

ULTRASONIC TESTING TRAINING COURSE

Level II - Outline

I. Introduction

1. History and development
2. Comparison with other NDT methods
3. Advantages and limitations
4. Math review

II. Review of ultrasonic technique

1. Principles of ultrasonics
2. Equipment
 - a. Transducers
 - b. Instruments and systems
 - c. Evaluating transducer and instrument performance
3. Testing techniques
4. Calibration
 - a. Straight-beam
 - b. Angle-beam
 - c. Resonance
 - d. Special applications
5. Evaluation of Base-Material Product Forms
 - a. Ingots
 - i. Process review
 - ii. Types, origin and typical orientation of discontinuities
 - iii. Response of discontinuities to ultrasound
 - iv. Applicable codes/standards
 - b. Plate and Sheet
 - i. Rolling process
 - ii. Types, origin and typical orientation of discontinuities
 - iii. Response of discontinuities to ultrasound
 - iv. Applicable codes/standards
 - c. Bar and Rod
 - i. Forming process
 - ii. Types, origin and typical orientation of discontinuities
 - iii. Response of discontinuities to ultrasound
 - iv. Applicable codes/standards
 - d. Forgings
 - i. Process review
 - ii. Types, origin and typical orientation of discontinuities
 - iii. Response of discontinuities to ultrasound
 - iv. Applicable codes/standards
 - e. Castings
 - i. Process review
 - ii. Types, origin and typical orientation of discontinuities
 - iii. Response of discontinuities to ultrasound
 - iv. Applicable codes/standards
 - f. Other product forms as applicable – rubber, glass, etc.

III. Material Inspection Lab

IV. Evaluation of Weldments

1. Welding processes
2. Weld geometries
3. Welding discontinuities
4. Origin and typical orientation of discontinuities
5. Response of discontinuities to ultrasound
6. Applicable codes/standards

V. Weld Inspection Lab

VI. Evaluation of Bonded Structures

1. Manufacturing processes
2. Types of discontinuities
3. Origin and typical orientation of discontinuities
4. Response of discontinuities to ultrasound
5. Applicable codes/standards

VII. Bonded Structures Lab

VIII. Discontinuity Detection

1. Sensitivity to reflections
 - a. Size, types, and location of discontinuities
 - b. Techniques used in detection
 - c. Wave characteristics
 - d. Material and velocity
 - e. Discontinuity
2. Resolution
 - a. Standard reference comparisons
 - b. History of part
 - c. Probability of type of discontinuity
 - d. Degrees of operator discrimination
 - e. Effects of ultrasonic frequency
 - f. Damping effects
3. Determination of discontinuity size
 - a. CRT/scope display and meter indications
 - b. Transducer movement vs. display
 - c. Two-dimensional testing techniques
 - d. Signal patterns
4. Location of discontinuity
 - a. CRT/Scope display
 - b. Amplitude and linear time
 - c. Search technique

IX. Discontinuity Detection Lab

X. Evaluation

1. Comparison procedures
 - a. Standards and references

- b. Amplitude, area, and distance relationship
 - c. Application of results of other NDT methods
 - d. Distance/Amplitude Correction
 - e. DAC curves
 - f. Electronic Distance/Amplitude compensation
 - g. DGS (AVG) diagram and screen overlay methods
 - h. AWS formula method
 - i. Dimensional measurement
 - j. Decay pattern technique
2. Object appraisal
- a. History of part
 - b. Intended use of part
 - c. Existing and applicable code interpretation
 - d. Type of discontinuity and location

XI. Evaluation Lab