

**40-HOUR NORM/TENORM RADIATION SAFETY OFFICER
 COURSE OUTLINE (36 CLASSROOM HOURS, 4 HOURS AFTER CLASS)**

**DAY 1: 8-HOUR NORM/TENORM RADIATION COURSE OUTLINE
 (8 CLASSROOM HOURS, 1 HOUR RSO WORKBOOK AFTER CLASS)**

Section 1.0 DISCOVERIES & DISASTERS – 1 HOUR

- 1.1 Scientists & Discoveries
- 1.2 Radiation Accidents and Incidents
- 1.3 Radiation Units – U.S. Units and S.I. Units
- 1.4 Prefixes

Section 2.0 ATOMIC THEORY – 1.5 HOURS

- 1.1 Radiation
- 1.2 The Periodic Table
- 1.3 Parts of the Atom – The Nucleus and Electrons
- 1.4 Isotopes and Nuclides
- 1.5 Half-Life
- 1.6 Radioactive Decay
- 1.7 Natural Radiation
- 1.8 Artificial Radiation Sources

Section 3.0 ALARA & DOSES – 2 HOURS

- 3.1 Acute and Chronic Doses
- 3.2 How Radiation Affects Cells
- 3.3 Cancer
- 3.4 ALARA Principle
- 3.5 Hazards of NORM/TENORM
- 3.6 Comparable Risks
- 3.7 Dose Assessment Triangle™
- 3.8 Time, Distance, and Shielding Calculations
- 3.9 Personnel Monitoring Devices
- 3.10 Air Monitoring
- 3.11 Bioassay
- 3.12 Occupational Exposure Records

Section 4.0 LICENSING & PLANS – 1.5 HOURS

- 4.1 NORM/TENORM Regulating States
- 4.2 Licenses
- 4.3 Permits and Licenses
- 4.4 Specific License Authorizations
- 4.5 Resident and Reciprocity Licenses
- 4.6 License Conditions
- 4.7 Protection Plans
- 4.8 Plan Content
- 4.9 Posting Requirements
- 4.10 Training





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Section 5.0 ACTS & AGENCIES – 1 HOUR

- 5.1 The Birth of the International Commission of Radiological Protection (ICRP)
- 5.2 Atomic Energy Act
- 5.3 Formation of the International Atomic Energy Act (IAEA)
- 5.4 History of the Nuclear Regulatory Commission
- 5.5 Conference of Radiation Control Program Directors Inc. (CRCPD)
- 5.6 Agreement States
- 5.7 Low-Level Waste Compact Act of 1985
- 5.8 Federal Regulation of NORM/TENORM
- 5.9 Example Forms

WRITTEN EXAM – 0.5 HOUR

RSO WORKBOOK DAY 1 RADIATION GUIDE – 0.5 HOUR IN CLASS, EVENING – 1 HOUR

DAY 2: 8-HOUR NORM/TENORM SURVEYOR COURSE OUTLINE (8 CLASSROOM HOURS, 1 HOUR RSO WORKBOOK AFTER CLASS)

Section 1.0 OIL AND GAS NORM/TENORM – 1 HOUR

- 1.1 Natural Background
- 1.2 Artificial Radiation Sources
- 1.3 Natural Background Radiation
- 1.4 NORM vs TENORM
- 1.5 Petroleum and Natural Gas Condensate
- 1.6 Oil and Gas Phases
- 1.7 Levels of Training

Section 2.0 RADIATION HAZARDS – 1.5 HOURS

- 2.1 Matter and Energy
- 2.2 The Nucleus
- 2.3 Isotopes and Nuclides
- 2.4 Electrons
- 2.5 Non-ionizing Radiation
- 2.6 Ionizing Radiation
- 2.7 Half-Life
- 2.8 NORM/TENORM Radionuclides
- 2.9 NORM/TENORM vs. H₂S
- 2.10 Characteristics
- 2.11 ALARA Principle
- 2.12 Exposure Reducing Tools
- 2.13 Acute and Chronic Doses
- 2.14 Hazards



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- 2.15 Comparable Risks
- 2.16 Gamma Rays
- 2.17 Beta Particles
- 2.18 Alpha Particles

Section 3.0 UNITS & STATE LIMITS – 1 HOUR

- 3.1 Radiation Units
- 3.2 Roentgen
- 3.3 REM
- 3.4 RAD
- 3.5 Curie
- 3.6 CPM
- 3.7 DPM
- 3.8 Prefixes
- 3.9 Federal NORM/TENORM Limits
- 3.10 NORM/TENORM Regulating State Agencies
- 3.11 General Licensee vs. Specific Licensee
- 3.12 Gamma Exposure Exemption Limits
- 3.13 Surface Contamination Exemption Limits
- 3.14 Waste and Soil Exemption Limits
- 3.15 Storage Time Limits
- 3.16 Crude Oil, Natural Gas and Produced Water Exemptions
- 3.17 Surveyor Training

*Courses taught outside of Arkansas, Louisiana, Mississippi, New Mexico, North Dakota, Ohio, Texas, and West Virginia will discuss any applicable draft rules, guides, or the CRCPD Part N as relevant alternatives.

Section 4.0 DETECTION & SURVEYS – 2.5 HOURS

- 4.1 General Radiation Instruments
- 4.2 Calibration
- 4.3 Check Sources and Response Checks
- 4.4 Scintillation Probes
- 4.5 Geiger-Mueller (GM Pancake) Probes
- 4.6 Personal Monitoring Devices
- 4.7 Analyzing Gamma Rays in a Gamma Spectroscopy
- 4.8 Air Monitors
- 4.9 Common Complications
- 4.10 Background Radiation Surveys
- 4.11 Confirmatory Surveys
- 4.12 Rental Equipment Surveys
- 4.13 Pre-Maintenance Surveys
- 4.14 Post-Maintenance Surveys
- 4.15 Grid Surveys/Land Surveys
- 4.16 Surveying Scrap Metal



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- 4.17 Fixed Surface Contamination Surveys
- 4.18 Loose/Removable Contamination Surveys
- 4.19 Contamination on a Person/Frisks
- 4.20 Release Surveys

Section 5.0 FIELD PRACTICES – 1 HOUR

- 5.1 Basic Steps for Performing a Survey
- 5.2 Performing Surveys on Equipment for Gamma Radiation
- 5.3 Performing Average and Max Surface Contamination Surveys
- 5.4 Performing Removable Surface Contamination Surveys
- 5.5 Performing Grid Surveys
- 5.6 Performing Surveys on Scrap Metal for Recycling
- 5.7 Survey Documentation
- 5.8 Sampling
- 5.9 Shipping NORM/TENORM Samples
- 5.10 Equipment Marking/Labeling
- 5.11 Maintenance vs. Decontamination
- 5.12 PPE
- 5.13 Respirators
- 5.14 Restricted Areas
- 5.15 Shipping NORM/TENORM Loads
- 5.16 Releases

REGULATIONS & GUIDANCE DOCUMENTS

- CRCPD Part N
- Arkansas ADH RH 6010
- Louisiana: LAC 33:XV 14
- Mississippi: MSDH 15:21.78.1.11
- New Mexico: 20 NMAC 3.1 Subpart 14
- North Dakota: NDAC 33-10-23
- Ohio: OAC 3701:1-43-11
- Texas: 25 TAC §289.259
- West Virginia: 64 CSR 23
- LDEQ NORM Manifest
- Implementation Manual for Management of NORM in Louisiana

WRITTEN EXAM – 0.5 HOUR

RSO WORKBOOK DAY 2 SURVEYOR GUIDE – 0.5 HOUR IN CLASS, EVENING – 1 HOUR

DAY 3: 8-HOUR NORM/TENORM DECONTAMINATION COURSE OUTLINE

(8 CLASSROOM HOURS, 1 HOUR RSO WORKBOOK AFTER CLASS)

Section 1.0 DECONTAMINATION PLANNING – 1 HOUR

- 1.1 Project Planning



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- 1.2 Job Site Notifications & Open Record Requests
- 1.3 Corporate Radiation Safety Officer (RSO)
- 1.4 Field Radiation Safety Officer (RSO)
- 1.5 Crewmembers - Workers
- 1.6 Evaluations
- 1.7 Standard On-Site Records

Section 2.0 ON-SITE DECONTAMINATION – 2 HOURS

- 2.1 Mobilization and Site Setup
- 2.2 Protective Equipment Worn by the Worker
- 2.3 Radiation Work Permits (RWP)
- 2.4 TLD Badges
- 2.5 Background Radiation Surveys
- 2.6 Restricted Areas
- 2.7 Air Sample Collection
- 2.8 Sampling Waste
- 2.9 Surveys
- 2.10 Equipment Marking/Labeling
- 2.11 Contamination On A Person
- 2.12 Job Closeout
- 2.13 Internal CRSO Audits

Section 3.0 DATA INTERPRETATION – 2 HOURS

- 3.1 Data Analysis
- 3.2 Restricted Area Boundary
- 3.3 Air Monitoring
- 3.4 Air Sample Results and Analysis
ALI and DAC Tables (Texas)
- 3.5 Bioassay
- 3.6 Dosimetry Analysis
- 3.7 Site Inventory of Radioactive Material

Section 4.0 RECYCLING, RECLAMATION & DISPOSAL – 1 HOUR

- 4.1 Scrap Metal Recycling
- 4.2 Oil Reclamation
- 4.3 Waste Characterization
- 4.4 Waste Profiling
- 4.5 Common Waste Conversions
- 4.6 Commercial Disposal Facilities
- 4.7 Certificate of Disposal

Section 5.0 RECORDS MANAGEMENT – 1 HOUR

- 5.1 Records Summary
- 5.2 Job Files
- 5.3 Personnel Files
- 5.4 Notifications and Reports to Occupational Workers



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- 5.5 Calibration Records
- 5.6 Inventory Records
- 5.7 Releases for Unrestricted Use Documentation
- 5.8 Inspections
- 5.9 Example Forms

WRITTEN EXAM – 0.5 HOUR

RSO WORKBOOK DAY 3 DECONTAMINATION GUIDE – 0.5 HOUR IN CLASS, EVENING – 1 HOUR

**DAY 4: 8-HOUR TRANSPORTATION OF NORM/TENORM COURSE OUTLINE
 (8 CLASSROOM HOURS, 1 HOUR RSO WORKBOOK AFTER CLASS)**

Section 1.0 PREPARATION – 1 HOUR

- 1.1 Department of Transportation Regulations and Requirements
- 1.2 Basic Steps for Shipping Class 7 Radioactive Materials
- 1.3 Radiation
- 1.4 NORM/TENORM Radionuclides
- 1.5 ALARA Principle
- 1.6 Hazards
- 1.7 Radiation Units and Prefixes
- 1.8 Gamma Spectroscopy Laboratory Analysis

Section 2.0 DETERMINATIONS – 1.5 HOURS

- 2.1 Exemption Limits
NORM/TENORM HAZMAT Determination Flowchart™
- 2.2 Exempt Activity Concentration Limit 10X Exemption
- 2.3 Collecting Values for the Exempt Activity Concentration Limit and Exempt Activity Concentration for the Consignment Limit
Federal Register 49 CFR 173.426 Exemption Tables
- 2.4 Determine if the Material is Considered Radioactive Per DOT

Section 3.0 SHIPPING CATEGORIES – 1.5 HOURS

- 3.1 The Shipping Category "V"™
NORM/TENORM HAZMAT Shipping Category Flowchart™
- 3.2 Limited Quantity – UN2910
Federal Register 49 CFR 173.435 A₁ and A₂ Tables
- 3.3 Low Specific Activity (LSA) – UN2912
- 3.4 Surface Contaminated Object (SCO) – UN2913
- 3.5 Tentative Shipping Category

Section 4.0 SHIPPING METHODS – 0.5 HOUR

- 4.1 Shipping Method Requirements
- 4.2 Transport Index



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- 4.3 Labels for Overpacks
- 4.4 Exclusive Use Shipments – LSA or SCO
- 4.5 Removable Contamination Levels

Section 5.0 TRANSPORT – 1 HOUR

- 5.1 Packages
- 5.2 Federal DOT Shipping Paper Requirements
- 5.3 State-specific Transportation Requirements
- 5.4 Federal DOT Exemption for Scrap Metal (DOT-SP 10656)
- 5.5 Documentation
Forms

WORKSHEETS (GROUP ACTIVITY) – 1.5 HOURS

WRITTEN EXAM – 0.5 HOUR

RSO WORKBOOK DAY 4 TRANSPORTATION GUIDE – 0.5 HOUR IN CLASS, EVENING – 1 HOUR

**DAY 5: REVIEW/EXAM
 (4 CLASSROOM HOURS)**

REVIEW RSO WORKBOOK SECTIONS DAY 1 THROUGH DAY 4 – 1.5 HOURS
COMPLETE RSO WORKBOOK SECTION DAY 5: REVIEW/EXAM – 1.5 HOURS
WRITTEN EXAM AND PRACTICAL SURVEY EXERCISE – 1 HOUR

**CERTIFICATE DISTRIBUTION:
 40-HOUR RSO CERTIFICATE
 ENTIRE CLASS**

16-HOUR NORM/TENORM SURVEYOR CERTIFICATE (ARKANSAS ONLY)
DAY 1 RADIATION
DAY 2 NORM/TENORM SURVEYOR

8-HOUR NORM/TENORM SURVEYOR CERTIFICATE
DAY 2 NORM/TENORM SURVEYOR

8-HOUR TRANSPORTATION OF NORM/TENORM CERTIFICATE
DAY 4 TRANSPORTATION

