

Ultrasonic Testing for Nondestructive Inspection Training Course

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Overview

Ultrasonic Testing for Nondestructive Inspection Training Course is a one-week intermediate course for NDT, inspection, welding, quality, maintenance, and asset-integrity professionals who leave with a UT Inspection Procedure and Evaluation File. Participants examine ultrasonic wave behavior, UT equipment calibration, straight-beam inspection, angle-beam weld inspection, discontinuity characterization, and ultrasonic indication evaluation. The course connects procedure requirements, scan coverage, instrument evidence, acceptance criteria, and reporting decisions. Agile Leaders Training Center presents ultrasonic testing for nondestructive inspection.

Who Should Attend

- Functions responsible for nondestructive inspection planning and field execution
- Teams responsible for weld quality, fabrication inspection, and repair verification
- Functions responsible for in-service equipment inspection and asset-integrity evidence
- Teams responsible for maintenance diagnostics, condition assessment, and outage inspection
- Functions responsible for quality records, procedure review, and inspection acceptance

The course assumes participants read engineering drawings and inspection procedures at work, and it leaves out personnel certification examinations and automated ultrasonic system programming.

Departments and Industries

The course supports departments and industries that inspect metallic welds, plates, forgings, castings, and in-service components.

- Nondestructive testing, quality assurance, and quality control
- Welding engineering, fabrication, and construction inspection
- Oil, gas, petrochemical, and process-equipment integrity
- Power generation, utilities, and industrial maintenance
- Manufacturing, structural steel, transport, and heavy equipment

Learning Objectives

By the end of this course, participants will be able to:

- Apply ultrasonic wave and sound-path principles to inspection setups
- Build instrument, probe, range, sensitivity, and reference-block checks
- Use straight-beam and angle-beam scanning techniques
- Analyze weld geometry and develop scan-coverage plans
- Diagnose and size relevant discontinuity indications
- Evaluate indications against procedures and document inspection results

Course Agenda

Day 1: Establish Ultrasonic Inspection Principles

- Longitudinal, Shear, Surface, and Mode-Conversion Wave Map
- Frequency, Wavelength, Velocity, Attenuation, and Resolution Relationship Sheet
- Reflection, Refraction, Snell's Law, and Beam-Angle Calculation Method
- Near Field, Beam Spread, Dead Zone, and Sound-Path Limitation Review
- Ultrasonic Testing Procedure and Examination Variable Register

Day 2: Configure Equipment and Calibration Controls

- Pulse-Echo Instrument, Display, Pulser, Receiver, and Gate Function Check
- Straight, Angle, Dual, and Delay-Line Probe Selection Matrix
- Reference Block, Couplant, Surface Condition, and Transfer Correction Record
- Range, Zero, Velocity, Index Point, and Refracted-Angle Calibration Sheet
- Sensitivity, Reference Level, DAC Curve, and Linearity Verification

Day 3: Execute Straight-Beam and Angle-Beam Scanning

- Plate, Forging, Casting, and Lamination Straight-Beam Scan Plan
- Thickness, Back-Wall, Loss-of-Echo, and Reflector Location Method
- Weld Profile, Heat-Affected Zone, Root, Cap, and Fusion-Face Geometry Map
- Angle-Beam Skip Distance, Leg, Sound Path, and Scan-Coverage Calculation
- ISO 17640 Weld Testing Level and Manual Scanning Review

Day 4: Characterize Indications and Report Decisions

- Geometric versus Discontinuity Echo Discrimination Checklist
- Crack, Lack-of-Fusion, Slag, Porosity, and Lamination Response Matrix
- Probe-Movement Location, Length, Height, and Amplitude Sizing Method
- Procedure and Acceptance-Criteria Evaluation Decision Tree
- UT Examination Report, Traceability, Limitations, and Review Record

Day 5: Practice Ultrasonic Inspection Decisions

- Suggested Exercise: Verify Instrument, Probe, Block, and Calibration Status
- Suggested Exercise: Develop Straight-Beam and Angle-Beam Scan Plans
- Suggested Exercise: Locate and Characterize Simulated Indications
- Suggested Exercise: Evaluate Indications and Complete an Inspection Report
- Capstone Exercise: Complete the UT Inspection Procedure and Evaluation File

Practical Exercises

The course uses suggested activities to connect instrument responses with inspection decisions.

- Suggested activity: select probes, reference blocks, couplant, range, and sensitivity for defined product forms and welds.
- Suggested activity: calculate beam angle, skip distance, sound path, index position, and coverage for a weld geometry.
- Suggested activity: distinguish geometric echoes from relevant indications using probe movement and signal behavior.
- Suggested activity: document location, characterization, sizing, evaluation, limitations, traceability, and review evidence.

FAQs

Who suits ultrasonic testing for nondestructive inspection training, and what does it assume?

Ultrasonic testing training suits NDT, inspection, welding, quality, maintenance, and asset-integrity functions. It assumes participants read drawings and procedures and excludes personnel certification examinations.

How does ultrasonic testing training differ from a general predictive maintenance course?

Ultrasonic testing training focuses on material examination, calibrated sound paths, scan coverage, discontinuity responses, sizing, acceptance evaluation, and traceable reports. Predictive maintenance training uses broader condition-monitoring methods for operating machinery.

How is an ultrasonic testing instrument calibrated?

An ultrasonic testing instrument is calibrated by verifying equipment condition and setting velocity, zero, range, probe index, refracted angle, sensitivity, reference response, display linearity, and applicable transfer correction with defined reference blocks.

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How are weld discontinuities located with angle-beam ultrasonic testing?

Weld discontinuities are located by combining probe index, sound path, refracted angle, leg or skip distance, scan position, weld geometry, and signal change during controlled probe movement.

What belongs in an ultrasonic testing report?

An ultrasonic testing report records the procedure, equipment, probes, blocks, calibration, test surface, scan coverage, indication coordinates, amplitude, characterization, sizing, evaluation criteria, limitations, traceability, and review status.

Conclusion

Participants take back a UT Inspection Procedure and Evaluation File linking equipment checks, calibration, scan plans, indication evidence, evaluation decisions, and reports. It changes isolated instrument signals into a traceable inspection path for quality and integrity teams. The file supports repeatable setup, examination, technical review, and repair verification.

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