



2KG TRAINING

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## ASME Code, Section VIII, Division 1: DESIGN AND FABRICATION OF PRESSURE VESSELS

Presenter: Mitchell J. Kowalczyk, P.E

### ABOUT THE PRESENTER: MITCHELL J. KOWALCZYK, P.E



He has 20 years of experience with CB&I in the design, analysis and fabrication of pressure vessels, including refinery turnarounds. He has an additional 22 years of experience with UOP (process licensor) in the design, analysis and fabrication of pressure vessels, including refinery turnarounds. Over the years he attained expert knowledge of the ASME Codes Sections VIII Divisions 1 and 2 and the Repair codes NBIC, API 510, API 579 and post construction codes.

He also attained expertise in related international codes. His work included training of new Engineers. He has 8 patents in applicable areas.

His work included domestic and international locations. He presently performs consulting services to the pressure vessel industry.

Number of days: 3

CPD Points: 3

### Live Virtual Classroom

2KG Training Live Virtual Courses offer participants the same instructors, training systems, course materials, personal support, and face-to-face engagement with instructors and other participants that they would expect to find in a conventional classroom.

The ASME VIII Div 1 Pressure Vessels Live Virtual Course brings participants together in a virtual classroom, where they receive training from an expert via a live video link. Participants are interconnected via audio and video, enabling them to interact both with the instructor and with their classmates. Learners can speak to their instructor at any time to ask questions, request assistance, and instructors can provide hands-on support.

### Description

Based on the rules for pressure vessel design and construction, this course is a comprehensive introduction to the requirements of Section VIII, Division 1 including background, organization, design, materials, fabrication, inspection, testing and documentation of pressure vessels operating at either internal or external pressures exceeding 15 psig.

Careful application of this Section will help users to comply with applicable regulations within their jurisdictions, while achieving the operational, cost and safety benefits to be gained from the many industry best-practices detailed within these volumes.

### Upon completion of this course you will be able to:

- Understand the background of the Code rules
- Apply the Code rules to more common design and fabrication situations
- Perform calculations for some of the loadings and situations not addressed by the Code
- Use Appendix 46, which allows the use of the Design by rule methods of Part 4 of the ASME Code Section VIII Division 2
- Prepare design specifications, design reports, Data Reports, and other documentation

## WHO SHOULD ATTEND

Individuals involved with design, analysis, fabrication, purchasing, repair, and inspection of pressure vessels, as well as supervisory and regulatory personnel. Some degree of technical background will be helpful, but such individuals are not required to have an Engineering degree or previous work experience in the subject matter. Both beginners and experienced personnel involved with pressure vessels will benefit from this course.

## COURSE OUTLINE

### Code rules, scope and jurisdiction

- Introduction to the ASME Code
- Code Editions and Addenda
- Interpretations and Code cases
- Code boundaries
- Jurisdiction
- Authorized Inspector
- Responsibilities of the User/Owner, Manufacturer and the Authorized Inspector

### General requirements related to materials

- Carbon steel, Low alloy steel, materials with tensile properties enhanced by heat treatment, High alloy stainless steel
- Code allowed material
- Certification of other material to be used as code material
- Materials fabricated by other than the manufacturer
- Traceability

### Material toughness and impact testing requirements

- Minimum Design metal temperature (MDMT)
- Evaluation of material for toughness and brittle failure
- Impact testing of material

### Design Requirements

- Design of Cylindrical shells
- Design of spherical, tori spherical and elliptical heads
- Design of cones
- Design of flat heads
- Design of Supports (uniform or discrete)
- Design of reinforcement for openings

### Design loadings, design criteria and allowable stresses

- Loadings to be considered to design a pressure vessel including wind and seismic
- Maximum stress theory for Division 1 versus the Von Mises stress theory used for Division 2
- Allowable stresses associated with the loads

### Formulas for internal pressure and tensile loading

- Formulas for hoop stress for cylindrical shells, cones and heads
- Formulas for longitudinal stresses for cylindrical shells and heads

**Openings and reinforcement**

- Present rules is to replace the area removed
- Normal limit
- Parallel limit
- Large openings
- Permissible new rules using the criteria of ASME Section VIII Division 2

**Procedures for external pressure (vacuum) and compressive loads**

- Design rules for Cylindrical and conical shells
- Design rules for spherical, torispherical and elliptical heads
- Design rules for axial loads on the skirt support
- Design rules for external stiffeners
- Alternative buckling rules: Code case 2286

**Explain Appendix 46**

- Appendix 46 allows the use of the Design by rule methods of Part 4 of the ASME Code Section VIII Division 2 for Division 1 vessels
- Limitations will be pointed out

**Hydrostatic and pneumatic testing**

- Hydrostatic Test pressure based on the MAWP
- Hydrostatic Test pressure based on the MAP
- Pneumatic Test pressure based on reduced ratio and more NDE.

**Procedures for Post Weld Heat Treatment**

- PWHT soak band
- Thickness used for determining the need for PWHT
- PWHT for service conditions
- Heating and cooling rates

**General requirements related to stamping and reports**

- Pressure relief Devices
- Data Report for overall vessel: Forms U-1, U-2, U-3 and U-4
- Name plate
- Pressure vessel booklet

**Example design problems and solutions and open discussions of design problems**

- Cylindrical shells and formed heads
- Seismic loading on vertical vessels
- Nozzle reinforcements
- Other special components
- External pressure and stiffening rings.

# INSPECTION, REPAIRS, AND ALTERATIONS OF PRESSURE VESSELS

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**Number of days:** 2

**CPD Points:** 2

## Live Virtual Classroom

2KG Training Live Virtual Courses offer participants the same instructors, training systems, course materials, personal support, and face-to-face engagement with instructors and other participants that they would expect to find in a conventional classroom.

The Inspection & Repairs Live Virtual Course brings participants together in a virtual classroom, where they receive training from an expert via a live video link. Participants are interconnected via audio and video, enabling them to interact both with the instructor and with their classmates. Learners can speak to their instructor at any time to ask questions, request assistance, and instructors can provide hands-on support.

## This inspection and repair course is run alongside the ASME Section VIII Div 1 course. Delegates may attend either or both courses.

This course is a comprehensive introduction to the requirements of various codes and standards, regarding inspection, repairs and alterations of pressure equipment, and in particular pressure vessels. The requirements of the National Board Inspection Code and the API-510 will be covered in detail. An introduction to API-579, Fitness for Service will also be included. Simple flaw evaluation procedures will be evaluated. The activities of ASME's Post Construction Committees will be explained and documents published by these Committees will be discussed.

## Who Should Attend

Individuals from users, manufacturers, repair organizations, inspection agencies and other organizations involved with maintenance and repair of pressure equipment. This course is intended for beginners, as well as experienced personnel wishing to update their knowledge.

## COURSE OUTLINE

### Introduction to post construction codes

- Post Construction: Safety of pressure equipment after put into service
- Inspection: Minimum frequency of inspection and evaluation of results of inspections
- National Board Inspection Code (NBIC) and API 510
- Evaluation of detected flaws
- API-579-1 is used to supplement the rules of NBIC and API 510

### Introduction to NBIC and API 510

- Section VIII, as well as other codes, contain rules for new construction only.
- Post-construction documents: National Board Inspection Code (NBIC) and API-510
- References to original code rules
- Jurisdictional Laws summarized in an API document
- Deviation from rules for new construction
- Authorized Inspector
- National Board Stamp
- Vessels moved from one jurisdiction to another

### Introduction to other documents

- API-579-1, "Fitness for Service", has rules for evaluation of various flaws
- API-579-2 example problems
- ASME PCC-2: Detailed repair procedures
- ASME PCC-3: Methods of establishing inspection periods

### National Board Inspection Code (NBIC)

- Editions and Interpretations
- Jurisdictional rules
- Consist of three separate volumes: Part 1 – Installation, Part 2 – Inspection and Part 3 – Repairs/Alterations
- Explanation of the responsibilities of the users, manufacturers, regulatory agencies/Jurisdictions and authorized inspectors
- How to obtain National Board stamp
- Examples of repairs and alterations and the documentation requirements for each
- Difference between repair and alteration
- U.S. Customary units and SI units
- Authorized Inspection Agencies
- Evaluation of flaws and damage mechanisms
- Required inspection period
- Inspection methods (internal or external): NDE, testing or leak testing.
- Toughness requirements
- Installation, provides requirements and guidance to assure all pressure equipment are properly installed and function properly
- Requirements for pressure relief devices
- Pre-inspection activities
- Inspection: Information and guidance for performing and documenting inspections

- Safety requirements for preparation for inspection
- Remaining life and Risk based assessment
- PWHT requirements
- Pressure testing and the approval of the A.I and jurisdiction
- Data Reports forms for documentation of repairs and alterations: R-1, R-2, R-3 and R-4
- Name plate
- Records

#### API-510

- Alternative to NBIC by most Jurisdictions. (rules are similar)
- Requires involvement of the Authorized Inspector (A.I)
- Applies to vessels built to Section VIII and other recognized codes
- References ASME/API-579 for Fitness For Service (FFS) evaluation methods
- In-service inspection
- Toughness requirements
- Repair/alteration
- Rating activities for pressure vessels
- Pressure relieving devices
- Major differences between API-510 and the NBIC
- Flaws can be evaluated by API 579
- Definition of Risk
- Inspection period as related to the risk associated with the equipment.
- Testing
- Formal Data Report for documenting repairs

#### An introduction to API-579, Fitness for Service

- Evaluation of corroded areas
- Evaluation of pitted areas and other flaws
- Brittle failure assessment
- Evaluation of misalignments and other geometric flaws
- Remaining life assessment
- Assessments: Levels 1 (conservative screening), Level 2 (More detailed evaluation and Level 3 (Intended to provide the most detailed evaluation)
- Examples demonstrating the application of the rules

#### Overview of Post Construction standards

- PCC-1, PCC-2 and PCC-3 will be provided





## Registration Form

### How to register for the course:

1. Complete this registration form and fax it to Phindi Mbedzi: Tel: 011 325 0686 Fax: 011 325 0488 Email: [phindi@2kg.co.za](mailto:phindi@2kg.co.za)
2. Acknowledgement will be emailed to you.
3. Final confirmation and details will be faxed or emailed to you approximately 7 days before the commencement of the seminar.

### Cancellation Policy:

By signing and returning the registration form, the authorizing signatory on behalf of the stated company is subject to the following terms and conditions.

- All cancellations must be received in writing
- Any cancellations received less than 3 working days before the date of the event, the full fee will be payable and no refunds or credit notes will be given.
- If a registered delegate does not cancel and fails to attend the Workshop, this will be treated as a cancellation and no refund or credit note will be issued.

### Delegate information:

Title: \_\_\_\_\_ Surname: \_\_\_\_\_ Name: \_\_\_\_\_  
Full Company name: \_\_\_\_\_ Job Title: \_\_\_\_\_  
Postal Address (to which invoice must be sent): \_\_\_\_\_  
Code: \_\_\_\_\_ VAT number: \_\_\_\_\_  
Tel: ( ) \_\_\_\_\_ fax: ( ) \_\_\_\_\_  
Cell: \_\_\_\_\_ Email: \_\_\_\_\_

### Contact/ Accounts information:

Title: \_\_\_\_\_ Surname: \_\_\_\_\_ Name: \_\_\_\_\_  
Tel: ( ) \_\_\_\_\_ fax: ( ) \_\_\_\_\_  
Cell: \_\_\_\_\_ Email: \_\_\_\_\_

Please tick the course that you would like to attend:

#### Live Virtual Classroom

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> 31 Jan - 2 Feb 2022 (3 Days)<br><b>R11 600.00 (excl VAT)</b> | <input type="checkbox"/> 3 - 4 Feb 2022 (2 Days)<br><b>R7 800.00 (excl VAT)</b>   | <input type="checkbox"/> 31 Jan - 4 Feb 2022 (attend both, 5 days)<br><b>R17 200.00 (excl VAT)</b> |
| <input type="checkbox"/> 7 - 9 Nov 2022 (3 Days)<br><b>R11 600.00 (excl VAT)</b>      | <input type="checkbox"/> 10 - 11 Nov 2022 (2 Days)<br><b>R7 800.00 (excl VAT)</b> | <input type="checkbox"/> 7 - 11 Nov 2022 (attend both, 5 days)<br><b>R17 200.00 (excl VAT)</b>     |

#### Conventional Classroom

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> Date to be advised (3 Days)<br><b>R14 500.00 (excl VAT)</b> | <input type="checkbox"/> Date to be advised (2 Days)<br><b>R9 750.00 (excl VAT)</b> | <input type="checkbox"/> Date to be advised (attend both, 5 days)<br><b>R21 500.00 (excl VAT)</b> |
|--|---|---|

I have read and agreed to all the conditions of registration as stipulated in this brochure.

Signature

Date

For more info and to register contact Phindi Mbedzi on tel: 011 325 0686 or cell: 071 125 6188 and email: [phindi@2kg.co.za](mailto:phindi@2kg.co.za) or visit [www.2kg.co.za](http://www.2kg.co.za)