

ASME has also facilitated participation by investing in information technology and the development of electronic tools tailored to enable standards development and communication on a global basis. Committee members can monitor and participate in standards development, and certificate holders can monitor conformity assessment activities at any hour of any day, from anywhere in the world, with a computer and Internet connection.

Besides focusing on membership and accessibility, ASME has been active in developing memorandums of understanding (MOUs) with global partners. For example, this past spring ASME signed MOUs with the Nuclear Power Institute of China (NPIC) and the Korea Agency for Technology and Standards (KATS). Both MOUs focus on information exchange; support for standards development, and reference/adoption of ASME standards; promotion of ASME conformity assessment activities; facilitating committee participation; and potential cooperation in training and workshops. ASME currently has 19 similar MOU's with government, industry, and professional organizations around the world. It is continuously exploring additional arrangements necessary to maximize global relevance.

Recognizing not all regions conduct business in English, ASME Technical Committees have translated several of its most popular standards into other

June Ling, associate executive director, ASME Standards & Certification, poses with Hyeong Ki Choi, director general of the Korea Agency for Technology and Standards (KATS) after signing memorandum of understanding in Busan, South Korea, March 2011.

languages, which are then adapted for local application. Section I (Power Boilers) of the *ASME Boiler and Pressure Vessel Code*, and B31.8S, *Managing System Integrity of Gas Pipelines*, both translated into Spanish, are two recent examples, and translations of other standards are in process.

Another trend has been in conducting more face-to-face meetings outside of North America. While everyone recognizes the importance of minimizing costs to participate, many of ASME's constituents also derive value from having face-to-face meetings – particularly when paired with complimentary business opportunities such as workshops and site visits, which help in obtaining input and perspectives that would not otherwise be available. For example, ASME's Council on Standards and Certification (which has overall responsibility for ASME's 500+ standards, 10 conformity assessment programs, and over 800 committees) recently held a meeting in Brussels, Belgium. This venue enabled Council members to hear from a range of organizations with mutual interest in standards development, including the World Trade Organization (WTO), the International Organization for Standardization (ISO), the European Committee for Standardization (CEN), the United States Mission to the European Union, and the European Commission.

Having a clear picture of potential gaps and overlaps in different markets is critical to making "smarter" standards, and as our membership becomes more geographically diverse, so too do our meeting locations. (Many readers may recall that up until the mid-1990s, the joint meeting with ASME's boiler and pressure vessel code committees and the National Board held in May each year was the only meeting outside of New York City. The resulting legacy is that May code meetings are occasionally still referred to as the "out-of-town meeting," despite the fact that virtually every standards meeting is held "out of town" these days.)

While standards often serve governments as a means of meeting their public safety, health, and/or environmental objectives, ultimately the power to regulate – and the responsibility for protecting their constituents – is left up to the authorities having jurisdiction. This important role makes them key stakeholders; however, just as standards developers cannot cater to the needs of a single manufacturer, insurer, or user group, neither can they cater to a single jurisdiction. With globalization, standards developers are forced to expand their scope beyond local, state, and federal regulators, and also consider the needs of foreign governments. It may surprise some that due in part to regulatory adoption of ASME's B31 piping codes, natural gas and oil pipelines in India are very similar to those in California.

In some instances, facilitating global relevance requires supporting both prescriptive and performance-based standards for the same family of products. With boilers and pressure vessels, for example, ASME and other standards bodies collaborated with the International Organization for Standardization (ISO) in the development of a performance-based umbrella standard with a registration process for prescriptive standards from around the world, thereby facilitating the compatibility of potentially competing systems. In other instances, such as in the areas of piping and flanges, other standards developing organizations may choose to include a normative reference to ASME standards within their standards, thereby enabling the ASME standard to be accepted "as is". Given the diversity of industries and environments, however, a one-size-fits-all approach is typically not possible, and very often solutions need to be evaluated on a case-by-case basis.

One final challenge is in helping workers obtain the skills needed to perform their jobs. In a global environment, providers of workforce training need to offer training materials both accessible and consistent, while also accommodating regional preferences. In order to facilitate the use of its standards and conformity assessment programs, ASME is expanding its training content and personnel certification programs, and developing both online and in-person delivery methods with multiple types of end-users in mind.

Final Thoughts

There is ample evidence that globalization is a force to which both ASME and the National Board must continue to respond. ASME is fortunate to have a long history of bringing together stakeholders with diverse (and often competing) interests, openly facilitating consensus while maintaining technical rigor and ensuring due process for all. While this has greatly added to its institutional knowledge and provided it with widely recognized credibility, in a global economy the ability to respond rapidly to continuously evolving landscapes is necessary for sustained success. According to June Ling, associate executive director of ASME Standards & Certification, perhaps the greatest challenge for ASME and its standards work will be remaining technically and globally relevant.

As the saying goes, "What got us here might not get us there."

Joseph Wendler P.E. is a project engineering manager for ASME Standards & Certification. He has previously served as secretary of the Boiler and Pressure Vessel Committee on Welding and Brazing (Section IX), the B31.3 Process Piping Committee, and numerous Safety Codes & Standards committees.

Common Misconceptions When Applying Code Rules: Part 3

BY PATRICK M. NIGHTENGALE, SENIOR STAFF ENGINEER

The third in a series of articles intended to focus on areas in the ASME code where requirements may be misunderstood. Previous National Board BULLETIN *articles in this series appeared in the fall 2008 and summer 2009 issues.*

ASME Section VIII, Division 1, Heat Treatment of Test Specimens

ASME Section VIII, Division 1, paragraph UCS-85 has rules applicable to vessel manufacturers for heat treatment of carbon and low-alloy steel material test specimens. The requirement considers one of two possibilities. The first possibility is heat treatment of material used in the vessel above the lower transformation temperature, such as annealing and normalizing. Above the lower transformation temperature, changes within the material occur, which affect its mechanical properties. The second possibility is postweld heat treatment (PWHT) of vessel material below the lower transformation temperature, such as stress relieving. Stress relieving of welds can also affect the mechanical properties of adjacent vessel material.

Paragraph UCS-85(c) establishes test specimen heat treatment requirements and exemptions. A notable exemption by reference to paragraph UCS-85(f) is P-No. 1, Groups No. 1 and 2 materials (see ASME Section IX, Table QW/QB-422), and all carbon and low-alloy steels used in the annealed condition as permitted in the material specification. These exemptions apply when heat treatment is limited to PWHT below the lower transformation temperature of the material.

When an exemption per paragraph UCS-85(c) cannot be applied, the vessel manufacturer must inform the material manufacturer of the heat treatment temperature, time, and cooling rates to which the vessel material will be subjected during fabrication. The material manufacturer will then subject material test specimens to similar heat treatment so that mechanical property values listed on material test reports are representative of the fabrication heat treatment affecting the vessel material. (As an alternative, testing as described herein may be performed by or under the control of the vessel manufacturer who will supplement original material test reports with mechanical property test results required by the material specification.) The type and number of tests and test results shall be as required by the material specification. The total time at temperature of material test specimens shall be at least 80% of the total time at temperature during actual heat treatment of the vessel, and may be performed in a single cycle, regardless of the actual number of fabrication heat treatment cycles.

Example:

Apply rules of paragraph UCS-85(c) and Table UCS-56 for the performance of PWHT.

Conditions:

- P-No. 3, Group No. 3 plate material.
- SA-299, Grade B, 2 inches (50 mm) thick, supplied in the as-rolled condition.
- Code minimum PWHT time at temperature during fabrication: 120 minutes.
- 80% time at temperature of the material test coupons, actual: 96 minutes.

Based upon the example, if the time-temperature recording for PWHT of the vessel is exactly 120 minutes, ASME code requirements have been met. But if the time-temperature recording for PWHT of the vessel identifies the total time at temperature as 121 minutes or more, code requirements will not be met. This is because the material test specimens would have received less than 80% of the vessel fabrication PWHT time at temperature.

What can be done to ensure code requirements are met? Thorough planning! Before performing heat treatment of test specimens on the vessel, determine what minimum code requirements apply regarding the performance of heat treatment, and whether performed above or below the transformation temperature of the vessel material. Transformation temperatures are not published in ASME Section VIII, Division 1, but may be found in various engineering and materials publications. Consider production heat treatment practices regarding variations in actual time at temperature. The vessel manufacturer's heat treatment department or its subcontractor may routinely run longer on time. Consider the possibility of welded repairs performed after the initial heat treatment cycle which may require the performance of additional heat treatment. Add up all the possible heat treatment minutes that may apply to the vessel, and then establish a minimum time for the material test specimen heat treatment based on 80% of the maximum time the vessel materials may receive.

ASME B31.1, Power Piping, Boiler External Piping, and Permitted Materials

The introduction to ASME B31.1, Power Piping, identifies typical applications which include piping found in electric power generating stations, industrial and institutional plants, geothermal heating systems, and central and district heating systems. ASME Section I, Power Boilers, limits the application of ASME B31.1 to boiler external piping as defined in PG-58.3 and referenced figures. ASME B31.1, paragraph 100.1.2(A), references boiler external piping to include steam, feedwater, blowoff, blowdown, and drain piping connected to boiler piping. This limits our interest in the use of ASME B31.1 to those few applications. The remainder of ASME B31.1 is outside the scope of ASME Section I power boiler construction.

It is important to recognize that the various ASME code sections, while having many similarities, have significant differences.

A review of ASME B31.1, paragraph 123.1.1(B) identifies permitted power piping materials as shown in mandatory Appendix A. All Appendix A material specifications are ASTM materials. Unlike other ASME construction code sections which require the use of ASME materials for pressure applications, ASME B31.1 specifies the use of ASTM materials with an option in paragraph 123.1.1(D) to use ASME materials. Question: Is the use of ASTM materials in the fabrication of power piping permitted? The answer is yes. Question: Is the use of ASTM material for boiler external piping permitted? The answer is no. Upon further study, paragraph 123.2.2 requires that boiler external piping material be specified in accordance with ASME SA, SB, or SFA specifications. When looking at ASTM materials listed in Appendix A, the reader must select the corresponding ASME material for a given specification and/or grade, type or class. In addition, when a material included in Appendix A references Note (1), that specification and/or grade, type, or class is not permitted for pressure-retaining parts of boiler external piping.

It's easy to overlook paragraph 123.2.2, especially since piping installers are permitted to use ASTM material in general power piping applications. For boiler external piping, recertification of ASTM materials to ASME material specifications per 122.3.2.2 may be performed by a comparative review of ASME Section II, Table ED-1, provided the year of the ASTM specification used to produce the material is known. Recertification may also be performed as required in ASME Section I, paragraph PG-10.

Material Certification and Material Marking Requirements

As applied to ASME code pressure-retaining material, two questions must be asked regarding material certifications. First, when are material test reports or certificates of compliance required to demonstrate compliance?

And second, when do material markings alone demonstrate certification? The answer depends on the code of construction requirements.

Material Certification

ASME Section I has no requirements for material certifications. ASME Section IV, paragraph HF-201(c) establishes a requirement for material test reports for plate products. Section VIII, Division 1, paragraphs UG-93(a)(1), UG-93(b) and (c) establish requirements for plate product material test reports (generally applicable to ferrous materials) or certificates of conformance (applicable to many non-ferrous materials) as provided for in the ASME Section II material specification.

When non-ASME material is proposed for recertification to an ASME material specification in a pressure-retaining application, ASME Sections I, IV, and VIII, Division 1 have requirements for a review of the certification to which the material was originally certified regardless of material product form (see PG-10, UG-10 and HF-206.)

These minimum material certification requirements are established by the respective ASME code section. Manufacturers may commit to additional material certification through their quality control system. When that happens, any additional requirements become mandatory and need to be verified for compliance.

Material Marking

ASME Section I, paragraph PG-5.1 states, "material subject to stress due to pressure shall conform to the requirements of the material specification and the boiler manufacturer shall ensure proper identification before proceeding with construction." ASME Section IV, paragraph HF-210 states, "material for pressure parts shall carry identification marking as required by the material specification." ASME Section VIII, Division 1, paragraph UG-93(a)(1) requires, "complete compliance with the material specification" for plate. UG-93(a)(2) identifies a limited marking requirement for all product forms other than plate (castings, forgings, pipe, etc.).

Once material is received and markings verified as complying with ASME code requirements, manufacturers must maintain material identification and traceability as required by the construction code section. All material for ASME Sections IV and VIII, Division 1 applications require identification traceable to the original required marking through completion of the boiler or pressure vessel. ASME Section I has similar requirements for plate material and is silent for other product forms. The permitted methods of maintaining traceability to the required markings are by either accurate transfer to a location where the markings remain visible on the completed boiler or pressure vessel, or a coded marking traceable to the original required markings. If only the coded marking is visible on the material, the manufacturer must record the original required markings. Additionally, ASME Section I requirements for plate and ASME Section VIII, Division 1 requirements for all product forms permit recording required markings using methods such as material tabulations or as-built sketches. Regardless of the method employed, control of material identification must be in accordance with the manufacturer's quality control system.

Conclusion

It is important to recognize that the various ASME code sections, while having many similarities, have significant differences. Permitted materials, heat treatment, material certification, and marking requirements are the focus of this article because if applied incorrectly, their differences may affect compliance with ASME code requirements and safety. A "one size fits all" approach will not work. For example, a manufacturer holding ASME code *Certificates of Authorization* for both ASME Section I, Power Boilers; and Section VIII, Division 1, Pressure Vessels, may not realize the extent of the differences if their normal fabrication work requires the use of only one of their certificates and their knowledge based on that application. If a contract is accepted for construction requiring the use of their other certificate, problems may result because of the differences. Also, an authorized inspector who routinely works with one ASME code section may likewise be less knowledgeable about requirements of other ASME code sections.

The differences are in the details. Requirements are not the same between differing ASME code sections. Validate your thoughts by a study of the proposed construction and review the applicable ASME code section requirements. ASME code requirements are mandatory. The public at large deserves nothing less. ♣

Boiler External Piping (BEP)

Introduction to a Three-Part Series on Steam, Feedwater, and Blowoff Piping

By Steve Kalmbach

As a contractor, service technician, and ASME and National Board Certificate Holder, I've had an opportunity to see and work on a wide variety of boiler systems that have been installed both in and out of compliance with the *ASME Boiler and Pressure Vessel Code*. After becoming an ASME **S** Certificate Holder, I became very involved with ASME B31.1 Power Piping code requirements for boiler external piping (BEP), primarily threaded piping.

A great number of boilers that National Board commissioned inspectors will likely look at incorporate threaded piping for their construction and installation. This three-part series on steam, feedwater, and blowoff piping will assist inspectors in determining if boilers are in compliance with the ASME code requirements and, therefore, jurisdictional requirements. Following these rules will give long and safe operation to these critical systems. But first, to understand BEP requirements, knowing how the code is structured and which organization has authority is fundamental.

STRUCTURE AND AUTHORITY

Who can install BEP and what are the requirements? Where does BEP start and where does it stop? What documentation is required? What is ASME B31.1 Power Piping? These and many other questions are frequently asked by individuals unfamiliar with the code requirements when they hook up a boiler or have been told by an inspector that the installed piping is not in compliance with the code requirements.

The rules for BEP apply only to the *ASME Boiler and Pressure Vessel Code*, Section I, Power Boilers. ASME Section IV and Section VIII vessels do not reference ASME B31.1 Power Piping. For an ASME Section I boiler, the termination point for the boiler proper is defined as the first connection for piping. This can be a circumferential weld, a threaded connection, a flanged connection, or other connection that is in compliance with the ASME rules. The boiler proper and everything up to the termination point is the sole responsibility of the ASME Section I code. This code determines all of the requirements for the construction of power boilers, including BEP, some requirements of which are delegated to the ASME B31.1 code.

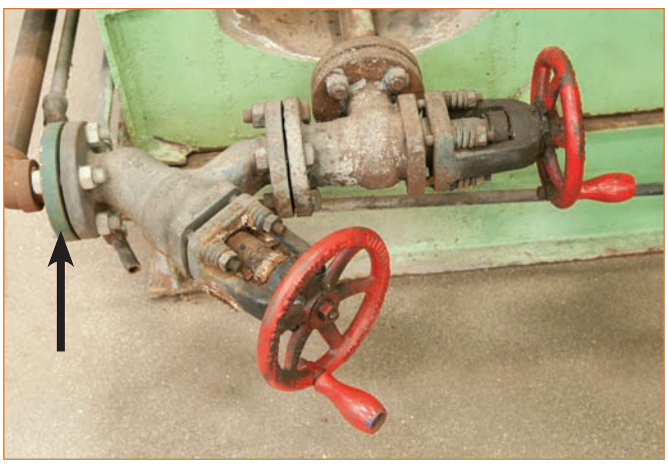
Piping from the connection point on the ASME Section I boiler proper to the outboard face of the valve or valves as defined by the ASME Section I, PG-58 for boiler external piping, becomes piping which is covered by the ASME Section I code for inspection and documentation, and the ASME B31.1 code for materials, design, fabrication, installation, and testing rules (see ASME Section I Preamble).

After the termination point of the BEP, there is still some piping used with boilers, which ASME B31.1 defines as non-boiler external piping (NBEP). This piping is used in the operation of the boiler but is not required to meet requirements for BEP, such as documentation and code stamping. The NBEP can include, but is not limited to, steam, water, oil, gas, and air service piping.

> The rules for BEP apply only to the ASME Boiler and Pressure Vessel Code, Section I, Power Boilers.

DOCUMENTATION AND AUTHORIZATION

The question of what documentation is required for piping within BEP can be confusing at times. Welded piping must meet the requirements of B31.1, which mandates compliance with ASME Section IX. This requires the use of welders certified to ASME Section IX requirements with qualified procedures. The B31.1 code also mandates requirements for any postweld heat treatment and/or nondestructive examination that may be required. To be code compliant, an ASME Section I, Master Data Report Form shall be completed by an **S**, **E**, or **M** *Certificate of Authorization* holder. BEP installed by others shall be documented using a P-4A data report for welded piping, which has to be filled out and signed by the holder of an **S** or **PP** *Certificate of Authorization*. No other ASME *Certificate of Authorization* holder can accept the responsibility for this piping to show it is in compliance with the code. The data report shows the design conditions of the piping and the hydro testing of the piping after installation. Field assembly may be performed by an ASME **A**, **S**, or **PP** Certificate Holder. Such field assembly and testing of the complete boiler unit shall be documented on the Master Data Report Form.



Blowoff valves on 250 psi steam boiler. Code jurisdictional limits include both valves and end at the arrow.

There is also some confusion with threaded piping (mechanically-assembled piping). ASME Section I, PG-109.4 states that mechanically-assembled piping may be installed by an organization not holding a *Certificate of Authorization*. However, the mechanically-assembled piping must be documented by a signed data report showing the piping is in compliance with the code. In this case, a *Certificate of Authorization* holder is accepting responsibility for all code requirements of the piping and performing the required hydro test even if he did not do the work. Threaded piping is documented on an ASME P-4B data report. As with the ASME P-4A data report that requires a signature of an **S** or **PP** Certificate Holder, an **A** Certificate Holder may also sign an ASME P-4B data report.

SCOPE OF WORK

The scope of work that **S** Certificate Holders can perform is broad. Not only can they fabricate an ASME Section I boiler, they can also fabricate ASME Section I parts such as headers, drums, and other pressure components. They are also permitted to fabricate power piping used in BEP services.

The scope of work for **A** Certificate Holders is slightly more restrictive. They can only perform work designed by an **S** *Certificate of Authorization* holder and will be subordinate to same for field assembly requirements. They are not permitted to fabricate individual parts for use by others. Such parts must be supplied by either an **S** or **PP** Certificate Holder.

The scope of work for **PP** Certificate Holders is even more restrictive. They can design and fabricate ASME BEP as required. They can assume the design responsibility for piping in ASME BEP. They can also fabricate parts for ASME Section I boilers as outlined on PG-109.3(b), provided some other organization assumes the responsibility for the design. Because the code allows mechanically-assembled piping to be installed by an organization not holding a *Certificate of Authorization*, yet requires that piping be certified by a certificate holder, there is some confusion. Problems occur when contractors, thinking they are in compliance with the code, install a new boiler and mechanically assemble the BEP. When the inspector performs the first inspection and discovers there is no code documentation as required and does not issue a certificate of operation because of this, there is a mad scramble by the contractors to get the paperwork signed. They then approach a *Certificate of Authorization* holder and ask them to sign the data report so the job can be finalized and completed. However, the certificate holder would probably be hesitant to sign the data report because most quality control manuals do not have provisions for accepting work performed by an organization not holding the appropriate *Certificate of Authorization*. When certificate holders sign the data report, they are accepting full responsibility for it.

Now that a foundation has been laid as to how the ASME Section I code and the ASME B31.1 Power Piping code work together and support each other, part one in this series will focus on steam piping to see if it can "handle the pressure."

Look for Steve Kalmbach's article, "Boiler External Piping (BEP), Part 1 – Steam Piping" in the *BULLETIN* summer issue.

Steve Kalmbach has been involved in the boiler repair, maintenance, and service industry for 40 years. His company, Kasco, has been in operation for 28 years and has a National Board ***R*** Certificate of Authorization *for repairs and alterations and an ASME* ***S*** *and* ***U*** Certificate of Authorization *controlled by their office in Golden, Colorado.*

LOST GEN

The New London School Explosion of 1937

Photos courtesy of New London Museum.

New London School constructed after the explosion.

ERATION:

This year marks the 75th anniversary of what is undoubtedly the most horrific, yet profoundly significant, gas explosion of the twentieth century. And while it extinguished the lives and futures of several hundred school children, this incident paradoxically resulted in safeguards that have since protected the lives of innumerable human beings around the world. Sadly, to this day, events of the New London School explosion remain unknown to many both outside and within the pressure equipment community.

There is perhaps no scene more unsettling than a natural gas explosion.

Shredded personal effects, mortar, shingles, wood splinters, and the pungency of smoldering embers make for sobering imagery. Multi-story residences having stood in place for decades are instantly dispatched, leaving but a crater as a reminder of the building's former address.

While natural gas has significantly improved the well-being and lifestyle of generations, it has been responsible for some extraordinarily gruesome catastrophes, the most devastating of which occurred March 18, 1937, at a high school in the East Texas oil field community of New London.

The time was just after 3:00 p.m. and in just a few moments, fifth to eleventh graders destined for home would soon be making their afternoon exodus.

This school, by all accounts, was an attractive building. Framed of steel, the E-shaped structure had modernistic flair and was a source of pride for the residents of New London.

And why not? Located in northwest Rusk County atop some of the richest oilfields in Texas, New London was among the most affluent rural school districts in the country.

But no one objected when school administrators – for purposes of controlling costs – decided to forgo a central steam heating plant or boiler room when the school was constructed in 1932. After all, the oil fields were flush with natural fuel and tapping a seemingly endless supply of residue gas would result in savings back then of $250 to $300 a month. ($4,000 to $5,000 in 2011 dollars.)

Use of the raw or waste gas was common in the oilfield community. Many among the populace took advantage of the free fuel, which was often burned in homes, churches, and yes, even schools.

The method of distributing gas within the school was not unusual for the time and had been used at other educational institutions. It involved equipping each of the 72 classrooms with individual heaters.

Rear view of the explosion.

Crowds gathered at the explosion scene.

Writing in the April 30, 1937, edition of the *National Fire Protection Association (NFPA) Quarterly*, H. Oram Smith of the Texas Inspection Bureau described the heaters thusly:

"*The device has the appearance of an ordinary steam radiator, but is an individual heating unit comprising a gas burner at the base, under a small water chamber cast into the unit. Steam circulates through the hollow sections of the radiator and heats by radiation like the standard steam type.*"

Each unit had a small regulator at the source of the gas supply as well as a safety valve on the water chamber. Smith added: "*It is a well-known make used extensively in the Southwest and is considered as safe as any gas heater on the market.*"

The residue fuel was delivered (via 1.5-inch pipes) to each of the rooms by a gas regulator connected to a 2-inch pipe located in the school basement.

Fire officials speculated a large quantity of colorless, odorless gas collected in the area under an 8-inch slab of reinforced concrete serving as the main structure first floor of the two-story school. It was further theorized that at 3:17 p.m., a spark was generated when instructor of manual training Lemmie Butler plugged an electric sander into a receptacle on the first floor.

Ignition of the gas produced a lone explosion with enough force to lift the school – including auditorium – off its foundation. The concrete slab floor was instantly catapulted through the roof.

While the detonation itself would have produced numerous casualties, falling debris from the slab and other building material further threatened building occupants. Many of the victims were crushed beneath masses of concrete, tile, and steel. Some surviving victims had to be extracted by jackhammer.

Final death toll: 294 (and some believe as many as 319). This included 120 boys, 156 girls, four male teachers, 12 female teachers, a woman visitor, and a 4-year-old boy visitor. (It should be noted no record exists of the actual number of people in the building during the incident). A total of 31 victims were sitting in the shop class when the gas ignited. Approximately 130 students were spared serious injury.

Hearing the blast, oil field roughnecks ran to the school site and toiled relentlessly to reclaim bodies and remove New London School's fragmented remains. Later that day, there would be over 1,500 volunteers on site from 20 organizations, agencies, and companies.

Firefighters arriving at the scene found no fire (there was a minimal amount of combustible matter), and so began the forbidding task of locating survivors and sifting through human carnage.

According to the New London School Explosion Museum: "*Bodies were carried to hospitals in five counties. When those hospitals were full, they began to put bodies dead or alive in garages, American Legion halls, tents, churches, car dealer shops or any place that could be found. Word was spread for all doctors, nurses and embalming personnel.*"

At perhaps no time in history did more parents dread the horrible responsibility of locating deceased children, many of whom were mutilated and dismembered.

The museum explains: "*Horror-stricken and agonized families rushed to the scene frantically searching for their children through the mounds of rubble with tears running down their faces and hands torn and bleeding from jagged debris.*"

This was not the life cycle as intended: children preceding parents in death. The few who survived the explosion were located at remote ends of the building structure.

Damage was not limited to the immediate area. A 1936 Chevrolet 200 feet from the scene was crushed by a two-ton slab of concrete. Another 50 vehicles were totaled after being struck by airborne concrete and stones. Adds the museum: "Some of the flying wreckage included precious children thrown through the air like broken rag dolls."

***Clockwise:** Aerial view of the school destruction; one of many vehicles crushed by flying debris; classroom heating unit after explosion.*

All photos courtesy of the New London Museum. For more information, visit www.newlondonschool.org.

Workers carefully pick through debris.

As with any disturbing event of this magnitude, news reporters from all over the state headed to New London. A cub reporter from the United Press International office in Dallas was excited about covering his first major story. As he arrived on the scene, he observed floodlights being readied for the evening darkness, as well as erection of large oil field cranes that would be used later to assist removal of large hunks of rubble.

Years later as this reporter approached the twilight of his career, he observed: "I did nothing in my studies nor in my life to prepare me for a story of the magnitude of that New London tragedy, nor has any story since that awful day equaled it."

Despite the fact that he expertly chronicled every major story from all over the world during an iconic 45-year broadcasting career, Walter Cronkite could never dislodge the recollection of the horrible scene he personally witnessed on March 18, 1937.

Less than a day after the explosion, the New London School site was completely devoid of any and all evidence from the previous day. Reported the *NFPA Quarterly*: "*In the short space of 17 hours after the work was organized, some 2,000 tons of debris were picked up piecemeal and hauled away during an all-night rain storm; concrete slabs were broken up, tangled steel cut with torches and the smaller fragments that had to be shoveled were carried off in small baskets and carefully emptied under flood lights to avoid overlooking a hand or foot or any torn portion of a body.*"

There was no shortage of theories on the cause of the school disaster. Unfortunately, in the accelerated confusion to save lives and remove rubble – not to mention the dreadful memories – there would be no evidence to dissect. Much of what would be learned later was based on conjecture, albeit conjecture having some foundation in logic.

Simply explained: "*This method of heating was entirely wrong and in combination with the unventilated floor space was*

Aftermath of the explosion.

responsible for the explosion," Smith wrote. Cause of the explosion, he noted, was ignition of a sizable gas pocket in the large improperly vented space under the floor.

The Texas Inspection Bureau official concluded the space under the concrete floor had become filled with an explosive mixture of gas and air. (Source of the gas leak was undetermined.) He concluded the gas found its way into the school shop area by way of an open door and was detonated by an arc formed when the sander plug was introduced into the receptacle. The consequent flash retreated under the concrete floor, creating superheated gas and enough pressure to dislodge the school from its foundation. The blast traveled the building's entire 254-foot length.

Following an investigation, a court of inquiry exonerated all school officials of the explosion and concluded no one individual was responsible.

Thirty New London high school seniors who survived the blast finished their academic year in temporary facilities as a new school was constructed on nearly the same site as its doomed predecessor.

As bad as this human catastrophe was, it could have been – although hard to imagine – much worse. The school had been using dynamite at its athletic field to build a running track. At the time of the blast, 18 sticks of the ordnance were stored in a lumber room under the auditorium. None was disturbed.

There is little solace in discovering something positive resulting from such a horrendous turn of events. But the deaths of over 270 children – nearly a complete generation of the New London community – did result in something that has saved the lives of perhaps millions of people worldwide.

Up to this point in history, gas was clear, odorless matter. But within weeks of the New London incident, the Texas legislature passed an odorization law requiring the addition of distinctive malodorants to all gases used commercially and industrially. It was not only the first law of its kind, it is currently law throughout the United States.

Since the raw unprocessed gas at New London School was being tapped directly from its underground source, there probably was no mechanical procedure to odorize the gas mixture collecting under the concrete floor. Hence, it is doubtful the 1937 disaster could have been averted.


Transporting a victim's casket.

Today, however, a smell tantamount to "rotten eggs" serves to alert anyone in close proximity to escaping natural gas and the real potential for an explosion.

Despite new technology, gas explosions still occur with alarming regularity. And that's why codes and standards remain critical to the well-being of every man, woman, and child.

As H. Oram Smith concluded in his review of the New London tragedy:

"*Practically all faults of construction and installation in this building were due to lack of supervising power such as would apply in communities having city ordinances. It serves to focus attention to the need of state laws on standards of construction, as well as approved standards for the installation of heating systems, electrical equipment, gas and oil systems and all other buildings where large numbers of people congregate.*"

And that's the way it is.

"Lost Generation: The New London School Explosion of 1937" is an excerpt from National Board Public Affairs Director Paul Brennan's forthcoming book, *BLOWBACK,* releasing later this year. R. Miles Toler, director of the New London Museum, will deliver remarks at the 81st General Meeting in May.

Winter Storm Warning

Elementary School Boiler Malfunctioned after Ice Storm

By Rick Smith, P.E.

Winter ice storms can cause electrical outages, resulting in potential boiler disruption. In the following incident, an elementary school was at risk when loss of power started a string of potentially devastating events.

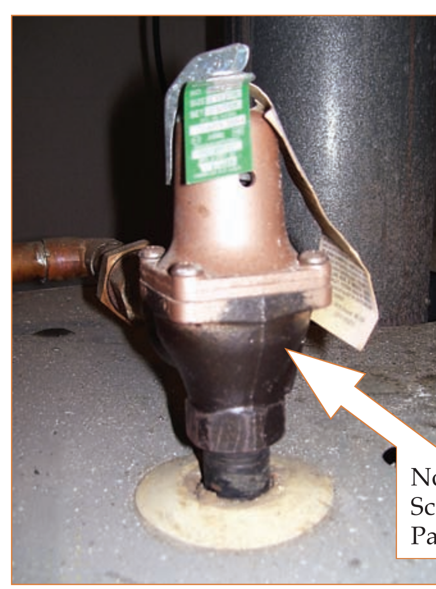
In early February 2011, a massive winter storm hammered large portions of the country. In central Ohio, severe ice accumulation knocked down large tree branches, taking power lines down with them. The affected school's power was lost around February 1 and partially restored on February 3. The building's incoming power was three -phase. When power was restored, only two phases were activated.

The boiler, a small flex tube hot water unit, restarted on its own for unknown reasons. Since complete wiring diagrams were never found, it could not be accurately determined why the boiler restarted when the direct digital controls system (DDC, which controlled the boiler) was de-energized. The DDC was connected to the "dead" third phase. The two hot water circulating pumps, which were immediately adjacent to the boiler, restarted. However, since they were only running on two phases, they overheated and shut down on internal thermal overload. The flow switches, which were wired into the DDC system and not the boiler's pre-start safety circuit, did not trip the boiler.

The boiler was equipped with an "energy saving" powered flue damper. The original, which was power-to-open/spring-to-close, had been replaced with a unit that required power to open and close. When the power was tripped, the damper remained in the "open" position. The damper, which had a mercury switch attached to the damper as an "end switch," was controlled by the DDC system.

The addition of the flue damper effectively bypassed and negated ALL of the boiler's automatic electrical safety systems. The boiler had an operating temperature control (OTC), a firing rate control, and a high limit (HL) control. Under normal circumstances, the OTC will start and stop the boiler based upon the outlet water temperature; the firing rate control will stop the firing rate from high fire to low fire, again, based upon the water temperature; and the high limit will shut down the boiler if the outlet water temperature exceeds the maximum allowable water temperature. The HL control did not have a manual reset button. These controls were wired in series in the boiler's safety circuit. The way the flue damper was wired created a jumper around all three of these control/safety devices.

Because the safety controls had been bypassed by the addition of the flue damper, the boiler had a burner "runaway" (when a burner goes to high fire and remains there, regardless of the water temperature) and started steaming. When the custodian arrived at the building for a routine check, she saw steam coming from the boiler room air vents. Fortunately, school was cancelled due to weather and no students were in



Sweated joints on relief valve outlet.

the building. The custodian recruited the help of her husband, a maintenance technician at a local factory, and together they investigated the boiler room, which was full of steam. The technician turned off the burner switch – a courageous act in retrospect.

Next, an HVAC contractor (who served the school district) was called in to investigate and make necessary repairs. He contacted me and I joined him in examining the damage on February 7. By this time, all three phases of electric power had been restored.

We observed scorched paint on the relief valve – something neither of us had ever seen. The relief valve outlet was ¾" sweated copper. The line heated to the point that the elbow separated – again, something neither of us had ever seen. After running some tests, we were shocked at what we found.

We started the boiler and it seemed to run fine. The burner switch would shut down the boiler. Disconnecting any of the three limit switches failed to shut down the boiler. In addition, turning off the pumps would not shut down the boiler due to lack of flow. We could not find a main disconnect switch for the boiler – it was in a remote panel we could not locate.

Damper end switch.

"Energy Saving" Damper.

No reset button was found on high limit switch.

The only safety device that functioned properly during the incident was the relief valve. None of the automatic electrical safety devices functioned, resulting in a burner runaway. The boiler had been inspected by several agencies and serviced by multiple contractors, but the issues went unnoticed.

In light of this incident, inspectors may want to consider the following:

- In boilers with powered flue dampers, verify all of the safety devices are tested to ensure no other electrical safety devices have been bypassed.
- Periodically have all safety devices tested on all boilers.
- Be especially observant when inspecting smaller boilers in non-industrial environments. Operating and maintenance (O&M) personnel may not have sufficient training.
- Carefully question the O&M personnel regarding any equipment changes, unusual incidents, or situations which may have occurred since the last inspection.

Rick Smith has been working on and around boilers (up to utility size) for 35 years. He is president of Applied Thermal Engineering, Inc., a central Ohio firm which specializes in industrial utilities and forensic engineering. He has been an expert witness in numerous boiler explosion and carbon monoxide cases and has taught several hundred boiler and HVAC classes since 1990. ✤

National Board Pressure Relief Programs
An International Perspective

BY JOSEPH F. BALL, P.E., DIRECTOR, PRESSURE RELIEF DEPARTMENT

A common question received by the Pressure Relief Department staff is, "Does my organization need to be certified by the National Board for the new pressure relief devices we build?" or "Do we need to be certified for the pressure relief valves we repair?" The reply, although sounding a bit confusing, is, "It depends!" Explaining this answer in more detail leads to the applicable requirements for a company doing business in the United States and Canada, and a company doing business in other areas of the world.

For a company located in the US or Canada, compliance with the *ASME Boiler and Pressure Vessel Code* – which includes National Board capacity certification for new construction or the *National Board Inspection Code* (NBIC) for repairs – is a mandatory regulatory requirement invoked by the jurisdiction. Recognizing the stored energy or hazardous materials contained in boilers and pressure vessels, and to protect the safety and property of the citizens of a US state or Canadian province, the ASME code and NBIC are adopted and referenced from the jurisdiction's laws and rules. These standards have been developed over many years by committees of experts to give widely accepted assurance that the equipment can be operated safely.

A company intending to manufacture new pressure relief devices to be installed on a boiler or pressure vessel in a code state or province must meet applicable ASME code requirements for that type of device. This applies even if the supplier is located elsewhere in the world. Evidence of compliance is the ASME Code Symbol Stamp and National Board **NB** capacity certification mark on the device nameplate, as well as inclusion in the National Board's online listing of certified pressure relief device types; *Pressure Relief Device Certifications* (NB-18).

New Construction

A brief outline of the process for obtaining certification under the ASME code is as follows:

1. The company applies to ASME for the applicable Code Symbol Stamp and applies to the National Board for type certification for each different design of pressure relief device it intends to build. A design family is based upon flow path being equivalent from one size to the next, and using the same operating principles. Some designs may include a wide range of sizes and pressures. Technical requirements to be met are included in the *ASME Boiler and Pressure Vessel Code*, and the proposed design is checked against those requirements.
2. The manufacturer provides a set of pressure relief devices for the initial design test to an ASME/National Board-accepted test lab. Depending on the scope of the design, the test program consists of three to nine or more test samples. Purpose of these tests is to show the design functions properly and demonstrates a consistent capacity across the range of items tested. If the consistency requirement is met, a rating value is declared that includes an additional safety factor. The rating value is then used to calculate nameplate data or to size the device in a system. These devices can be considered as prototypes at this stage of the process.
3. When the design is ready to go into production, a representative of the National Board (which acts as the designated organization for pressure relief devices for ASME) travels to the manufacturing facility for an inspection of the quality system. At that time the representative witnesses the manufacture of several sample devices and marks them with a seal or other identifying mark. One main purpose of witnessing the manufacture is to ensure that the procedures being witnessed are typical of standard production practices.
4. The sample pressure relief devices are then sent to an ASME/National Board-accepted test lab for verification of the performance of the device and a capacity test. The measured capacity is compared to the rating value previously determined (which includes a safety factor to account for production variations), and must meet or exceed that rating value. Successful completion of the plant quality audit and both parts of the test program allows the company to be issued an ASME Code Symbol Stamp and National Board capacity certification for the design tested. Each design is then added to our NB-18 listing.

Note: *Pressure relief devices being supplied for use in Canada must also receive Canadian registration (often called a "CRN number"). This process includes additional review by the Canadian authorities, but one prerequisite is being able to show the pressure relief device type has been through the ASME/National Board program.*

If a company is manufacturing pressure relief devices for use elsewhere in the world, why would they need to obtain ASME/National Board certification? Are there benefits that would assist them in marketing their products?

As it turns out, there are a number of benefits that can be obtained by compliance with the ASME code, even if there isn't a jurisdictional requirement to do so.

First, it is often a contractual requirement of the customer. Instead of preparing a detailed specification for pressure relief devices to be used for a construction project, most design or engineering firms will reference widely available standards. *The ASME Boiler and Pressure Vessel Code* is one of the most widely used standards for this equipment in the world. Having a product which meets the code makes it easier to meet bid specifications and have your product considered for inclusion in a project.

In some cases the final destination for the pressure relief device may not be known to the pressure relief device supplier if it is being provided for installation in a system or package unit. If that unit is later supplied to a jurisdiction requiring code devices, there will not be the need to change those devices for those bearing the ASME and National Board symbols.

Secondly, there will be auditable examples of independent tests having been done to demonstrate the product's compliance with the standard. A unique feature of the capacity certification requirements in the ASME code is that all code testing has to be performed at a test laboratory independently certified through an ASME review process. All ASME/National Board tests are done only at recognized test labs (including the National Board lab in Columbus, Ohio) that have been audited and compared with one another to show consistent, repeatable flow measurements.

A closely related benefit is that since the testing was done at an audited flow lab, the flow testing performed can often be used for demonstrating compliance with other standards. For example, the number of test objects and test procedures required are similar to those needed for the ISO-4126 standards used in Europe.

There is quite a bit of flexibility built into the ASME code. Code requirements for pressure relief devices are very much performance-based. Some general design requirements and features are invoked, but most of the requirements center around meeting a performance specification, such as demonstrating consistent capacity within a +/-5% criteria, or meeting a +/-3% set pressure tolerance. There are often different design details and features manufacturers include in their design, all of which are acceptable as long as the performance criteria can be met.

Code material requirements also offer a good amount of flexibility. ASME code materials, which include a wide range of material product forms and alloys, are specified for the pressure relief valve body and bonnet (or rupture disk holder). Internal parts of pressure relief valves can be made to a wide variety of material specifications, as long as the materials are appropriate for the application and have a detailed specification to allow control of quality. Coatings and material surface treatments are widely used to enhance material properties such as corrosion resistance. Therefore, the customer's special needs will be easy to take care of, while still meeting code rules.

Finally, meeting ASME code requirements is a method to demonstrate overall quality of the product. Users will know the product has been through an independent test program and a third-party review of manufacturing procedures. Since a pressure relief device's only purpose is for safety, additional assurance the product meets a long-recognized standard in use worldwide is certainly an added benefit.

Valve Repair

Similar benefits can be demonstrated by qualification for the National Board's Valve Repair (**VR**) program. This program certifies organizations performing repairs of ASME code-stamped/National Board capacity-certified pressure relief valves. Even when there is not a jurisdictional requirement that a repair company be certified by the National Board, possession of the **VR** Certificate and stamp convey a number of benefits for the organization.

First, the **VR** program denotes quality and consistency in pressure relief valve repair. An emphasis is put on performing a complete disassembly of the valve that is being repaired for inspection. Conformance to original equipment manufacturer (OEM) specifications is required, and special processes, such as welding, are controlled to original code specifications. Testing on qualified test stands using the proper test fluid is also mandated. The goal is to return the valve to a "like new" condition so it can once again be relied upon for overpressure protection.

The **VR** program provides consistent expectations for vendors who supply valve repair. All repair work must be documented. Valves are tagged with a repair nameplate which includes the **VR** stamp and matching seals that identify the repair organization. The repair organization must maintain a documented quality program (described in a quality control manual) that is reviewed by an experienced National Board representative. Additionally, the organization's capabilities are demonstrated by testing samples of their repaired valves at an independent lab.

Third-party inspectors who then see the repair documentation and **VR** stamp on the repair nameplate (which also includes the date of repair), can rest assured of the valve's condition and move on to other elements of the inspection process.

In conclusion, even when jurisdictional rules do not mandate ASME code/National Board certified pressure relief devices for new construction, or National Board **VR** certification for repair, there are still benefits for suppliers and users of the devices. Stringent controls during new manufacture and repair ultimately contribute to a greater level of safety for all involved.

Resources on the National Board Web Site:

A list of ASME/National Board-accepted test laboratories can be found under the Pressure Relief Devices tab. *Pressure Relief Device Certifications* (NB-18) can be found under Resources.

Institutional Memory

Why Remembering is Critical for a Culture of Safety

By James R. Chiles

James R. Chiles, author of **Inviting Disaster** *and* **The God Machine**, *has been writing about technology and history for over 30 years. His work has appeared in* **Smithsonian, Air & Space, Popular Science, Harvard, Aviation Week, Mechanical Engineering,** *and* **Invention & Technology.** *He maintains a blog called* **Disaster-Wise.**

Two months after a wave from the Great Tohoku Earthquake demolished hundreds of towns in northeast Japan, the *Associated Press* described one that survived: Fudai, a community of 3,000 residents nestled in a narrow valley wide open to the sea. In 1972 its mayor called on the town to build a 51-foot-high floodgate. The project attracted much opposition over the cost ($30 million in today's dollars) and the land required to hold off a big wave – the next big wave, in the view of then-mayor Kotaku Wamura.

As a young man Wamura had seen the aftermath of a 1933 tsunami that killed hundreds in Fudai alone. As mayor, he led the project and faced many skeptics: why did the town need it? How could they ever pay for it? Why are you taking my land for the foundations? Why so high? Other Japanese cities had put up gates and seawalls, but none were so high.

Wamura was undaunted. A good thing, too. When that next big wave arrived on March 11, 2011, water lapped over the top but the damage was inconsequential; the only death was one man who had climbed over to check on his fishing boat. Without Wamura's big wall, Fudai would have been reduced to bodies, trash, and rubble. Again.

Memory – vivid and awful – carried Fudai's floodgate project forward despite all opposition. But it needed more than the mayor's individual memory: it needed the collective memory of everybody old enough to have seen the effects of the 1933 wave.

Mystic Chords of Memory

The subject of memory and how to hold onto it is a hot topic because baby boomers aren't babies anymore. Experts warn that looming retirements across all sectors of the economy will be a "silver-haired tsunami."

However much 50-somethings look forward to retirement, they're even more eager for anti-Alzheimer nostrums, whether vitamin packets, red wine, Soduku puzzles, or online memory tests. Worries over memories slip-sliding away extends to the largest scale. Consultants are wagging their fingers at companies and agencies like NASA, warning them to capture their "institutional memory" now with extended videotaped interviews and copious databases.

They want to capture the unwritten knowledge held by skilled workers, seen-it-all foremen, and hands-on managers. It's trouble-shooting. It's the agility that strikes a balance between handling existing projects and taking on new challenges as conditions change. In short, it's the know-how that gets things done and heads off the ICE – the Imminent Catastrophic Event.

Before examining collective memory, let's think about individual memory. While our brains are sometimes compared to a computer's storage banks, people are radically different from computers in how they collect and store information. In 1861 Abe

Lincoln referred to the mystic chords of memory, and he wasn't far off the mark. Memory is not a predictable set of nerve connections. We know more about how it goes away than why it stays.

A Palace of Memories

Experts in mnemonic techniques assure us that with training and jaw-aching concentration just about anybody can erect a "memory palace" in their minds and wow their friends by memorizing the order of a shuffled deck of cards. Meanwhile, most of us don't have a memory palace but something more like a drafty house. Even without the affliction of Alzheimer's, facts blow out the back door when we're not looking. Other facts get mixed up like old keys in a junk drawer.

The good news is that humans are, or can be, quite good at building and holding a body of *knowledge*. Knowledge is what drives our decisions. It's a combination of skills, recalled facts and insights, and is unique to each person. Instead of a drafty memory house, imagine a snug, warm greenhouse in the back yard – a place where plants grow and thrive.

Vast collections of individual knowledge fit into a few pounds of brain tissue because they're braced and motivated by personal experiences, vivid stories from trusted sources, reading, and (hopefully) certification and training courses like those at the National Board.

Individual memory is one thing, but what about collective memory? Can an entire company, or even the workers across a single plant, share a "collective memory"? Safety experts like Trevor Kletz, author of *What Went Wrong*? and *Still Going Wrong*, think so. The tendency of refineries and chemical plants to lose their institutional memory of past disasters, about every 10 to 15 years, has been a concern in the chemical-processing safety literature for years. Writing in *Modern Railways*, Roger Ford said that accidents happen "when the last man who remembers the previous disaster retires."

Dumbsizing and Memory Drain

The problems of rapid employee loss and turnover are magnified by the loss of supervisors with long and plant-specific experience. It's been said that foremen and supervisors act like synapses of our brains. On the job, they link individuals into functional units that span the organizational charts; along with motivated higher-ups, they can press for prompt action to head off a disaster. Critics like Kevin Foster call the discharge of such experts not downsizing but dumbsizing. But the nation would still have a memory drain problem even if companies reversed direction, because there's a graying workforce moving on sooner rather than later.

A plant can turn into something dangerously unfamiliar as employees change jobs and memories fade. Disaster annals are full of spectacular events triggered after an incoming worker looks at some pre-existing gizmo, decides it's getting in his way or slowing him down, and changes it without asking anybody. This can be an enormous hazard at an oil refinery, where a peculiar-looking vent stack might be essential to avoiding a vacuum that would cause two chemicals to mix and react at the wrong time. In a perfect world, a complete set of plans would not only show the machine in its actual, "as built, as modified" status, it would also have little tags explaining what the pipes and safety appurtenances in a boiler room or refinery are there for, in case someone has the hankering to tinker.

Forging Collective Memory

How can industries forge a collective memory that leads to safer operations? The New London explosion – the worst school catastrophe in US history – illustrates the most *costly* method: high-profile, landmark cases that resonated strongly with the public and lawmakers. Soon after the New London tragedy, laws were passed requiring odorants in natural gas for sale and the registration of professional engineers. Also influential were the gas leak at Bhopal in 1984, the collapse of the Quebec Bridge in 1907, the 1986 Chernobyl reactor explosion, and the Northeast Blackout of 1965.

But even the most vivid memories fade and the ranks turn over. How to keep them fresh? On July 6, 1988, Steve Rae was an electrical technician aboard the *Piper Alpha* rig at the time a chain of mistakes led to a natural-gas leak from a high-pressure pipe. The chain of events promptly killed 167 men. Twenty years later he took the podium in front of 130 students at a petroleum technician school to relive the day, its aftermath, and its costly lessons like the importance of a safety-case approach to prevention. "I attended three funerals on the same day," he told the newly minted graduates, "and that will never leave me."

Assuming that institutional memory is important, we have to consider this tough question: Will preserving institutional memory always make the critical difference? Not alone, it won't. The loss of *Challenger* seared itself into the memory of NASA and its contractors, and changes made another solid-rocket booster failure very unlikely – but it didn't prevent the loss of *Columbia* seventeen years later.

"One of the big reasons for exploiting [information technology] advances to collect and analyze information is to create a database that is so sufficiently useful and usable that it reduces the need to rely upon human memory," says Christopher Hart, vice-chairman of the National Transportation Safety Board. "Ideally, the process of learning from past problems should not depend upon who happens to retire or otherwise leave." While common sense might tell us that each person's own school of hard knocks must be his best teacher, it's better to learn from others too because there's an enormously larger database of screw-ups to draw from.

A common objection companies have toward major efforts to gather and preserve institutional memory is that the effort will drain thousands of hours of productivity, in addition to consultant costs. And once it's done, who'll have the time to go through a mass of recollections that seem less relevant by the year? Won't the competition take advantage of hard-won knowledge? A fear of tipping off your rivals to safer operations is short-sighted, according to Trevor Kletz: "If we tell other people about our accidents, then in return they may tell us about theirs, and we shall be able to prevent them from happening to us."

Institutional Memory on a Budget

I think two broad types of collective memory are achievable and worthwhile in high-risk industries, and they don't have to be time-burners. They're what I call *motivational memory* and *working memory*.

Motivational memory is less about technical details and more about remembering the *need* to work cooperatively and safely. Why do newly graduating structural engineers in Canada join in the ritual of the Iron Ring? It's not a refresher on statics and dynamics – it's a reminder that people die in collapses if experts don't sweat the details. Jack Gillum has given speeches about the 1981 catastrophic collapse of atrium walkways at Kansas City's Hyatt Regency Hotel. Gillum, as the engineer of record, was found negligent in not catching a fatal flaw in revised shop drawings. He lost his Missouri license over it and 114 people lost their lives. Many more were injured in the collapse. A firefighter had to perform an amputation with a chainsaw. I heard Gillum speak at an engineers' forensic convention ten years ago, and what he said that day, his wish to turn back the hands of time, remains with me still. Further, I believe when employees are injured on the job, managers who controlled the job site are obligated to visit them in the hospital, and attend funerals, too. If leaders know this duty is unavoidable, they'll be more likely to support safe operations.

Working memory involves strengthening the day-to-day, functional memory as held in the minds of high-performance teams. I think in most cases this is better than taking aside all employees for long recorded interviews as they approach retirement. Confronted with the need to design its new LH line of cars from scratch, Chrysler split the job among 100 "tech-clubs," each responsible for a key component or assembly. By forcing early companionship between design engineers, marketers, and suppliers, Chrysler found it could speed development and cut costs. One advantage of a team approach is that expertise is broadly distributed, lowering the risk that a single employee's departure could cripple a critical operation. That's how the American military works, putting hugely consequential decisions in young hands, mentored by old hands.

Another argument for taking a team approach is that a team is, or can be, much more than the sum of its parts. According to psychologists who study memory formation, both individual and collective, people remember an incident most vividly if they've participated in a group discussion afterward. Safety-oriented tailgate talks at jobsites are a good time to bring up lessons learned, fresh off the docket.

Group discussions about accidents and close calls also complete the circle of safety by building up the motivational memory. Through such discussions, even people who weren't at the scene of an explosion feel the emotional impact of hearing about burn injuries, and are inspired to go the extra kilometer – to restart the checklist at the top if they've been interrupted halfway through. To paraphrase Yogi Berra, no one wants to experience disaster *déjà vu* all over again. ✤

Sansone and Pringnitz Become National Board Members

New New York Member

Matthew H. Sansone has been accepted to National Board membership representing New York State. From 1983 to 1990, Mr. Sansone worked as a service technician for Bill Anderson & Sons, Statewide Machinery, and XL Equipment. In 1990 he was a boiler inspector for the New York State Department of Labor. In 2001 he became senior boiler inspector. He assumed the role of supervising boiler inspector in 2008.

Matthew H. Sansone

New Oklahoma Member

Dusty Pringnitz has been accepted to National Board membership representing the state of Oklahoma. Mr. Pringnitz received his bachelor of science degree in industrial safety from the University of Oklahoma in 1995. He held the position of safety consultant for the Oklahoma Department of Labor in 1996 to 2001. In 2001 he became a boiler inspector until assuming the role of senior boiler inspector in 2011. Mr. Pringnitz is both a National Board and ASME team leader.

Dusty Pringnitz

Jerry Stoeckinger Remembered

Longtime National Board friend and former Advisory Committee member Jerry Stoeckinger passed away on December 31, 2011, following a lengthy illness.

Mr. Stoeckinger graduated with honors from Purdue University with a degree in mechanical engineering. In 1968 he received his master's degree in metallurgy from UCLA. He enjoyed a career in aerospace and worked at Rocketdyne and McDonnell Douglas. He held a number of patents that were pivotal in NASA's space program. He culminated his career as head of research and development at Manchester Tank in Nashville, Tennessee.

Mr. Stoeckinger was appointed to the National Board Advisory Committee representing pressure vessel manufacturers at the August 11-12, 1994, Board of Trustees meeting. He was reappointed in 1997 and in 2000. "Jerry was a genuinely great guy who dedicated his life's work to safety. He will be greatly missed by many," says National Board Executive Director David Douin.

Jerry leaves his wife of 53 years, Julie, son Mark, daughter Lisa, and six grandchildren.

Testing Laboratory Switches to Liquid Nitrogen

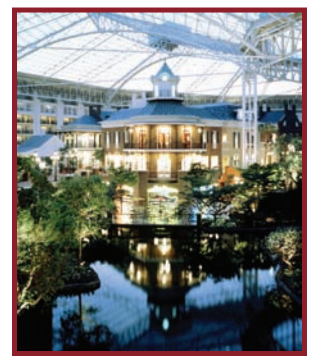
The National Board's Pressure Relief Department is updating the pressure source for its air and water test systems from compressed air to liquid nitrogen.

The system includes a 6,000-gallon liquid nitrogen storage vessel, two 20-horsepower pumps, two vaporizer units, and six storage bottles. The changeover from compressed air to liquid nitrogen simplifies maintenance operations and reduces energy needs.

"Overall, we are increasing our capabilities and can focus on testing rather than maintaining rotating equipment," says Joe Ball, director of the Pressure Relief Department.

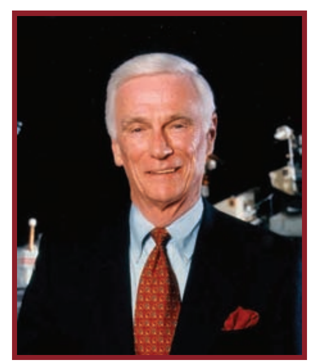
THE 81ST GENERAL MEETING
NASHVILLE 2012

Gaylord Opryland Resort & Convention Center



Located in the heart of Music City in Nashville, Tennessee, the newly renovated Gaylord Opryland Resort & Convention Center is the flagship facility of Gaylord Hotels. As such, it is centrally located to many Music City's legendary attractions, including the Grand Ole Opry, Ryman Auditorium, Wildhorse Saloon, Country Music Hall of Fame, and the General Jackson Showboat.

"Last Man on the Moon" Astronaut Gene Cernan to Commence Opening Session



I lowered my left foot and the thin crust gave way. Soft contact. There, it was done. A Cernan footprint was on the moon. I had fulfilled my dream. – Captain Gene Cernan

It was December 1972 when Captain Gene Cernan's dream of walking on the moon came true. His third historic mission into space on Apollo XVII also bestowed him the distinction of the last man to have left his footprints on the moon. Forty years later, attendees at this year's 81st General Session will receive the distinction of hearing Captain Cernan's opening remarks.

Captain Cernan spent 20 years as a naval aviator, 13 of them with the National Aeronautics and Space Administration (NASA). He ventured on three missions to space (twice to the moon) as the pilot of Gemini IX, the lunar module pilot of Apollo X, and as the commander of Apollo XVII.

Raspyni Brothers to "Juggle" Wednesday Evening Banquet

They may not share the same parents, but Barry Friedman and Dan Holzman – the Raspyni Brothers – share the sweet taste of success. The entertainers partnered in 1982 and have since earned two International Juggling Championships, multiple appearances on the Tonight Show, and a place in the Guinness Book of World Records.

What can audience members expect from this team of professionals (who have opened for superstars such as Robin Williams, Billy Crystal, and Tony Bennett)? How about golf clubs balancing in impossible configurations? Cabbages colliding midair with flying blow darts? Blazing torches, machetes, and 16-pound bowling balls soaring above the stage?

And, let's not forget, audience participation.

The Raspyni Brothers' dynamic mix of skill, improvisation, and comic dialogue will infuse a jolt of fun and energy to the 81st General Meeting Wednesday Evening Banquet.

81st GENERAL MEETING

PRELIMINARY PROGRAM

The National Board of Boiler and Pressure Vessel Inspectors & ASME Boiler and Pressure Vessel Committee

Monday, May 14

Opening Session

10:15 a.m. REMARKS
Astronaut Gene Cernan*
Author of "The Last Man on the Moon"

General Session

1:00 p.m. POTENTIAL DETRIMENTAL CONSEQUENCES OF EXCESSIVE PWHT ON PRESSURE VESSEL STEEL PROPERTIES
Carl Spaeder, PhD, Consultant

1:30 p.m. THE DAY A GENERATION DIED
R. Miles Toler, Museum Director
NEW LONDON MUSEUM

2:00 p.m. FUKUSHIMA DAIICHI NUCLEAR POWER PLANT UPDATE
Kenneth R. Balkey, P.E., Consulting Engineer
WESTINGHOUSE ELECTRIC COMPANY
Senior Vice President
ASME COUNCIL ON STANDARDS AND CERTIFICATION

2:30 p.m. BREAK

2:45 p.m. SOLAR BOILERS: EVOLVING ISSUES WITH AN EVOLVING TECHNOLOGY
Don Cook, Principal Safety Engineer
STATE OF CALIFORNIA
Tim Zoltowski, Regional Risk Engineering Manager
ZURICH NORTH AMERICAN INSURANCE

3:15 p.m. ESTABLISHMENT OF A FEDERAL INSPECTION AGENCY AT OAK RIDGE NATIONAL LABORATORY
John P. Swezy Jr., Mechanical Engineer
OAK RIDGE NATIONAL LABORATORY

3:45 p.m. APPLICABILITY OF NATIONAL BOARD TESTING DATA TO RELIABILITY FOR INDUSTRY
Joseph F. Ball, P.E., Director
THE NATIONAL BOARD PRESSURE RELIEF DEPARTMENT

* PHOTO SESSION WITH CAPTAIN CERNAN FOLLOWS OPENING SESSION
(No autograph requests, please)

General Meeting Notices

- Participants and guests are encouraged to dress in a business-casual style for all hotel events except the Wednesday banquet (where ties and jackets will be the evening attire).
- Distribution of any and all literature other than informational materials published by the National Board and ASME is strictly prohibited at the General Meeting.
- To obtain a preregistration discount of $50, all forms and fees must be received by May 1.
- On-Site Registration Desk Hours:

  Sunday, May 13 . . . . 9:00 a.m. - 2:00 p.m.
  Monday, May 14 . . . 8:00 a.m. - 10:00 a.m.
  Tuesday, May 15 . . . 8:00 a.m. - 10:00 a.m.

- General Meeting Registration is required in order to receive the special $194 room rate at Gaylord Opryland Resort and Convention Center.

Reminder

General Meeting details can also be found on *InfoLink!* located on the National Board Web site at *nationalboard.org*.

ASME Boiler and Pressure Vessel Code Meetings

- Meetings are scheduled all week.
- Check hotel information board for locations and times.
- Meetings are open to the public.

GENERAL MEETING GUEST TOURS

NOTE: Registrants are not permitted to attend the Monday or Tuesday tours intended for designated guests. This policy is strictly enforced.

Monday, May 14 Nashville Stars Tour, 1 p.m. – 4:30 p.m.

Those who enjoy seeing the sites of General Meeting host cities will not be disappointed with this custom tour. In addition to receiving a Nashville lay of the land, guests will delight in touring the lush neighborhoods of country Music City greats calling Nashville home. Among homes to view are those of Alan Jackson, Martina McBride, Dolly Parton, Trisha Yearwood, Ronnie Dunn, and Taylor Swift, to name but a few. Guests will also be treated to fascinating stories of Nashville legends as they are escorted through the sprawling countryside of Middle Tennessee.

NOTE: This tour requires a minimal amount of walking.

Tuesday, May 15 *The Widow of the South* Tour, 8:30 a.m. – 3:30 p.m.

Guests continue their tour of Nashville by hitting some of the best highlights of Music City. Begin the morning with a driving tour of the historic downtown area, State Capitol, Bicentennial Park, WWII Memorial, the Ryman Auditorium (the very first stage of the Grand Ole Opry), and more. Other attractions along the way will include world-famous Music Row (the heartbeat of the country music industry), Centennial Park, and a visit to the Parthenon (both the building and 42-foot Athena statue are full-scale replicas of the Athenian originals from ancient Greece). The Parthenon serves as the city of Nashville's art museum.

The next stop is Carnton Plantation in Franklin, TN. The city of Franklin represents a unique blend of history and progress. It is also the setting of Robert Hicks' *New York Times* bestseller *The Widow of the South*. The elegant Carnton Plantation home served as a makeshift field hospital during the Battle of Franklin. Lunch will be served on plantation grounds with a lecture by Hicks. The tour of the mansion will include the actual rooms where surgeries took place, as well as visiting the ornamental gardens and the largest privately-owned Confederate cemetery in the country.

Guests touring this remarkable plantation can visualize the true-to-life human tragedies of the Civil War. This exciting Tuesday outing is guaranteed to fascinate all guests, history buffs or not.

NOTE: This tour requires a modest amount of walking, including ascending and descending stairs. Carnton Plantation is not ADA compliant.

Wednesday, May 16 "You'll Be Sorry If You Miss This Tour," Tour, 9 a.m. – 3:30 p.m.

Still haven't gotten enough of Nashville by mid-week? This all-day Wednesday tour will leave everyone pleasantly exhausted!

First stop is the Grand Ole Opry House, where country music magic has been made for more than 35 years. A tour of the Opry House provides a behind-the-scenes look at country music's most famous show and a true entertainment business phenomenon, complete with great stories about the Opry and its members. Guests will visit backstage as well as get an up-close-and-personal look at the dressing rooms of Music City's biggest country stars.

Next on the tour is a visit to a legendary Nashville destination not commonly available to local tourists. At high noon, guests will head to Fontanel Mansion for a BBQ cookout lunch with tours and special activities. Only minutes from downtown Nashville but miles from ordinary, the Fontanel Mansion is a 27,000-square-foot log home formerly owned by Country Music Hall of Fame® member Barbara Mandrell. This extraordinary home boasts three stories, over 20 rooms, thirteen bathrooms, five fireplaces, two kitchens, an indoor pool, and even an indoor shooting range on 136 acres of pristine land.

Fontanel Mansion has been the site of countless dinners and parties entertaining country music stars from yesteryear to today. And telling guests all about these behind-closed-doors gatherings will be the young lady who grew up in the mansion: Jamie Dudney, daughter of Barbara Mandrell and Ken Dudney!

Bring your cameras. This Wednesday tour features enough photo opportunities to fill any Nashville scrapbook!

NOTE: This tour requires a modest amount of walking.

Please see *InfoLink!* on the National Board Web site for tour guidelines and restrictions. ✤

Mail or Fax Registration Form

Name ______________________________

First Name for Badge ______________________________

Company/Affiliation ______________________________

Telephone ______________ Fax ______________

Address ______________________________

____

Email ______________________________

Guest Name ______________________________

Guest Address (city/state only) ______________________________

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Additional Guest* Name ______________________________

Additional Guest Address (city/state only) ______________________________

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*Additional guests (16 years of age or older) may register for a fee of $215.00 each.

Those requesting special or handicapped facilities are asked to contact the Public Affairs Department at 614.431.3204.

FEES

Only one registration fee will be charged for each attendee and one guest (guest program participant).

General Meeting Preregistration Fee .... $ __________
(includes ONE banquet ticket)

Registration fee is $375.00 if received *on or before* May 1.
Registration fee is $425.00 if received *after* May 1.

Additional Guest Fee(s)
________ Additional guests at $215.00 each .... $ __________
(each includes ONE banquet ticket)

Additional Banquet Ticket(s)
________ Additional tickets at $75.00 each..................... $ __________

AMOUNT ENCLOSED...... $ __________

To preregister by telephone or fax using your VISA, MasterCard, or American Express, contact the National Board at 614.431.3203, or fax 614.888.0750.

❏ VISA ❏ MasterCard ❏ American Express

Card # ______________________ Exp. Date __________

Cardholder's Name ______________________________

Signature ______________________________

All checks and money orders must be made payable in US dollars to:
The National Board of Boiler and Pressure Vessel Inspectors

Preference for registration confirmation: ❏ Email ❏ Fax ❏ Mail

REGISTRATION DEADLINE: May 1

Accounting Department Only: AMOUNT $ __________ DATE __________

Online Registration Form

Online registrations are accepted using a secure Web site form accessible via *InfoLink!* at *nationalboard.org*. This allows General Meeting attendees to process payment and receive a receipt and email confirmation at time of online registration.

General Meeting Hotel Information

Hotel reservations are the responsibility of attendees and can be made through Gaylord Opryland Resort and Convention Center:

615.883.2211

To receive the $194 nightly group room rate,* reference Group Name:

National Board

Group rate reservations must be received by April 10.

Room refunds available only with 72-hour prior notification.

** Group rate for General Meeting registrants only*

IMPORTANT NOTICE

While the National Board and the host hotel will do everything possible to accommodate all General Meeting visitors, registered participants will be given first priority for all discounted sleeping rooms. In the event of a sold-out hotel, the National Board reserves the right to cancel the reservations of anyone in its room block not preregistered for the General Meeting. It is therefore strongly recommended participants register for the General Meeting before securing room reservations. Additionally, it is suggested participants make their hotel arrangements early to ensure availability. Those seeking special room rates but failing to register for the National Board General Meeting are not guaranteed the discounted nightly rate.

MICHAEL J. RYAN

Chief Boiler Inspector, City of Chicago

When it comes to Chicago, one thinks of "da Bears" (as city purebreds assert), White Sox, Navy Pier, Al Capone, Sears Tower, the Magnificent Mile, Oprah, and deep dish pizza.

And Mike Ryan.

Well, his colleagues at the National Board do.

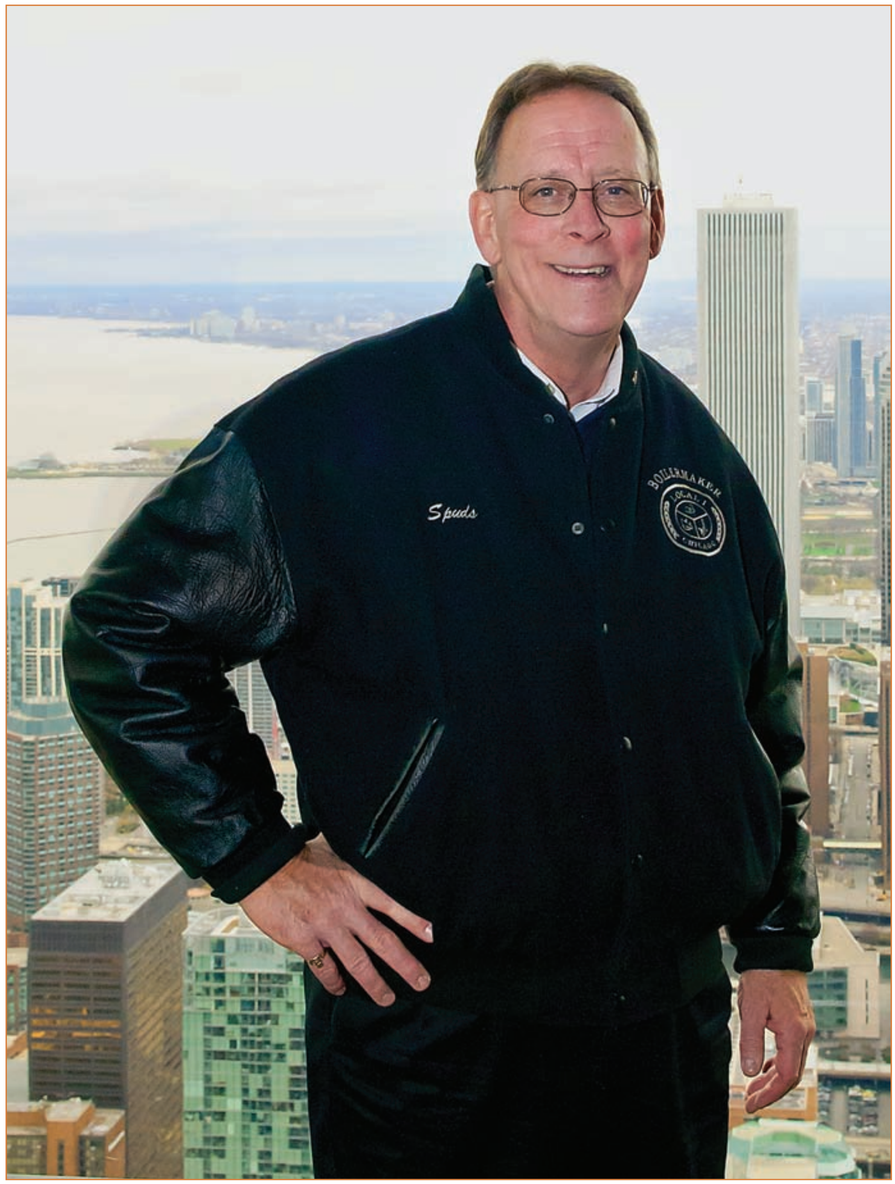
That's because there is perhaps no better walking, talking specimen of the Windy City than its chief boiler inspector. After all, this is a blue collar city where politics are not for amateurs and men of grit work hard, exalt their sports teams, and eat with a purpose underscoring their passions.

And so it should come as no revelation Mike Ryan was born in Chicago. The Bridgeport section, actually, where mayors Daley were also born and held forth.

Having a younger brother and sister, Mike shared the distinction of being his family's oldest sibling with twin sister Cathy. "Dad worked for the city Forestry Department," he explains. "He worked for the city all of his life!"

Among the vivid memories of growing up in the tough streets of Chicago were his mother's strong religious convictions. Of all the Ryan children, it was Mike who regularly accompanied his mother to prayer devotions. "She always took me because she said I was the one who needed it most!"

Back "in the day," everyone in the neighborhood knew everyone, Mike explains. "Doors and windows were unlocked. And despite the rough neighborhood, people were civil. They still talked to each other."



BULLETIN Photograph by Brandon Sofsky

As most who worked for the city and its vendors, Mike's dad was actively involved in Chicago politics, an allegiance that would not be lost on his eldest son.

While growing up in Chicago provided no direction as to what Mike wanted to do following high school, he did have an unusual approach in dealing with the street ruffians of Bridgeport.

"A lot of us took it upon ourselves to watch out for the senior citizens in our neighborhood," he relates unapologetically. "That meant spending a lot of time with the old folks on their porches." And that meant receiving an education he could never obtain in the public school system.

"We chatted for hours," Mike fondly remembers. "I walked away with a lot of stories from people who had spent more time on earth than I had. I learned of their lives, their values; what it was like to experience war. I had lengthy conversations with immigrants who grew up in Ireland and Poland."

Mike also had a conversation with his dad following high school graduation in 1969. "In no uncertain terms, he told me to grow up and prepare myself for life." Two years later, Michael J. Ryan was a US Marine.

Completing the obligatory battery of aptitude tests, Mike was designated an infantryman and subsequently assigned ship duty overseas for ten months. "Irony of the situation is that I never fired a bullet while on duty!"

Aboard the USS *Tripoli*, he traveled to Okinawa with the Seventh Fleet and to the coast of Vietnam. From there, the ship headed to the Philippines before returning to North Carolina where Mike finished the last six months of his tour.

The new civilian lost no time returning to the old neighborhood where he took a part-time job as a night bartender. During the day he held a variety of jobs, including positions at an auto parts company, drug store, and local department store.

But it was Mike's bartending at Shinnick's Pub that provided him what he missed while in the Marines: a social outlet. No, a *Chicago* social outlet.

It was at Shinnick's where he was able to revisit his senior citizen friends. Then there was the year-long struggle to get a girl named Christine to go out with him (they married in 1980).

The homecoming brought yet another transformation to Mike's world: entry into Chicago politics. "We put out posters, kept in contact with voters, performed small favors for the seniors like moving furniture or running errands, getting them to the polls . . . in general, making sure the needs of our neighborhood voters were being taken care of."

Three years after his discharge, Mike was still a part-time bartender. So it came as no surprise when father and son had another conversation. "Dad told me it was time to get a job. A real job. A full-time job!"

The elder Ryan introduced his son to a business agent for the Boilermakers Union at a meeting in 1976 that led Mike to enter the union's apprentice program. While joining the union was in no way unusual, it did result in the bartender's introduction to pressure equipment and consequently a new career.

The Chicago National Board member earned his boilermaker's card in 1980 during what he remembers was a bad economy. Spending the next six years working in the field, Mike joined the city in 1986 as a boiler inspector.

"Back then, inspecting boilers was a lot different than what we experience today," Mike laments. "People took pride in their buildings. The equipment was clean. The floors were clean."

Mike recalls inspecting the boilers of a large downtown mansion on a Monday morning and being greeted by a house in serious disarray. "I didn't realize it at the time, but it was Hugh Heffner's mansion. What I witnessed was the aftermath of a celebrity party that had lasted the entire weekend."

The Illinois native worked as a city inspector for six years before being promoted to supervisor in 1992. In 1998, he became chief inspector. "It took me a couple of years, but I finally earned my National Board Commission in 2004, the same year I became a National Board member."

Mike says his involvement with the National Board has been an extremely positive experience. "It's kindness and a total effort by the staff that makes me – actually, I think all of the members – feel very fortunate."

The fact Mike has called Chicago home since birth underscores his love and commitment to the Second City. That and being a White Sox and Bears season ticket holder.

Whereas many chief inspectors experience the occasional wanderlust, Mike isn't one of them. The city official of 25 years says he's content with his sports, playing some golf, reading, and continuing his important role as father to two grown daughters.

Looking back, Mike says he has no regrets about tying himself so tightly professionally and personally to Chi-Town. "You can take the man out of the city," he keenly observes, "but you can't take the city out of the man."

Channeling his best Frank Sinatra, the National Board member from Chicago concludes: "It's my kinda town ." ♣

Working Together for Safety

The National Board, ASME, and the International Code Council

By Chuck Withers, Assistant Executive Director – Technical

The National Board of Boiler and Pressure Vessel Inspectors, the American Society of Mechanical Engineers (ASME), and the International Code Council (ICC) are established organizations with one common vision – **SAFETY!** Each organization develops and maintains independent, internationally recognized safety standards that become mandatory requirements when adopted by jurisdictions and other regulatory authorities. It is difficult to understand all the requirements identified in these standards, but it is even more difficult to understand which standard must be followed and how standards relate to one another. To help users recognize the applicability of standards, this article will focus on the development, relationship, and importance of standards published by these three organizations.

Development

In 1911, ASME established a committee (now called the Boiler and Pressure Vessel Committee) to provide rules of safety relating to the construction of boilers and pressure vessels. The term "construction" includes materials, design, fabrication, examination, inspection, testing, certification, and over-pressure protection. In 1915, the first ASME boiler code was published. Over time, these rules became recognized and followed by jurisdictions in the United States and Canada as new construction safety standards to help prevent the numerous boiler and pressure vessel accidents that were on the rise. Once construction standards were recognized and adopted by jurisdictions as codes to follow, jurisdictions were faced with a new dilemma. How could uniform construction code requirements be ensured and accepted by each jurisdiction when boilers and pressure vessels fabricated in one state or province were shipped to another?

Hence, in 1919 The National Board of Boiler and Pressure Vessel Inspectors came into existence as an organization comprising chief inspectors from states, cities, and territories of the United States and provinces of Canada. At that time inspection laws differed widely between states and provinces. As jurisdictions began adopting the *ASME Boiler and Pressure Vessel Code* (ASME B&PVC), National Board members recognized the need for uniform qualification and commissioning of boiler and pressure vessel inspectors. Their motto, "One Code, One Inspector, and One Stamp," greatly advanced adoption of the ASME code throughout the country. Generally speaking, the National Board (through members and commissioned inspectors) can be considered the enforcement body for the ASME B&PVC and post-construction activities involving installation, inspection, and repairs to boilers and pressure vessels. Both organizations have differing roles but work closely together to maintain pressure equipment standards.

In 1946, the National Board published the *National Board Inspection Code* (NBIC) to address the needs of jurisdictions and inspectors when performing inspections and repairs to operating pressure equipment. To date, the NBIC recognizes and addresses three specific areas for safety with regards to boilers, pressure vessels, piping, and pressure relief devices. These key areas include *Installation* requirements, NBIC Part 1; *Inspection* requirements, NBIC Part 2; and *Repair and Alteration* requirements, NBIC Part 3. Just as the ASME B&PVC describes in detail rules to follow for fabricating various types of pressure equipment, the NBIC describes requirements for the safe installation, inspection, repair, and alteration of pressure equipment once new fabrication or construction is complete. For instance, just as the ASME new construction boiler codes differ between high-pressure and low-pressure boilers, there are different requirements for installing or inspecting a large utility high-pressure steam boiler compared with a low-pressure steam boiler installed in an office or apartment building. Therefore, the **type of pressure-retaining item and where that item is installed will dictate which standards or codes to follow.**

Relationships

As time progressed, ASME and National Board committees, through their voluntary members, began working closely with other organizations – such as users, manufacturers, insurance companies, installers, and contractors – to fully understand their needs and concerns and to expand and improve codes and standards. Because of this philosophy, the ASME B&PVC and NBIC are now recognized by jurisdictions, regulatory agencies, and many other organizations worldwide. These international standards or codes are developed and maintained under the rules of the American National Standards Institute (ANSI) and in accordance with World Trade Organization (WTO) principles.

As time progressed, building officials and code administrators recognized a need to develop a comprehensive set of regulations for mechanical, plumbing, and fuel gas systems associated with various types of pressure equipment. Under the development process of the International Code Council (ICC), these particular codes are maintained and revised continually, just as the ASME and NBIC codes. The *International Fuel Gas Code*, *International Plumbing Code*, and the *International Mechanical Code* are widely used and recognized as international safety codes.

The ICC's international safety codes reference the requirements of the ASME code and the NBIC, as well as other recognized standards developed by organizations such as Underwriters Laboratories (UL) and the National Fire Protection Association (NFPA). Design and construction of pressure equipment; installation, inspection, and repairs to pressure equipment; and the systems that serve to connect and operate pressure equipment all fit together to identify different aspects of needed requirements that provide public safety.

Requirements for boilers and pressure vessels such as combustion air, installation clearances, and safety devices are also specified within the ICC codes. Many of the same requirements are specified in jurisdictional regulations, the ASME code, and the NBIC, as well as other referenced standards. Some requirements are the same while others may conflict. Trying to understand and follow all of these requirements while still meeting the manufacturer's recommendations can be a whirlwind of confusion for owners-users, installers, and contractors.

Here in the United States most cities, states, and other local jurisdictions regulate pressure equipment and define the requirements, limitations, and exceptions within their laws or regulations. Individuals such as owners, manufacturers, installers, contractors, inspectors, and many others associated with the safe operation of pressure equipment have an important responsibility. All laws and regulations should be understood by these individuals. However, between the many standards referenced by jurisdictional rules and regulations, additional requirements, exceptions, and limitations identified by each jurisdiction (not uniform between jurisdictions), understanding the requirements needed for safety can be an overwhelming nightmare for most. By performing research (electronically) and asking jurisdictional representatives pertinent questions, an individual can have a better understanding of which rules pertain to specific pressure equipment and how to apply those rules. Knowing requirements may differ or overlap within jurisdictions should help individuals recognize that the most stringent requirements identified should be followed for optimal safety. When this philosophy is kept in mind, safety is improved.

Importance

Jurisdictional rules, regulations, safety codes, and standards are living documents – forever changing in response to a perpetually evolving technical and global environment. As such, many safety-minded organizations realize the importance and responsibility of communicating and participating as voluntary members in developing these safety codes and standards. It is even more important for standard-developing organizations to clearly define the boundaries of applicability for specifying rules and regulations to prevent confusion, overlap, and conflicts. Just as ASME develops and maintains rules strictly for new construction of pressure equipment and the National Board develops and maintains rules for post-construction activities, each standard should be clear as to applicability of rules or specified requirements. Rules and requirements should not differ or conflict with other standards to further confuse users. When conflicts exist, understanding of requirements begins to diminish, and ultimately, safety is jeopardized.

Today, standards-developing organizations encourage their personnel to get involved in and participate on standards committees. Volunteer committee members contribute their time and knowledge with the single-minded goal of continually refining their respective standards. Volunteers are mainly supported by their employers and the costs can be substantial; however, the benefits gained by each employer and all users of associated safety standards are worth the investment.

More organizations are realizing the value of committee involvement and are proactively working together with other standards-developing organizations on vital safety requirements. It is the mission of the National Board to continue working closely with other standards developers and establish long-term relationships with these industry partners to ensure pressure equipment safety standards are of the highest degree – to the benefit of all.

The Numbers

BY KIMBERLY MILLER, MANAGER OF TRAINING

Some may wonder, "What does the training department actually do?" And the answer could be as simple as, "We conduct training for the boiler and pressure vessel industry's inspectors."

But if we looked at what training does in a narrower sense, what would we find? Here are some of the highlights…

In 2011 the National Board Training Department conducted 31 training classes for a total of 176 days of training. That equals 35.2 weeks of classroom time where instructors taught the 911 students who enrolled in 2011. While the majority of those students traveled to our facilities in Columbus, Ohio, we also went to them with classes conducted in Minnesota, Illinois, Arizona, California, and Washington, as well as China and Germany. That added up to a lot of frequent flier miles for our instructors!

And when instructors are not in front of a classroom, what are they doing?

They are developing new training material and updating existing material to meet the changes in codes and technology. That can take a great deal of time since we currently have well over 400 files – whether they be slide presentations or other documents – used throughout the year to teach the current menu of courses and seminars. The instructors are also working with our administrative and curriculum development staff to constantly improve the material. This may include a new method of delivery, improved or additional graphic elements, or the integration of equipment in our inspection room.

But that is just the classroom side of things. *What about the online training program?*

In 2010 and 2011 the National Board rolled out 10 online courses. An online training course can take anywhere between 85 and 185 hours of development time to generate one hour of online training material, depending on the complexity of the material. That includes drafting, writing, and editing content; creating storyboards; a round or two of technical review by staff engineers; development of the course itself; and at least one level of beta testing before an online course is ready to be rolled out. With six of the 10 courses premiering in 2011, the National Board staff spent nearly 2,000 man-hours on the online training program.

And in the last calendar year, over 330 students enrolled in online training. That is an increase of 300% from the previous year's 107.

So that is classroom and online training. *What about the development of examinations?*

The training department and its staff are also involved in the validation of examination questions. What that means is the National Board is committed to having solid exam questions that have been reviewed by a committee of staff engineers for accuracy, validity, and fairness. Currently there are close to 2,000 exam questions in our database and over 700 have been through the validation process. As it takes an average of 10 minutes for a committee of four to validate one question, 486 hours have been spent validating exam questions to date. And this does not include time on data entry or other pre-validation committee work.

So as you can see, the numbers add up to a very busy training department committed to continuous improvement in order to better address the needs of the boiler and pressure vessel industry.

And that about sums it up. ✤

2012 Classroom Training Courses and Seminars

The 2012 training calendar is currently released through July. Additional class dates are released monthly and posted on the Training section of the National Board Web site. Class size is limited and availability subject to change. Check the National Board Web site for up-to-date availability.

COMMISSION/ENDORSEMENT COURSES

(N) **Authorized Nuclear Inspector Course**
TUITION: $1,495
March 26-30, 2012
July 9-13, 2012

(IC) **Inservice Commission Course**
TUITION: $2,995
June 4-15, 2012

(A) **New Construction Commission and Authorized Inspector Course**
TUITION: $2,995
June 18-29, 2012

(B/O) **Authorized Inspector Supervisor Course**
TUITION: $1,495
July 23-27, 2012

(I) **Authorized Nuclear Inservice Inspector Course**
TUITION: $1,495
TBA

(C) **Authorized Nuclear Inspector (Concrete) Course**
TUITION: $1,495
TBA

(NS) **Authorized Nuclear Inspector Supervisor Course**
TUITION: $1,495
TBA

CONTINUING EDUCATION SEMINARS

(RO) **Boiler and Pressure Vessel Repair Seminar**
TUITION: $725 (complete seminar)
$250.00 (day 1 only)
May 22-24, 2012

(VR) **Pressure Relief Valve Repair Seminar**
TUITION: $1,495
March 12-16, 2012

All training is held at the National Board Training Centers in Columbus, Ohio, unless otherwise noted.

Boiler Explodes at Steam Laundry

It was business as usual for the employees of Banner Steam Laundry in West St. Paul, Minnesota, on the morning of July 22, 1919. Among others, about 45 women arrived at the laundry for "another day, another dollar."

Their shift ended around 4 p.m. and they departed for their homes. One hour later, a boiler – located directly beneath where the women worked – exploded, demolishing the building. One man was killed and several more injured. The 45 women lost their jobs with the explosion, but they didn't lose their lives.

The scene was described in an anonymous letter to the editor in *The International Steam Engineer* (September 15, 1919, Volume 36, Number 3): "The boiler was moved from its setting about 50 feet through a stone wall about 3 feet in thickness. The building was completely wrecked. A portion of the boiler front was thrown over a four-story building and landed in a vacant lot nearly a block away. A hot fire brick coming out of the boiler was thrown two and one-half blocks through the window of an office where a bookkeeper was at work."

An investigation into the cause of the incident showed a liberal allowance of 110 pounds per square inch as the approved pressure. According to the then two-year-old ASME boiler code (which Minnesota had adopted) the boiler should not have been allowed over 100 pounds of pressure.

Frustrated with the lack of consistency in boiler code regulations, the anonymous writer appealed to his colleagues: "The engineers' organizations throughout the United States ought to insist upon the adoption of the ASME code and its strict adherence by all inspectors, no matter who they represent – state, municipalities, or insurance companies. In doing so they will be taking steps towards protection of their own lives." He signed the letter, "One Who Knows."

Others also knew the vital importance of boiler and pressure vessel regulation: less than two months after the fatal steam laundry explosion – and the very month the anonymous letter was published – four chief inspectors met to develop a safety organization to regulate the ASME boiler code across jurisdictions – The National Board of Boiler and Pressure Vessel Inspectors.

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