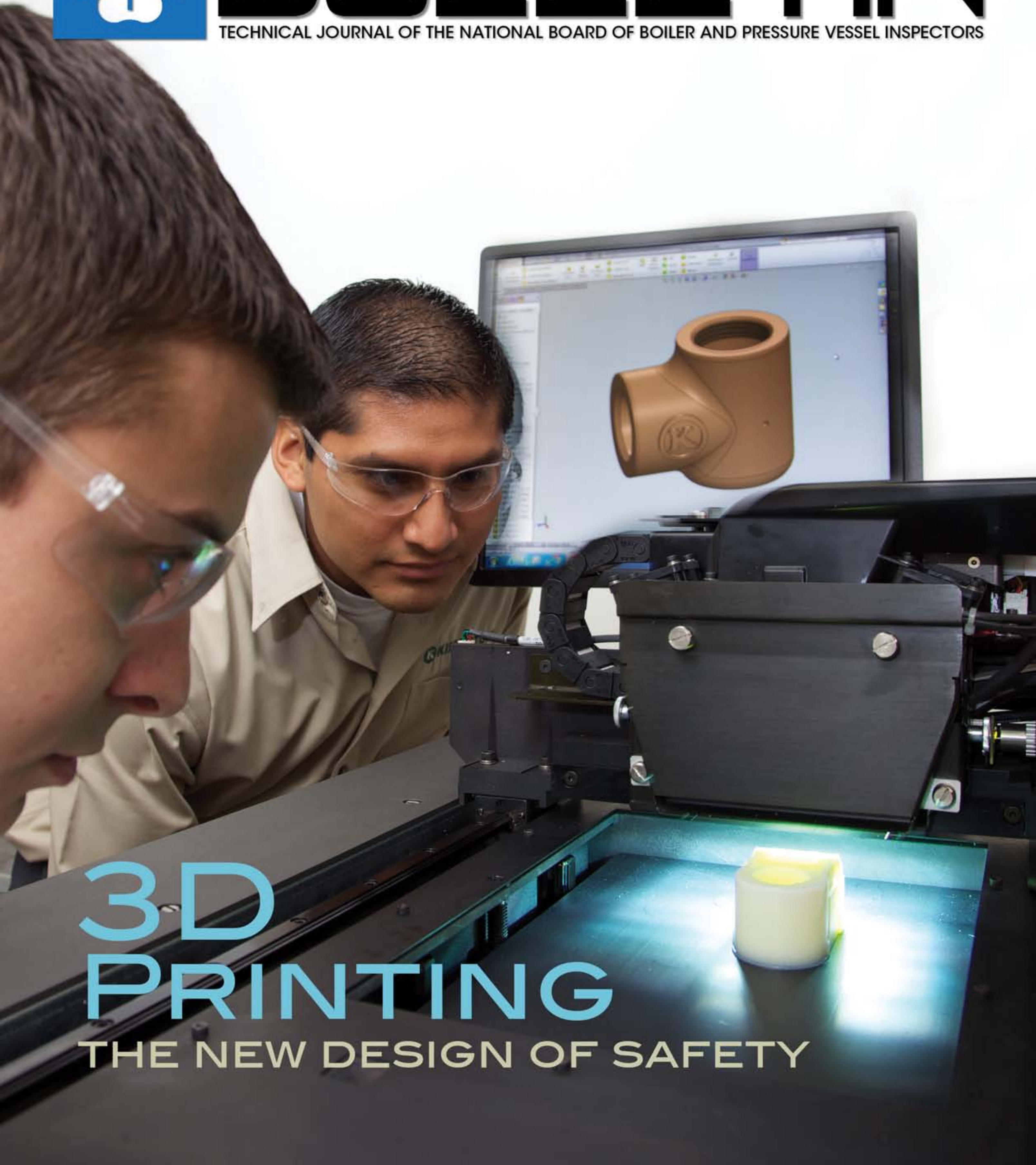
FALL 2013

BULLETIN

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



3D PRINTING

THE NEW DESIGN OF SAFETY

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

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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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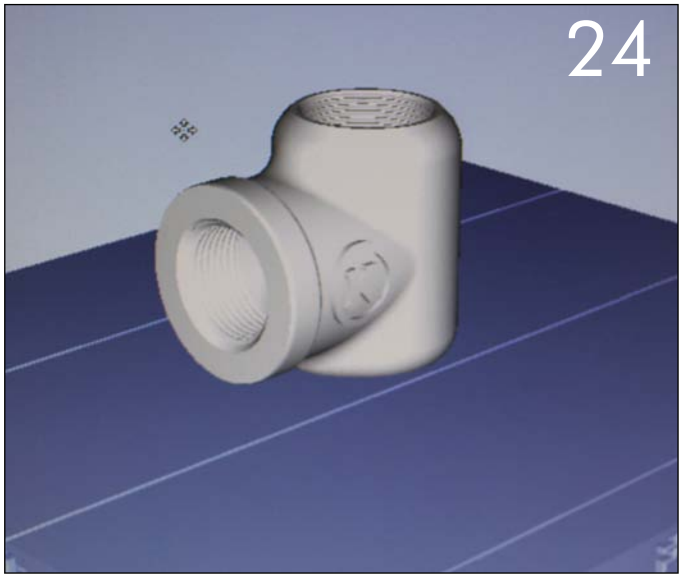

◀ Designing safety: A 3D model of F.C. Kingston's side outlet pressure relief valve was created in a computer-aided design (CAD) software program – the first step in the 3D printing process.

On the Cover: ▲
F.C. Kingston engineers Derek Parnett (left) and Marco Martinez (right) watch as their valve component materializes on a 3D printer. For the first time, 3D-printed valve prototypes have been successfully tested at the National Board Test Lab and could become standard procedure.

COVER STORY

FEATURES

DEPARTMENTS

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IN CODE WE TRUST

BY DAVID A. DOUIN, EXECUTIVE DIRECTOR

For as long as I can remember, pressure equipment has been primarily perceived to be rather low-tech.

The operative word here is "perceived."

Those of us who have spent the better part of our careers observing the evolution of our industry understand that however subtle, improvements in design, materials, controls, and composites have been critical to advancing a safer, more predictable product. Best practices, more-efficient processes, and an ever-expanding foundation of inspection knowledge have transformed one of the most deadly industries at the turn of the last century to one of today's most reliable.

Granted, there will always be naysayers who ask, "how complicated can this technology be?"

These are the same individuals who have never heard of the ASME or National Board codes. Indeed, if the technology were so elementary, how does one reconcile the necessity of a manufacturing code that celebrates its 100th anniversary next year? It should be noted the *ASME Boiler and Pressure Vessel Code* is a living code that is the product of hundreds of thousands of hours spent discussing and arguing the nuances of pressure equipment design and function with, of course, an emphasis on safety.

Just when it appears the latest development in technology will never be surpassed, along comes a radical process to print 3D products from a machine. Yes, it requires a CAD drawing, and yes the finished product is plastic. But as you will see in the story on pages 24-31, the use of 3D printers promises to have a profound impact on the future of our industry.

Imagine for a moment the effect on equipment design. Soon we may have the amazing capacity to design an entire pressure vessel, print it in 3D form, and modify it structurally before ever having to construct a metal prototype. More important, imagine the savings of time and resources.

Of course, saving *time* and *resources* is not often mentioned in the same sentence with safety. Safety is a discipline that requires a methodical and highly focused effort on the part of dedicated industry professionals. That's why a few purists will put forth some reservations about 3D printing and its future role in a trade known traditionally for its precautionary work ethic.

But what if the savings of *time* and *resources* were reinvested into, say, additional research and development? And what if those savings could be applied to improving the quality of pressure equipment?

Include *research* and *development* as well as *quality* in the same sentence with *safety* and we have a formula in which all can agree.

Of course, any significant breakthroughs in technology – or change in code for that matter – bring a need to keep those in our industry up-to-date on latest developments. That is why the National Board recommends those sitting for our classes take a refresher course every two years. Technological innovations, like code modification, can be both subtle and elusive.

While I cannot predict with any certainty the success of 3D printing in our industry, I am encouraged by the ingenuity and possibilities new technology presents.

But like all changes we have witnessed during our careers, the final arbiters will be those who sit on the code committees of ASME and the National Board. As long as our codes remain living documents, new technology will continue to be properly vetted and evaluated with the wisdom and caution that has been the steadfast symbol of our respective organizations.

If evolving technology does anything, it will ensure the final editions of the ASME and National Board codes will *never* be written. ◆

2013 Registrations

National Board *Certificate of Authorization to Register* ensures a third-party inspection process, providing for uniform acceptance of pressure-retaining equipment by member jurisdictions. This important safety process is documented via submission of data reports by the manufacturer to the National Board. These are the only reports carrying the National Board registration number. Once registered, each report is maintained in a permanent file by manufacturer name and National Board number.

The list below identifies boiler, pressure vessel, and nuclear vessel registrations by size for the past five fiscal years. The National Board fiscal year is from July 1 to June 30.

The total number of registrations on file with the National Board at the end of the 2013 reporting period was 50,113,555.

SIZE		FY 2013	FY 2012	FY 2011	FY 2010	FY 2009
BOILERS						
square feet of heating surface						
≤ 55	(A)	190,799	163,189	154,964	156,129	161,041
> 55 and ≤ 200	(B)	27,903	28,591	28,823	30,884	32,371
> 200 and ≤ 2,000	(C)	9,015	8,281	8,362	8,032	9,084
> 2,000 and ≤ 5,000	(D)	477	607	557	420	720
> 5,000	(E)	516	475	572	650	766
TOTAL		228,710	201,143	193,278	196,115	203,982
PRESSURE VESSELS						
in square feet						
≤ 10	(A)	911,754	927,192	788,752	680,873	774,899
> 10 and ≤ 36	(B)	207,702	207,621	202,902	183,449	214,107
> 36 and ≤ 60	(C)	43,805	44,401	40,017	35,798	43,648
> 60 and ≤ 100	(D)	17,261	16,162	12,924	11,039	14,714
> 100	(E)	24,098	21,189	16,784	13,783	18,509
TOTAL		1,204,620	1,216,565	1,061,379	924,942	1,065,877
NUCLEAR VESSELS						
in square feet						
≤ 10	(A)	476	443	482	481	494
> 10 and ≤ 36	(B)	181	79	51	30	38
> 36 and ≤ 60	(C)	21	9	14	7	13
> 60 and ≤ 100	(D)	8	6	18	5	5
> 100	(E)	143	169	94	14	9
TOTAL		829	706	659	537	559
TOTAL ATTACHMENTS*		96,557	103,175	92,158	90,117	86,961
GRAND TOTAL		1,530,716	1,521,589	1,347,474	1,211,711	1,357,379

*An attachment is any type of additional information to be submitted with the primary data report.

For more information on the Authorization to Register Program, access the National Board website at nationalboard.org

Calibration

BY FRANCIS BROWN, SENIOR STAFF ENGINEER

The *National Board Inspection Code* (NBIC) and Sections I, IV, VIII, X, and XII of the *ASME Boiler and Pressure Vessel Code* require the ASME certificate holder or **R** stamp holder to have a system for the calibration of all test and measuring equipment (see Table 1). Although measurements are required, the accuracy of most measurements is not defined. The codes do not require the certificate holder to purchase the most accurate measuring equipment available, and accuracy of measuring and test equipment may degrade over time because of wear from use and handling. As a result of inherent and cumulative inaccuracies, the values from the test or measuring device (test device) may not be true values. Calibration is the means of correcting the inaccuracies of the test device.

Calibration is the comparison of a test device to a standard device, and in the United States the accuracy of the standard device is usually traceable to the National Institute of Standards and Technology (NIST). Any error in the standard device is much smaller than the potential error in the test device, and therefore the standard device is considered to yield true values. The test device is calibrated over its useful measuring range by recording the test device and standard device readings at numerous points, yielding a curve or table. The calibration curve or table is used to correct a measured value to the true value.

For illustration purposes, a pressure vessel manufactured per ASME Section VIII, Division 1, is to be hydrostatically tested. The ASME code requires the hydrostatic test pressure to be a minimum of 1.3 times the maximum allowable working pressure (MAWP) [see UG-99(b)]. That is, true pressure shall be 1.3 MAWP or higher to comply with code requirements. The indicated pressure reading must be corrected to the true pressure to ensure compliance with code requirements.

Table 1: Code References

Code	Reference Paragraph
NBIC (R stamp)	Part 3; 1.6.1m)
Section I	A-302.10
ASME Section IV	F-202.8
ASME Section VIII, Division 1	10-12
ASME Section VIII, Division 2	2-E.12
ASME Section VIII, Division 3	2-120
ASME Section X	1-110(i)
ASME Section XII	I12

Depending upon the model, pressure gage accuracy ranges from 0.1% to 5.0% of full scale (FS). In addition, some pressure gages are more accurate in the middle range of the dial compared to the ends of the dial (3-2-3). That is, the accuracy is 3% over the first 25% of the dial; 2% accurate over the middle 50% of the dial; and 3% accurate over the upper part of the dial.

ASME Section VIII, Division 1, requires the range of the pressure gage scale to be 1-1/2 times the test pressure (TP), but not to exceed four times the TP (see Table 2). For a test pressure of 800 psi, the upper limit of the scale may be 3,200 psi. This means a new 3,000 psi gage with an accuracy of 3% FS may be in error by ±90 psi. Will the actual test pressure be 890 psi, 710 psi, or somewhere in between?

The pressure gage to be used for a hydrostatic test should be selected to maximize the accuracy of the pressure reading by selecting a gage so the test pressure will read in the middle part of the gage scale. The calibration curve or table provides the information to correct the indicated reading to the true test pressure. The calibration table for a 3,000 psi gage is shown in Table 3. Note the calibration table defines the useful range of the pressure gage. The gage shown in Figure 1 shall not be used to determine pressures below 500 psi or above 2,200 psi.

At a true pressure of 1,800 psi, the gage reads 1,800 psi when the pressure is increasing, but reads 1,795 psi when the pressure is decreasing. The gage has a negative error of 2.5 psi, and the indicated reading must be corrected to arrive at the true pressure. At a gage-indicated pressure of 1,795 psi, the true pressure is 1,797.5 psi.

During a hydrostatic test, pressure gage readings are corrected to true pressure via the calibration curve or table. Continuing with the preceding example, the calibration table shows a 3,000 psi pressure gage reads 800 psi at a true pressure of 800 psi. In this case a correction to the gage reading is not required to find the true pressure.

As required by the quality assurance program, a tag is applied to the gage showing date of calibration; initials of the technician performing the calibration; and calibration expiration date (see Figure 1). The calibration is valid until the expiration date. If there is reason to believe the gage is in error, recalibration is required.

For additional information on pressure gage calibration see ASME B40.100-2011, *Pressure Gauges and Gauge Attachments*.

Although the codes listed in Table 1 do not specify the accuracy of pressure gages (or any measuring devices), it is good practice to use pressure gages more accurate than the 3% FS gages illustrated in this article to minimize the correction applied to the indicated reading. The accuracy and calibration status of test and measuring devices should be suitable for the intended purpose.

As demonstrated in this article, calibration of pressure gages used for testing is critical to ensure compliance with code requirements. Test and measuring devices used for final acceptance for code compliance shall be calibrated to ensure true values are used. All test and measuring devices should be calibrated periodically to ensure measurement accuracy. ✤

Table 2: Pressure Gage Scale Limits

Code	Minimum Scale Limit	Maximum Scale Limit
ASME NBIC	Per original Code of Construction	
ASME Section I	1.5TP	2TP
ASME Section IV	1.5TP	4TP
ASME Section VIII, Division 1	1.5TP	4TP
ASME Section VIII, Division 2	1.5TP	4TP
ASME Section VIII, Division 3	1.5TP	4TP
ASME Section X	1.5TP	4TP
ASME Section XII	1.5TP	4TP

Table 3: Pressure Gage Calibration

NATIONAL BOARD TESTING LABORATORY
DIAL TEST GAUGE CALIBRATION DATA SHEET
Procedure CP-1

Standards:

AMETEK SN: 8571 MODEL: R-10 __HI PRESS. PISTON __LO PRESS. PISTON

ASHCROFT SN: 13A-89156 MODEL: 1305 __HI PRESS. PISTON __LO PRESS. PISTON

_x_CG-1 (0-5000) S/N 237139 __CG-2 (0-300) S/N 237021

GAUGE ID: DTG-8 MANUFACTURER: Ashcroft PRESSURE RANGE: 0-3000

NOMINAL	PRESSURE UP	PRESSURE DOWN	AVERAGE PRESSURE	CORRECTION	HYSTERESIS
0	0	0	0		
500	500	500	500		
800	800	800	800		
900	900	900	900		
1200	1200	1200	1200		
1400	1400	1400	1400		
1600	1600	1600	1600		
1800	1800	1795	1797.5	2.5	5
2000	2000	1995	1997.5	2.5	5
2200	2200		2200		

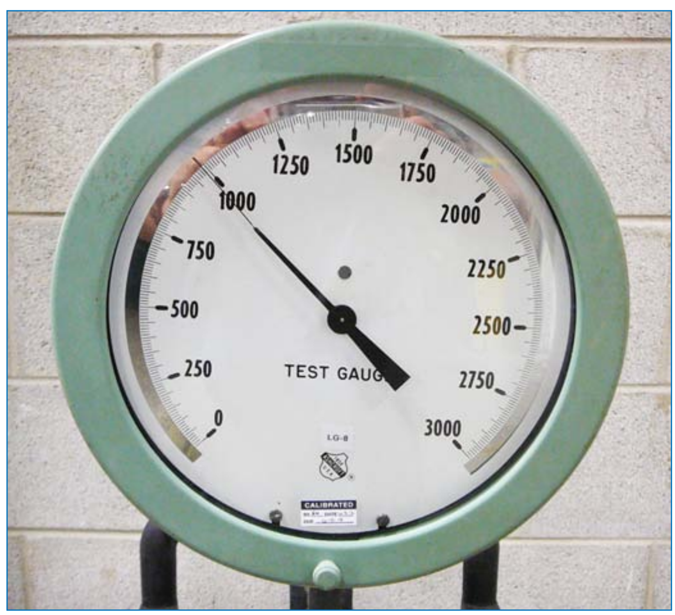
Max. Allowable Correction = 7.5 psi Max. Allowable Hysteresis = 7.5

CALIBRATOR: John Smith DATE: 4-15-13

AUTHORIZED OBSERVER: ____________ DATE: ________

File: H:\GENERAL\NB PRD Procedures & Forms\FORMS\587 Dial Test Gage Rev.3.doc NB-587 Rev 3

Figure 1: Calibrated Gage



Grab the Opportunities:
An Interview with New ASME President Madiha El-Mehelmy Kotb

Longtime National Board Member and New ASME President Madiha Kotb Discusses Global Impact, Industry Challenges, and the Professional Journey

Madiha El-Mehelmy Kotb has always believed that destiny and opportunity come hand in hand – but it's up to each person to seize the moments and give their very best. With nearly three decades' experience in the technical industry, Kotb knows a little something about grabbing opportunities and seeing where they'll take her. Destiny's latest baton came to Kotb in the form of a nomination to become ASME's next president for the 2013-2014 term. True to Kotb's tenacity, she seized the challenge. In this exclusive interview with the *BULLETIN*, Ms. Kotb discusses points of focus in her professional career along with personal insights that have helped shape her life's trajectory.

What unique qualifications and perspective do you bring to your new post as ASME president?

I bring a different perspective mainly because of my cultural background, language skills, and life experience. I have been involved with ASME in different capacities for almost three decades now. I believe in the ASME mission and I believe that the future of ASME depends on its global activities. The internet has changed the world; it has broken and eliminated barriers. For an organization to survive and grow, it needs to adapt and evolve in the global market.

What is the primary focus of your presidency?

ASME has three major strategic initiatives: global impact, workforce development, and energy. My focus will be on global impact. By many measures, ASME is already a global organization with many international activities, but we need a shift of paradigms and change of business culture in order to be perceived and accepted as a legitimate partner in countries where we don't have an established presence and in geographical areas where we need to increase our programs, products, and services. Our member, stakeholder, and volunteer bases are becoming more and more diverse, and this trend is not going to change. We need to be cognizant of these facts and strengthen our legitimacy as a leader in the global marketplace.

Can you specify any projects that relate specifically to pressure equipment that could impact the pressure equipment industry?

It is hard for anyone to think of ASME without considering the *ASME Boiler and Pressure Vessel Code*, which not only serves the public by enhancing public safety, but also serves the pressure equipment industry as a whole. With more and more countries adopting and recognizing the ASME code, there will be growth in our Conformity Assessment programs and training associated with the application, adoption, and recognition of the code.

As you know, the ASME stamp is a valuable brand and provides cachet that is well recognized when put on a boiler or pressure vessel – as are the qualifications of National Board inspectors who witness the use of the stamp. Stamping is a final action in the manufacturing process and is ultimately what remains visible on pressure equipment. However, people should be cognizant of the process that leads to the application of the stamp and the important role of National Board qualified inspectors, who have gone through extensive training – a process of qualification that enables them to provide oversight and adherence to the certificate holder quality system and proper use of the stamp. National Board qualified inspectors are, in my view, the guardians of the process day in and day out.

National Board training programs have grown considerably in the last few years and have also gained international recognition everywhere the ASME code is used. I see this trend continuing. A natural extension is the use of the *National Board Inspection Code* (NBIC), which is the recognized code for inspection, repair, and alteration of pressure equipment.

What do you see as one of the biggest challenges the boiler/pressure vessel industry faces today?

While globalization has been a huge opportunity for the pressure vessel industry, it is also our major challenge. Users do have a choice now and North American manufacturers must compete with other manufacturers from all over the world. You can no longer win out over your competitors simply by knowing them and their products. Also, the competition today is not so easy to identify as it has no borders.

How can the industry work toward a solution to that challenge?

The industry can get there through innovative designs, manufacturing processes, and new materials. It is unfortunate for the North American boiler/pressure vessel industry that the number of ASME certificate holders from outside North America is on the rise, whereas the number of North American manufacturers is declining or is at best stable. North American manufacturers have a longstanding reputation of producing high-quality, safe equipment; we need to capitalize on this and get back to the top.

National Board and ASME have had a long, durable relationship. How would you characterize it and how do you see it evolving in the future?

When ASME was celebrating the 125th anniversary of Codes and Standards, National Board Executive

Anyone who's been involved with the National Board in the past 24 years knows her. But for newcomers, the following is a short list of Kotb's professional achievements.

- National Board member representing Québec (1989-Present)
- National Board's Board of Trustees member at large (1991-1993)
- ASME active volunteer for nearly 30 years
- ASME president (2013-2014)
- Chair of the ASME Presidential Task Force on Uniform (Financial) Reporting
- Lead volunteer member for Engineering for Change (E4C)
- Member of the E4C LLC Management Committee
- Committee member of ASME's Engineering for Global Development (EGD)
- ASME Board of Governors (2008-2011)
- ASME's Dedicated Service Award (2008)
- Vice President of Conformity Assessment (2003-2006)
- Chair of the ASME Québec Section (2000-2003)
- Canadian Standards Association Award of Merit (2003)
- Served as member: ASME's Committee on Governance and Strategy, the Council on Codes and Standards, and the Committee on Ethical Standards and Review

Director David Douin said, "ASME and the National Board are joined at the hip." I totally agree with Mr. Douin's statement. I see this partnership becoming stronger as it is working, and it serves our industry well; not only for both organizations, but also for government bodies, industry, and first and foremost, the public. Public safety has and will always be our primary focus and purpose. We should never lose sight of this fact.

You are very involved in the ASME-conceived Engineering for Change (E4C) program – a growing alliance within the global technical community which seeks to find technical solutions to the world's humanitarian and development challenges. What about this organization speaks to you?

To me, Engineering for Change exemplifies the highest aspirations of the engineering profession, and it does so in a way that engages new constituencies to get involved. What could be better than helping engineers use their vital skills to the aid of their fellow men and women around the world? The E4C team is so enthusiastic and committed – it's a pleasure to be involved.

Regarding E4C, is there a particular success story you'd like to share?

E4C is not only a relatively new project; it is a relatively new and unique idea that has not reached its full potential. That being said, the speed by which it took off, the excitement that was created around it, the number of organizations that chose to sign on, and the number of members who signed up for it are, in my opinion, success stories that speak for themselves. Whereas several engineering solutions have been developed through E4C, I anticipate that we have yet to hear the big success stories where lives are transformed and communities saved.

You pioneered a pathway in the male-dominated boiler and pressure vessel industry. Can you share some of your "secrets" as to how you successfully established yourself in this industry?

Looking back in time, I must confess it has not always been easy. That said, perseverance and humor helped me through it. I remember a week-long meeting where my presence was completely ignored and all speakers chose to address the audience as "gentlemen." I was new in my role, relatively young, and much less-experienced than most attendees, so when I had the opportunity to speak, I prefaced my comment by stating that I never realized I had an edge over everyone present. First, there was silence; then, I added that I was the only person present who was not making a mistake by calling everyone 'gentlemen.' There was laughter and I was unanimously voted "Honorary Gentleman!" I have several anecdotal stories like this. You can imagine that once I established my professional competence in the field, I earned my peers' respect and things were no longer the same.

Adhering to the ASME B&PV Code and the *National Board Inspection Code* (NBIC) is fundamental to the safety and integrity of pressure equipment. Do you have a personal "code" that you live by, and if so, would you share it with us?

In a nutshell, my code is to always give the best of myself and do the best I can in everything I try. In that respect, when I look back, I have no regrets. Not to say there aren't things I wish would have turned out differently. But no one can guarantee outcomes.

Would you do anything differently if you could go back in time?

Seriously, not much! I am very content and proud of my accomplishments, both on the professional and the personal sides of things. I cherish my family and they are a big part of my pride. As for my professional career, had I planned it, I don't think I could have imagined I would be where I am today. I have always believed in destiny; not in a sense that you sit back and do nothing, but rather that opportunities present themselves if they are part of your destiny, and it is up to you to grab the opportunities.

You have a very long list of professional accomplishments and involvements. What are you most proud of?

Being generous with my knowledge and helping people any way I can. Mentorship and transferring knowledge are particularly important to me. I was fortunate in my career to come across several people who were extremely generous to me. This allowed me to grow as a person and as a professional, and I feel I owe it to the field of engineering to give back in the same way.

What's the next skill set you would like to add to your body of knowledge?

Learning new languages. I believe reading about different cultures can always be enhanced by learning the language of the land.

What's next for you professionally? What are you reaching for?

Hmm, this is a tough one! Only time will tell. It all depends on the next opportunity that will present itself to me. ✥

Makeshift Socket Weld Fittings

Convenience Now, Problem Later?

BY THOMAS P. BEIRNE, P.E., SENIOR STAFF ENGINEER, PRESSURE RELIEF DEPARTMENT

Socket weld fittings can be a convenient alternative to both threaded and butt weld fittings for certain applications. Socket weld fittings are typically used in smaller pipe sizes and combine the leak-tight permanent joint properties of a butt weld fitting with the ease and quickness of installation of a threaded fitting.

Socket weld fittings and threaded fittings are generally made from the same rough forging or casting, and then final machining is done to create the fitting in its final form. For this reason it gives the user added flexibility of specifying a combination socket weld/threaded fitting. These fittings are especially useful where a piping system is welded throughout to minimize the possibility of leaks, but the termination point for the end user would need to be threaded.

A combination socket weld/threaded fitting can be made in two ways. The first method is to machine the socket weld on one end and the thread on the other from the rough forging or casting. This is usually done by the fitting manufacturer. The second method is to bore the threads out of one end of a threaded fitting, thereby creating a makeshift socket. This is usually done by somebody other than the manufacturer. Although the first method is preferred, the second method is perfectly acceptable when done properly and in accordance with the *ASME Boiler and Pressure Vessel Code*.

Lack of time is usually the reason for picking the second method over the first. Although this type of fitting is not uncommon, it is not conventional enough that most distributors would stock it. Consequently, a fabricator or piping contractor pressed to meet a deadline might forgo the longer lead time of procuring the fitting manufactured by the first method as described above and opt for the second method. The second method becomes a problem when the socket is bored out too much.

The issue becomes apparent when a company doing the machining is unfamiliar with the ASME bore tolerances for fittings and does not give the machinist the maximum acceptable socket bore when machining the threads smooth. The maximum bore dimensions, along with other dimensions related to fitting manufacturing, are found in ASME Forged Fittings, Socket-Welding and Threaded B16.11, Tables 4 and I-1.

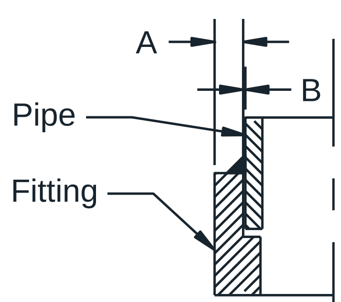


Fig. 1

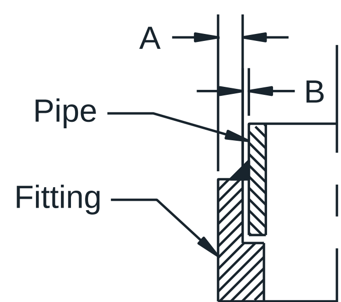


Fig. 2

Why is the bore so critical?

First and foremost, boring the socket too large reduces the wall thickness of the fitting in that location and may decrease the rating of the fitting. Second, the amount of stress applied to the welded joint can increase greatly if the bore of the socket is too large.

Figure 1 shows the proper bore. Figure 2 shows an oversized bore. The wall thickness of the fitting (A) is reduced and the gap between the fitting and the pipe is increased (B). This impacts the stress on the joint in several ways. By reducing the wall thickness (A), the section modulus is also reduced, thereby increasing the bending stress on the joint under pressure. The reduction in the wall thickness (A) also puts the fillet weld more in tension, thereby further weakening the joint. By increasing the gap between the fitting and pipe (B) it increases the amount of the weld area subjected directly to the pressure being contained. These increased stresses may cause premature failure of the welded joint, particularly in service conditions where cyclic loads are applied.

Another issue to consider is that there is no easy way to inspect these dimensions after the weld joint is complete. This is why it is important for the bore to be checked prior to the fitting being used.

In conclusion, when using the second method to create a combination socket weld/threaded fitting, it is incumbent upon the purchaser to specify the bore tolerances given in ASME B16.11, Tables 4 and I-1. It is also the responsibility of the quality control manager or receiving inspector to make sure the bore tolerances for the parts received meet those given in ASME B16.11, Tables 4 and I-1. Failure to follow these tolerances may result in more frequent and/or premature failures which could prove costly and unsafe depending on where the fittings are installed. ✤

Clarification of Pressure Vessel Terminology

BY JIM WORMAN AND FRANCIS BROWN, SENIOR STAFF ENGINEERS

In the purchase and manufacture of ASME Section VIII, Division 1, pressure vessels, there can be confusion as to the meaning of terms containing the word *pressure*. Some of the terms are from industry and some are from ASME Section VIII, Division 1. Below is a list of terms containing the word *pressure* and their definitions.

In order to design, fabricate, test, certify, and operate a pressure vessel, these terms and definitions should be clearly understood by all individuals involved directly or indirectly with pressure vessel safety.

TERM	DEFINITION
User-Specified Operating Pressure (Industry Term)	*See Operating Pressure.*
Basic Design Pressure (Industry Term)	The design pressure at the top of the vessel that is established by the designer by increasing the operating pressure by a suitable margin to avoid premature operation of the pressure relief device.
Design Pressure (Proposed ASME Section VIII, Div. 1, Appendix 3, *Definitions*)	The pressure used in the design of a vessel component together with the coincident design metal temperature, for the purpose of determining the minimum permissible thickness or physical characteristics of the different zones of the vessel. When applicable, static head shall be included in the component design pressure to determine the thickness of any specific zone of the vessel (See UG-21).
Maximum Allowable Working Pressure (MAWP) (From ASME Section VIII, Div. 1, Appendix 3, *Definitions*)	The maximum gage pressure permissible at the top of a completed vessel in its normal operating position at the designated coincident temperature for that pressure. This pressure is the least of the values for the internal or external pressure to be determined by the rules of this Division for any of the pressure boundary parts, including the static head thereon, using nominal thicknesses exclusive of allowances for corrosion and considering the effects of any combination of loading listed in UG-22 that are likely to occur (See UG-98) at the designated coincident temperature [See UG-20(a)]. It is the basis for the pressure setting of the pressure-relieving devices protecting the vessel. The design pressure may be used in all cases in which calculations are not made to determine the value of the maximum allowable working pressure.
Operating Pressure (From ASME Section VIII, Div. 1, Appendix 3, *Definitions*)	The pressure at the top of a vessel at which it normally operates. It should not exceed the maximum allowable working pressure, and it is usually kept at a suitable level below the setting of the pressure-relieving devices to prevent their frequent opening (see M-9).
Safety Valve "Set Pressure" (From ASME PTC 25, Section 2, *Definitions*, 2-7)	The value of increasing inlet static pressure at which a pressure-relief device displays one of the operational characteristics as defined under opening pressure, or breaking pressure. (The applicable operating characteristic for a specific device design is specified by the device manufacturer.)
Service Pressure (Industry Term)	See *Operating Pressure*. Note: Other codes may use this term differently.

How are these different pressure terms used in specifying, purchasing, designing, manufacturing, stamping, and installing a pressure vessel? A scenario in which the owner-user needs a pressure vessel to contain a gas over liquid at 100 psi maximum pressure at a maximum temperature of 120°F will illustrate the use of these terms.

The owner-user writes a purchasing specification and purchase order for an ASME Section VIII, Division 1, accredited organization (ASME certificate holder) to design and fabricate the vessel. The 100 psi pressure specified in the purchase documents is the "user specified operating pressure," and is also the "operating pressure" defined in ASME Section VIII, Division 1.

The ASME Section VIII certificate holder needs to design a vessel that will meet the owner-user specifications. He must consider maximum operating pressure, maximum operating temperature, static head pressure, if applicable, and any additional loadings identified for normal and abnormal operating conditions. (Refer to ASME Section VIII Division 1, paragraph UG-22.)

The design pressure and design temperature are established for each vessel component. Typically, the certificate holder establishes the design pressure for the top component (location A in Figure 1) by increasing the specified operating pressure by 10% or more to provide a suitable margin between the specified operating pressure and the pressure-relieving device (PRD) set point. The design pressure at the top of the vessel is the basic design pressure for the vessel. If the vessel content is a liquid, the design pressure for a component is the basic design pressure increased by the static head pressure at that specific location. Consequently, the maximum design pressure in the vessel is at the bottom of the vessel where static head pressure is greatest (location D in Figure 1). The component design pressure at location B is the same as the design pressure at location A, because there is no static head pressure at either location. The design pressure at location C in Figure 1 is between the design pressure at locations B and D, and depends on the depth of the liquid at that location. The component design pressures are used to calculate the minimum required wall thickness of each vessel component. If the designer wants to be conservative, he can use the maximum design pressure to calculate the component thicknesses for the entire vessel.

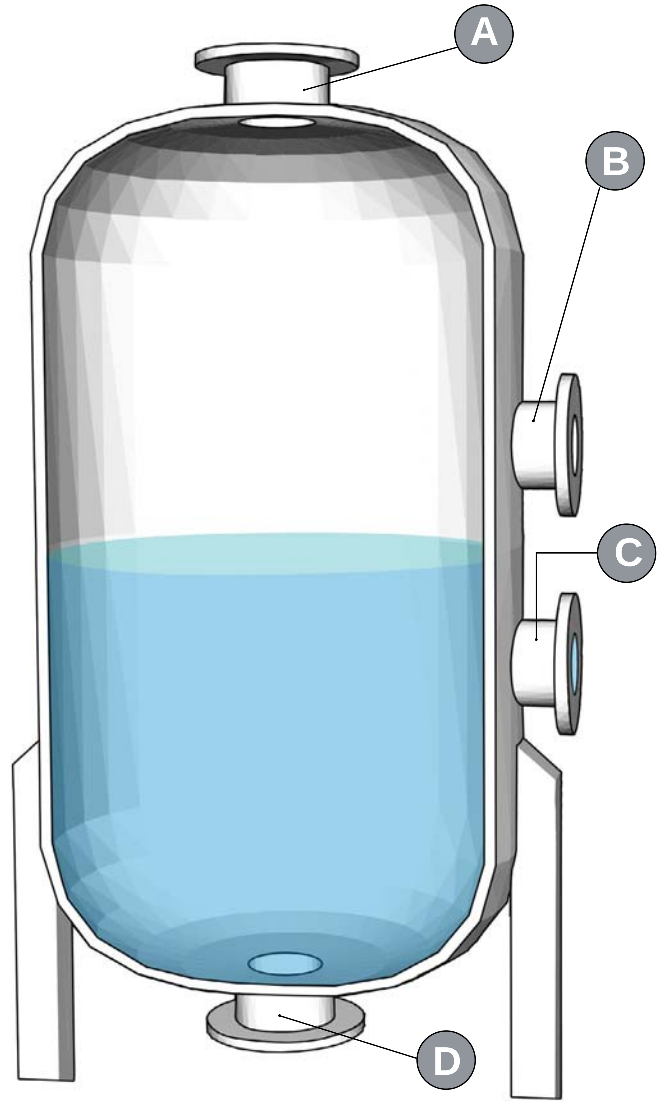


Figure 1: A, B, C, and D are different areas of a pressure vessel, each having different pressures.

As noted, the minimum design pressure (location A) for the vessel may be used for the maximum allowable working pressure (MAWP). The MAWP may also be determined from actual component thicknesses. In this case the MAWP is the lowest pressure determined by the design calculations for each component. The MAWP is indicated on the nameplate and the Manufacturer's Data Report for the vessel. The PRD is set at the MAWP for the vessel.

Figure 2: Horizontal pressure vessel.

Given the horizontal pressure vessel shown in Figure 2, the MAWP on the nameplate is 250 psi at 150°F as shown in Figure 3. What does this mean for the operation of this vessel? Typically, most vessels are designed so the "operating pressure" is 10% or more below the MAWP; therefore, this vessel will operate at 225 psi or less and have a PRD set at 250 psi.

In conclusion, the operating pressure of a pressure vessel is normally established by the owner-user and given to the certificate holder with the order. The basic design pressure is established by the certificate holder who is designing the pressure vessel, and is typically 10% greater than the operating pressure. The maximum design pressure of the vessel is the basic design pressure plus the maximum static head pressure if applicable. This maximum design pressure of the vessel is at the lowest point of the pressure vessel. The MAWP for the vessel may be the basic design pressure (lowest design pressure), which is typically found at the top of the vessel. ✤

Figure 3: Horizontal pressure vessel nameplate.

National Board Inspection Training Center Equipment Update

BY JOHN HOH, SENIOR STAFF ENGINEER

Many *BULLETIN* readers have had the opportunity to visit the Inspection Room located in the Inspection Training Center on the campus of the National Board, and there are countless others who wish they could. The various pieces of equipment in the Inspection Room grab the attention of all who visit, and that is the key to the entire room. Students will spend as much time as they can exploring the room, pouring over the equipment, and asking questions. That is why the Inspection Room exists. We want to continue to open the students' eyes and foster those questions while they are visiting. We may not have another chance once they leave.

This is where the boiler and pressure vessel industry comes in. We have received generous donations of equipment and tools from various companies, and we are very grateful for their help. In order to provide a more complete cross-section of the industry, we still wish to obtain several items:

- ASME Section IV coil-type hot water boiler
- ASME Section IV cast aluminum boiler
- ASME Section IV copper fin-tube boiler
- ASME Section I electric boilers – immersion resistance element type and electrode type
- Vertical firetube boiler
- Autoclave with a wedge/ring door closure

Piping components and valves donated by Kasco

Donated pressure equipment does not have to be operational, but the more complete it is, the better. Also, it does not have to be new. Manufacturers will sometimes use a piece of equipment in research and development for several months and then scrap it. Before you scrap it, consider donating it to the National Board's training program. Donated items will be affixed with a plate acknowledging the donor.

Any company interested in donating equipment should contact John Hoh at jhoh@nationalboard.org. The National Board will make the necessary arrangements for shipping items to the Inspection Training Center.

The National Board thanks the following companies who have made donations to the Inspection Training Center in the past year:

- Babcock & Wilcox Power Generation Group, Inc.
- Chart Inc.
- Kasco ✤

Stainless steel cut-away vessel donated by Chart

Inspections and the Briar Patch

BY JAMES R. CHILES

I grew up in the rocky hills of southern Missouri, so the first time I read Joel Chandler Harris's folktales, I had no trouble visualizing where Br'er Rabbit lived. Briar patches take hold in neglected stretches of land, starting with fallen branches and piles of rocks. Over the years, the thickets thicken with spike-studded canes of wild blackberry, poison ivy, and multiflora rose bushes that have the consistency (and resiliency) of concertina wire. Such a stronghold resists human-sized intruders but is home to wildlife: snakes, bugs, and birds. Farmers wanting to tame a briar patch might start with a bulldozer, followed by several years of bush-hogging. It's not easy. Multiflora rosebushes produce up to a million seeds a year, and seeds in the ground remain viable for up to 20 years.

The April 2013 explosion of West Fertilizer, an agricultural-chemical blender on the edge of West, Texas, resulted from a fire that lasted about 22 minutes. While the cause of that fire isn't known, it certainly exposed a metaphorical briar patch: a thicket of neglect, ignorance, and half-hearted regulation that screened a hazardous operation from scrutiny. Result: none of the six federal and state agencies with jurisdiction over West Fertilizer acted to protect workers and nearby residents from the dangers of stored ammonium nitrate. But danger there was. Following a fire in a storage building, an explosion equivalent to a truckload of TNT flattened 37 blocks of houses and businesses. Among the dead were a dozen volunteer firefighters and Adolph Lander, a handicapped resident of a nursing home.

The dangers of stockpiled ammonium nitrate should have been no surprise, given the gigantic explosion at Texas City in 1947, as well as many others (most recently at Toulouse, France, in 2001). Yet all relevant agencies, including the local volunteer fire department, kept a polite distance when it came to engaging with West Fertilizer.

That is, agencies were tolerant or distant before the blast; *afterward*, representatives came from all levels to express opinions ranging from "our hands are tied," to "we're short-staffed," to "no code is in effect."

I'm not here to cast blame. While it's easy to label politicians, bureaucrats, and company representatives ex post facto as reckless, the real problem lies in how the system had been set up over the years, then tweaked, so as to leave wiggle room for dangerous operations. The Office of the State Chemist made regular visits to the business, but that was mainly in the interest of product quality. If the subject matter edged into explosive safety, the State Chemist could do no more than look for locks on doors into the fertilizer-storage area. What about the US Environmental Protection Agency (EPA)? It's prohibited from requiring risk management plans when it comes to stored ammonium nitrate, and the US Federal Bureau of Alcohol, Tobacco, Firearms, and Explosions (ATF) doesn't do that either for the quantities that West had in stock. The state's environmental agency, the Texas Commission on Environmental Quality (TCEQ), only investigated routine air pollution, and an odor complaint was the only reason a TCEQ inspector came calling in 2006. West was supposed to tell the US Department of Homeland Security (DHS) about the huge quantities of ammonium nitrate it kept in stock, but West didn't tell DHS, nor did any other agencies that knew about it.

Mr. Chiles writes extensively about technology and history. Contact him at j.chiles2015@gmail.com or at his blog: Disaster-wise.

Texas runs no Occupational Safety and Health Administration (OSHA)-like department at the state level, so any employee safety visits were up to federal OSHA, which paid its last visit almost three decades earlier. And no wonder. OSHA can field only one inspector for every 4,000 businesses. When the throng of news media asked why 10 years passed with nearly annual break-ins, but nobody seemed to do anything about it (apparently the thieves were after anhydrous ammonia for meth manufacture), Chief Deputy Sheriff Matt Cawthon of McLennan County replied that "everybody trusts everybody here." In my mind that sums up the entire situation. He called it trust; I'd say it was closer to "everybody is supposed to leave each other alone around here."

West Fertilizer didn't just blow up due to a fire in its dry storage building. The system was broken: the county had no fire code, which could have required checks for fire alarms and sprinklers; there was too much reliance on voluntary reporting; government was lax about "grandfathered" businesses and anything having to do with farming; agencies didn't connect the dots; and OSHA suffered from a huge inspection backlog.

No wonder West Fertilizer showed such a lack of interest in chemical safety or plant security: it hadn't had a thorough inspection for seven years. But the boiler and pressure vessel industry has no such problems as what lies behind the West explosion.

. . . Or does it?

Here's one problem in common that shows up in some states – an inspection backlog that defies logic and law: a large and growing stack of notices from facility owners notifying a state that their certificates are about to expire. I won't name names, but a quick search of headlines from 2008 onward will show several states struggling to get on top of past-due inspections. It's not a huge problem yet, not a big ol' briar patch like the one that shielded West Fertilizer from tough inspections. But little briar patches have a way of growing. One might say briars like multiflora rose thrive on sunlight and water, but they really thrive on neglect.

States can't run deficits like Uncle Sam. During downturns, they're supposed to use whatever kluge or stopgap they can get away with to "balance" each budget. So it's tempting for state legislatures and governors to look for one-time transfers out of dedicated funds. That way they can avoid hiking taxes or slashing social services. Easy targets apparently include special accounts that are funded by owners of safety-critical equipment who need a visit from the state inspector. Commonly, one office handles the boilers and pressurized equipment you know about, but also amusement park rides, elevators, and escalators. They're all safety-critical hardware.

Such raids on an otherwise self-supporting fund put the chief inspector's office in a bind. Even though all inspections would be paid for via the invoice, he doesn't have enough inspectors in the field to keep up with the backlog.

Looking across broad trends in the building-safety and critical-hardware inspections commonly done by states and cities – including elevators – here are some trouble signs: a poorly maintained (or nonexistent) database showing when certificates come due; a failure to make follow-up visits after a violation; a "prioritization" approach that sets aside an increasingly large share of outdated certificates to wait for a few years; a cut in pay that starves the state of expert inspectors and sets impossible productivity goals; and decisions to privatize state inspections to lists of inspection contractors that need to compete for business. All these can accrue from cuts in inspection staff.

My opinion: in some cases boiler and pressure vessel checks don't need fewer inspectors, they need more. Take the typical inspection of a high-pressure boiler: it's done once a year by one person from the state or an insurance company. That's fine in most cases. But consider a lesson from the fast-growing heat recovery steam generator (HRSG) field. HRSGs are large and complex boilers that offer high efficiency to the rapidly growing population of gas turbines at power plants, but that also pose new and complex failure modes. In some difficult cases, a team of two or even three inspectors going in together might save everyone a lot of grief later, whether that's in the form of lost business, equipment replacement, or medical payments. Think of how much skill is packed into a trio of inspectors made up of a representative from the owner's boiler division, one from the manufacturer, and an inspector from the insurance or state jurisdiction.

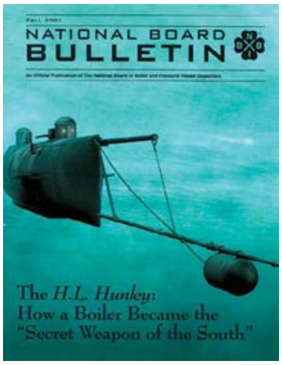
I'm not arguing that double- or triple-teaming is needed for the average boiler or pressure vessel inspection, but it could be appropriate in some instances: while training new inspectors; when a string of tube or pipe-support failures can't be explained; or where a facility has had repeat violations.

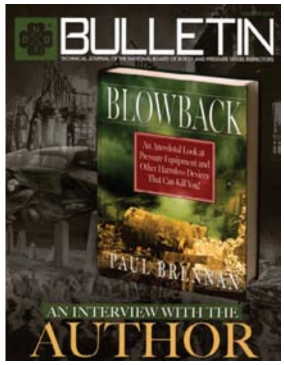
Such actions, judiciously applied, can help to keep that regulatory-failure briar patch under control.

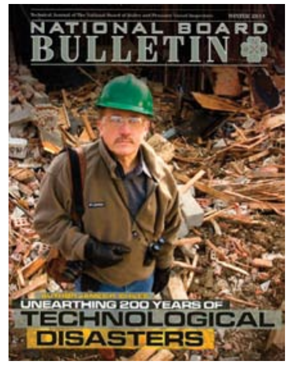
And with enough good minds, and their attention to the matter, no problem is insoluble. It reminds me of an expression from the hill country: "Grinning like a mule in a briar patch!" Missouri mules don't hesitate to barge into the thickest, darkest briar nests, and they might find a goat or two in there, because goats chomp up those hellishly prickly roses with relish.

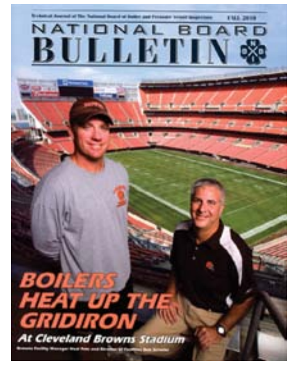
So, for risk-takers who think crawling deep within their anti-regulatory, dark and weedy briar patches will shield them from keen-eyed inspectors, be warned. Not everybody is scared of the thorns, and the next disaster might just bring some daylight.

The views and opinions in this article are those of the author and do not necessarily reflect the views of the National Board.



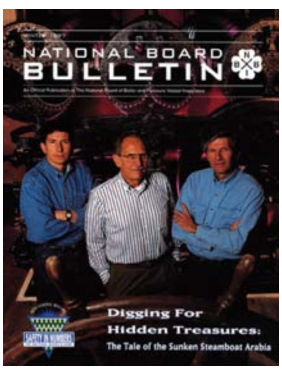


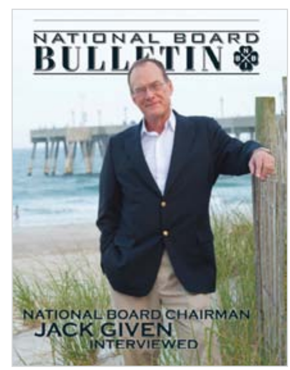


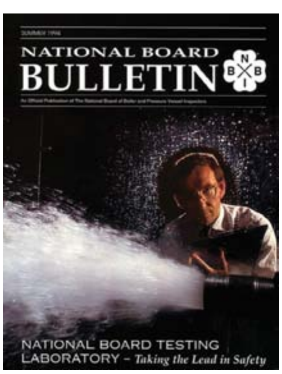


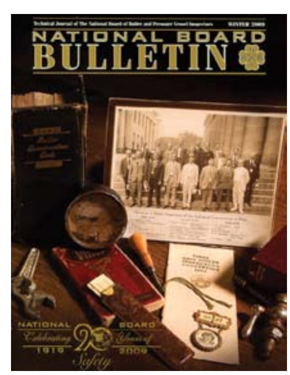
70 YEARS of the *National Board* *BULLETIN*

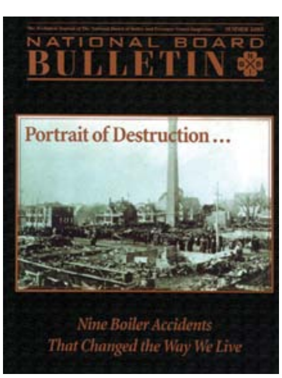
SINCE 1919

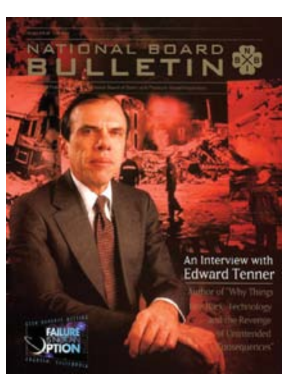


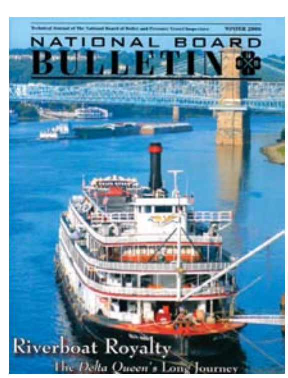












Wartime travel restrictions.

Murder and interlopers.

Poetry, jokes, and a good dose of humor.

These are a few of the more peculiar elements that can be found alongside an abundance of technical content in early publications of the National Board *BULLETIN*.

2013 marks the 70th year the *BULLETIN* has been in print. Similar to today's journal, initial *BULLETINS* contained technical articles, General Meeting notes, membership news, and industry reports. But there was more. Early issues provide a snapshot of the good-natured, family-oriented group of men and women who together pursued boiler and pressure vessel safety, and by default, brushed against each other's personal lives.

Here we will glance back 70 years and look at some of the events, people, and unique characteristics that marked both the times and the fraternity of the burgeoning publication and its affiliates.

The *BULLETIN* was established in May 1943 at the 14th Members Meeting (known today as the General Meeting) in New Orleans. Its purpose: to promote the objectives of the National Board and keep members advised of executive committee (today, Board of Trustees) meeting updates and developments in the Boiler Code, among other industry-related issues.

The first publication was issued in July 1943 and was eight pages long. By issue three it had doubled to 16 pages. After four issues, *BULLETIN* founding editor C.W. Obert (who was the former secretary of the Boiler Code Committee and associate member of the National Board Executive Committee), reported that "the magazine has everywhere met with favorable reception." National Board inspectors also showed strong interest in receiving distribution, and it was decided "as the number of such inspectors does not exceed 2,000, action was taken to authorize this increase in circulation."

An Inspector's Experience

On one of a mother's busiest days, her small son, who had been playing outside, came in with his pants torn.

His mother said to him: "You go right in, take off your pants and mend them."

Sometime later she went to see how he was getting along.

She found the torn pants lying on a chair and the door to the cellar, usually closed, was open. She called down loudly and sternly: "Are you running around down there without your pants on?"

A voice answered: "No Madam, I am inspecting the boiler for your insurance."

"An Inspector's Experience," October 1945 *BULLETIN*

1940 Realities

To read through early issues is to step back in time and catch a glimpse of what life was like in the 1940s. References to rail travel and wartime restrictions remind us how much society has changed in 70 years.

Wartime travel restrictions were a reality for all Americans in the 1940s. These limitations affected National Board matters and were reported in the *BULLETIN*. In the premier issue, several wartime matters are noted. An article about the 14th Members Meeting in New Orleans indicated that "while the meeting sessions were not scheduled to start until Tuesday, May 18th, quite a number of members, due to the wartime travel conditions, arrived late Sunday."

Another article, "Acknowledgement from the War Production Board," was a reprint of a letter sent to the National Board from Mr. R. M. Hatfield of the War Production Board. Part of the letter reads: "You and your associates have played and are playing an important part in the war effort and are making a valuable contribution to the overall war program. Please be assured that the Power Division will do everything in its power to further assist you in your continued efforts to conserve materials and to 'Beat the Axis.' "

It was also noted that after the New Orleans meeting, New Orleans Chief James E. Leddy had resigned in order to accept the post of chief engineer aboard a ship of the Maritime Commission. "Uncle Jim left very suddenly with practically no advance notice," the article says. "We shall miss Mr. Leddy while he is away in the service of his country."

Two years later, as reported in the July 1945 *BULLETIN*, the 15th Members Meeting in New York City was an "unusual experience" because of restrictions imposed on travel by the US

Office of Defense Transportation, which issued a limitation order forbidding all conventions or meetings that would bring together more than 50 persons who would require railroad travel and hotel accommodations.

In response, the Members Meeting was limited to regular members only with no more than 50 in attendance. As a result, it was noted that the entertainment was "sharply curtailed at this particular meeting due largely to wartime conditions, but also because very few women accompanied the members due to travel restrictions." Despite the difficulties, the meeting was eventful, as aptly described by *BULLETIN* editor C.W. Obert:

> "The women had one social get-together on Thursday evening which was in the form of dinner and show at Billy Rose's Diamond Horseshoe. This party consisted of 12 women (several of whom were local women) and one man, a member who deserted the main dinner party given by the Boiler Code Committee to the members, and was later termed an interloper. Being a southerner, his excuse for joining the women was to guide them and protect them from harm, while the women reported on their return that they had to show him the way back to the hotel. The women have photographs to prove this. At any rate, 'a good time was had by all,' and both the dinner and show were reported highly enjoyable."

The mystery "interloper" was exposed two pages later under the column "Convention Notes" (a who's-who comment section written by editor Obert "on the doings and sayings of the members at the meeting" which were "gleaned from observations in the headquarters room and at luncheon and dinner tables").

Here it is revealed that the one and same New Orleans Chief James E. Leddy "stole the show" when he ran out on the dinner party held for the men and accompanied the women on their outing. "Some of the members accused him of putting over a fast one and threatened to come back to N.O. to 'haunt' him," Obert reported.

Personal Reports

Peppered among technical and industry content are personal anecdotes, announcements, jokes, and even poems submitted by members or reported by Obert. These excerpts and intimate accounts range from humorous to sentimental to heart-wrenching.

For example, between articles on hot-water heater explosions and Boiler Code Committee updates is the ebb and flow of former secretary-treasurer and founding member C.O. Myers' personal life. In the October 1943 issue it is sadly reported that Myers' wife had died unexpectedly at their summer home in Millersport, Ohio. Three issues later (July 1944) Myers shares happier news about the birth of his third grandson in a most novel birth announcement

"Poor Bill"

He's gone; Poor Bill was one swell cuss,
But he left a lesson for the rest of us,
He shot up the pressure on a tank one night,
Didn't know it was loaded—like dynamite.

Sure, the tank had an old time spring-loaded pop,
Mounted out of the way, upon the top,
But just the same the darn tank blew,
And that's the last that Poor Bill knew.

Maybe the valve was rusted shut,
Perhaps the pop did open, but
Was just too small for a job so tough,
And couldn't discharge near fast enough.

Whatever the trouble was, we'll bet,
That Bill's successor immediately set,
To find a way to tame their tanks,
'Ere other explosions thinned their ranks.

It took not long to find his cue,
And he drops this hint for the rest of you,
There's many a man now lying dead,
Who could have saved his head if he'd used his head.

By A Member

"Poor Bill," April 1946 *BULLETIN*

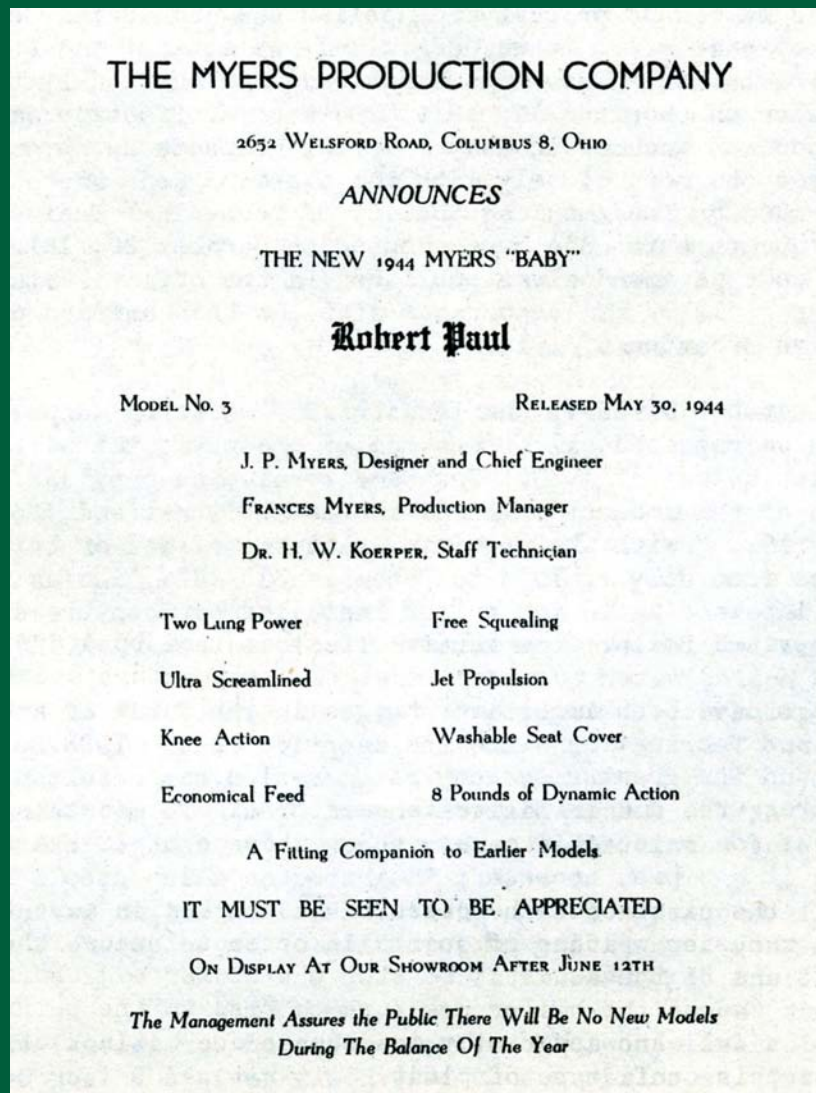
(at right). And in the very next issue, October 1944, it is revealed that a "social event of extraordinary interest" took place between C.O. Myers and his secretary, Miss Helen A. Smithhisler. The couple was wed and details about the ceremony and wedding trip to San Francisco were shared with members.

In a 1945 issue editor Obert expressed a desire for more personals. He wrote that the members agreed personal items were "extremely interesting" and offered to assist him in broadening that section. This is clearly seen in the July 1946 issue in which a generous portion of the *BULLETIN* is given to Tennessee Chief L.C. Peal and his family's adventure driving to the 16th General Meeting, which was held in Montreal, Quebec, in June of 1946:

> "The Peal family drove up from Nashville, a distance of 1,178 miles, and had a most enjoyable journey, the five travel days of which his daughter, Jeannine, chronicled in a most interesting diary which they termed 'Peal-grim's Progress.' In order to permit the members to enjoy the trip with the Peals, an abridged version of the diary is included in this issue."

In fact, three full pages were devoted to reprinting excerpts from Jeannine's diary, which included details such as:

> "The first mishap of our journey occurred 25 minutes after it began. We were riding along and all of a sudden it seemed to be raining. It was only our radiator hose which was broken."
>
> "Our second mishap came when we were stopped by the State Highway Patrol for speeding."


THE MYERS PRODUCTION COMPANY

2652 Welsford Road, Columbus 8, Ohio

ANNOUNCES

THE NEW 1944 MYERS "BABY"

Robert Paul

Model No. 3 — Released May 30, 1944

J. P. Myers, Designer and Chief Engineer

Frances Myers, Production Manager

Dr. H. W. Koerper, Staff Technician

Two Lung Power	Free Squealing
Ultra Screamlined	Jet Propulsion
Knee Action	Washable Seat Cover
Economical Feed	8 Pounds of Dynamic Action

A Fitting Companion to Earlier Models

IT MUST BE SEEN TO BE APPRECIATED

On Display At Our Showroom After June 12th

The Management Assures the Public There Will Be No New Models During The Balance Of The Year

Myers birth announcement, July 1944 *BULLETIN*

> "Poor Daddy had to attend the business meeting, so 'us girls' went shopping. In the evening we all dressed for the banquet in our formals."

And Jeannine's final thoughts:

> "Looking back over all the incidents that have happened to us during this whole trip, I remember most vividly the way people treated us – especially the members there for the convention. We really hated to leave them, and we're looking forward to next year when we shall see them again."

A little over one year later, the October 1947 *BULLETIN* reported that Mrs. Peal had died. "Mrs. Peal had been operated upon on August 19th for what was then thought not to be a serious disorder, but a cancerous growth was discovered . . . The sympathy of both the officers and the members go forward to Mr. Peal for the loss of his wife whom

Jeannine Peal and her sister Frances, July 1946 *BULLETIN*

we so much enjoyed meeting at many conventions."

Perhaps the most disturbing news reported in early *BULLETINS* appeared in the April 1945 issue where it was announced that National Board Chairman and Arkansas Chief J.D. Newcomb had been gruesomely murdered during a routine day of boiler inspection. The tragedy spurred C.O. Myers to travel to Arkansas to assist in the investigation. This dramatic event is chronicled throughout several *BULLETIN* issues as details were made available during the ongoing investigation.

The story of J.D. Newcomb's murder is featured in a two-part special in "The Way We Were" *(see page 44 in this publication for Part One)*. The conclusion of Newcomb's story will be published in the winter 2014 issue.

These few examples characterize the fraternity National Board members shared beyond professional borders. But the bevy of technical articles on Boiler Code Committee updates, inspector questions and answers, and executive committee notes, along with prolific essays from Chairman Newcomb and Secretary Myers about the future of the organization, reveal the dynamic nature of the pressure vessel industry during that time period. The following milestones underscore the professional progress the National Board was making during those formative years.

Noteworthy Milestones

October 1944: Inception of the "Inspectors Code" book is announced. It was the groundwork for what would become the *National Board Inspection Code:*

> "The proposal for preparation and publication of a compilation of such topics as the inspectors need in their daily work was again discussed. . . It was decided to proceed at once with this compilation."

January 1945: First published "Census of States and Cities Enforcing Regulations Affecting Pressure Vessels" [forerunner of the *Synopsis*], compiled by the headquarters office of the National Board.

> "So many inquiries have come to the Secretary's office concerning the attitude of the various Code states and cities toward inspection

and safety of unfired pressure vessels that it was decided to conduct a census of the entire country in the endeavor to learn which jurisdictions have such regulations."

October 1945: The first chapter of the "Inspection Code" is published in the *BULLETIN*:

> "It [chapter one] is submitted herewith as the first installment of the new [Inspection] Code and the members and inspectors who receive the *BULLETIN* are urged to preserve this Chapter to keep with the others and form the initial edition. The remaining Chapters will come to our readers with subsequent issues of the *BULLETIN*."

July 1946: First time the General Meeting was held in Canada:

> "The sixteenth General Meeting (June 25-27, 1946) was one of the most interesting and successful meetings in the history of the National Board. It was the first meeting to be held in Canada and it not only served to celebrate the active cooperation between the States and the Provinces in boiler inspection, but also threw an international aspect on our growing and useful organization."

October 1946: The *National Board Inspection Code* is officially named:

> "This Code will be called the *National Board Inspection Code* and a copy will be made available to every member and to the 2,000 National Board commissioned inspectors. It will serve as a text book for the beginner and as an important influence toward uniformity for the more experienced."

January 1947: The important announcement that the 17th General Meeting was scheduled for California:

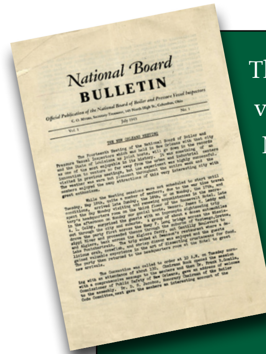
> "Los Angeles, California, chosen for the first meeting on the Pacific Coast. Travel in special Pullman cars to be chartered for members from New York and Chicago districts. Stop over at Houston, Texas, to permit members to attend a public hearing to be held there by the Boiler Code Committee."

For National Board members and associates, the fledgling *BULLETIN* was a significant resource for technical updates and industry news. But it was also its own kind of social media akin to today's Facebook or LinkedIn networks.

While much has changed over the past 70 years within the boiler and pressure vessel industry (and indeed, the world), some things remain unmoved: the ongoing pursuit of public safety and the shared human experience of work, family, life, and loss. Here's to the next 70 years. ♣

Sample of Technical Articles Found in Early *BULLETINS*

- Fired and Unfired Pressure Vessels: Their Operation and Their Hazards
- Qualification of Operators for Repair Welding
- Answers to Inspectors' Questions (an ongoing column)
- Explosion of Hot-Water Heating Boiler
- Failure of Spherical Hydrogen Storage Tank at Schenectady, N.Y.
- Boiler and Pressure Vessel Construction and Inspection
- Steam Flow through Safety Valves
- Rules in the Code for Dished Heads: History and Development
- Protection of Forced-Circulation Water Heating Systems
- Stresses in Cylindrical Shells
- Pressure Vessel Research (reproduced by permission from June 1945 *Welding Journal*)
- Rules for Protection of Closed Forced-Circulation Water Heating Systems
- Tube Failures in Watertube Boilers
- Construction of Blowoff Tanks



The first printed version of the National Board *BULLETIN* was initiated by executive director C.O. Myers in July 1943.

Temper Bead Welding

BY JOHN HOH, SENIOR STAFF ENGINEER

The National Board Inspection Code *(NBIC) Part 3, 2.5.3, addresses welding methods that may be used during repairs or alterations as alternatives to postweld heat treatment. It should be noted these methods are very specific and must be followed without deviation. Repair and alteration organizations are cautioned to seek advice or guidance from a competent welding engineer and/or metallurgist before any attempt to use these welding methods. Four of the five listed methods use a technique called temper bead welding.*

NBIC Part 3, 2.5.3d), directs the reader to ASME Section IX, and more specifically, to QW-290. ASME Section IX, QW-492, defines temper bead welding as a weld bead placed at a specific location in or at the surface of a weld for the purpose of affecting the metallurgical properties of previously deposited weld metal. Qualification of a Welding Procedure Specification (WPS) using temper bead welding is covered in QW-290 when an applicable ASME code Section specifies the use of temper bead welding during new construction. As an example, temper bead welding is referenced in Section I, PW-40.3.4(f), and Section VIII, Div. 1, UCS-56(f)(4)(c), as well as ULW-26(b)(3). Finally, QW-462.12 in Section IX has sketches of various applications along with the nomenclature for temper bead welding.

This article focuses on the example for a typical groove weld using NBIC Part 3, Welding Method 3 (2.5.3.3), and perform the actual welding on sample test plates. The test plates are each 6" x 4" x 1" thick P-No. 1, Group No. 1, with a 22.5-degree bevel; the backing strip is 0.25" thick P-No. 1, Group No. 1; and the SMAW electrodes are 3/32" diameter E7018 H4R, meeting ASME SFA-5.1. The "H4R" suffix on the electrode identification is defined as follows:

- "H4" designates the electrode has a diffusible hydrogen content of 4ml average in 100g of deposited weld metal.
- "R" designates the electrode is moisture resistant. (Although the electrodes were taken from a new, factory-sealed container, they were placed in a storage oven for a few hours prior to use.)

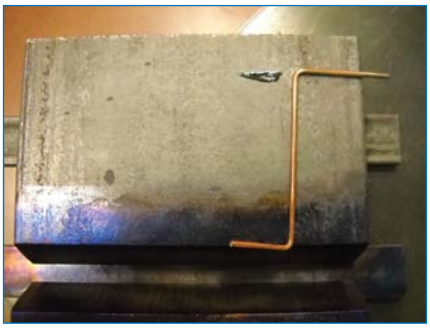
The welding parameters used were direct current electrode positive (DCEP) and 85 amps. The electrode manufacturer specified a welding current range of 70-110 amps.

If this were an actual repair or alteration, nondestructive examination (NDE) using either liquid penetrant (PT) or magnetic particle (MT) would be performed before any welding to ensure the prepared area contained no defects.

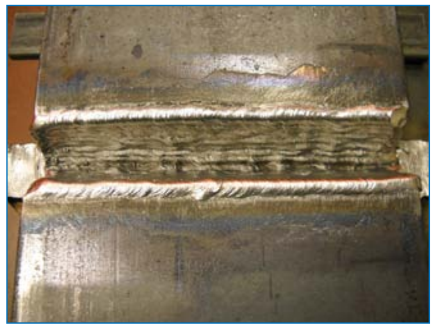
Picture 1 shows the test plates with the backing strip (tack welded on the back side) as it came from an oven. A piece of wire was bent to use as a measuring gage when using temperature-indicating crayons. A 350°F crayon melted at 3" from the bevel edge. The short leg of the wire (next to the bevel) is 1" long to measure from the bevel edge for interpass temperature. The root gap is approximately 5/16" to allow better access to the bevel faces as the weld beads were deposited.

Picture 2 shows the first layer of weld beads covering the root gap and stacked one on top of another on each bevel face. This step is the same as buttering. After cleaning, the test plate assembly was returned to the oven for approximately 45 minutes to ensure the preheat temperature was maintained and evenly dispersed.

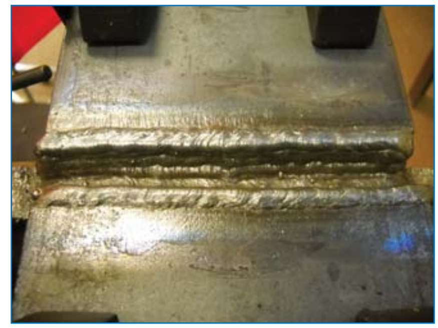
Picture 3 shows the first layer of tempering beads applied to the buttered surfaces in picture 2. Notice the topmost tempering beads do not extend beyond the toe of the previous buttering beads, avoiding contact with the base metal. From this point, the welding process was only interrupted for brief periods to allow cleaning. Note: It is very important for the welder to remove the welding slag and use a wire brush as the welding progresses. He must also ensure the weld bead layers do not form small crevices where slag inclusions could be trapped. A thin grinding disc or pointed carbide burr may be necessary to excavate potential "slag traps." Also, if the preheat source is not continuous, the time spent on cleaning and grinding may lead to the weld area falling below the required preheat temperature.



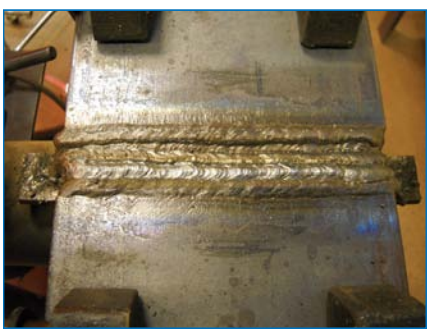
PICTURE 1



PICTURE 2



PICTURE 3



PICTURE 4

PICTURE 5

PICTURE 6

Picture 4 shows a second layer of tempering beads and fill weld beads. The marks above and below the welding area are from a 450°F temperature-indicating crayon, which did not melt. This was done to ensure the interpass temperature did not exceed 450°F as required by NBIC Part 3, 2.5.3.3g)1).

Picture 5 shows the surface temper weld reinforcing beads. According to NBIC Part 3, 2.5.3.3g)3), a hydrogen bake-out treatment can be omitted since the electrodes had a diffusible hydrogen designator of H4.

After cooling to ambient temperature, the surface temper weld reinforcing beads are removed substantially flush with the base metal surface. This is typically accomplished by grinding. Photograph 6 shows this work in progress.

Before this job can be considered complete, the welded area (now ground flush) is again subjected to NDE in the form of PT or MT. Additionally, this weld must be examined with radiography (RT) since it was more than 0.375" deep. This would also apply to welds requiring RT by the original code of construction, regardless of the weld depth. NBIC Part 3, 2.5.3e), allows the use of PT or MT in lieu of RT in cases where it is not practical to perform RT. The NBIC places an additional requirement on these cases in that the maximum allowable working pressure and/or allowable temperature must be re-evaluated to the satisfaction of the jurisdiction.

As you can see, temper bead welding, when used in conjunction with the NBIC, is only one piece of the complete process. While it is a tool that repair and alteration organizations can use, the steps must be followed very carefully to obtain the desired results and meet the requirements of the NBIC.

COVER STORY

3D PRINTING

THE NEW DESIGN OF SAFETY

PHOTOS BY TONY ALOI PHOTOGRAPHY AND BRANDON SOFSKY

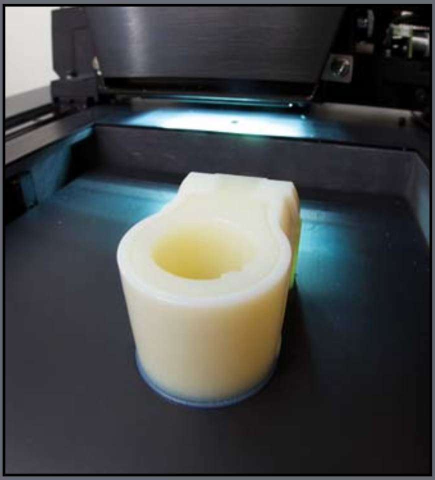
Additive manufacturing, also known as 3D printing, has been making headlines: from the controversial first fully 3D-printable handgun; medical pursuits to print human tissue, organs, and body parts on demand; research toward printing edible, artificial meat for consumption; to a myriad of dust-collecting hobbyist knickknacks and other common household items.

And now, pressure relief device parts.

The use of additive manufacturing is on the rise in virtually every industry. It helps that the cost of 3D printers has come down from many thousands of dollars to often less than $1,000, making it an accessible apparatus for virtually anyone who wants to print on demand. But those observing the manufacturing community see something more, and some predict 3D printing will pioneer the next industrial revolution – just as steam was a major technological development of the Industrial Revolution of the 1800s.

Why?

3D printing is an advanced, digital-manufacturing process that reduces costs and production time, and gives manufacturers significant latitude when it comes to designing and prototyping new products. And the technology has made its way to the National Board.



Top: A variety of 3D-printed valve body parts engineered by F.C. Kingston.
Above: A 3D printer produces a valve part.

A NEW PROPOSAL

The National Board Pressure Relief Department (PRD) recently had the opportunity to look at pressure relief valve parts produced with a 3D printing process. After considering issues related to the safety of the parts, the PRD accepted the new configuration for testing.

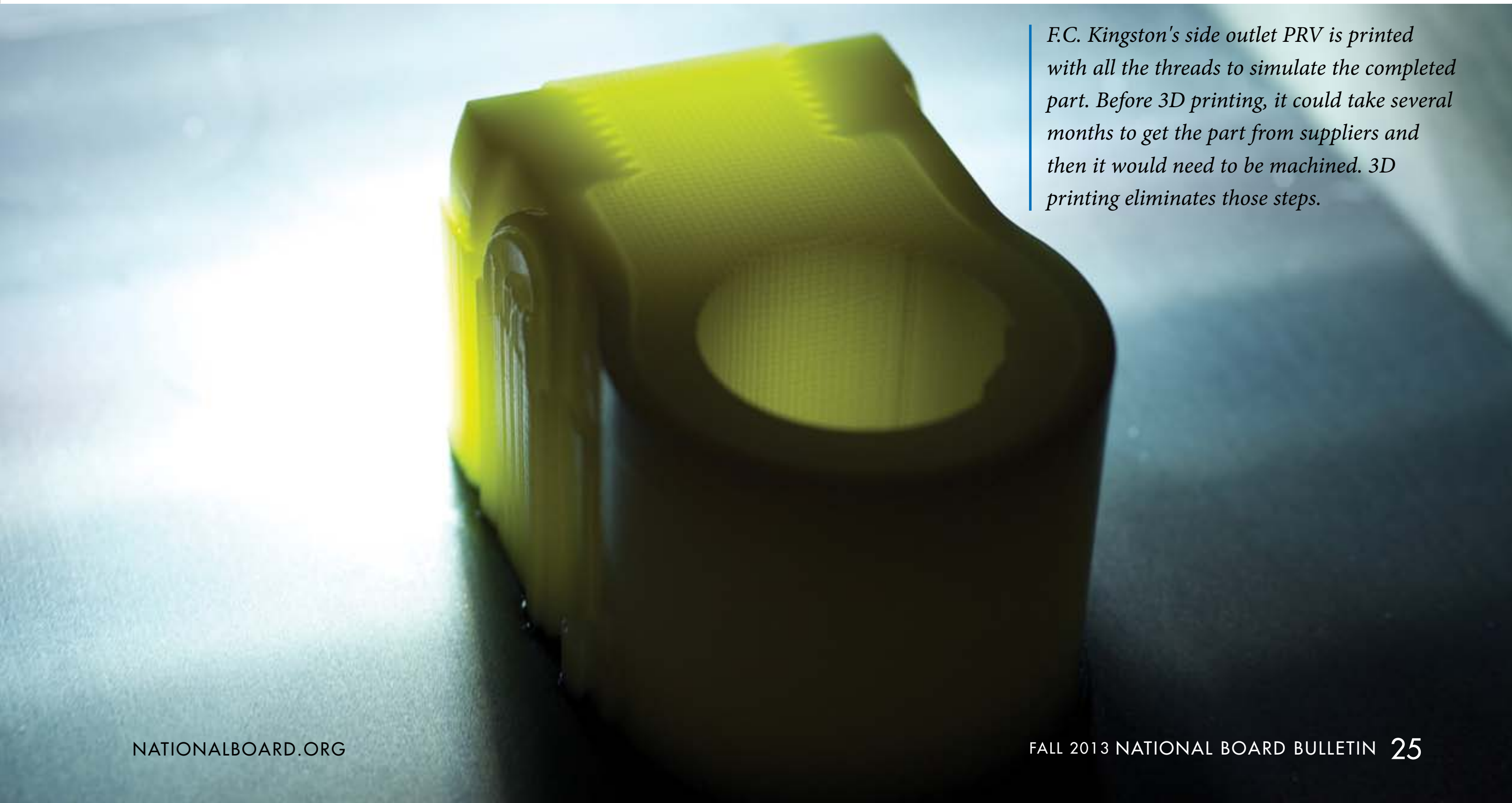
The capacity certification test process for a new pressure relief valve design involves two steps. First is a test program where the capacity rating factor for the design is determined. The valves being tested at this stage are prototypes, since the ASME certification mark and **NB** mark cannot be applied until the rating value has been determined. If they will not be sold later, the valves are often manufactured with different materials than will be used in the final, finished design. The second step requires that samples using standard production procedures and materials be inspected and submitted for test, validating the capacity rating factor determined when the prototype valves were tested.

The F.C. Kingston Company (part of Storm Manufacturing Group, Inc.), a pressure relief valve manufacturer in Torrance, California, presented the National Board with a new valve type for capacity certification. The valve body would be produced as a brass casting when the design was finalized. The production of castings is an involved process where the part design is determined and a casting pattern produced. Sample castings are made and dimensionally checked; machining is done; and finally, a part is ready. The casting patterns can be quite involved and expensive, and if subsequent flow testing reveals that the cast part does not flow properly, a new pattern would be required and the process repeated. This cycle can take several months each time it is determined that a design change is necessary.

The manufacturer's engineer came to the National Board with a proposal that the cast body for the valve would be produced using the 3D printing process. The prototype part would be "printed" directly from their CAD software. The valve would be tested, and if a problem was found, the design could be easily modified; a new part printed; and additional testing performed. By using the 3D printing process, expenses associated with revising casting patterns would be eliminated, and the lead time needed to produce a new casting pattern would be avoided.

PROOF TEST

"While the National Board embraces new technology, it first considers the safety of any item accepted into the test laboratory," stated Joe Ball, director of the National Board Pressure Relief Department. "The National Board's experience within the realm of the *ASME Boiler & Pressure Vessel Code* is mostly with parts produced from metal where the engineering properties of the materials used are well understood," he added.



F.C. Kingston's side outlet PRV is printed with all the threads to simulate the completed part. Before 3D printing, it could take several months to get the part from suppliers and then it would need to be machined. 3D printing eliminates those steps.

For the F.C. Kingston test program, the PRD would be receiving a liquid service pressure relief valve (PRV) whose body was made of plastic. "Our initial response was to request that the manufacturer validate the design based upon the material properties of the plastic," said Ball. "But it turns out that the material properties are not extensively documented because parts made by this process are not often used as production pieces where a detailed design analysis is needed."

And so a second proposal was made: validate the printed parts via proof testing. The PRD staff requested that the manufacturer follow the principles in ASME Section VIII, Paragraph UG-101, for guidance. "We recognized that since material properties were not known, they would not be following those rules exactly; however, the rules would serve as a reference for the process and procedures to be used," said Ball.

The pressure required for a proof test was agreed upon as four times the maximum pressure that the part would be expected to see during the test. The highest set pressure of the valves to be tested was 250 psig with an overpressure of 275 psig. However, the valve body is part of the secondary pressure zone of the valve (discharge pressure region), and from previous experience, the pressure in this part was estimated to be 10% to 20% of the valve set pressure, with 20% being used for conservatism. It was also requested that operational stresses be considered, which included stresses on the threads where other parts are attached to the casting, and thrust forces. The valve spring exerts force on the adjusting screw, which in turn exerts force on the valve body as well.

For final conservatism, the manufacturer used a proof test pressure of four times the overpressure of the valve, which would cover the case where the valve outlet was actually pressurized to the inlet overpressure. (Since the valve outlet should never be blocked, this pressure is much higher than would actually be seen during the test, but this would also give some margin for operational stresses.)

The company produced several samples and went through the proof test procedure. Valves were assembled with the various holes plugged and water pressure was slowly applied with a hydraulic hand pump. The pressure was recorded with a data acquisition system, with the pressure sensor calibrated against a dead-weight tester. The first two tests resulted in burst pressures of 460 and 580 psi. One of the advantages of the 3D printing process is the ability to quickly modify the design in the CAD software, and then make a revised part. The wall thickness was increased and the radii on fillets at discontinuities were increased to reduce stress risers. New parts were printed, and the test repeated.

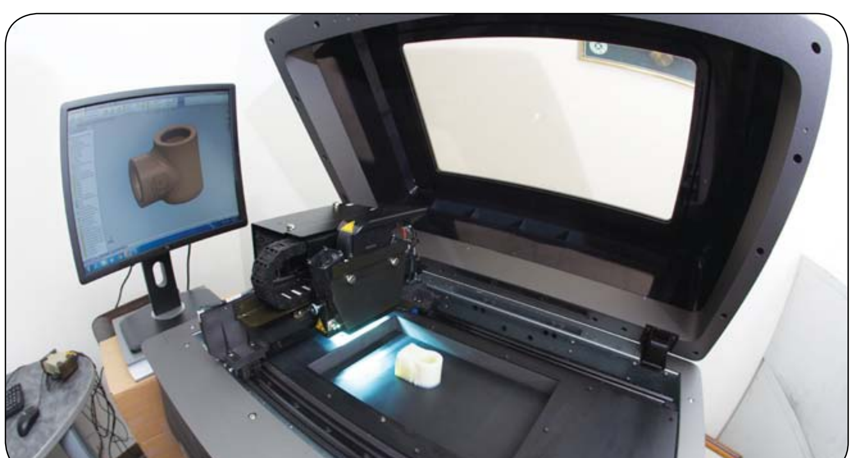
THE RESULTS

While it had been agreed that the proof test pressure only needed to go to the pressure necessary to verify the test pressure, the part was tested to burst. On the retest, a burst pressure of 1,150 psi was measured. This met the goal of having the burst pressure

How 3D Printing Works

Fans of the old *Star Trek: The Next Generation* television show may recall a device called the "replicator," which magically created food or other objects seemingly from nothing. The future is present and fiction one step closer to reality with advances in 3D printing technology.

Imagine an ordinary inkjet printer. On demand, the printing device moves the ink cartridge back and forth across the page to print words or images. Additive manufacturing equipment works in similar fashion but with a third dimension. Following a blueprint from a computer-aided design (CAD) program, the 3D printer moves back and forth and deposits layers of material until the desired object is built. The type of material used to make the product depends upon the application, but common materials include powder, paper, sheet metal, and liquids – and scientists are experimenting with human tissue.



Work in progress: The partially-completed body of F.C. Kingston's side outlet pressure relief valve (PRV) emerges on a 3D printer.

The National Board Test Lab's very first 3D printed valve part from F.C. Kingston, a liquid service PRV, undergoes successful water testing.

be equal to or greater than four times the valve overpressure. The test was deemed successful.

Based upon the proof test data and supporting analysis work, the PRD accepted several sample valves for testing in its lab, which included the printed bodies. These valves were tested for operation and capacity with test media of both air and water. For the first tests, PRD staff took care to bring the pressure up at a slow rate, but ultimately all of the valves tested worked as they were supposed to and no functional or pressure boundary failures were observed.

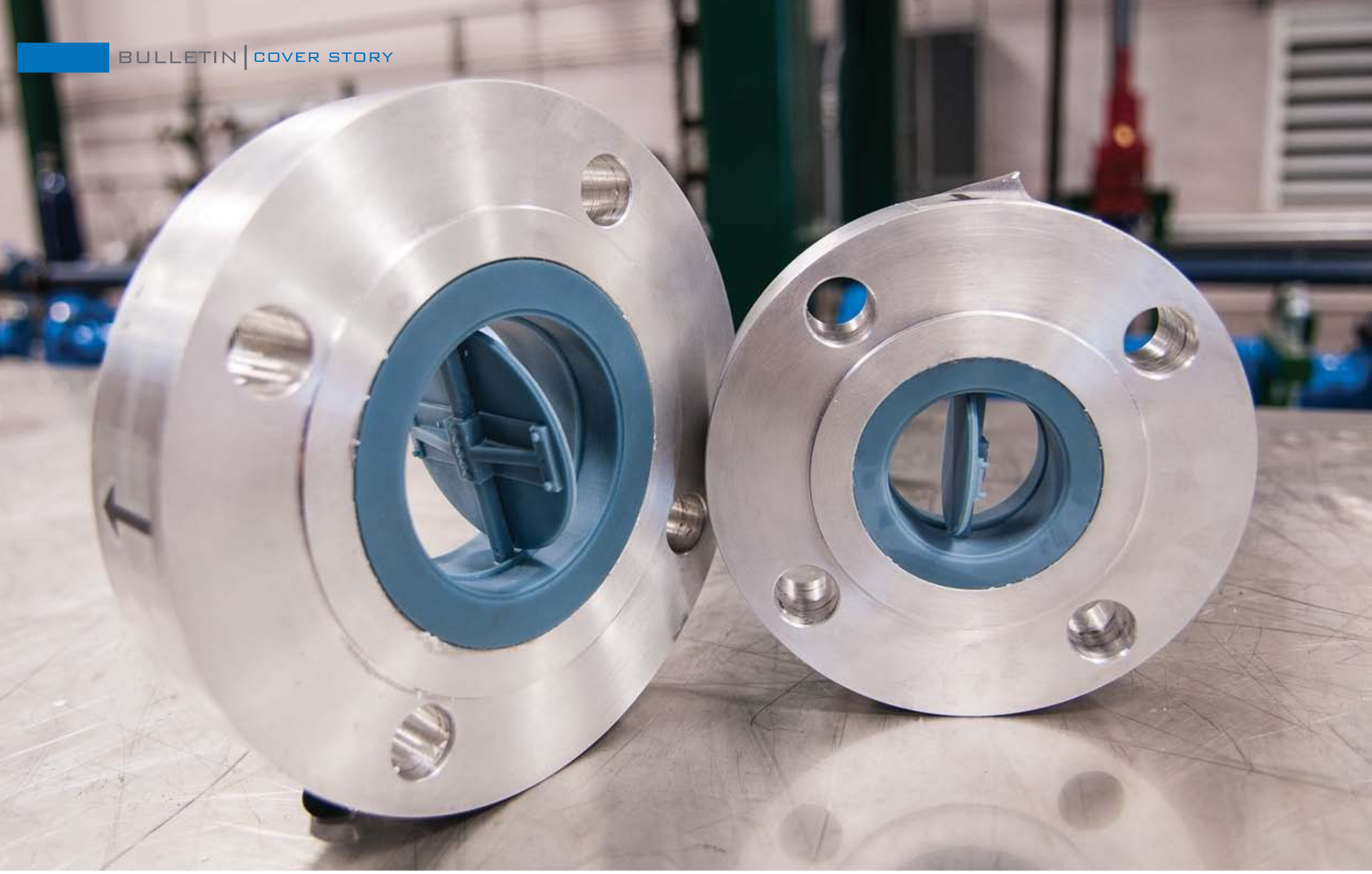
"Being able to complete tests using a plastic body that was printed overnight was a definite milestone for our company," said F.C. Kingston engineer Derek Parnett. "The ability to validate a design without dedicating money to tooling was a huge improvement from traditional design methods. Working with the National Board to develop guidelines enabled us to use printed prototypes for preliminary testing. We applaud the National Board for recognizing this emerging technology and taking on the challenge."

The ability to quickly produce parts through 3D printing was also used in other ways by the company. A valve body was produced that had three pressure taps in the outlet portion of the valve. Flow tests performed at their facility verified that pressure in the valve body during the flow test was very close to the 20% value previously estimated. They also later reported that tooling for the casting pattern was produced by the same method for the casting supplier. Additionally, four weeks were eliminated from the time needed for the first run castings, and a savings of over $3,000 was recognized in the pattern production process.

"From this project, it appears that a safe test object can be prepared using 3D printed parts," said Ball. "At this time, the lab is not quite ready to use these parts in a production valve because data for the long-term material properties is not available, but for a short duration test, the process appears to be a valuable addition to the development process, and I would not hesitate to accept new products built by this method in the future."

In fact, a second valve company, EnviroValve Inc., submitted 3D production parts to the lab in July for testing. The valves were scale models of a larger valve not compatible with the lab's equipment. Ball explained: "The 3D printing technology made it easy for the manufacturer to scale down the larger valve and produce models that would fit on the lab's equipment. They were also able to produce complicated internal geometries that would be difficult to machine." Ball reported that EnviroValve's tests were also successful.

Ball is optimistic that the use of 3D printing technology in valve manufacturing will expand. "What was initially a unique request by F.C. Kingston to use 3D printed valve



EnviroValve's reduced scale model of a pin-actuated non-reclosing pressure relief valve. The blue pieces are the printed parts.

parts is on its way to becoming a standard procedure. I believe we will see production valves made this way someday," he predicted, and then added: "I'm glad the National Board is able to respond to requests and incorporate new technologies in the testing process. It helps manufacturers improve their time to market and it reflects the ever-increasing pace of industry."

F.C. KINGSTON TALKS RAPID PROTOTYPING

Derek Parnett (application engineer) and Marco Martinez (design engineer) of Storm Manufacturing Group (SMG) provided insight about their use of 3D printing in its pre-production of safety valves (referred to as rapid prototyping) and how the growing technology could change manufacturing as we know it.

BULLETIN: When did you begin using 3D printing and what sparked the company's interest in trying the technology?

Parnett/Martinez: We began implementing rapid prototyping at the end of December 2011. Storm Manufacturing Group continually looks for improved efficiencies in the design and production of safety valves. Some members of our engineering team brought their 3D rapid prototyping experience to SMG. Management recognized the potential benefit immediately and invested in the required equipment.

BULLETIN: Besides valve parts, how else are you utilizing the technology?

Parnett/Martinez: We have also used this technology to reduce casting lead times by printing pattern tooling, to take weight out of assembly fixtures and to design new product concepts.

BULLETIN: What are some of the benefits of using this process?

Parnett/Martinez: Time savings is by far the greatest benefit for engineering when it comes to developing new designs. Three-D printing has enabled us to print multiple designs simultaneously, which not only frees up time in the machine shop, but also saves time in the design development process. We can expedite prototyping through our machine shop and reduce time to market.

Printing casting tooling also cuts down lead times by almost half and reduces tooling costs. The ability to print accurate and repeatable components reduces human error in machining, thus saving time. Overall, rapid prototyping has been a great alternative to traditional prototyping and has proved to be a vital asset to our design process.

BULLETIN: Have you encountered any downsides to the technology?

Parnett/Martinez: The biggest downsides are the size constraints (6" x 8" X 10"), material costs, material expiration dates, and the inability to print multiple surface finishes on the same design. These constraints may impact testing of different valve designs (surface finish, threading, etc.) because of irregular flow paths which may affect flow.

The limitations of manufacturability are also a downside to this technology. The quality of a rapid prototype component that was printed may not

Marco Martinez uses 3D CAD software to design the side outlet pressure relieve valve component.

Pressure Relief Device Parts: Coming to a Printer Near You

Derek Parnett explains how pressure relief device parts are produced using 3D printing:

1) An engineer begins by creating a 3D model of the desired component in a 3D CAD software program. When the model is complete, the engineer uses the software program to convert the 3D model into a binary ".stl" file.

2) Next, the engineer will use the host computer to access the software program and select the files to be printed, as well as select the desired surface finish and the orientation of the part. The host computer is connected to the 3D printer via network cables similar to the way a standard ink printer is connected.

Parts are created using a rigid and durable material that starts out as a liquid. Complimentary support material (also liquid) is also used to temporarily fill all openings, gaps, and crevices of a part while it is being printed. The materials are loaded into the printer via plastic bottles, each of which contains 1KG of liquid material.

3) The 3D printer then begins making hundreds or thousands of "passes" back and forth over the print area. The nozzle deposits very small amounts of the liquid material on each pass. Each layer that is deposited is only 28 microns (.0011 in.) thick. The printer is equipped with a powerful UV light that instantly cures the liquid material as it is deposited. The complimentary support material is also deposited during the printing process and is also cured via UV light. The printer continues to make passes back and forth until the part is completed. Depending on the complexity of the design, printing a part can take anywhere from 2 to 14 hours. For a standard valve body, the process usually takes 10 to 12 hours.

4) The finished part is cleaned with a high-pressure water jet. This process removes all of the complimentary support material from the model and leaves only the hard plastic material. Once the part is cleaned, it is ready to be assembled to metal parts or other printed parts to create the final product. At this point, if the part will need to be tested at high pressures, hydrostatic tests of the printed part are conducted to ensure it can safely handle the desired pressures.

F.C. Kingston's fully assembled valve on their test equipment. The valve is mounted on a tank inside a sound abatement structure and tested for set pressure, flow, blowdown, and leak tightness.

translate to actual real-world manufacturing because of unrealistic designs. This may increase the cost of manufacturing and delay the product from being introduced into market.

BULLETIN: How would you forecast the use of 3D printing in valve manufacturing?

Parnett/Martinez: Companies looking to deliver increased value with new products or "application specific" valves will eventually gravitate to 3D printing.

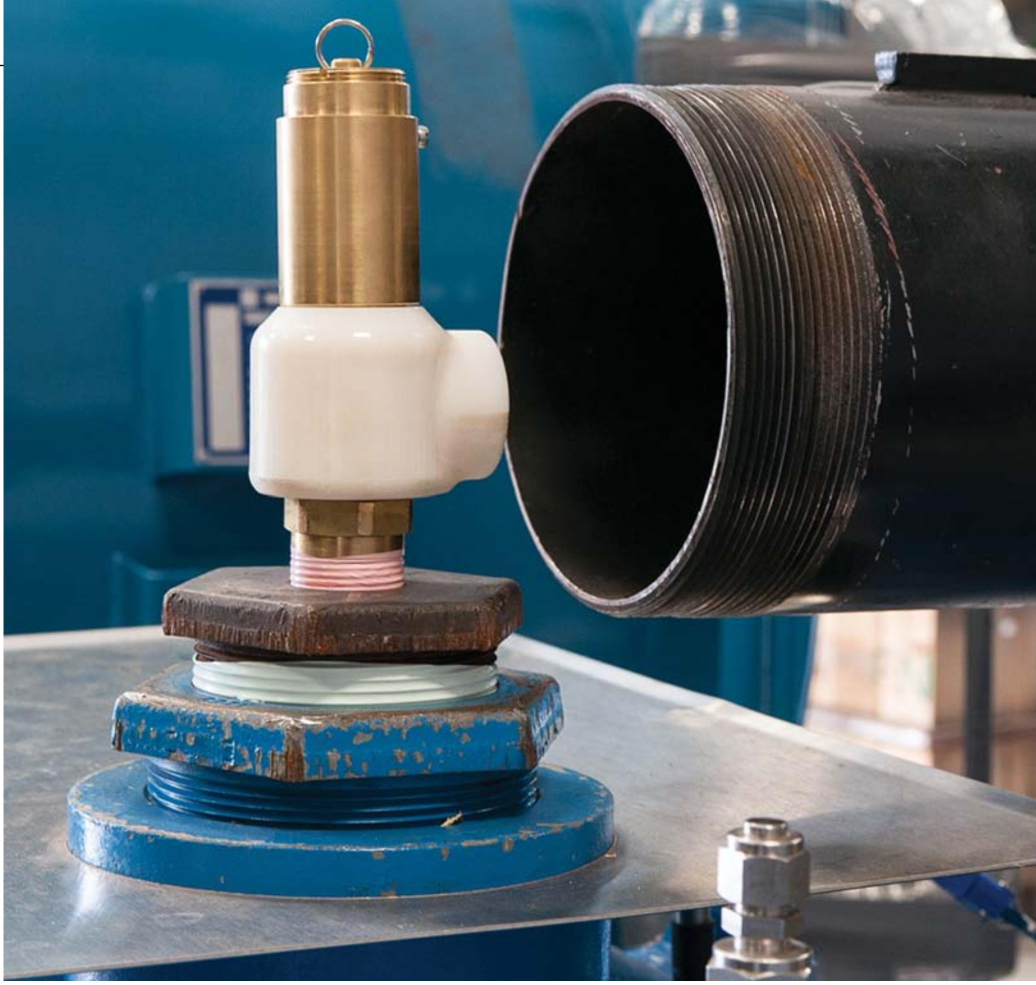
BULLETIN: In current media coverage of 3D printing, some suggest that this technology could become the next industrial revolution akin to the steam engine and the printing press. Your thoughts?

Parnett/Martinez: Three-D printing has already demonstrated its potential across industries: medicine, space exploration, and textile manufacturing currently see the benefits of 3D printing. The use will grow exponentially with advances in technology.

BULLETIN: An article on additivemanufacturing.com says "additive manufacturing is a truly disruptive technology" to traditional manufacturing. How could 3D printing impact or disrupt traditional manufacturing?

Parnett/Martinez: At this point, the technology is aiding traditional manufacturing; however, in the distant future it is possible that it will replace manufacturing as we know it today. As 3D printing becomes readily available, the use will grow because of the attractiveness to reduce waste, improve efficiency, and achieve repeatability. In the near future we can see the use of rapid prototyping for custom products, printing repair parts in remote locations, and design support.

With developing technology in rapid prototyping and the materials used, one can only imagine what the future holds, such as printing valves or replacement parts. ✤



Above: F.C. Kingston's side outlet PRV is successfully air-tested at the National Board lab.
Below: Engineers Derek Parnett (left) and Marco Martinez (right).

Pressure Relief Valve Conversions

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

A popular slogan related to the environment is "Reduce, Reuse, Recycle," which reflects the idea that reducing waste or reusing an item can have a positive effect for society. An application of this slogan in the boiler and pressure vessel industry is the reuse or repurposing of a pressure vessel or a pressure relief valve into a service different from the one for which it was originally designed. Although an obvious benefit to the user is an economic one, changes in service require a thorough engineering-based review to ensure that the equipment will be safe for use in the new service.

The *National Board Inspection Code* (NBIC) committee is currently reviewing this topic and considering the addition of a new appendix to the code to address this issue (NBIC business item numbers NB08-0320, NB08-0321, and NB08-0322). The proposed appendix would outline considerations for various changes in service, and work needed to ensure that a vessel can be reused in a particular manner. An example is that when a pressure vessel is changed from ammonia service to LP gas, internal access may be needed for internal inspection of the vessel, which may require the addition of a manhole. (Please note that NBIC changes are not final until they have completed the committee review and public review comment procedures.)

An area where the concept of a change in service has succeeded is in the "conversion" process for pressure relief valves. This process is part of the National Board Valve Repair (**VR**) program and has been widely used by repair organizations for a number of years.

When the National Board **VR** program started in 1978, it was very much oriented toward standard repairs only. In the repair process a pressure relief valve (PRV) is disassembled, inspected, repaired as indicated by the inspection, reassembled, and reset back to the specification it was received in by the repair organization. A program requirement is that the valve be returned to a condition "equivalent to the standards for new valves."

However, as the program matured, users often expressed the need to make changes to the valve where its final specifications would be different than when it was brought into the repair firm. Rules were first added to allow for changes in set pressure. This could permit a valve to be used in a different system in their plant, or be adapted if a boiler or pressure vessel was re-rated.

In the early 1980s rules were added to the *ASME Boiler and Pressure Vessel Code* requiring capacity certification of valves that would be used in liquid service. Valve manufacturers made design modifications to ensure that their process-type valves would perform acceptably in liquid service, often using different springs and modified valve trim parts, such as a different disk design or adjusting ring dimensions and configurations. They then began to offer these parts to the marketplace so valves in liquid service (but originally produced as an air or steam valve) could be upgraded to the new designs.

In review of manufacturers' catalogs and literature, it was often observed that valve designs were promoted as being easy to adapt from one service to another, or that changing the valve configuration from one variation to another could readily be done.

All of these potential changes to a valve (other than set pressure changes) did not have a ready **VR** program reference where rules for making these changes could be found. Therefore, the concept of "conversions" was developed to cover all of the potential changes that could be made to a valve.

For NBIC users with a boiler or pressure vessel background, it should be noted that a valve *conversion* is different from a boiler or pressure vessel *alteration*. An alteration takes place when a change is made that affects the original boiler or pressure vessel design. Examples are the addition of a nozzle to a pressure vessel or the change of a vessel's design pressure or temperature. When alterations are made (whether physical work is done or not) design calculations must be completed by the repair organization, and additional NDE and pressure testing is often needed. A pressure relief valve conversion cannot change the design into a variation that the valve manufacturer does not include within the design family.

A PRV conversion is defined in NBIC Part 3, Section 9, Glossary of Terms:

> **Conversion** — Pressure Relief Devices: The change of a pressure relief valve from one capacity-certified configuration to another by use of manufacturer's instructions.

The key to the change is that the final configuration of the valve is still capacity certified. This means that particular variation has been evaluated through the National Board's Capacity Certification program, using the technical type certification rules as contained in the *ASME Boiler and Pressure Vessel Code*.

The allowable scope of conversions is further described in NBIC Part 3, par. S7.2 b):

> b) Conversions, changes, or adjustments affecting critical parts are also considered repairs. The scope of conversions may include changes in service fluid and changes such as bellows, soft seats, and other changes that may affect Type/Model number, provided such changes are recorded on the document as required for a quality system and the repair nameplate.

An indication that a potential change to a valve is a conversion is that the valve type or model number requires revision. The traceability for the change made to a valve is provided in two places. The first is on the repair document used to record a repair, commonly called a valve repair traveler. Here the original type or model number on the valve nameplate is recorded, and the revised model number the valve is being changed to is also listed. That new model number is also shown on the VR nameplate. The detailed instructions for the change being done must come from the manufacturer's repair documents (maintenance manuals often include these instructions).

Since the type number is being changed, the NBIC then also requires that the original type or model number be marked out on the original manufacturer's nameplate. It should, however, be left legible, so common practice is to mark through the original model number with a steel stamp with an "x" or "-" mark which will still allow the original number to be read.

In the **VR** program, conversions are permitted only as part of a complete **VR** repair. During a **VR** repair, a valve must be completely disassembled and internally inspected, including detailed checks of valve "critical dimensions" which ensure the valve's condition is correct before any changes are made. Where repairs are indicated they are performed as needed. Then the conversion process may take place, to modify the valve as requested by the customer.

Conversions commonly done in the repair industry include the following:

- **Changing set pressure:** Although the model number is not always affected, often a new spring is required, and a new repair nameplate capacity must be calculated. Data necessary to perform the nameplate capacity calculation can be found in the National Board's NB-18 document on the National Board web page. In some designs, changes to a lower set pressure sometimes require that the disk be modified or replaced with what is called "low-pressure trim" (trim are the internal parts such as the disk and adjusting rings). Those valves may have a different type number (sometimes includes the letters "LP" for low-pressure parts).
- **Changing service fluid:** Re-evaluation of service media may indicate a change from gas to liquid service or the reverse. Trim parts require replacement with parts of the correct specification and often a spring change is needed as well.
- **Reconfiguring cap and lever**: ASME Section VIII valves require a test lever for steam air or hot water service. Use in other services is optional, and users may specify the addition or deletion of the lift lever as they see necessary. The model number often differs when the lift lever style is changed.
- **Revising seat material:** To enhance seat tightness of a pressure relief valve, soft seat variations are available. A change from a metal-to-metal seat to a soft seat often can be done, and the model number then must be revised.
- **Adding or deleting bellows:** A bellows valve is used in services where back pressure may be present, or where built-up back pressure can occur and prevent the valve from being affected by that back pressure. If it is determined that back pressure is not present, the bellows could be deleted. If it is determined the back pressure was a concern that was not recognized when the valve was originally specified, it could be added. Again, the change will affect the type number.

The benefits to the user are many. Where a valve's service conditions are found to have changed, the valve can be converted as needed to avoid buying a new valve. Spare valves can be used to support multiple valves in the plant and the number of spares reduced. Older valves can be upgraded to newer configurations to improve performance. Repair costs are reduced, particularly where an expensive bellows requires replacement, but is found to not be critical to the valve's application.

The addition of the conversion rules has been found to be popular among PRV users. It allows them to tailor valves to their needs as their plants change, "reuse" a valve in a different application, or enhance valve performance.

All of this leads to maintaining pressure relief valve capabilities in protecting boilers and pressure vessels from the catastrophic effects of uncontrolled, overpressured conditions. ✚

Improving Safety Through Violation Tracking

Device Type: Safety Relief Devices

BY CHUCK WITHERS, ASSISTANT EXECUTIVE DIRECTOR – TECHNICAL

A closer look at the major violations found on specific safety devices as reported to the National Board by participating member jurisdictions.

Last summer the National Board modified its Violation Findings Report in order to identify a comprehensive account of specific inservice violations commonly found during jurisdiction-required inspections. The new violations tracking report focuses on five types of pressure equipment: high-pressure/high-temperature boilers; hot water heating/supply boilers; low-pressure steam boilers; potable water heaters; and pressure vessels.

For each type of pressure equipment, the report details specific safety violations found on installed safety devices (see "2012 Report of Violation Findings" in the summer 2013 issue of the *BULLETIN*). Mandated codes and jurisdictional requirements identify which safety devices are required to be installed for each pressure equipment type. These devices include: safety relief devices; low-water cutoffs/flow sensing devices; pressure controls; temperature controls; burner management controls; level indicators such as gage glasses, bulls eyes, and fiber opticals; pressure/temperature indicators; and other pressure-retaining items associated with the proper operation of the pressure equipment (piping, pumps, valves, expansion tanks, etc.).

The revised and expanded Violation Findings Report exposes key problem areas to provide the pressure equipment industry with categorical statistics that can be analyzed and used to focus attention on installation, inspection, and maintenance of specific safety concerns to ultimately reduce the number of safety violations found during inservice inspections. For instance, a safety relief device that is improperly installed may fail to operate as designed, which is to relieve excessive pressure and prevent equipment failure. Any failure of a required safety device to function and operate properly may cause a catastrophic failure of the pressure equipment, resulting in property damage, personnel injuries, and even death.

This article is the first in a continuing series that will identify a specific safety device and the major violations noted when performing inservice inspections.

The National Board's goal is to identify specific violations found on specific types of pressure equipment as inservice inspections are performed and to inform industry of these statistics to provide a basis for improving inspections and pressure vessel safety. In July 2013, the National Board successfully collected one year's worth of specific violation data for improved accuracy and reporting of statistics. As the National Board gains ever-more accurate information over time, it is our hope that by informing industry of key violations found, identifying causes, and discussing methods to minimize these causes, it will result in fewer violations for improved pressure equipment and public safety.

This article is the first in a continuing series that will identify a specific safety device and the major violations noted when performing inservice inspections.

To begin, the most important protection for equipment and personnel is the **safety relief device** (typically valves). Notably, this is where the highest number of violations have been reported. Therefore, we will discuss the top three violations associated with safety relief devices. As you can see by reviewing the following table, those three violations are: improper installation, devices inoperable, and leaking safety relief devices.

Table 1

Violation Tracking Statistics for Safety Relief Devices
Period: 7-1-2012 to 6-30-2013

Device Type - Safety Relief Devices (ASME Certification Designator)	(Inoperable)	(Improper Installation)	(Leaking)
High-Pressure/High-Temperature Boilers (S)(M)(E)	182	257	155
Low-Pressure Steam Boilers (H)	162	620	200
Hot Water Heating/Supply Boilers (H)	794	2,326	1,469
Pressure Vessels (U)(UM)	499	1,156	142
Potable Water Heaters (HLW)	181	458	197

Safety Relief Devices – Improper Installation Violation

The *National Board Inspection Code* (NBIC) 2013 Edition, Part 1, Sections 2.9, 3.9, 4.5, and 5.3, discuss in detail specific requirements to properly install, mount, and connect safety relief devices for power boilers, steam heating, hot water heating, and hot water supply boilers; tanks, heat exchangers, and other pressure vessels and piping.

Some observed causes are:

- Lack of understanding of laws, rules, and regulations
- Lack of knowledge of design, materials, and requirements for proper installation specified by the manufacturer and / or codes and standards
- Inexperience
- Lack of attention to detail

The above causes can be explained in one word – ***ignorance*** or the state of being unaware or uninformed.

As shown in photos 1-4, there is a right way and a wrong way to install safety devices. Take time to review the installations and see how many violations you can identify. Answers can be found on page 38.

Photo 1 - Section I boiler safety valve

Photo 2 - Section IV hot water boiler safety relief valve

Photo 3 - Section VIII liquid service pressure relief valve

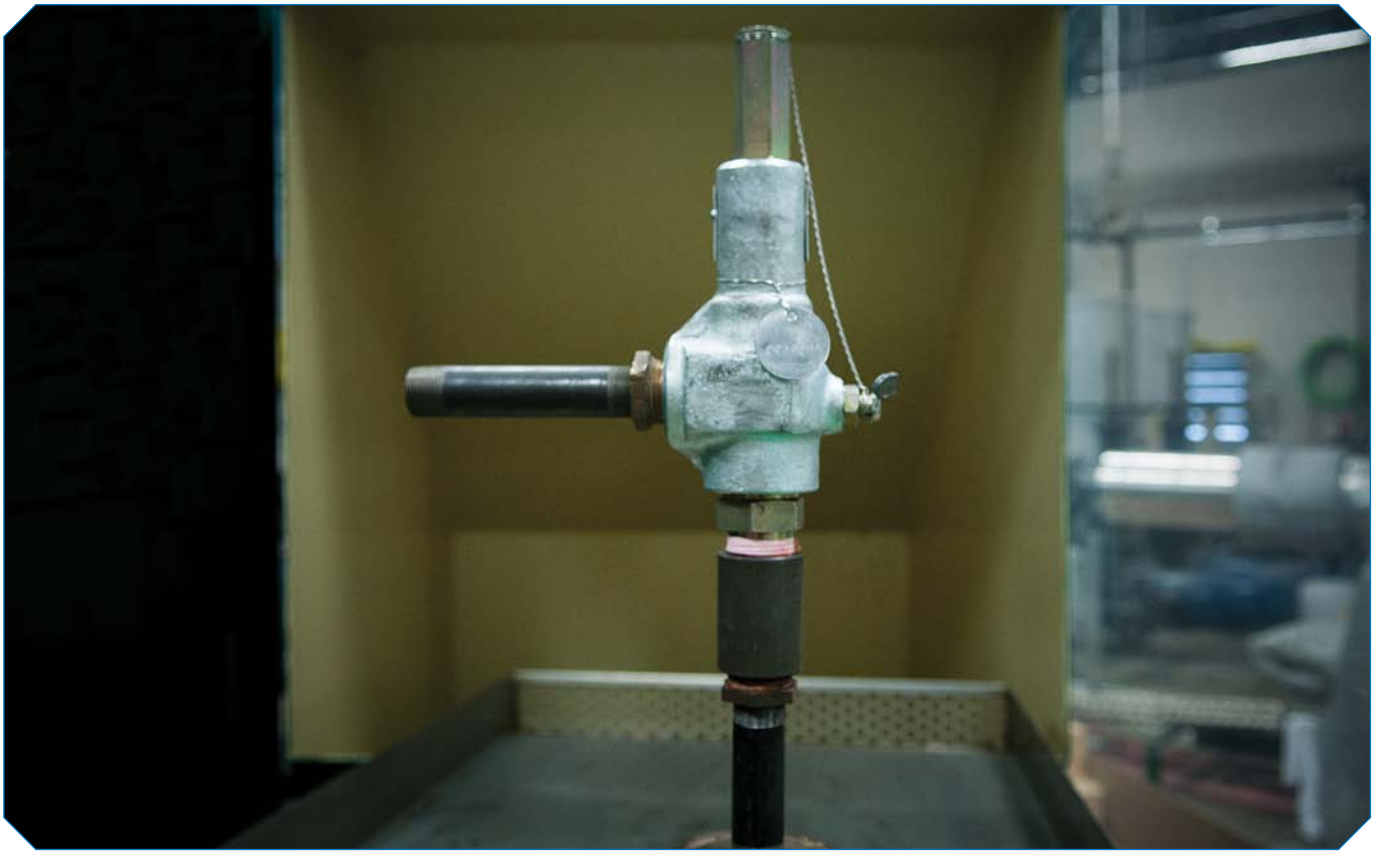


Photo 4 - Section VIII gas service pressure relief valve

As specified in the NBIC, the following is a minimal list (not inclusive) of some basic requirements that should be understood and followed for proper installation of safety relief devices.

- **For boilers** – Safety and safety relief valves shall be connected directly (***no intervening valves***) to a tapped or flanged opening located at the highest practicable part of the boiler, but in no case installed below the normal operating level or below the lowest permissible water level.
- The connection between the boiler and safety relief device shall have at least the area of the safety valve inlet.
- Safety and safety relief valves shall be installed with their spindles vertical.
- Discharge piping shall not be less than the full area of the valve outlet or the total of the valve outlets discharging thereinto. Discharge piping shall have a safe point of discharge (understanding the safety concerns when discharging steam or liquid medium), shall be adequately supported so as to minimize stress, and shall have provisions made for venting and draining the piping.
- No shut-off valves shall be installed in the inlet connection or outlet piping.
- Safety relief devices shall be manufactured in accordance with national (ASME) or international standards and shall be National Board capacity certified.
- Safety relief devices shall meet manufacturers' requirements, jurisdictional rules, and mandated codes or standards for set pressures, capacity, certification, stamping, and sealing of adjustments.
- **For pressure vessels and piping** – The majority of the above specified requirements should be followed, with the understanding that there are additional requirements, limitations, and allowances for installing safety relief devices on pressure equipment other than boilers.

Extreme Caution

Those installing and inspecting safety relief devices on pressure equipment must pay particular attention to the valve stamping information and the type and operation of the equipment to determine if the correct safety relief device is being utilized and installed correctly. There **are many variables** that must be considered to determine the adequacy of each safety relief device. Besides set pressure, capacity, design (water, steam, or air) and certification noted on the stamping, there are hundreds of various types and designs of pressure equipment that require special pressure relief devices to be installed in such a manner as to consider their normal operation and application. For example, coil- or header-type boilers shall have the safety relief device located on the steam or hot water outlet end. Another example would be for potable hot water heaters, hot water heating, or supply boilers limited to a water temperature of 210°F (99°C), which may have temperature and pressure safety relief valves mounted directly to the boiler or hot water heater with no more than 4 in. interconnecting pipe, and the valve may be installed in the horizontal position with the outlet pointed down. If the installer or inspector has questions, they should seek competent technical advice from the manufacturer of the equipment, the jurisdiction, or other reliable resources, while at the same time reviewing or researching requirements specified in applicable codes and standards.

When operating conditions are changed, such as installing additional heating surface, the safety relief device must be verified adequate to meet the new conditions.

Leaking and Inoperable Safety Relief Devices

Although improper installation of safety relief devices has the most observed violations, leaking or inoperable safety relief devices continue to be a major concern. A leaking safety relief device is a good indication that an internal problem exists that may prevent the safety relief device from functioning as required. When a safety relief device is inoperable, essentially the equipment is not protected from an overpressure condition and ultimately will be a contributing factor **if** or **when** a catastrophic failure occurs.

Ways to Minimize Violations

We can ask ourselves "What can we personally do to minimize these noted violations?" To answer this question we need to review and discuss each individual violation.

Leaking safety relief device violations can easily be reduced when operators and maintenance personnel observe this situation and immediately take action to repair or replace the leaking device. As time goes on the situation only worsens until the device becomes inoperable.

One way an inoperable safety relief device can be prevented is for the owner to have a maintenance program in place to test the safety relief device at a specified frequency based on operation, experience, and usage of equipment. Such a program can be easily reviewed and verified by inservice inspectors.

Violations noted for improperly installed safety relief devices can be easily minimized through training, education, and improved awareness of the specific knowledge and understanding needed for each type of pressure equipment and the proper installation requirements to be met for each associated required safety relief device. Manufacturers, suppliers, pressure equipment associations, inspection agencies, jurisdictions, and many other safety-minded organizations can be utilized as resources to ensure safety relief devices are correctly installed and meet specified codes, standards and jurisdictional requirements.

All one has to do is ask, if or when a question arises!

Whether a safety relief device is leaking, inoperable, or installed improperly, this important safety device rightly deserves the most attention from contractors, installers, inspectors, and owners to ensure these violations are minimized. Over time, instead of being the most frequently cited, these specific violations can be the least. By working together we can all say, ***"We have succeeded in making our environment a safer place to live."*** ✤

Answer key: 2011 NBIC, Part 1

1. Inlet pipe too long (2.9.6c)); Process line out of inlet pipe (2.9.6a)); Adjusting ring seals are missing (Part 2, 2.5.3b)); Drain hole has plug in it (2.9.6h)).
2. Inlet pipe is smaller than valve inlet (3.9.1.1.1); Outlet should be pointed down or have a separate drain (3.9.1.5b)); The heavy elbow should probably be independently supported (3.9.1.5a)).
3. Inlet pipe size is less than size of valve (4.5.6a)); Outlet pipe should be pointing down or have a separate drain (4.5.6g)).
4. Inlet pipe is smaller than valve inlet (4.5.6a)); Outlet pipe is reduced from valve outlet size (4.5.6g)).

The Pressure Equipment Inspector

A new certification from the National Board

BY KIMBERLY MILLER, MANAGER OF TRAINING

The new **Pressure Equipment Inspector** (PEI) program is designed to enhance an individual's knowledge of the inspection processes associated with boilers and pressure vessels, and allows individuals performing inspections to receive a certification recognizing the scope of their work – something which has not been available in the past.

Unlike the National Board Commission credential, the PEI certification is extended to the *individual*, and is not associated with employment by an authorized agency or enforcement jurisdiction. Instead, the PEI may be an independent contractor or employed by an owner of pressure equipment, manufacturer, repair organization, or any other organization performing inspection-type work.

It is important to note the PEI credential does not allow an individual to perform inspections required by the ASME Boiler and Pressure Vessel Code (ASME B&PVC) *or those required by the* National Board Inspection Code (NBIC). *Those inspections are outside the scope of the PEI and must be conducted by the Commissioned Inspector.*

What is the scope of the Pressure Equipment Inspector?

Two areas of inspection and related activities are recognized under this new certification: inservice and new construction. Depending upon the area of inspection, the scope will be slightly different.

Within the area of inservice inspection, the individual's primary duties may include installing, operating, maintaining, or repairing / altering boilers, pressure vessels, or piping systems.

The duties and responsibilities for new construction may include inspections and other activities related to boilers, pressure vessels, or piping during the construction or fabrication phase.

For example, an inspector for the inservice category may be the individual responsible for all pressure equipment maintenance and reliability at a user's facility, whereas an inspector in the new construction category may be the individual responsible for performing quality-related inspections during various stages of fabrication (such as material control, welding, NDE, examination, and inspections).

What are the qualifying criteria for the Pressure Equipment Inspector?

The list of requirements to qualify for the new PEI certification includes:

- Attend either the National Board's inservice or new construction inspection course (whichever applies to the person's area of interest).
- Earn a passing score on the final examination.
- Have a minimum of three years of qualifying work experience.

Once those three items have been achieved, the next step is to complete and submit the online application form located on the National Board's website. After the application is received and approved, the individual is issued a certificate and PEI card. The card serves as the individual's credential and identification as it includes not only their name but also their photograph. The PEI card also lists the type of certification held by the inspector (inservice or new construction) and the certification renewal date. Although most individuals will qualify for either the inservice or new construction, a person may hold both inservice and new construction PEI credentials.

Renewal of the PEI is annual and also completed online. Like other National Board credentials, continuing education training requires renewal and must be completed every two years.

Since the PEI program was designed as an elective, anyone having attended the National Board inservice or new construction inspector training courses since January 2011 will automatically have their training acknowledged. However, a passing score on the associated examination and the necessary job experience requirements will also need to be met before their application can be approved. Anyone not electing to sit for the examination at the end of the training class – or those who may have not passed the exam – now will only need to take and pass the exam, with no need to return for additional training.

For more details about the PEI certification, visit the National Board website at www.nationalboard.org.

Coming soon: the 2014 training calendar.
Visit the Training section on the National Board website for current listings of classroom courses and seminars.

STEVE NELSON

Chief Boiler Inspector/Program Manager, State of Colorado

BULLETIN Photograph by Joel Silverman Photography

Steve Nelson looks perplexed.

"Why," the Colorado boiler inspector/program manager asks, "would anyone want to read a story about me? My life has been pretty boring."

And while he may not be Horatio Alger material in that respect, it turns out that Mr. Nelson has, after all, led a pretty remarkable existence since growing up in rural Minnesota just north of Minneapolis.

Granted, the early years were rather routine.

Steve's dad worked as a tool and die shop foreman. (The younger Nelson received his first exposure to steam when the shop owner brought a miniature live steam train set into work.) The Colorado official took a succession of part-time jobs while in high school working at a lumber yard, gas station, and manufacturing company.

Following retirement, the older Nelson took to raising cattle and keeping horses on a small hobby farm. And although only a part-time farmer, the elder Nelson welcomed his son's help with the chores.

Always interested in math and science, Steve attended a junior college after high school with the hopes of becoming a dentist.

But it was the late 1960s. Between the Vietnam War and the conscription of young men who were given a draft number based on their birth dates, it was a difficult time for those planning their futures.

"My number was '9' and it was a forgone conclusion I would be among the very first to be drafted," Steve admits with a half-smile. "It was time to make a decision: wait it out in hopes the draft would bypass me, or join the service and have at least some say on my professional future."

Steve made a pact with a high school classmate that both would join the Navy at the same time and serve some of their time through a kind of buddy system.

While the Minnesota native honored his part of the agreement by enlisting for a six-year active obligation, his buddy was held back in boot camp. "He couldn't swim," Steve says with a laugh.

Having gone through the obligatory military aptitude tests, the future National Board member decided on pursing the Navy's nuclear program. And so in the fall of 1970, Steve found himself at Navy boot camp in San Diego. "After that I attended 'A' school before being sent to nuke school in Bainbridge, Maryland, and finally over to Nuclear Prototype School in Idaho Falls, Idaho."

While stationed in Idaho, Steve found time to fly back to San Diego. To get married.

"I met my wife Marlene in San Diego and we dated for two years mainly through an exchange of letters," Steve adds with a chuckle. "However," he is quick to add, "I did propose to her over the phone!"

The newlywed couple moved to Idaho Falls before Steve was assigned ship duty aboard the *USS Long Beach* (CSG 9), one of the world's first nuclear powered ships.

"The day I left, I waved goodbye to Marlene who was on the dock and pregnant," he reflects with a grin. It would be seven months before he would hold his new daughter for the very first time.

"As for the *Long Beach*, we spent most of our time traveling back and forth between the Tonkin Gulf, off the coast of Vietnam, and Subic Bay," the Colorado official explains. Fortunately, the travel provided Steve a productive opportunity to train and become qualified as an electrical plant operator. "My thinking at that time was that I could eventually get a job at a nuclear plant back in Minnesota."

Steve served on the *Long Beach* for two years before receiving his orders to report for new construction duty on the Nimitz Class *USS Eisenhower* (CVN 69). It was the summer of 1978 when he decided to take his discharge and move Marlene and his now two daughters back to Minneapolis.

As he envisioned on the *Long Beach*, Steve sent out applications to nuclear plants "all over the upper midwest" with the hopes of securing an operator position. But as Steve points out, "a man and his family have to eat." And so he took a transitional position with a company making soda cans.

With connections to his Navy buddies still fresh, Steve received a call from a friend recently discharged from the *Eisenhower*. "He had just taken a job with Hartford Steam Boiler and told me the company was looking for boiler inspectors," the Colorado official recalls.

Steve started with Hartford in 1979 and was promoted to supervisor two years later. "Because of my nuclear background, I was charged mainly with conducting nuclear plant inspections."

Around 1983 Marlene expressed frustration with the Minnesota weather. "We had traveled back and forth across the country during my Navy days and both of us had a pretty good idea where we wanted to relocate."

That was the Denver area. When an opening became available, Steve accepted a transfer to the Hartford office in Denver where he assumed the position of field service supervisor.

"I was still at Hartford when I began receiving calls from [then Colorado chief] Randy Austin," he recollects. "Randy told me he would be retiring soon and that I should apply for the position."

And so after 29 years with Hartford, Steve interviewed for and was chosen the state's new chief inspector in January of 2008.

In 2010, the Colorado official's duties were expanded to include program manager within the boiler inspection section. At present, he manages eight fulltime inspectors, one part time, and his trusty administrative assistant. He is also responsible for inspection of 41,000 boilers and fired vessels across the state.

Both Steve and Marlene speak glowingly of their family, which now includes two grown daughters and a son, and five grandkids aged five to 19 years.

Upon further reflection, the Minnesota native concedes his life has really not been that uninteresting.

"I guess traveling the world, having a loving wife and family, working on the first generation of our country's nuclear-powered battleships, and achieving the responsibility of chief inspector has been quite the trip," he admits.

"Did I tell you about my music career," Steve hastens to add. "In high school I was in a garage band. I played electric guitar and organ. Still have the guitar!"

The band was called *From Left to Right*. When asked the genesis of the group's moniker, Steve pauses a second and sarcastically reveals: "When we were onstage, the audience looked at us from left to right."

Although they never hit it big, performances at school dances and parties still gave *From Left to Right* the occasional opportunity to be *front and center.*

New National Board Member

Ontario


Michael J. Adams

Michael J. Adams has been elected to National Board membership representing the province of Ontario. Mr. Adams served in the Canadian Navy from 1975-1995 and achieved lieutenant-commander status. He earned a bachelor of science degree in mechanical engineering from the University of Manitoba in 1979 and received his master's in electrical engineering from the Royal Military College of Canada in 1986.

The new Canadian member began a civilian career as owner of a part-time engineering consulting business, Corealis Power (1996-2000), while also working as a program manager at Science Applications International Corporation (1995-2001). From 2001 to 2004, he was director of programs at Fuel Cell Technologies. In 2004, he became a section manager, engineering work management, with Ontario Power Generation (nuclear). In 2007, he became manager of business support at Ontario Power General. In 2011, he assumed the role of director of boiler & pressure vessels/operating engineers with the Technical Standards & Safety Authority of Toronto. Mr. Adams holds two patents, is a member of ASME and the Institute of Power Engineers, and holds a National Board Inservice Commission.

Member Retirement

British Columbia


Edward Hurd

Edward Hurd retired from his position as member representing British Columbia on July 12, 2013. He was the provincial safety manager, boiler safety program, for the British Columbia Safety Authority.

Mr. Hurd served as a marine engineer in the Canadian Armed Forces from 1977 to 1987. He received his bachelor of engineering degree from the Royal Military College of Canada in 1981. During his career he worked as an engineering inspector, technical officer, design survey engineer, and as a codes and standards engineer.

He started with the engineering department of the British Columbia Boiler Safety Branch in 1991, becoming codes and standards supervisor in the British Columbia Boiler, Gas, and Railway Safety Branch in 1998. In 2004, he accepted a position with British Columbia Safety Authority as leader of engineering and research.

Mr. Hurd is a member of the Association of Professional Engineers and Geoscientists of British Columbia.

2014 Technical Scholarship Submission Period Now Open

September 1 marked the open submission period for the 2014 National Board Technical Scholarship. Applicants may apply through February 28, 2014. The program offers up to two $6,000 scholarships to selected students who meet eligibility standards and who are pursuing a bachelor's degree in certain engineering or related studies.

Full requirements and applications can be accessed on the National Board website by clicking the TECH SCHOLARSHIP button on the home page. For additional information, contact Connie Homer at chomer@nationalboard.org.

Wheaton, Greenawalt, and LaRochelle Remembered

Gary Wheaton


Gary Wheaton

Gary Wheaton, Rhode Island chief boiler and pressure vessel inspector from 1983 to 1988, passed away May 6, 2013.

Mr. Wheaton served in the United States Navy as a machinist mate and obtained his Merchant Marine fireman/water tender license and served on board the research vessel *Atlantis II* for the Woods Hole Oceanographic Institute. He became an authorized inspector employed by the state of Rhode Island in 1981, and received his National Board Commission in 1982. The following year he was promoted to chief inspector for the state of Rhode Island and was elected to National Board membership. Mr. Wheaton held the National Board **A**, **B**, and **N** endorsements. ◆

James W. Greenawalt Jr.


James W. Greenawalt Jr.

Former Oklahoma chief James W. Greenawalt Jr. died Tuesday, May 14, 2013.

Mr. Greenawalt was elected to National Board membership in 1981. His professional career began in the US Air Force when he was drafted in 1952. His military career spanned 20 years, seven of those as a single-engine jet fighter pilot. In 1960, he transitioned to a job in Air Force financial management. His career advanced to a position on the Air Force Inspector General's traveling inspection team, where he assisted in inspecting financial management operations. His last assignment with the Air Force was at Altus Air Force Base in Oklahoma as the base comptroller. In 1972, he left the military and started a new life and career as a civilian. He became employed with the Boy Scouts of America as a professional organizer in Altus before joining the Oklahoma State Labor Department as a boiler inspector. In 1979, he earned his National Board Commission and was also named Oklahoma chief boiler inspector. He was appointed director of the Oklahoma Safety Standards Division in 1983. He left his post with the state in 1996. ◆

Wilfred LaRochelle


Wilfred LaRochelle

HSB Global Standards Principle Nuclear Consultant and good friend to the National Board Wilfred LaRochelle passed away June 10, 2013, following a valiant battle with cancer. He was 60 years old.

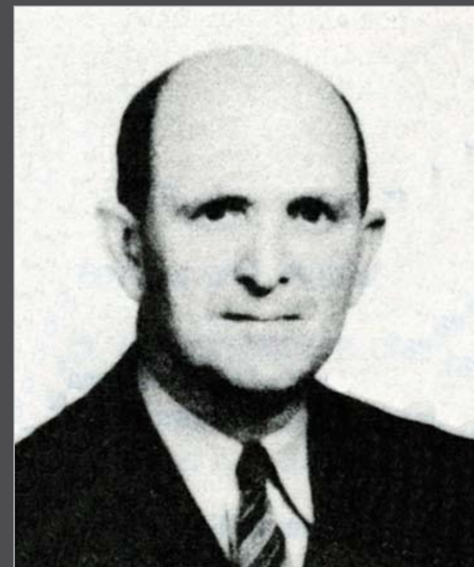
The 36-year employee of HSB specialized in quality assessment programs and ASME conformity assessment. At the time of his death, Mr. LaRochelle was serving as chair of the Subcommittee on General Requirements ASME Section III. Additional leadership positions within ASME included: vice president and chairman of the Board on Conformity Assessment; chair of the Subcommittee on Boiler and Pressure Vessel Conformity Assessment, and vice chair of the Committee on Nuclear Certification. Other ASME positions in which he had served: the Council on Standards and Certification; the Board on Codes and Standards Operations; the Board on Nuclear Codes and Standards; and the Standards Committee for Qualification of Authorized Inspection.

Mr. LaRochelle had represented ASME on delegations to South Africa, France, Italy, Korea, Japan, India, and China. Past ASME awards include a Certificate of Achievement, Certificate of Acclamation, and a Dedicated Service Award. He was named the recipient of the prestigious Bernard F. Langer Nuclear Codes and Standards Award in 2011. ◆

FLASHBACK THE WAY WE WERE Part 1

Mystery Surrounds Chairman's Disappearance

This is the first in a two-part account of a tragedy that struck the National Board organization in 1945. The Board's active involvement to help resolve the former chairman's death exemplifies the sense of community and comradery characterized in early BULLETIN *issues. The following is an excerpt taken from the April 1945* BULLETIN*. Part 2 will appear in the winter 2014 issue.*



National Board Chairman J.D. Newcomb

It is with deep regret that the Officers and Executive Committee announce the death of our Chairman, Mr. J. D. Newcomb, which occurred on Thursday, March 8, 1945, while he was on an automobile trip in the course of boiler inspection duties. There was at first a great deal of mystery surrounding Mr. Newcomb's disappearance and tragic death and Secretary C.O. Myers made a hurried trip to Little Rock to cooperate in the investigation. Within a few days, however, the cause of the tragedy was revealed by the capture of an irresponsible individual who proved to be a fiend that had been on a killing rampage in different parts of that state. It was learned that he had gained access to Mr. Newcomb's car as a hitchhiker and had then shot and robbed him and later burned the body and car to destroy evidence of his crime.

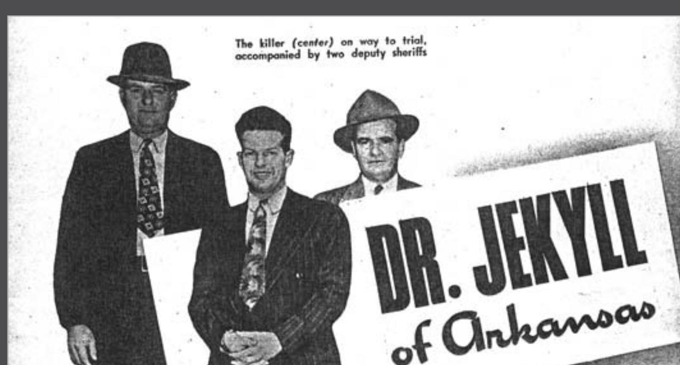


Photo Courtesy of Patterson Smith

Secretary Myers received the news of Mr. Newcomb's disappearance late Saturday afternoon, March 10th, and after telegraphing the other National Board officers, he left immediately for Arkansas. Mr. Myers made a very thorough investigation and interviewed both the Little Rock police and the Arkansas State police and he recounts the events of Mr. Newcomb's disappearance as follows: Mr. Newcomb left Little Rock about 1 p.m. on Thursday, March 8th, to inspect a boiler in Clarksville, a town about 85 miles to the west. He was reported to have stopped at his regular gas station and had his tank filled up with gasoline before leaving; the attendant reported that he was alone when he left for his drive to Clarksville. He did not return that night and his family became alarmed. Friday, the firm whose boiler was to be inspected, called to inquire why he had not arrived. Friday afternoon late, two farm residents living near the village of Herber Springs discovered a partly burned car about 200 yards off the highway in a wooded hollow. They reported their discovery to the sheriff and the authorities found Mr. Newcomb's car badly damaged by fire with what appeared to be the remains of his body on the floor between the front and back seats.

It was Secretary Myers' deduction from studies of local conditions that the offer of a substantial reward for the murderer would be likely to hasten his location and identification. As this is in line with the practices of the National Board in serving its officers and members, he offered a $500* reward for information that would lead to the arrest and conviction of the slayer. About a week after the reward was published the police authorities arrested a taxicab driver whose disappearance during several recent robberies and murders had caused local comment and the criminal, James W. Hall, boldly and unhesitatingly confessed to the slaying of six persons, one of whom proved to be Mr. Newcomb. He admitted the shooting of Mr. Newcomb for the purpose of robbery and said that he threw his body into the car and after driving into a secluded wooded spot, off the highway, set fire to it. In addition, Mr. Newcomb's watch was found in his room. [**Approximately $6,450 in current dollars.*]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