Practical Application of ASME BPV Code Section VIII Division 1

A Practical, Case Study-based Training Program
Led by:

John P. Swezy, Jr.

22.5 Hours • 2.25 CEUs • 22.5 PDHs

About this MasterClass (MC147)

This three-day MasterClass is a practical application course intended to take participants beyond an introductory level understanding, diving deeper into the detailed code rules of ASME Section VIII, Division 1. By providing a detailed explanation of the requirements for materials, design, fabrication, toughness, examination, inspection, testing, and documentation of pressure vessels, participants will develop a greater insight in the practical application of code rules for the construction and certification of pressure vessels. Case studies, including Code Case 2695, are discussed in detail to develop a greater understanding of the code rules and resolving common problems associated with code construction of pressure vessels.

ASME Training & Development
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ASME MasterClass Series

The ASME Master Class Series focuses on applications and case studies of a particular topic. Each Master Class is led by an ASME Master, an expert in his professional discipline, who brings a wealth of knowledge and practical examples to the forum. Participants are expected to have prior knowledge of the topic area to gain the most from this interactive environment.

Sessions are focused on real world examples and case studies, with active class discussion and analysis.

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Upon completion, attendees will be able to:

- Identify acceptable materials, and explain submission procedures for new materials
- Explain the use of Code Case 2695, and the selection of design formulas and variables
- Describe general fabrication requirements, testing and certification requirements, toughness requirements, pre-heat and post-weld heat treatment requirements, and pressure testing requirements.
- Evaluate how to apply the Code Mark and prepare the Manufacturer's Data Report

Who Should Attend

This course is intended for engineers, managers, quality control personnel, and vessel owners involved with the purchase, design, construction, or inspection of pressure vessels who already have a basic working knowledge of ASME Section VIII, Division 1. Some amount of prior exposure and experience with ASME Section VIII, Division 1 is recommended, as the presentation has been targeted for this audience. Attendees do not require an Engineering degree to benefit from exposure to this course material.

About this ASME Master

John P. Swezy, Jr. has over 40 years of experience in steam and combustion driven prime mover electrical generation plants and associated engineering auxiliary systems, and over 20 years of experience in developing and implementing detailed procedures, work instructions, and QC programs for design, welded fabrication, repairs, and alterations of pressure equipment following ASME BPV, B31 Piping, NBIC Repairs and Alterations, and various International Codes and Standards. He also has extensive experience in the area of nondestructive examination.

Mr. Swezy has been a member of various ASME Codes & Standards Committees since 1996. He is a National Board Commissioned Boiler and Pressure Vessel Inspector and Supervisor, and an American Welding Society Certified Welding Inspector (CWI). He is recognized for his expertise with the ASME Code rules of Section VIII, Divisions 1 and 2 as they apply to the design, toughness, fabrication, and examination of pressure vessels. He is past Chair of the Subgroup on Toughness, current Chair of the Subgroup on Fabrication and Examination, and member of the Standards Committee for Pressure Vessels. He is also a member of the Standards Committee for Welding, Brazing, and Fusing; the ASME B31 Piping Standards Committee; Chair of the B31 Fabrication and Examination Technical Committee; a member of the ASME B31.3 Section Committee, and Subgroup E for Fabrication and Examination for ASME B31.3. John was presented the ASME Dedicated Service Award in 2013.

MasterClass Requirements

This Master Class is structured on the assumption that participants have a basic understanding of ASME B&PV Code Section VIII, Division 1.

Participants are encouraged to discuss actual scenarios/issues encountered at work as part of class discussion.

COURSE OUTLINE AND LEARNING OBJECTIVES

MC147: Practical Application of ASME BPV Code Section VIII, Division 1

Content	Learning Objectives
DAY 1	*At the end of the Day you will be able to:*
Module 1: General Material Requirements	
Topics include: • Acceptable Material • Purchasing • Receipt • Reconciliations • Identification and Traceability • Interaction with the PED • New Materials Review Questions	• Identify acceptable materials • Find purchasing information • Accept received materials • Explain Material Recertification • Apply identification markings • Explain the use of code materials under the PED • Explain submission procedures for new materials
Module 1 Exercises	
Exercise 1-1: Reviewing a Material Test Report **Exercise 1-2:** Resolving Material issues	-Verify material markings, documentation, and acceptability -Applying nonconformance resolution principles to typical material problems
Module 2: General Design Requirements	
Topics include: • Use of Code Case 2695 • Applying Code Formulas • Formula Input Variables • Allowable Stress Values • Joint Efficiencies • RT Designators Review Questions	• Explain use of CC 2695 • Select design formulas • Select formula variables • Determine appropriate allowable stress values • Determine joint efficiencies • Select RT Designators
Module 2 Exercises	
Exercise 2-1: Perform a shell and head calculation using a set of hypothetical user design requirements **Exercise 2-2:** Add nozzles to the shell and head, and verify the adequacy of their opening reinforcement, weld sizing, and weld strength.	-Apply fundamental design principles for selecting the correct design formulas and input variables to perform the calculations for a typical vessel shell and head -Apply nozzle thickness, reinforcement, weld sizing, and weld strength requirements for a nozzle in either a vessel shell or head.
Module 3: Using the Design Appendices	
Topics Include: • Custom Bolted Flanges (Appendix 2 & Y) • Jacketed Vessels (Appendix 9) • Noncircular Vessels (Appendix 13) • Dimpled Jackets (Appendix 17) Review Questions	• Compare/contrast Appendix 2 & Y flange designs • Discuss the types and elements of vessel jackets • Discuss elements of noncircular vessels • Discuss the types and elements of dimpled jackets

Module 3 Exercise	
Exercise 3-1: Prepare an Appendix 2 flange calculation	-Develop an understanding of controlling design parameters
Content	**Learning Objectives**
DAY 2	*At the end of the Day you will be able to:*
Module 4 General Fabrication Requirements	
Topics Include: • Forming and Cutting • Forming Tolerances • Post Forming Stress Relief Review Questions	• Describe acceptable forming processes • Describe forming tolerances • Identify need for post forming stress relief
Module 4 Exercises	
Exercise 4-1: Evaluate a formed head for extreme fiber elongation and determine if post forming stress relieving is required. **Exercise 4-2:** Evaluating a formed head for shape tolerances, determining corrective actions	-Applying fiber elongation calculations to a design problem and evaluating the application of post forming stress relief rules -Applying shape tolerances to a hypothetical head, and applying nonconformance resolution principles
Module 5: Requirements for Welded Construction	
Topics include: • Weld joint alignment/offsets • Inspection of weld joint fit-up • WPS Qualifications • Welder Qualifications • NDE requirements • RT vs UT • Visual Inspection of welds Review Questions	• Explain joint alignment/offset requirements • Explain weld joint fit-up inspection requirements • Describe basic WPS qualification • Describe basic welder qualification • Identify required NDE methods/alternatives • Discuss use of UT in lieu of RT • Describe visual weld inspection criteria
Module 5 Exercises	
Exercise 5-1: Determine the allowable offset and whether tapered transition requirements apply on a hypothetical head to shell fit-up. **Exercise 5-2:** Requirements for applying UT in lieu of RT	- Assessing a joint alignment condition, applying code rules, and resolving problems using nonconformance resolution techniques. -Developing an understanding of the details in the rules for applying UT in lieu of RT
Module 6: Toughness Testing Requirements	
Topics include: • UG-84 Testing Rules • Part UCS Testing and Exemption Governing Thickness Exemption Curves • Part UHA Testing and Exemption • Part UNF Testing and Exemption • Part UHT Testing and Exemption Review Questions	• Describe Basic Toughness Testing Requirements • Describe testing rules for carbon steels Governing Thickness, Exemption Curves and Coincident Ratio • Describe toughness exemptions and limitations Carbon steels Stainless steels Nonferrous materials Quenched and Tempered Steels
Module 6 Exercises	
Exercise 6-1: Evaluate a hypothetical carbon steel vessel design for toughness requirements **Exercise 6-2:** Evaluate a hypothetical stainless steel vessel design for toughness requirements	-Applying the rules of Parts UG and UCS to a specified design condition to determine testing requirements - Applying the rules of Parts UG and UHA to a specified design condition to determine testing requirements

Content	Learning Objectives
DAY 3	*At the end of the Day you will be able to:*
Module 7: Preheat and Postweld Heat Treatment Requirements	
Topics include: • Part UCS • Part UHA • Part UNF • Part UHT Review Questions	• Describe "nominal thickness" for PWHT • Describe Preheat and PWHT for Carbon Steels • Describe Preheat and PWHT for Stainless Steels • Describe Preheat and PWHT for Nonferrous • Describe Preheat and PWHT for UHT Materials
Module 7 Exercises	
Exercise 7-1: Apply PART UW and Part UCS rules for PWHT to a hypothetical vessel design and write a PWHT procedure	-Applying the principles of "nominal Thickness", hold time, heating and cooling rates, and thermocouple placement to specify a code compliant heat treatment.
Module 8: General Testing and Certification Requirements	
Topics include: • Hydro Testing • Pneumatic Testing • Proof Testing • Test Temperature • Test Gages Review Questions	• Describe Hydro Test requirements • Describe Pneumatic Test requirements • Describe Proof Test requirements • Describe Test Temperature requirements • Describe Test Gage requirements
Module 8 Exercises	
Exercise 8-1: Apply the rules of UG-99 to a pressure vessel for a normal and "New and Cold" pressure test	-Applying the principles of MAWP, LSR, test temperature, test gages, and calculating test pressures
Module 9: Overpressure Protection	
Topics Include: • Types of Pressure Relieving Devices • Design and Material Requirements • Set Pressure Requirements • Installation Requirements • Device Certification Review Questions	• Identify Pressure Relieving Device types • Describe Pressure Relief Device certification • Describe Pressure Relief Device installation • Describe Pressure Relief Device set pressure • Describe Pressure Relief Device markings
Module 10: Applying the Code Mark and Preparing the Manufacturer's Data Report	
Topics include: • Nameplate/Stamping Arrangement • Mfr's Data Report Prep and Certification Review Questions	• Describe the arrangement of Stamped Information • Discuss applying the ASME Mark and Designators • Describe Manufacturer's Data Report Preparation
Module 10 Exercise	
Exercise 10-1: Prepare a Manufacturers Data Report for a single chamber pressure vessel. Exercise 10-1: Prepare a Manufacturers Data Report for a U-Tube Heat Exchanger.	-Applying the rules of Part UG and Appendix W to prepare a U-1A Data Report. -Applying the rules of Part UG and Appendix W to prepare a U-1 Data Report.