COURSE DESCRIPTION

FOR

NONDESTRUCTIVE TESTING

TULSA, OKLAHOMA
COURSE DESCRIPTION: In this course students will learn about materials and processes, find basic NDT methods in an overview of N.D.T. Students will then study in depth the methods of magnetic partial testing and liquid Penetrant testing. Students will study inspection reports, cleaning processes, magnetism, properties of liquid penetrants using equipment standard to industry.

- Material Processings for Raw to Finished Products: 10 hours
- Classification of Materials: 6 hours
- Discontinuities and Defects: 10 hours
- Heat Treatment: 10 hours
- M.S.D.S.: 6 hours
- Need for N.D.T. in Industry: 10 hours
- Basics of N.D.T.: 16 hours
- Advantages and Disadvantages: 10 hours
- Safety Hazards: 10 hours
- Handling Parts: 8 hours
- Corrosion: 10 hours
- Defects: 10 hours
- Magnetic Particle Inspection: 32 hours
- Liquid Penetrant Inspection: 32 hours

Total: 180 hours
RADIATION SAFETY

QCT1827

COURSE DESCRIPTION: In this course students learn the fundamentals of radiation safety and radiographic inspection safety techniques. Students study the causes of radiation accidents and pertinent federal and state regulations. Students will also learn to change sources and set up a gamma ray projector and accessories. They will learn to set boundaries correctly.

- Introduction to Radiation Safety: 10 hours
- Radiation and Radioactivity Key Terms: 20 hours
- Harmful Effects of Over Exposure: 20 hours
- Detection and Measurement of Radiation: 15 hours
- Radiation Protection: 15 hours
- Radiography Cameras: 15 hours
- Operating and Emergency Procedures: 15 hours
- NRC Regulations: Title 10 Chapter 1, Part 19, Notices Instructions and Reports to Workers: Inspections. Part 20, Standards For Protection Against Radiation. Part 34, Licenses For Radiography and Radiation Safety: 22 hours
- Actual Setups of Boundaries: 48 hours

Total: 180 hours
COURSE DESCRIPTION: Students review and utilize their previous (QCT1819) radiation safety training and continue to develop skill and proficiency at producing a radiography (with x-ray tubes and radioactive isotopes) safely and correctly. Students also learn manual film processing, handling and basic film interpretation.

- Origin of Penetrating Radiation: .5 hour
- Radiation Characteristics and Interactions with Matter: .5 hour
- X-ray Equipment and Generation: 5 hours
- Gamma-Ray Sources and Equipment: 5 hours
- Protecting Against X-ray and Gamma Rays: 1.5 hours
- Factors in Determining Exposure Time: 5 hours
- Positioning the Film, Specimen and Radiation Source: 5 hours
- Developing the Film and Reading the Results: 4 hours
- Penumbra Shadow (UG): 5 hours
- Distortion: 4 hours
- Enlargement: 4 hours
- Screens: 5 hours
  - Purpose: 3 hours
  - Lead-Foil Screens: 3 hours
  - Fluorescent Screens: 3 hours
- Film: 8 hours
- Film Processing: 6 hours
- Scattered Radiation Related to the Specimen: 10.5 hours
- Performing Radiography with X-ray and Gamma Ray: 102 hours

Total 180 hours
COURSE DESCRIPTION: In this course students learn the fundamental properties of sound waves, principles of wave propagation, generation of ultrasonic waves, ultrasonic testing methods, and the use of testing equipment. Students develop skills in set-up and calibration of ultrasonic testing equipments, using straight beam and angle beam contact testing. They also learn the basic theory to immersion testing.

Introduction to Ultrasonics 3 hours
Concepts of Sound 6 hours
Basic Ultrasonics 3 hours
Transducers 9 hours
Ultrasonic Flaw Detectors 9 hours
Behavioral Patterns of Sound Waves 9 hours
Choosing and Coupling the Transducer 6 hours
Straight Beam Calibration (AWS) 12 hours
Angle Beam Calibration (AWS) 12 hours
IIW Miniature V2 (Rampas) Blocks 5 hours
Sonatest Universal Block 5 hours
Beam Plotting Procedure (ASME) 5 hours

Basic Angle Beam Testing
Basic Terms and Relationships 12 hours
Calculating Horizontal and Vertical Distances 6 hours
Skip Distance 6 hours

Reflector Evaluation
First Phase 3 hours
Second Phase 3 hours
<table>
<thead>
<tr>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Amplitude or Half Value Method</td>
<td>3</td>
</tr>
<tr>
<td><strong>Weld Testing</strong></td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>5</td>
</tr>
<tr>
<td>Welding Metallurgy</td>
<td>5</td>
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<tr>
<td>Selections of Shear Wave Angles and Frequencies</td>
<td>12</td>
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<tr>
<td>Recommended Sequence for AWS Ultrasonic Weld Inspection</td>
<td>5</td>
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<tr>
<td><strong>Sound Velocity</strong></td>
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<tr>
<td>Introduction and Units of Measurement</td>
<td>3</td>
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<tr>
<td>Calculation: The Velocity of Sound in a Specimen</td>
<td>3</td>
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<tr>
<td>Measurement of Velocity with a Calibrated Specimen</td>
<td>3</td>
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<tr>
<td>Measurement of Velocity with a Calibrated Delay</td>
<td>3</td>
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<tr>
<td><strong>The Decibel</strong></td>
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<tr>
<td>Introduction to the Decibel</td>
<td>3</td>
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<tr>
<td>Relationship Between Echo Height, Distance, and Reflector Size</td>
<td>3</td>
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<tr>
<td>Attenuation</td>
<td>3</td>
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<tr>
<td><strong>Immersion Testing</strong></td>
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<tr>
<td>Introduction</td>
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<tr>
<td>Monitor Gates</td>
<td>3</td>
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<tr>
<td>Interface Triggers and Echo Locks</td>
<td>3</td>
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<tr>
<td>Through Transmission Immersion Testing</td>
<td>3</td>
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<tr>
<td>Tubular Product Testing</td>
<td>3</td>
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<td><strong>Total</strong></td>
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</table>
EDDY CURRENT TESTING

COURSE DESCRIPTION: In this course students will learn the theory and basic test methods of Eddy Current testing. This course includes 90 hours of Eddy Current theory. The student will also receive 90 hours of laboratory instruction using a variety of portable eddy current testing equipment. Students will perform standard calibration techniques and complete projects locating flaws using Eddy Current test methods.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Hours</th>
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<tr>
<td>Introduction to Eddy Current Theory, History, and Applications</td>
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<tr>
<td>Fundamentals of Electricity</td>
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<tr>
<td>Fundamentals of Magnetism</td>
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<tr>
<td>Fundamentals of Electromagnetism</td>
<td>6</td>
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<tr>
<td>Inductive Reactance, Impedance, and Phase</td>
<td>6</td>
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<tr>
<td>Basic Components of Eddy Current Test Systems</td>
<td>5</td>
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<tr>
<td>Test Coils (Encircling, Inner Diameter, Outer Diameter)</td>
<td>6</td>
</tr>
<tr>
<td>Test Coil Arrangements (Single, Double, Absolute, Differential)</td>
<td>6</td>
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<tr>
<td>Instruments, Read-out Mechanisms, Presentation Formats</td>
<td>15</td>
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<tr>
<td>Variables affecting Eddy Current Testing</td>
<td>15</td>
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<tr>
<td>(Testing Material and Equipment)</td>
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<tr>
<td>Standards, Calibrations, Industry Specific</td>
<td>10</td>
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<tr>
<td>Laboratory, Performing Basic Calibrations</td>
<td>40</td>
</tr>
<tr>
<td>Laboratory Projects, Locating Flaws using Eddy Current Techniques</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
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</tbody>
</table>
COURSE DESCRIPTION: In this course students learn the basic principles and methods of leak testing. Students learn basic visual inspection techniques, the physical properties of gases and safety hazards involved with leak testing. Students study technical data prepared by the American Welding Society (AWS), the American petroleum Institute (API), the American Society for Testing and Materials (ASTM), the American Society of Mechanical Engineers (ASME), and MIL Standards.

Introduction to Welding Inspections

- The Welding Inspector 3 hours
- The Metric System, Welding Terms and Symbols 6 hours
- Basic Welding Metallurgy 5 hours

Welding Processes and Qualifications

- Joint Preparation and Temperature Control 4 hours
- Welding, Joining and Cutting Process (I and II) 6 hours
- Qualification of Welders, Welding Procedures and Welding Operations 4 hours

Codes, Discontinuities and Destructive Testing

- Codes and Welding Inspection 3 hours
- Welding Imperfections and Discontinuities 3 hours
- Chemical, Metallurgical and Mechanical Testing of Welds 4 hours
- Visual and Liquid Penetrant Inspection 3 hours
- Magnetic Particle and Radiographic Inspection 3 hours
- Ultrasonic Inspection 3 hours
- Eddy Current Inspection, Acoustic Emission Proof Tests And Leak Tests 3 hours

ASME Boiler and Pressure Vessel Codes

- Articles 1 through 5 6 hours
Articles 6 through 10 6 hours
Articles of Subsection B 6 hours
Appendices A and B 6 hours
AWS Structural Welding Code D1.1-80
    Part A – General Requirements 6 hours
    Part B – Radiographic Inspection 6 hours
    Part C – Ultrasonic Inspection 6 hours
API 1104, Standard for Welding Pipeline
    Section 1 – General 4 hours
    Section 5 – Inspection and Testing of Production Welds 4 hours
    Section 6 – Standards of Acceptability, Nondestructive Testing 4 hours
    Section 8 – Radiographic Procedures 4 hours
Introduction to Leak Testing, History and Terminology 6 hours
Specific Tracer Fluids, Hazards and Safety Characteristics 12 hours
Principles, Techniques and Methods of Pressure Change/Measurement Tests to include Bubble Tests, Halogen Test, Mass Spectrometer Test, and Miscellaneous Tests 24 hours
Achievement Tests
    Magnetic Particle 6 hours
    Penetrant Inspection 6 hours
    Radiographic Inspection 6 hours
    Ultrasonic Inspection 6 hours
    Eddy Current Inspection 6 hours
Total 180 hours