

RADIOGRAPHY TEST

1.0 INTRODUCTION TO RADIOGRAPHIC TESTING

- Radiography
 - Advantages of Radiographic Testing
 - Limitations of Radiographic Testing
- Test Objective
 - Safety Considerations
- Qualification
- Certification

2.0 RADIOGRAPHIC TESTING PRINCIPLES

- Penetration and differential Absorption
 - Geometric Exposure Principles
 - Film/Detector Image Sharpness
 - Image Distortion
- X-Radiation and Gamma Radiation
 - X-Rays
 - Electron Source
 - Electron Target
 - Electron Acceleration
 - Radiation Intensity
 - Inverse Square Law
 - X-Ray Quality Characteristics
 - Interaction with Matter
 - Photoelectric Absorption
 - Compton Effect
 - Pair Production
 - Scatter Radiation
 - Internal Scatter
 - Side Scatter
 - Backscatter
 - Gamma Rays
 - Natural Isotope Sources
 - Artificial Sources
 - Gamma Ray Intensity
 - Specific Activity
 - Half Life
 - Gamma Ray Quality Characteristics

3.0 EQUIPMENT

- X-Ray Equipment
 - Portable X-Ray Units
 - X-Ray Tube
 - Tube Envelope
 - Cathode

- Filament Heating
- Anode
- Focal Spot
- Linear Accelerators
- X-Ray Beam Configuration
- Accelerating Potential
- Iron Core Transformers
- Heat Dissipation
- Equipment Shielding
- Tube Heads
- Control Panel
- Gamma Ray Equipment
 - Gamma Ray Sources
 - Radium
 - Artificial Radioisotopes
- Isotope Cameras

4.0 **RADIOGRAPHIC FILMS**

- Introduction
- Usefulness of Radiographs
- Radiographic Contrast
 - Subject Contrast
 - Film Contrast
 - Characteristic Curves
 - Film Speed
 - Graininess
- Film Selection Factors
- Film Processing
- Tank Processing
- Tank Processing Procedures
 - Developing
 - Stop Bath
 - Fixing
 - Washing
 - Drying
- Automatic Film Processing
- Darkroom "Facilities and Equipment"

5.0 **SAFETY**

- Introduction
- Units of Radiation Dose Measurement
 - Roentgen
 - Radiation Absorbed Dose (Rad)
 - Quality Factor
 - Roentgen Equivalent Mammal (Rem)

- International System of Units (SI) Measurements
 - Becquerel Replaces Curie
 - Coulomb per Kilogram Replaces Roentgen
 - Gray (Gy) Replaces Rad
 - Sievert (Sv) Replaces Rem
- Maximum Permissible Dose
- Protection against Radiation
 - Allowable Working Time
 - Working Distance
 - Shielding
 - Exposure Area
 - Radiation Protective Construction
 - Gamma Ray Requirements
- Regulatory Authority of Saudi Arabia
 - Occupational Radiation Exposure Limits
 - Levels of Radiation in Unrestricted Areas
 - Personnel Monitoring
 - Caution Signs, Labels and Signals
 - Exposure Devices and Storage Containers
 - Radiation Survey Instrumentation Requirements
 - Radiation Surveys
- Detection and Measurement Instruments
 - Pocket Dosimeters
 - Personal Electronic Dosimeters
 - Film Badges and Thermo Luminescent Dosimeters
 - Optically Stimulated Luminescence (OSL) Badges
 - Ionization Chamber Instruments
 - Geiger - Mueller Counters
 - Area Alarm Systems
- Electrical Safety

6.0 **SPECIALIZED RADIOGRAPHIC APPLICATIONS:**

- Introduction
- Selection of Equipment
- Accessory Equipment
 - Diaphragms, Collimators and Cones
 - Filters
 - Screens
 - Fluorescent Screens
 - Lead Screens
 - Masking Materials
 - Image Quality Indicators (IQI)
 - Shim Stock
 - Film Holders and Cassettes
 - Area Shielding Equipments
 - Densitometer
 - X-Ray Exposure Charts
 - Preparation of an Exposure Chart
 - Film Latitude

- Gamma Ray Exposure Chart
- Dated Decay Curves
- Film Characteristic Curves
- Radiographic Equivalent Factors
- Exposure Variables
 - Movement
 - Source Size
 - Source-to-Film Distance
- Radiographic Applications
 - Radiography of Welds
 - Tube Angulations
 - Incident Beam Alignment
 - Discontinuity Location
 - Critical and Noncritical Criteria
 - Improper Interpretation of Discontinuities
 - Elimination of Distortion
 - Proper Identifications and Image Quality Indicators Placement
 - Radiography of Welded Flat Plates
 - Radiography of Welded Corner Joints
- Single - Wall Radiography of Tubing
- Double - Wall Radiography of Tubing
 - Tubing up to 3.5 in. (9 cm) Outside Diameter (OD)
- Radiography of Closed Spheres
- Radiography of Closed Tanks
- Radiographic Multiple Combinations Application
- Radiographic of Hemispherical Sections
- Panoramic Radiography
- Radiography of Large Pipe Welds
- Radiographic Techniques of Discontinuity Location
- Alignment
- Discontinuity Depth Location Techniques

7.0 DIGITAL RADIOGRAPHIC IMAGING:

- Introduction
 - Development
 - Detectors for Digital Imaging
- Principles of Digital X-Ray Detectors
 - Charge Coupled Devices
 - Thin Film Transistor
 - Light Collection Technology
 - Radiation Conversion Material
 - Storage Phosphors
 - Linear Arrays
 - Scanning Beam, Reversed Geometry
 - Detection Efficiency
- Spatial Resolution
 - Modulation Transfer Function (MTF)
 - Gain and Offset Correction
 - Radiation Damage

- Selection of Systems to Match Application
- X-Ray Detector Technology
 - Amorphous Silicon Detectors
 - Amorphous Selenium Detectors
 - Charge Coupled Device Radiographic Systems
 - Linear Detector Arrays

8.0 **SPECIAL RADIOGRAPHIC TECHNIQUES:**

- Introduction
- Fluoroscopy
- Image Amplifier
- Television Radiography
- Xeroradiography
 - Stereo radiography and Double Exposure
 - Stereo radiograph
- Double Exposure ((Parallax Radiographic Technique)
- Flash Radiography
- In - Motion Radiography
- Conclusion
