Developing Effective Bolted Flange Joint Assembly Procedures Using ASME PCC-1 *(MC136)*

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

Clay D. Rodery

15 Hours • 1.5 CEUs • 15 PDHs

About this MasterClass (MC136)

Bolted flange joint assemblies that provide leak free service are the result of many selections/activities having been made/performed within a relatively narrow band of acceptable limits. This two-day MasterClass provides an in-depth review of the guidelines contained in ASME PCC-1 that are essential elements in achieving a high level of leak tightness integrity of otherwise properly designed and constructed bolted flange joint assemblies. This includes an overview of the basic fundamentals of bolted joint assembly, including the recently developed uniform criteria for training and qualifying bolted joint assemblers, alternatives to the traditional (legacy) assembly patterns and load increment steps, and guidance in determining the most optimal assembly bolt stress. This guideline may be used in the development of effective joint assembly procedures for the broad range of sizes and service conditions normally encountered in industry.

For more information and to register, visit
http://go.asme.org/mc136

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ASME MasterClass Series

The ASME MasterClass Series focuses on applications and case studies of a particular topic. Each MasterClass 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 MasterClass

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Upon completion, attendees will be able to

- Use the guidelines in ASME PCC-1 to develop effective bolted joint assembly procedures
- Evaluate and apply updated joint assembly patterns/ bolt load increment combinations that are more efficient than the traditional legacy methods
- Determine the most optimal assembly bolt loads considering each aspect of joint integrity
- Use the guidance on troubleshooting to investigate and diagnose flange joint leakage incidents

Who Should Attend

This course is intended for individuals who have a role in improving the integrity of bolted joints in process facilities, either by developing or reviewing assembly procedures or by troubleshooting leakage incidents. This may include those who work for owner-users, manufacturing, engineering and design firms, as well as contractors who write and/or execute bolting procedures.

About this ASME Master

Clay D. Rodery is Pressure Equipment Technical Authority with BP and has over 34 years of experience in the refining, chemicals and upstream engineering functions providing pressure equipment services including design, maintenance, inspection, and development and maintenance of codes, standards and specifications. He is the current Chairman of the ASME Post Construction Subcommittee on Flange Joint Assembly.

Mr. Rodery has been a member of various ASME Codes and Standards Committees since 1997, including the ASME BPV Committee on Pressure Vessels, Subgroup on Design and Subgroup on Fabrication & Examination (where he was Past Chairman) of ASME BPV Code Section VIII, the ASME Post Construction Standards Committee and Subcommittee on Repair and Testing. He is also a past Team Leader of the Process Industry Practices (PIP) Vessel Function Team. He is a member of the Design & Analysis Committee of the ASME Pressure Vessels and Piping Division and has contributed as a session developer, author, speaker, panelist and tutorial leader.

Mr. Rodery earned his Bachelor's degree from Purdue University. He is an ASME Fellow and has received numerous awards for his contributions to both ASME Codes and Standards and with the Pressure Vessels and Piping Division.

MasterClass Requirements

This MasterClass is structured on the assumption that participants have a basic understanding of ASME PCC-1. Participants are encouraged to bring examples of real issues they have experienced or are experiencing for class discussion.

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AGENDA

The contents are presented in 3 sessions, tentatively organized as shown. 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

8:00am – 5:00pm

1. Scope & Introduction of ASME PCC-1

2. Assembly fundamentals
    a. Cleaning and examination of flange and fastener contact surfaces
    b. Alignment of flanged joints
    c. Installation of gasket
    d. Lubrication of "working" surfaces
    e. Installation of bolts
        - Check for proper bolt/nut specification and adequate length
    f. Numbering of bolts
        - Numbering of bolts when a single tool and multiple tools are used
    g. Tightening of bolts
        - Tightening method/load control techniques
        - Bolt elongation (bolt stretch) determination
        - Tightening method/load control technique selection (example)
        - Start-up retorque
    h. Tightening sequence
        - Single or multiple tool usage
        - Measurement of gaps
    i. Target torque determination
        - Adjustments to obtain final target torque for different prestress levels
    j. Joint pressure and tightness testing
    k. Records/documentation requirements
    l. Joint disassembly

3. Review of Appendices
    <u>Appendix A</u> - Training and qualification of bolted joint assembly personnel
    a. Scope/background, qualification program overview
    b. Requirements for Qualified Bolting Specialists, Qualified Senior Bolting Specialists, and Qualified Bolting Specialist Instructors
        - Qualifications and experience
        - Training curriculum
            1. Training of fundamentals and additional training required to obtain supplemental qualifications
            2. Practical demonstrations and examination
            3. Duties
            4. Maintenance and renewal of qualifications
    c. Quality assurance
        - Scope and qualification manual
        - Procedures for quality control
        - Program effectiveness

(End of Day One)

DAY TWO

8:00am – 5:00pm

Review of appendices (continued)

- Appendix B - Description of common terms for tightening and gaskets
- Appendix C - Recommended gasket contact surface finish for various gasket types
- Appendix D - Guidelines for allowable gasket contact surface flatness and defect depth
- Appendix E - Flange joint alignment guidelines
- Appendix F - Alternatives to Legacy tightening sequence/pattern
  - Modified Legacy pattern
  - Quadrant pattern/star or circular sequence
  - Circular pattern
  - Simultaneous Multi-bolt Legacy pattern
  - Simultaneous Multi-bolt quadrant pattern
- Appendix G - Use of contractors specializing in bolting services
- Appendix H - Bolt root and tensile stress areas
- Appendix I - Elastic Interaction during tightening
- Appendix J - Calculation of target torque
- Appendix K - Nut factor calculation of target torque
- Appendix L - ASME B16.5 flange bolting information
- Appendix M - Washer usage guidance and purchase specification for through-hardened washers
- Appendix N - Definitions, commentary, and guidelines on the reuse of bolts
- Appendix O - Assembly bolt stress determination
  - Introduction, scope and cautions
  - Assembly bolt stress selection
  - Review of the *Simple* and *Joint Component* approaches
  - Required information
  - Determining the appropriate bolt stress
  - Example calculation
  - Determining flange limits by elastic or finite element analysis
- Appendix P - Guidance on troubleshooting flanged joint leakage incidents
  - Investigative and diagnostic evaluation guide
  - Checklist of flange design and acceptable practice considerations
  - Leakage problems and potential solutions

(End of Day Two)