

# **Ultrasonic Testing**

## **Level II**

### **Training Course Outline**

Prerequisite for this Class is Level I Ultrasonics

#### **SCOPE**

This course introduces the basic principles of ultrasonics and prepares the candidate for Angle Beam Inspections.

This course prepares a candidate to

- Perform Specific Calibrations
- Specific NDT
- Interpretation of Codes
- Evaluations for Accept or Reject Determinations according to written Instructions
- Record Results

#### **TRAINING**

Training Material is presented in Module that are followed by Quizzes

MODULE CP-1: PERSONNEL CERTIFICATION (**Covered in Level I Training**)

MODULE MD -1: MANUFACTURING DEFECTS (**Covered in Level I Training**)

MODULE 1: MATHEMATICS (**Covered in Level I Training**)

MODULE 2: WAVE MODES (**Covered in Level I Training**)

MODULE 3: ACOUSTIC IMPEDANCE (**Covered in Level I Training**)

**MODULE 4: REFRACTION AND REFLECTION (Covered in Level I and II)**

- Reflection and Refraction
- Snell's Law
- Mode Conversion
- First and Second Critical Angle
- Creeping Waves
- Problems on Mode Conversion

MODULE 5: PIEZOELECTRIC TRANSDUCER (**Covered in Level I Training**)

MODULE 6: PULSER RECEIVER

- Calibration of Ultrasonic Equipment - Time and Amplitude Linearity
- All other Topics Covered in Level I Training

**MODULE 7: ATTENUATION (Covered in Level I Training)**

**MODULE 8: THICKNESS MEASUREMENT (Covered in Level I Training)**

**MODULE 9: IMMERSION TESTING (Covered in Level I Training)**

**MODULE 10: FLAW DETECTION - 0 DEGREE (Covered in Level I Training)**

**MODULE 11: CALIBRATION BLOCKS**

- IIW Block Type I
- IIW Block Type II
- Miniature Angle Beam / Rompass Block
- DSC Block
- AWS Resolution Block
- Step Wedge
- Area- Amplitude Block
- Distance- Amplitude Block

**MODULE 12: ANGLE BEAM INSPECTION**

- Selection of Screen Range
- Measurement of Beam Exit Point
- Measurement of Actual Refracted Angle
- Calibration using IIW, Rompass and DSC Block
- Sensitivity and Resolution
- Reference Amplitude
- Distance Amplitude Correction Curve
- Distance Gain Size
- Discontinuity Length Sizing using 6 dB and 20 dB drop method
- Discontinuity Evaluation
- Angle Selection
- Surface Distance, Skip Distance, Depth, Full V Path
- Plotting of Discontinuities like Crack, Lack of Fusion, Lack of Penetration, Slag, Porosity in welds
- Worksheet: Plotting of discontinuities for butt welds

**MODULE 13: WRITING AN ULTRASONIC PROCEDURE**

- ASME Section V
- Essential Variables

- Non Essential Variables

#### **MODULE 14: CODES AND STANDARDS**

- ASME Section V, Article 4, 2004 Edition
  - ASME Section VIII
  - SA 609 Castings
  - SA 388 Heavy Steel Forging
  - SA 578 Straight Beam Inspection of plain and Clad Steel Plates
- Additional Codes Standards as per student's requirements (please discuss this at the time of registration)

#### **INTRODUCTION TO ADVANCED TECHNIQUES**

Time of Flight Diffraction (TOFD)

Phased Arrays

#### **PRACTICALS**

Shear Wave Testing on API Pipe Samples with Weld defects – ID Cracks, OD Cracks, Slag, Porosity, Lack of Fusion, Lack of Penetration

#### **EXAMINATIONS**

General

Specific

Practical

Candidates must score a minimum of 70 % in each test and a minimum of 80% average for all the three tests.

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