



Radiographic Testing Level II

Course Outline

- 1. Review of Basic Radiographic Principles**
 - a. Interaction of radiation with matter
 - b. Math review
 - c. Exposure calculations
 - d. Geometric exposure principles
 - e. Radiographic-image quality parameters

- 2. Darkroom Facilities, Techniques, and Processing**
 - a. Facilities and equipment
 - a. (1) Automatic film processor vs. manual processing
 - b. (2) Safe lights
 - c. (3) Viewer lights
 - d. (4) Loading bench
 - e. (5) Miscellaneous equipment
 - b. Film loading
 - (1) General rules for handling unprocessed film
 - (2) Types of film packaging
 - (3) Cassette-loading techniques for sheet and roll
 - c. Protection of radiographic film in storage
 - d. Processing of film – manual
 - (1) Developer and replenishment
 - (2) Stop bath
 - (3) Fixer and replenishment
 - (4) Washing
 - (5) Prevention of water spots
 - (6) Drying
 - e. Automatic film processing
 - f. Film filing and storage
 - (1) Retention-life measurements
 - (2) Long-term storage
 - (3) Filing and separation techniques
 - g. Unsatisfactory radiographs – causes and cures
 - (1) High film density
 - (2) Insufficient film density
 - (3) High contrast
 - (4) Low contrast
 - (5) Poor definition
 - (6) Fog
 - (7) Light leaks
 - (8) Artifacts
 - h. Film density
 - (1) Step-wedge comparison film
 - (2) Densitometers



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3. Indications, Discontinuities, and Defects

- a. Indications
- b. Discontinuities
 - (1) Inherent
 - (2) Processing
 - (3) Service
- c. Defects

4. Manufacturing Processes and Associated Discontinuities

- a. Casting processes and associated discontinuities
 - (1) Ingots, blooms, and billets
 - (2) Sand casting
 - (3) Centrifugal casting
 - (4) Investment casting
- b. Wrought processes and associated discontinuities
 - (1) Forgings
 - (2) Rolled products
 - (3) Extruded products
- c. Welding processes and associated discontinuities
 - (1) Submerged arc welding (SAW)
 - (2) Shielded metal arc welding (SMAW)
 - (3) Gas metal arc welding (GMAW)
 - (4) Flux cored arc welding (FCAW)
 - (5) Gas tungsten arc welding (GTAW)
 - (6) Resistance welding
 - (7) Special welding processes – electron beam, electroslog, electrogas, etc.

5. Radiological Safety Principles Review

- a. Controlling personnel exposure
- b. Time, distance, shielding concepts
- c. ALARA (as low as reasonably achievable) concept
- d. Radiation-detection equipment
- e. Exposure-device operating characteristics

6. Radiographic Viewing

- a. Film-illuminator requirements
- b. Background lighting
- c. Multiple-composite viewing
- d. Penetrameter placement
- e. Personnel dark adaptation and visual acuity
- f. Film identification
- g. Location markers
- h. Film-density measurement
- i. Film artifacts

7. Application Techniques

- a. Multiple-film techniques
 - (1) Thickness-variation parameters
 - (2) Film speed
 - (3) Film latitude
- b. Enlargement and projection



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- c. Geometrical relationships
 - (1) Geometrical unsharpness
 - (2) Penetrator sensitivity
 - (3) Source-to-film distance
 - (4) Focal-spot size
 - d. Triangulation methods for discontinuity location
 - e. Localized magnification
 - f. Film-handling techniques
- 8. Evaluation of Castings**
- a. Casting-method review
 - b. Casting discontinuities
 - c. Origin and typical orientation of discontinuities
 - d. Radiographic appearance
 - e. Casting codes/standards – applicable acceptance criteria
 - f. Reference radiographs
- 9. Evaluation of Weldments**
- a. Welding-method review
 - b. Welding discontinuities
 - c. Origin and typical orientation of discontinuities
 - d. Radiographic appearance
 - e. Welding codes/standards – applicable acceptance criteria
 - f. Reference radiographs or pictograms
- 10. Standards, Codes, and Procedures for Radiography**
- a. ASTM E94/E142
 - b. Acceptable radiographic techniques and setups
 - c. Applicable employer procedures
 - d. Procedure for radiograph parameter verification
 - e. Radiographic reports