

MEA LEARNING EMPOWERS™
Operational Excellence



Construction Inspector

Non-Destructive Testing (NDT)

November 4, 2021

NDT- Definition

- An inspection process in which no damage occurs to the item (weld, pipe, valve, etc.) being inspected.

As opposed to destructive tests, e.g., tension, bend, nick, notch, etc.

NDT Certifications

- Training in accordance with ASNT-TC-1A, CP-189, or ACCP (CP-10)
- Level I- Qualified to perform specific calibrations and tests. Works under the direction of a Level II or III.
- Level II- Qualified to set up and calibrate equipment and to interpret results with respect to applicable codes and standards.
- Level III- Shall be capable of establishing inspection techniques and procedures; shall provide leadership and direction in their discipline(s).

NDT Methods

- Visual Testing (VT)
- Penetrant Testing (PT)
- Magnetic Particle (MT)
- Ultrasonic Testing (UT)
- Radiographic Testing (RT)

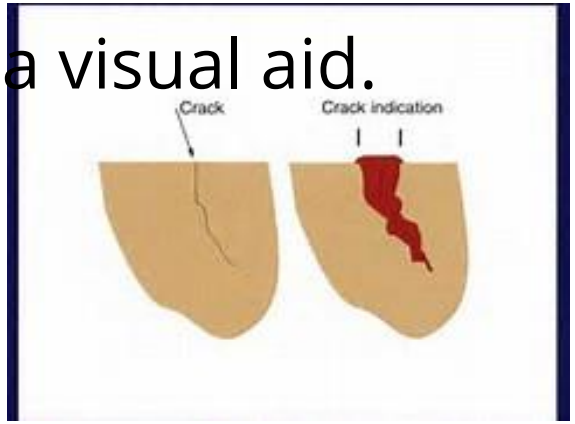
Let's discuss each method as it relates to steel

Visual Testing (VT)

- The most widely used NDT method
- The only NDT method that an Inspector would perform
- Can be enhanced with borescope, welding gauges, ruler, magnifier, flashlight, etc.
- Inspector must be knowledgeable of: Process used (welding, fusing, etc.)
- Acceptance requirements (Blueprints, Procedures)
- Advantages: Quick and easy process
- Disadvantages: Depends largely on experience, surface flaws only

Penetrant Testing (PT)

- Employs capillary action, which is the ability of a liquid to move into tight closures. Fluorescent is often used as a visual aid.
  - Process: Thoroughly clean surface> Apply penetrant> Remove excess penetrant> Apply developer> Inspect> Notify of results



- Advantages: Fairly quick process, highly sensitive to surface indications
- Disadvantages: Surface has to be clean, detects surface indications only

Magnetic Particle Testing (MT)

- Highly sensitive method for surface and subsurface indications. Fluorescent is often used as a visual aid
  - Process: Magnetize the part while applying magnetic particles; an indication will hold the magnetic particles > Notify of results

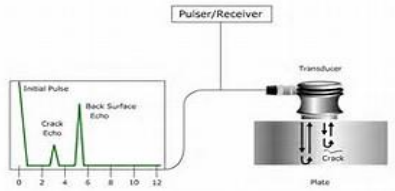


- Advantages: Sensitive to surface and subsurface indications
- Disadvantages: Carbon steel only, equipment, careful evaluation by skilled NDT Technician is needed

Ultrasonic Testing (UT)

- Equipment includes UT unit, transducers, couplant, calibration blocks
  - Process: Calibrate equipment using calibration block>Scan part to ensure full coverage> Calculate size and depth of indications, if any > Notify of results





- Advantages- Highly accurate volumetric exam, only method with ability to determine volumetric flaw height, can be used on all metals with proper calibration blocks
- Disadvantages- Requires highly trained/skilled technician; precise calibration blocks/calibration prior to use

Radiographic Testing (RT)

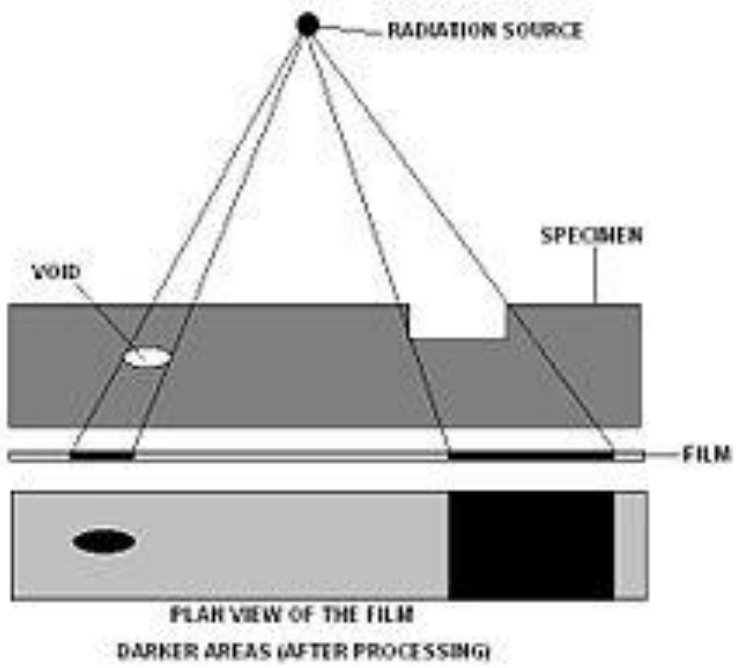
- The most widely used NDT method on pipelines for volumetric inspection; similar in principle to hospital x-rays
  - Process: Clear the area and set up radiation restricted boundaries> Calculate the exposure time> Develop and interpret the film*> Notify of results



- Advantages: Volumetric, reliable, provides a good record
- Disadvantages: Requires highly trained/skilled technician; safety hazards need to be understood and managed (watch for the yellow and magenta!)

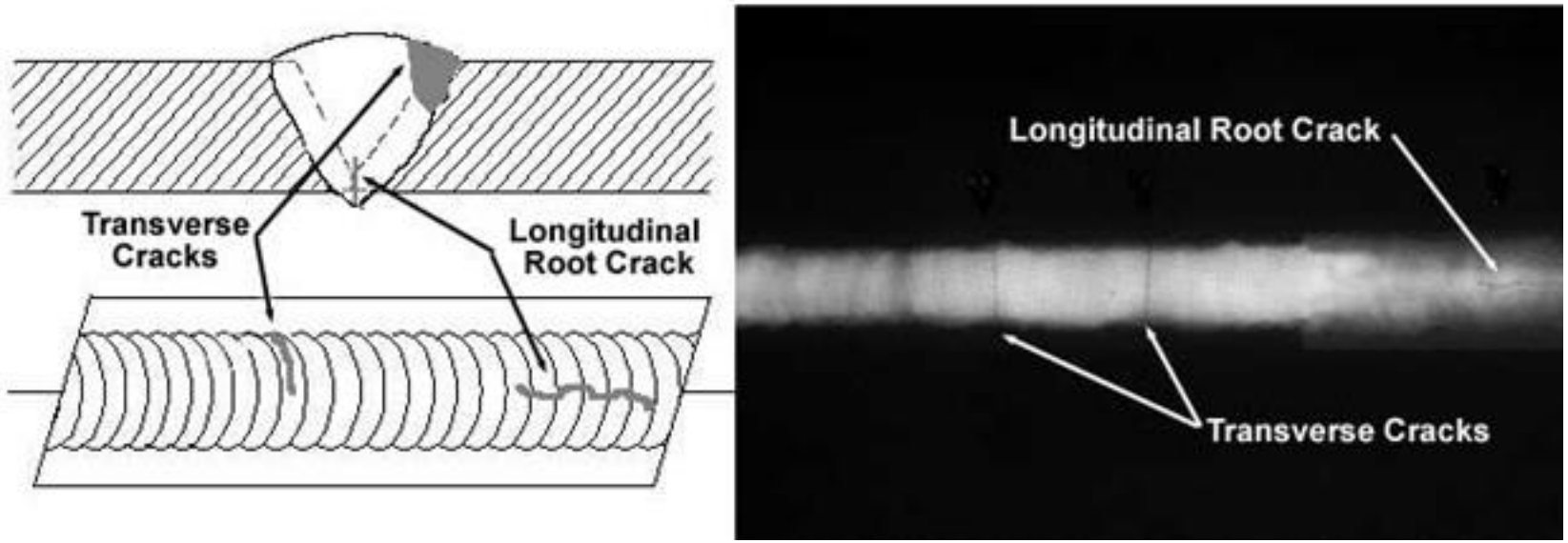
*You should become familiar with radiographic film

Radiographic Testing (RT) Film



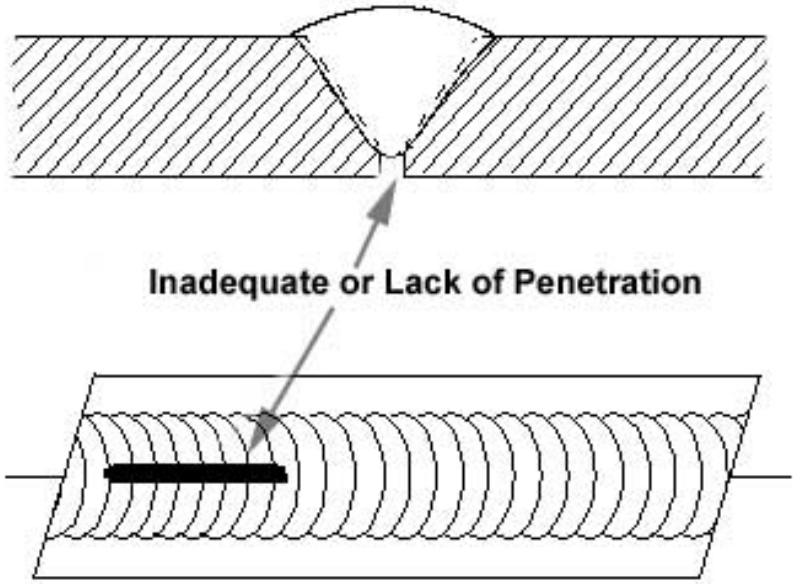


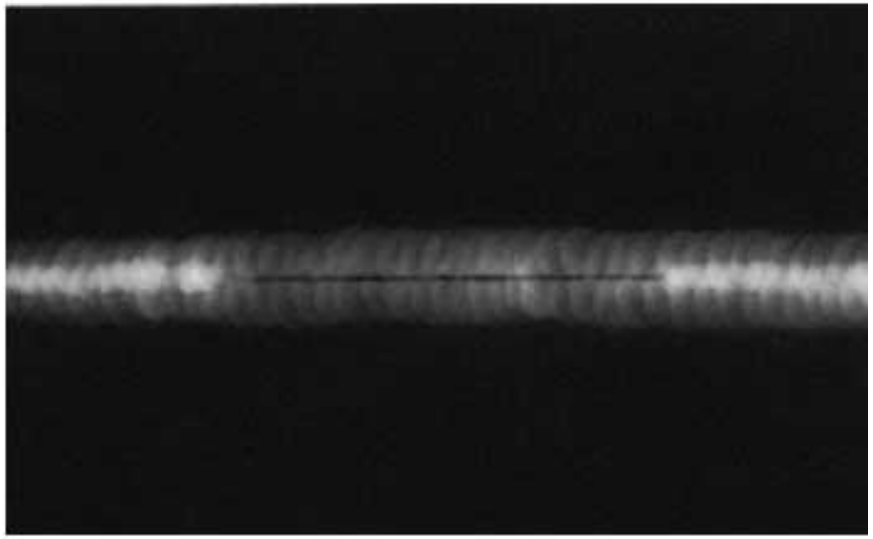
Radiographic Testing (RT) Film Cont'd



Cracks

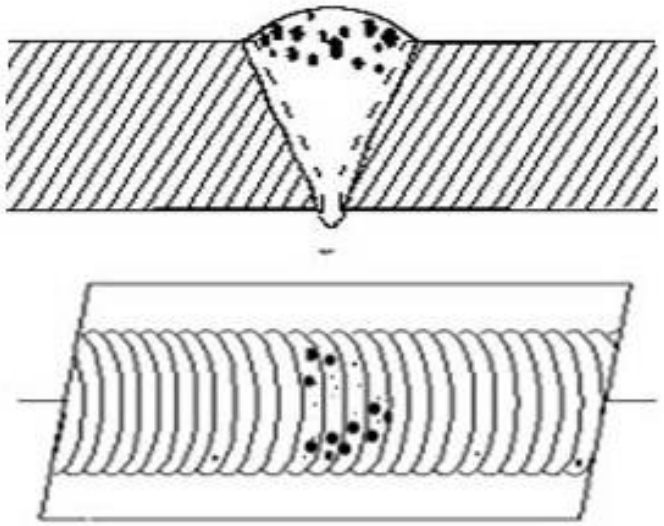
Radiographic Testing (RT) Film Cont'd

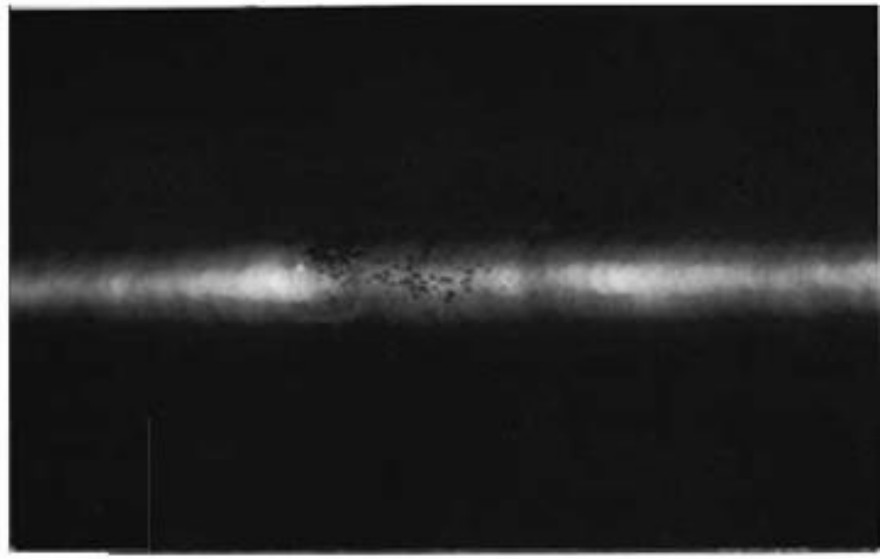




Inadequate Penetration (IP)

Radiographic Testing (RT) Film Cont'd





Cluster Porosity (CP)

Radiographic Testing (RT) – Safety

- NRC and state/local laws requirements must be understood and followed
- Watch for, and respect a radiation-boundary area
- NDT RT certified individuals are responsible for establishing and maintaining a radiation area
  - Only NDT RT certified individuals can enter the restricted area; Inspectors stay out!





What About Plastic?

- Increased use of plastic pipe in the gas industry
  - Larger diameters, higher pressures
- Verify that it's the correct pipe for the job
- Inspect pipe to ensure it is free of defects (cracks, cuts, abrasions, gouges)
- During storage, watch for exposure to UV and weather



Cont'd Plastic

- Fuser Qualification
  - Must qualify for any fusing technique that they will complete in the field
    - One year re-qualification
  - Visual inspection
    - Fusion should be uniform, nonporous, well aligned appearance
    - Follow standard for proper melt bead size by pipe diameter
  - Destructive tests
    - Butt fusion- Face bend test, root bend test, torque test
    - Sidewall fusion - Impact resistance tests
    - Electrofusion - Cut into strips and inspect

Cont'd Plastic

- Pre-Construction
  - Verify specifications and plans
  - Equipment check, soil check
  - UT wall thickness for min. wall requirements
- Construction
  - Inspect pipe for cracks, tears, dents, gouges, etc.
  - Fusion and joint should be uniform, nonporous, well aligned appearance
  - Follow standard for proper melt bead size by pipe diameter
- Post installation
  - Leak test. If leak is detected, depressurize and repair. Fuser is suspended and must requalify

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Questions?

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