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HSE194

CERTIFIED RADIATION PROTECTION OFFICER (RPO)

Course Introduction:

The course is designed to provide delegates with a detailed and up-to-date overview of radiation protection. It covers ionizing radiations that includes basic physics, units and biological effects; calculations for radiation protection; medical exposures in diagnostic radiology, radiotherapy and nuclear medicine; storage of radiation sources; transport of radioactive substances; as well as local rules, emergency response and contingency plans.

The course will also cover personal dosimetry; radiation protection practices including time, distance, shielding, PPE, etc; as well as the Federal Authority for Nuclear Regulations (FANR); and roles and responsibilities of a radiation protection officer (RPO).

At the completion of the course, participants will be able to perform ionizing radiations and sealed source exercises; recognize management and safety aspects of nucleonic instrumentation; identify NORM and managing contractors, specific radiation sources and industrial gauges; apply systematic monitoring techniques, dosimetry and leak testing for radiation detection and measurement; and recognize ionizing radiation sources, radiation protection legislation and radiation protection management.

Course Objectives:

Upon the successful completion of this course, each participant will be able to:

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- Apply proper rules and regulations on radiation safety and describe the characteristics of ionizing radiation and radioactive decay mechanisms
- Identify the different types of radiation units and measurement terminology, biological effects of radiation exposure and use proper methods of minimizing radiation dose
- Employ proper radiation monitoring, surveys, dose limits and personal monitoring
- Discuss the types of industrial radiation sources and safety equipment including personnel monitoring equipment, radiation detection equipment, x-ray machines, radiography cameras, associated equipment, transport containers, inspection, maintenance equipment, etc.
- Practice emergency planning procedures and perform personnel monitoring as well as contamination control including posting for radiation and radioactive materials
- Recognize ALARA program on maintaining exposures and dose limitations
- Distinguish workers and management responsibilities on safety protection from hazards and apply the general rules of safe handling of radioactive sources
- Illustrate the design and safety assessment of radiation protection in the industry

- Describe the operational and environmental monitoring protection from radiation and identify the responsibilities of the regulators and other agencies as well as the purchasing, receipt and disposal of radiation sources
- Practice safe transport of radioactive materials and apply the control and safety aspects of radiation protection program for transport
- Follow safety procedures for radioactive waste management and demonstrate radiography emergency planning, incident response and mitigation as well as recognize Abu Dhabi radiation protection law

Who Should Attend?

This course provides an overview of all significant aspects and considerations of radiation protection for those who are willing to be a Radiation Protection Officer (RPO) such as safety officers, supervisors, engineers, inspectors and other technical staff.

Course Outline:

Day 1

- **Pre-Test**
- **Introduction to Radiation**

  Basic Physics of Radiation • Made all From Atoms • Made up Atoms • Atom Look Like • Two Important Properties the Atom • Radioactivity • Line of Nuclear Stability • Isotopes • Decay Mechanism • Radioactive Decay • Radon Series Decay Chain • Half-Life • The Exponential Decay Curve • Radioactive Decay – Half-lives • Radiation Characteristics • Videos • Radiation – Energy Concept • X-Rays• Neutron Radiation • Characteristic Radiation • Radiations and Their Ability to Pass Through Matter • Interact with Matter? • Products of Ionisation • Direct Effect Direct DNA Damage • Indirect Effect • Radiation Comes from? • Sources of Exposure • Two Sources of Radiation • Terrestrial Radiation • Cosmic Radiation • Cosmic Radiation Generation • Sources of your Background Radiation Exposure • Atom Bomb Tests • Typical Radiation Doses from Commonly Known Activities • Typical dose Rates Experienced • Typical dose Rates Experienced • Sources of Radiation • Industrial Sources • Sterilisation Sources • Laboratory Research • Well Logging

- **Radiation Effects**

  Discoveries and Health Effects • Radium Dial Painters • Radium Tonics, Quack Cures, Etc. • Atomic Bomb Survivors • Prompt Effects • Delayed Effects • Effects of Radiation at the Molecular and the Cellular Level • Deterministic Effects • Stochastic Effects • Radiation Effects • How can Radiation Damage DNA? • Deterministic Health Effects •

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Video • Examples of Deterministic Effects • Deterministic Health Effects • Skin Breakdown and Erythema • Deterministic Effects • Thresholds for Deterministic Effects • Threshold Values • The Graph • Stochastic Effects • Hereditary Effects • Embryo and Foetus • Pregnancy Risk • Radiation Total Dose Effects • Radiation Dose Effects in Plants and Animals

- **Radiation Detection and Measurement**

  Radiation Measurement Techniques • Detector Voltage Principles • Ionisation Chamber • Proportional Counter • Geiger Muller Tube • Generation of Avalanches within a GM Tube • GM Tube • Scintillation Detector • Scintillation Detector Operation • How does it Function in Practice • Contamination Probe • Matching the Detector to the Radiation • A Guide for Reference Only • Radiation Measurement Good Practice • Surface Contamination • Contamination Measurements • Meter Efficiency • Counts per Second • Becquerel per cm2 • Contamination Formula Contamination • Calculation • Making a Surface Swipe • Direct Measurement

- **Personal Dosimetry and Workplace Monitoring**

  Monitoring using a Radiation Dose Rate Meter • Not per Hour • Direct Measurement of Surface Contamination • Air Monitoring • Airborne Monitoring • Installed Contamination Air Monitoring System • Surface Contamination Monitoring Technique • Radiation Dosimetry • Individual Monitoring • Active Dosimeter • Passive Dosimeters • Film Badge • Thermoluminescent Badge (TLD) • Thermo Luminescent Dosimeters (TLD's) • Thermoluminescent Dosimeter

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Day 2

- **Health Surveillance and Medical Exposures**

  Health Surveillance • Adequate Medical Surveillance • Health Surveillance Records • Radiation Overexposures and Investigations • Overexposure • Need for Investigations • Investigation • Key Information for an Investigation • Returning to Work After Overexposure

- **Radiation Quantities and Measurements**

  Radioactivity • Radioactivity Units • Sizes of the Units • Prefixes • Radiation Units • Radiation Units: Activity • Specific Activity • Absorbed Dose • Equivalent Dose • Not all Radiations are the Same • Radiation Weighting Factors • Linear Energy Transfer (LET) • Effective Dose • Tissue Weighting Factors • Committed Effective Dose • Dose Records • National Radiation Dose Limits for the United Arab Emirates

- **Radiation Protection Practices and PPE**

  Organisation and Management • Qualified Expert • Radiation Protection Officer • Responsibilities • Methods of Protection • The Inverse Square Law • Calculating a Radiation Dose • Shielding • Personal Protective Equipment • Personal Protective Equipment Definition • Problem with PPE • PPE is the Last Resort •Type of Personal Protective Equipment • Gloves • Hard Hats • Fall Arrest Equipment • Fall Arrest Equipment Key Points • Over Suits and Lab Coats • Full Body Suits • Respiratory Protection • Respiratory Protection – Key Points • Visors and Eye Protection • Key Notes on Personal Protective Equipment

- **International Regulatory Framework and Concepts**

  Radiation Protection Objectives • IAEA Basic Safety Standards • JOL • Organisations • Basic Safety Standards • Occupational Exposure • Medical Exposure • Public Exposure • Planned Exposure Situations • Existing Exposure Situations • Emergency Exposure Situations • Regulatory Control • Regulatory Powers • Openness • RP Law • Duties of a Regulator

Day 3

- **Regulatory Control and FANR**
  - Legal Framework for Radiation Protection and the Safe Use of Radiation Sources
  - Safety Fundamentals
  - Safety Requirements
  - Safety Guides
  - National Regulatory Body of United Arab Emirates
  - Regulatory Structure
  - Who is Subject to the Regulation

- **Management and Safety Aspects of Nuclear Instrumentation**

  Why are we Monitoring Radiation • Where We Monitor • 4 Principle Requirements for Radiation Protection Instrumentation • Radiation Instrumentation • Hand Held Instrumentation • Typical Portable Instrumentation • Installed Instrumentation • Instrument Management • Instrument Maintenance • Maintenance • Oil and Gas Safety • Substitution Arrangements

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- **Industrial Irradiators**

  Industrial Irradiators and Calibration Devices • A Simple Sterilisation Irradiator • How the Irradiator Functions • Safety Systems on the Irradiator • Radiation Sources • Uses of Such an Irradiator • Blood Irradiator • Security of the Irradiator • Typical Security Measures Include • Large Industrial Irradiators • Industrial Irradiator Source Array • Beam Sterilisation Unit

- **Industrial Gauges**

  Industrial Gauges • Materials • Examples of Gauges • The Paper Thickness Gauge • Actual Installation with a Thickness Gauge • Using Radiation to Detect Fill • Can Fill Gauge • Liquid Makeup Density Checker • Gauge Method of Operation • Typical Gauge Installations • Gauges Installed and Labelled • The Radiation Sources Installed Within a Gauge • Working with Gauges and Problems Associated with Their Use • Some Very Bad Looking Gauges • Moisture Density Gauges • How they Work • Moisture Density Probe • Gauge Functions: Direct Transmission • Gauge Functions: Backscatter • About the Gauge • Portable M/D Gauges • Instrotek • M/D Gauges: Asphalt Content • M/D Gauge Design • Probe in Use • Neutron Scattering • Arriving at the Detector • Neutron Detection • Typical Radiation Results – Troxler • Problems with Moisture Density Gauges • What Happens when Things go Wrong • Safe Transport • Deployment of the Gauge • Signage for an Installed Gauge • Emergency Action

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Day 4

- **Industrial Radiography**

  Industrial Radiography • Radiography • Radiography Accidents • Enclosure Radiography versus Site Radiography • Site Radiography • Performing a Risk Assessment • Risk Assessment • Planning Radiography • Managing Site Radiography • Use and Maintenance of Equipment for Radiography • Maintenance • Local Rules • Optional Contents for Local Rules • Monitoring Arrangements During Radiography • Consulting a Radiation Protection Expert • What's the Problems with Industrial Radiography Sources • Important • Source Containers • Guide Tubes • Source Container Design • Collimators • Typical Industrial Radiograph • Gamma Alarms • Handling Tongs • Shielded Emergency Container • Lead Shot Bags • References • Well Logging • Well Logging Vehicle • Well Logging at the Source • Device Deployment • Typical Well Logging Source • Well Logging

- **Managing Contractors with Radiation Sources**

  Managing Contractors with Radiation Sources • They Are on Your Site • Your Arrangements • Role of your Radiation Safety Specialist • Employee Responsibilities • Typical Contents of a Safe System of Work • Key Things to Check • Personal Electronic Dosimeters • Radiation Dose Records • Dealing with Emergencies • Safe System of Work Controller Duty • Review

- **Radiation Source Storage and Accountancy**

  Radiation Source Accountancy and Storage • Radiation Sources • Radiation Storage Facilities • Source Storage • Radiation Source Store Construction • The store • Security • A Typical Source Store • Radiation Source Stores • Radiation Sources, Some Good Ones • Layers of Protection • Keys • Local Rules • Radiation Source Records • Radiation Source Leak Tests • Emergencies

- **Radiation Areas, Local Rules and Signage**

  Radiation Areas • Controlled Radiation Areas • Setting the Boundaries • Controlled Areas • Supervised Areas • Signage • Blue you must do • Warning Sign • Radiation Warning Notice • White on Green, The Safe Way To Go • Red on White, Fire Fire… • Prohibition Sign • Signs

Day 5

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- **Role of the Radiation Protection Officer**

  Radiation Protection Officer • Other Tasks of the RPO • Supervision • Maintenance of Records • RPO Duties • Issuing Dosimetry • Accident and Incident Investigation • What to Investigate? • Stages in an Accident/Incident Investigation • Interviews • Determining Causes • Determine What Changes are Needed • Recording & Analysing the Results • Reviewing the Process

- **Transport of Radioactive Sources**

  RAM Transportation Regulations • Regulations • Overview of Regulations for RAD Transport • IATA • Regulations • Rad. Prot. Program for RAM Transport • Emergency Response • Design Approval • Definitions • Package Types • Excepted Packages • Excepted Package Construction • Industrial Packages • IP-2 Container • Type A Packages • Type B Packages • Package Design & Tests – Type A & B • Content Limits – Type A & B • Content

Limits – Type A & B • Type C Packages • Content Limits for Type C Packages • Packages for Fissile Material & U Hexafluoride • Uranium Hexafluoride Shipment • Overpacks • Marking, Labeling & Placarding • Radiation Warning Labels • Category I – White • Category II - Yellow• Category III – Yellow • Package Warning Labels • Label Categories • Cargo Only Label • Identification Labels • More Labels • Questionable Labels • Placards • Placarding Transport Vehicles • Properly Placarded Vehicle • Shipping Papers • Sample Air Shipping Paper • Consignors Declaration • Notification of Competent Authorities • Segregation in Transit & Storage • Blocking & Bracing Packages • RAM Shipping Areas

- **Emergencies and Emergency Planning**

  Radiation Emergency • Type of Radiological Emergencies • Basic Concepts for Emergency Response • Emergency Planning & Preparedness • Emergency Plan Contents • Communication and Reporting • Not all Emergencies are the Same • Overview of Assessment and Response in a Radiological Emergency • Communication, Communication, Communication • Monitoring in a Nuclear Accident or Radiological Emergency • Out on Monitoring Duty • Intervention Levels • International Response • Emergency Equipment • Emergency Procedure • Response Action • Accidents Involving Contamination • Accidents Involving External Exposure • Accidents Involving Fire • Accidents Involving Fire • Accidents Involving Fire • Personnel Decontamination • Radiological Emergency Information • Contamination Treatments

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- **Safety Culture**

  What is Safety Culture? • IAEA Definition • INPO Definition • Nuclear Safety versus Radiological Safety • INPO Nuclear Safety Cultural Principles • Good Examples of Safety Culture??? • Tank incident

- **Course Conclusion**
- **COMPETENCY EXAM**

Course Certificate:

International Center for Training & Development (**ICTD**) will award a Completion certificate(s) and International Certificate from **IAOSHE** Certificate with wallet card to the participants who have successfully completed the course and passed the exam at the end of the training.

Course Fees:

This rate includes hotel training venue, participant's manual, hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day, completion certificate & wallet card and IAOSHE Certificate & Wallet Card.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionaires
- Group Work
- Discussion
- Presentation

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Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session