Design by Analysis Requirements
ASME Boiler and Pressure Vessel Code
Section VIII, Division 2 – Alternative Rules

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

David A. Osage

15 Hours • 1.5 CEUs • 15 PDHs

About this Master Class

This two-day Master Class provides the engineer an in-depth examination of the techniques used in Design by Analysis (DBA) of pressure vessel design. This course includes discussions on general requirements for numerical simulation using Finite Element Analysis (FEA); material modeling requirements for use with FEA; design load combinations for pressure vessel design; design for protection against plastic collapse using elastic stress analysis, limit load, and elastic-plastic stress analysis; background and requirements for the new strain limit criterion; buckling analysis types and differences in design margins; fatigue analysis using smooth bar and welded joint technology in the new structural stress approach; ratcheting assessment using both elastic and elastic-plastic analysis; and a special emphasis on the evaluation of thermal stresses.

For more information and to register, visit
http://go.asme.org/mc121

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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.

About this Master Class

The focus of the two-day Master Class is to provide an understanding of the analytical methods found in Part 5 of Section VIII, Division 2 as well as to convey practical information on how to meet the requirements using FEA. Discussion on the background of the analysis methods and their application will be presented through the ASME Pressure Technology Bulletins, *PTB-1-2013 Section VIII - Division 2 Criteria and Commentary* and *PTB-3-2013 Section VIII - Division 2 Example Problem Manual*. The attendees will gain an appreciation and understanding of how these analytical techniques can be applied to practical design situations. The class will include detailed example problems that demonstrate how the analytical techniques are to be applied, and their limitations. Detailed FEA models will be presented to help illustrate the various analytical techniques.

Upon completion, attendees will be able to:

- Define the basis and application of the design by analysis techniques to ensure proper vessel design.
- Apply the design by analysis techniques to the evaluation of in–service components through the Life-Cycle Management Process and the relationship to API 579-1/ASME FFS-1 Level 3 Assessments.
- Evaluate the basis of design by analysis techniques and how they compare with other International Pressure Vessel Codes, EN 13445 and PD 5500.

Who Should Attend

This course is intended for pressure vessels engineers working for Owner-Users, manufacturers or engineering and design construction firms in the refining, petrochemical, and other comparable industries, that desire a practical understanding of one of the major areas of the new Division 2.

About this ASME Master

David A. Osage, P.E., is internationally recognized for his expertise in the design of new equipment and as an industry expert and leader in the development and use of FFS technology. He is the President and CEO of The Equity Engineering Group, Inc. and has over 30 years of experience in the refining and petrochemical industries. As the lead investigator and principal author of the new ASME B&PV Code, Section VIII-Rules for Construction of Pressure Vessels Division 2-Alternative Rules, he developed a new organization and writing style for this code and was responsible for introducing the latest developments in materials, design, fabrication, and inspection technologies. These technologies include new models for materials behavior suitable for use in a construction code, updated design-by-rule methods, modern design-by-analysis procedures including the introduction of elastic-plastic analysis methods, and a new fatigue method for welded joints. Mr. Osage received a Certificate of Acclamation from ASME for this work. He has served on several ASME BPV VIII Code Committees. Mr. Osage earned his Bachelor and Master's degree in Mechanical Engineering at Stevens Institute of Technology, Hoboken, NJ in 1977. He is a registered professional engineer in Ohio.

MasterClass Requirements

Attendees are encouraged to discuss actual scenarios encountered as part of a class discussion.

This Master Class is structured on the assumption that participants have a basic understanding of ASME B&PV Code Section VIII, Division 2.

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AGENDA

The contents are presented in 7 sessions, tentatively organized as shown. Lunch and coffee breaks will be provided. The two-day schedule allows for ample discussion and interaction with attendees. The instructors reserve the right to modify the content to address the audience's needs and preferences.

Day One: 8:00 am to 5:00 pm

Background and Development of VIII-2 — 8:00 AM – 10:00 AM

- Overview of VIII-2
- Comparison - Current VIII-2 vs Old VIII-2 (2006)
- ASME PTB-1
- ASME PTB-3
- Key References

Basic Concepts in VIII-2, Part 5 Design by Analysis — 10:15 AM – 12:00 N

- Design By Analysis
- Stress Definitions
- Primary Stress Basis
- Primary Stress Limits
- VIII-2 Allowable Stress Basis
- Secondary Stress Limits
- Peak Stress Limits
- Stress Categories – The Hopper Diagram
- Stress Categories – Nozzles
- Stress Calculations for Code Compliance

Special Topics in VIII-2, Part 5 Design by Analysis — 1:00 PM – 3:00 PM

- Applicability
- Numerical Analysis
- Material Properties
- Load Cases and Multipliers
- Brittle Fracture Assessment Using Facture Mechanics

Design for the Protection against Plastic Collapse — 3:15 PM – 5:00 PM

- Overview
- Elastic Stress Analysis Method
- Elastic Stress Analysis Method – Example
- Limit Load Analysis Method
- Limit Load Analysis Method – Example
- Elastic-Plastic (EP) Analysis Method
- Elastic-Plastic (EP) Analysis Method – Example
- Protection Against Plastic Collapse – Summary

End of Day One

Day Two: 8:00 am - 5:00 pm

Design for the Protection of Buckling 8:00 AM – 10:00 AM

- What is Buckling?
- Buckling Analysis
- Buckling Analysis – Type 1
- Buckling Analysis – Type 2
- Buckling Analysis – Types 1 & 2
- Buckling Analysis – Type 3
- Buckling Analysis – Load Cases
- Buckling Analysis – Example
- Buckling Analysis – References

Design for the Protection of Fatigue 10:15 AM – 12:00 N

- Definition
- VIII-2 Fatigue Analysis – Overview
- Fatigue Screening
- Fatigue Assessment Methods
- Fatigue Assessment Methods – Comparison
- Fatigue Assessment Methods – Example
- Fatigue Assessment Methods – Commentary
- Fatigue Assessment Methods – References

Design for the Protection of Fatigue - con'td 1:00 PM – 3:00 PM

Fundamentals of Ratcheting for Design by Analysis 3:15 PM – 5:00 PM

- Ratcheting Overview
- Definitions
- Bree Diagram
- Upcoming Code Modification
- Elastic-Plastic Modeling of Ratcheting Using FEA
- Cyclic Plasticity
- Summary
- Ratcheting – References

End of Class