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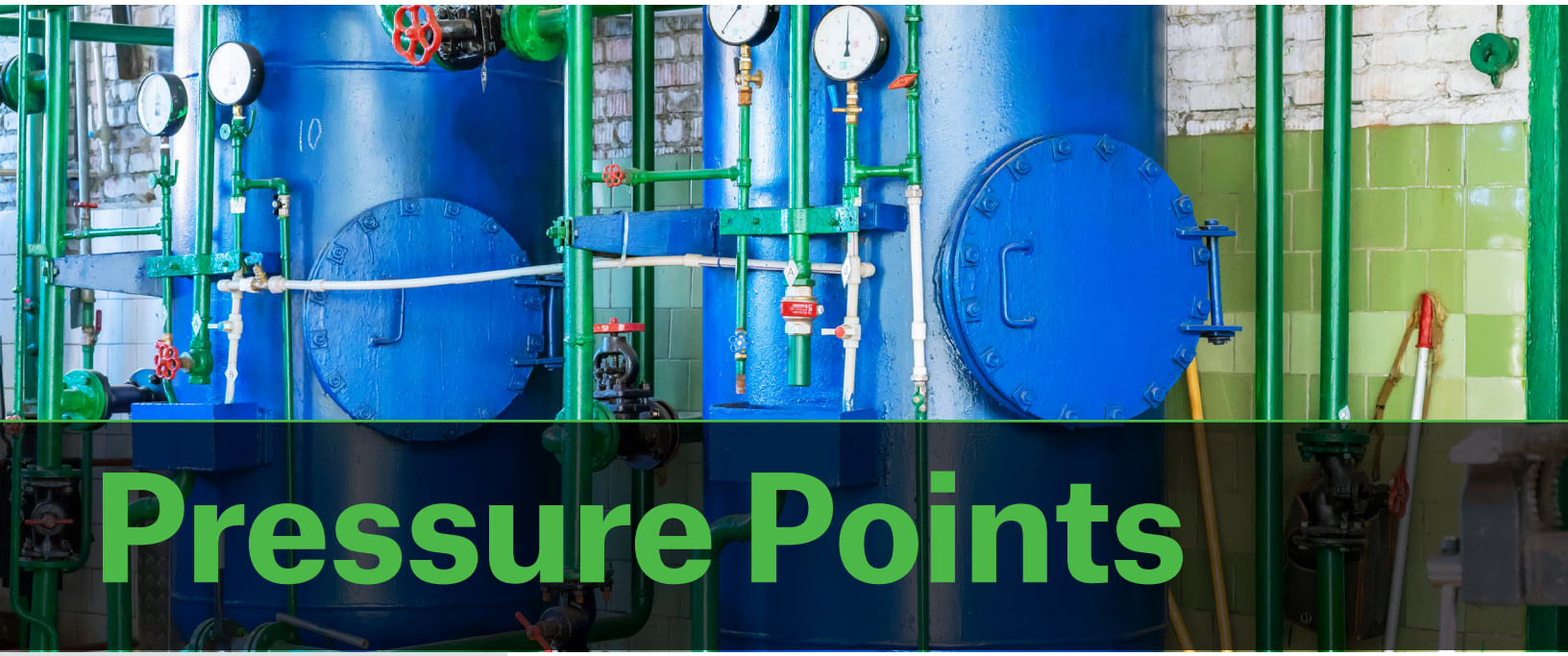

Pressure Points

Table of contents

HSB, a Munich Re company, is a technology-driven company built on a foundation of specialty insurance, engineering, and technology, all working together to drive innovation in a modern world.

Nuclear certificate holder scope expansion for metallic Division 5

Author: Paul Coco, P.E., Senior Engineer

Many of the proposed advanced reactor designs operate at temperatures higher than that of the current global commercial fleet. ASME Section III, Division 1 establishes rules for components where material strength and deformation are time independent. Prior to 1995, ASME Section III, Division 1 did not account for the construction of nuclear facilities that operate in excess of 425 °C (800 °F), known as high temperature reactor systems. High temperature design applications for nuclear facilities have been addressed by ASME since the 1970s through various code cases, which developed into the issuance of Section III, Division 1, Subsection NH, in 1995. In 2015, Subsection NH was relocated from Division 1 to Division 5 to account for high-temperature metallic applications.

Section III, Division 5 was first published in the 2011 Addenda of the Boiler Pressure Vessel Code. Metallic applications in Division 5 for low and elevated temperature considerations extend the rules in ASME Code, Section III, Division 1 to provide for the construction of metallic nuclear plant components that would operate within the creep regime (time dependent), which would include temperatures above 425 °C (800 °F).

When comparing Division 5 to Division 1, the equivalencies to component classifications are:

- ASME Section III, Division 5, Class A, is equivalent to ASME Section III, Division 1, Class 1
- ASME Section III, Division 5, Class B, is equivalent to ASME Section III, Division 1, Class 2

– ASME Section III, Division 5, Class SM, is equivalent to ASME Section III, Division 1, Class CS

ASME Certificate Holders have inquired on extending their scopes to include metallic applications for Division 5 to support the advanced reactor supply chain. Recently, ASME updated their Survey applications to include Division 5 within a Certificate Holder's scope. As a result of this update, ASME has also offered scope expansion for Certificate Holders with the equivalent ASME Section III, Division 1 scope prior to their next triennial resurvey for renewal.

A Certificate Holder request for a scope change when the scope of the certificate does not include the appropriate Division 1 equivalent scope statements will require an ASME Survey of the applicant's QA Program and its demonstration/ implementation prior to obtaining the new scope expansion.

However, Certificate Holders of existing ASME Section III, Division 1 Certificates can obtain a change of Certificate scope to include the appropriate equivalent Division 5, provided:

– The Certificate Holder's Authorized Inspection Agency of Record shall have Division 5 in the scope of their ASME Certificate.
– The Quality Assurance Program Manual is updated to address the additional Division Classes to be included on your Certificate Scope statement.
– The revised Quality Assurance Program Manual is submitted for review and acceptance by your Authorized Inspection Agency of record and ASME.
– A letter is submitted to ASME requesting the additional scope be added to your Certificate.
– The Certificate Holder indoctrinates and provides training for their personnel to the revised program prior to implementation.

HSB has worked closely with ASME on the issuance of Division 5 scope expansions. Many of our Authorized Nuclear Inspector Supervisors and Inspectors have been trained and designated to support Division 5 activities. Additionally, HSB has completed the first and only training available for our clients on Division 5 and was also one of the first Authorized Inspection Agencies (AIA) to include Division 5 within their scope.

For more information, email us at GetInfo@hsb.com, or contact your Authorized Nuclear Inspector Supervisor for scope extension and Division 5 training.

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Paul Coco is a graduate of the United States Naval Academy where he earned a Bachelor of Science in aeronautical engineering, a master's degree in Engineering Management, a Master of Science in Mechanical Engineering, and is a licensed professional engineer in the state of Maryland.

Paul served in the United States Navy from 2002 through 2022 as a Reactor Mechanical Division Officer and Training Officer aboard a nuclear aircraft carrier and a Science Officer for the Office of Naval Research. From 2007 through 2010, Paul taught Applied Engineering Thermodynamics for Naval Applications as a Military Professor for the Mechanical Engineering Department at the United States Naval Academy. After active duty, Paul worked as a Reactor Operations Engineer where he conducted detailed technical reviews of nuclear licenses in accordance with federal codes and standards, and performed quality assurance inspections on domestic and international nuclear vendors for nuclear safety related components for the United States Nuclear Regulatory Commission.

Paul joined HSB Codes and Standards in January of 2014, where he is responsible for providing code technical support to internal and external clients with a focus on nuclear construction to ASME Section III and the associated nuclear conformity assessment programs.

Ask the engineer

Part 1

Author: Jayaram Vattappilly, P-Eng.

Question: My shop received an order to build pressure parts for a power boiler and the fabrication involves bending of carbon and carbon-molybdenum tube and pipe materials. I realize that when the three conditions listed in paragraph PG-20.1.1 are met, postforming heat treatment is mandatory.

Does Section I require postforming heat treatment of a cold bent carbon or carbon-molybdenum steel tube or pipe if one or more of the three conditions [(a), (b), and (c)] in PG-20.1.1 are not met?

And, I have a follow-up question: if I purchase carbon steel pipes and tubes and the material test report states "normalizing formed," does that satisfy the requirement of PG-20.1.2(a)?

Response: The quick answer is no to both questions.

PG-20.1.1 clearly says, "The cold-formed areas of carbon and carbon-molybdenum tube and pipe that convey water or steam shall be heat treated after cold forming when **all of the following conditions** are met:" See Question and Replies 1, 2, and 3 of the Interpretation BPV I-21-19 copied below.

As for the second question, SA-941 defines normalizing as follows:

> "**normalizing**, v—*reheating* a steel object to a temperature above the transformation range and then cooling it in air to a temperature substantially below the transformation range to achieve both grain refinement and improved homogenization."

The keyword to note here is *"reheating"* from the definition from SA-941, which does not include normalizing forming or rolling. In European specifications, normalize rolling (hot rolling at normalizing temperatures) is considered to be equivalent to normalizing (allowing the hot-rolled plate to cool, then separately normalizing in a heat treat operation). However, in ASTM and ASME, the two are not considered equivalent.

See Interpretation IIA-95-13 and Question and Reply (4) of Interpretation BPV I-21-19 and copied below:

> **Standard Designation:** BPV Section I
> **Edition/Addenda:** 2019
> **Para./Fig./Table No:** PG-20.1
> **Subject Description:** Heat treatment
> **Date Issued:** 12/21/2021
> **Record Number:** 21-1163
> **Interpretation Number:** BPV I-21-19
> **Question (1):** Does Section I require postforming heat treatment of the cold bent area of a carbon-molybdenum steel tube or pipe that meets all three conditions [(a), (b), and (c)] in PG-20.1.1?
> **Reply (1):** Yes.
> **Question (2):** Does Section I require postforming heat treatment of the cold bent area of a carbon steel tube or pipe that meets all three conditions [(a), (b), and (c)] in PG-20.1.1?
> **Reply (2):** Yes.
> **Question (3):** Does Section I require postforming heat treatment of a cold bent carbon or carbon-molybdenum steel tube or pipe if one or more of the three conditions [(a), (b), and (c)] in PG-20.1.1 are not met?
> **Reply (3):** No.
> **Question (4):** If the material specification for carbon steel pipe or tube permits the material to be supplied in the hot-finished condition and does not require further annealing or normalizing, does this satisfy PG-20.1.2(a)?
> **Reply (4):** No.

Standard Designation: BPV Section II Part A
Edition/Addenda:
Para./Fig./Table No:
Subject Description: Heat treatment
Date Issued: 12/20/1996
Record Number: BC95-382
Interpretation Number: IIA-95-13
Question: For SA-353 double-normalized and tempered 9% Ni alloyed steel plates, which have been first normalized in the flat condition at a uniform temperature of 1650°F + 25°F, may the second normalizing treatment be omitted, if hot forming is performed after heating to a temperature within the range of 1450°F + 25°F?
Reply: No

The above interpretation was transcribed by HSB from the official ASME interpretation database [http://cstools.asme.org/Interpretation/SearchInterpretation.cfm]. Although every effort was made to accurately reproduce this interpretation, use of this information should be for research only. It is strongly recommended that the ASME interpretation published from their website be used for Code business.

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Jay holds a Mechanical Engineering degree from the University of Calicut, India, a Master's of Engineering in Welding from National Institute of Technology (NIT), Tiruchirappalli, India and a second Master's in Advanced Design and Manufacturing from the University of Waterloo, Ontario, Canada.

Jay's work experience has principally been in the area of pressure equipment construction, working in the role of a QA/QC Engineer, Inspection Engineer for a large engineering consulting firm servicing refineries and petrochemical plants, welding engineer responsible for both structural and pressure vessel welding activity, and as design engineer of pressure equipment constructed to ASME Sections I, IV, B31.1, and VIII.

Jay presently holds a Professional Engineering license from Ontario, Canada, and National Board Commission with "NS" & "A" endorsements. He is a member of Subgroup of Design (BPV I) and member of Committee on Power Boilers (BPV I). He is also a member of the Subgroup on Design (BPV VIII), Subgroup on Toughness (BPV VIII), Special Committee on Interpretations (BPV VIII) and Subgroup on Materials (BPV I). Jay provides technical support on ASME Boiler and Pressure Vessel Code Sections I, IV, VIII & IX, and is our subject matter expert on the Indian Boiler Regulations (IBR).

Part 2

Author: Thomas Pastor, P.E.

Question: My shop maintains a set of shop test bolts made from SA-354 BD that we regularly use when carrying out hydrostatic tests of flanged heads. On a recent order, the design called for SA-193 B7 bolts 2 inchs in diameter to be used to attach a flanged head. I was told by my Inspector that it was no longer acceptable to use the SA-354 BD test bolts for the pressure test. Why would that be the case since the SA-354 BD bolts have a higher allowable stress at room temperature than the specified bolting? This pressure vessel is being constructed to Section VIII, Division 1.

Response: New rules were introduced in UG-99(l) of the 2021 Edition of Section VIII, Division 1. At the time of the pressure test, a custom-designed flange assembly must be assembled with bolting having identical allowable stress at room temperature as used in the design calculations. Similar rules are also given for the use of shop test gaskets. Note that these new requirements do not apply to standard rated flanges such as B16.5 or B16.47, unless they are modified such that additional calculations are required to establish the P/T rating.

At room temperature, the SA-193 B7 bolts have an allowable stress of 25 ksi and the SA-354 BD test bolts have allowable stress of 30 ksi. Because this is not exactly the same allowable stress, the shop test bolts cannot be used for the pressure test. The reason for this rule change is to ensure the pressure test represents the vessel operation as close as possible. Since one of the purposes of the final pressure test is to verify leak tightness, using shop test bolts and gaskets may mask a potential leak problem when the vessel is put into operation with its specified bolting and gaskets.

But as is so often the case with ASME requirements, you do have an option to continue to use the shop test bolts made from SA-354 BD, under one condition: The user or designated agent must include a statement on Form U-DR-1 or Form U-DR-2, or equivalent that the use of test gaskets and bolting with properties differing from those used in the design calculation does not necessarily verify the integrity of flange joints. Forms U-DR-1 and U-DR-2 can be found in Nonmandatory Appendix KK.

As manufacturers begin to fill orders for pressure vessels to be constructed to the 2021 Edition, they should take time to carefully review these new pressure test requirements in UG-99(l) and UG-100(g).

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Thomas Pastor is currently Vice President of Codes and Standards for HSB, Global Inspection and Engineering Services and has been with HSB for over 34 years. He holds a B.S. and M.S. in Civil Engineering from the University of Connecticut, is a licensed Professional Engineer in the state of Connecticut and holds a National Board Commission. Tom's technical expertise is in the area of stress analysis and pressure vessel design, and he has presented over 150 courses and workshops on ASME boiler and pressure vessel standards to audiences around the world. Additionally, Thomas Pastor is an ASME Fellow and currently serves on several ASME committees; Senior Vice President of the Council on Standards and Certification, Member of the Board on Pressure Technology Codes & Standards, BPV-VIII Standards Committee (Pressure Vessels), Subgroup Design of BPV-VIII, and Subgroup General Requirements of BPV-VIII.

Take note!

ASME celebrates 50 years of Boiler and Pressure Vessel Code Section V

Author: Alex Garbolevsky, P.E.

During the May 2022 Code Week meeting, ASME's Boiler and Pressure Vessel Code (BPVC) Committee celebrated the 50th anniversary of the publication of BPVC Section V – Nondestructive Examination.

Issued on July 1, 1971, BPVC Section V was the culmination of work beginning with its first draft in 1967. Section V rationalized nondestructive examination methods collected from the ASME Construction Codes of the time.

Guests of the meeting were provided with a reprint of the vintage 188-page document and early 1970s excerpts of the National Board of Boiler and Pressure Vessel Inspectors' Proceedings. These excerpts detailed the thoughts and efforts of the Subcommittee members who drafted the first edition of BPVC Section V.

Michael Burns, Senior Staff Engineer at the National Board, offers a concise and somewhat lighthearted look at the history of Section V, in the National Board Bulletin (Summer 2021 issue, 14-15) available at nationalboard.org.

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Alex joined HSB in 1979, after serving in the US Navy as a Main Propulsion Assistant. He holds a B.A. in Chemistry from the College of the Holy Cross, and an M.S. in Engineering Science from the Rensselaer Polytechnic Institute. Prior to his assignment to Codes and Standards in 2000, he spent 13 years in Germany and represented HSB in more than 25 countries, serving in positions ranging from Authorized Inspector to Technical Managing Director of our subsidiary – HSB International GmbH.

Alex concentrates in providing support for ASME Section V and IX, as well as for the European Union Pressure Equipment Directive "PED" (2014/68/EU), and ASME Section III. He is actively involved in inspector training within the company as well with external technical training seminars including ASME's "Section I – Power Boilers" (PD-665).

Alex holds National Board "AI" and "IS" Commissions with "B", "I", "N", "NS," and "R" endorsements. From 1993 to 2002, he served as Chairman of ISO/TC-11 Technical Committee for Boilers and Pressure Vessels and currently is a member of ASME's Standards Committee on Nondestructive Examination, Subgroup on International Materials Specifications, Subgroup on Volumetric Methods, Working Group Radiography, and Subgroup on Brazing. He is a Registered Professional Engineer (Mechanical) in the Commonwealth of Massachusetts.

2022 technical training and marketing events

Dates	Location	Topic
July 12-14	Virtual/Americas	ASME Section III, Division 1
August 16-18	Virtual/Americas	**Hot new topic!** – ASME Section VIII – Toughness
September 6 & 7	Virtual/Americas	PED Series and PE(S)R
September 13 & 14	Virtual/Americas	**Hot new topic!** – ASME Section V
October 18-20	Virtual/Americas	**Hot new topic!** – ASME Section II
November 2 & 3	Virtual/Americas	**Hot new topic!** – ASME Section VIII – Design
November 15 & 16	Virtual/Americas	ASME Section IX

For more information on HSB training and events, please email us at GetInfo@HSB.com.

To register for an event, click here.

Please note, registration for the 2022 schedule is currently open for events that have firm dates posted. New topics may also be added throughout the year.

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