

# (ME#04) INSPECTION, FITNESS-FOR-SERVICE FLAW EVALUATION, AND REPAIR METHODS FOR PRESSURE EQUIPMENT

*Turning GOOD Engineers into GREAT Engineers!*

## COURSE OVERVIEW

This course will familiarize the participants with several post-construction codes and standards, for pressure equipment. It will also provide the background of these documents and hands-on instructions on the use and application. This will provide the participants with adequate background to evaluate any flaws discovered during service of any pressure equipment, and to perform remediation measures. The knowledge may be applied to pressure vessels, boilers, piping, tanks or other pressure equipment. The overall procedures for flaw evaluation, calculation of remaining life, and various levels of evaluation will be discussed. The level 1 procedures for evaluation of all various flaws will be explained and demonstrated by example problems. Some level 2 procedures will also be introduced. An introduction to level 3 analyses methods and acceptance criteria will be covered. Stresses of various categories and failure modes associated with each will be explained. Stress categorization and linearization methods will be presented. Simple Code design formulas for calculating required thickness will be presented. At the conclusion of this course, the participants will recognize various degradation mechanisms and their associated failure modes. They will have the background for effective inspection planning, flaw evaluation, application of remediation methods, and cost effective repairs.

## WHO SHOULD ATTEND

The course is intended for experienced personnel, as well as beginners. The course could be of benefit to inspectors, maintenance personnel, design engineers, stress analysts, and project personnel. Those involved with repairs/alterations of vessels and piping will also benefit.

## LEARNING APPROACH

Each session will be conducted in lectures, discussion and problem solving format which is designed to provide intensive instruction and guidance on understanding Code requirements. The instructor will be available following each day's session to provide participants with further opportunity for discussion and consideration of specific problems.

## AMONG INTERESTING TOPICS COVERED DURING THE COURSE

Introduction to Post Construction Documents

- Evaluation of Cracks

Basic repair/alteration rules of the National

API-579

- Evaluation of Bulges and Dents
- Evaluation of Fire Damage
- Evaluation of Material Toughness
- Example Problems and Application of Rules
- Calculation of Remaining Strength Factors
- Calculation of Remaining Life

Board Inspection Code

Introduction to API-510

API-579 Fitness-for-Service

- Introduction and Background
- Procedures for Various Evaluation Levels
- Evaluation of General and Local Corroded Areas
- Evaluation of pitting
- Evaluation of Blisters and Laminations
- Evaluation of Misalignment and Other Deformations

API-579

- Overview of Stress Analysis Methods
- Categorization and Evaluation of Stresses
- Stress linearization

- Introduction to fatigue analysis

ASME Post Construction Standards

- Assembly of Bolted Flanges
- Standard Procedure for Insertion of Patch Plates
- Introduction to Inspection Planning and RBI
- Various Repair Procedures for Piping
- PCC-2 repair methods
- Introduction to PCC-3 "Inspection Planning, using RBI"

Research Work Going On Related to Post-Construction Issues