

# 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

- Select equipment to conduct test
- Setup test equipment
- Steps to conduct test
- Calibration
- Familiarize with codes and standards
- Interpret results with respect to applicable codes and standards
- Understand limitation of the test method
- Write test reports.

### **TRAINING**

Training material is presented in modules that are followed by quizzes

### **PERSONNEL CERTIFICATION**

ASNT SNT-TC-1A

NAS 410

Training, experience and examination requirements

Training Requirements

- Recommended Course Outline
- Training Hours
- Practicals
- Quizzes and examinations

### **MODULE 1: MANUFACTURING DISCONTINUITIES**

- Types of Discontinuities: Inherent, Processing and Service
- Casting Discontinuities: Hot Tear, Cold Shut, Porosity, Shrinkage
- Primary Processing Discontinuities including discontinuities in Rolling, Forging, Drawing, Extruding
- Secondary Processing Discontinuities including discontinuities in Grinding, Heat Treating, Machining, Welding, Plating
- Service Discontinuities:- Erosion, Wear, Fatigue, Corrosion, Creep

### **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 (DAC) Curve

- Time Corrected Gain (TCG)
- 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 Weld Examination
- SA 388 Heavy Steel Forging
- AWS D1.1
- Additional Codes Standards as per student's requirements (please discuss this at the time of registration)

### **INTRODUCTION TO ADVANCED TECHNIQUES**

- Time of Flight Diffraction
- Phased Arrays

### **PRACTICALS**

Shear Wave Testing on Pipe Samples with embedded 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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