Radiation Safety Training
For Authorized Users with Industrial X-ray Units
2-Hours

SYLLABUS

PRESENTED BY:
Applied Environmental Consulting, Inc.

COURSE OVERVIEW

Radiation History & Fundamentals
Radiation Units and Terminology
Types of Radiation emissions and X-ray production
Radiation exposures & dose effects
Radiation protection factors
Measuring/Monitoring devices
Administrative controls & postings
Handheld devices
Emergency procedures

MATH REVIEW

Inverse Square Law
Radioactivity
Time, Distance and Shielding

HISTORY OF RADIATION DISCOVERY, HISTORICAL EVENTS & EMERGENCE OF REGULATORY AGENCIES

The Beginning Big Bang Theory
Forming Elements
Discovery of Radiation
- Henri Becquerel
- Wilhelm Roentgen
- Madam Curie
- (Plus others)

Development of Nuclear Technology
- Manhattan Project
- Albert Einstein
- Enrique Fermi

RADIATION FUNDAMENTALS

Energy Spectrum
- Ionization
- Non-Ionizing

Atomic Structure
- Nuclear
- Proton

Unstable Atoms

Radiation Protection Principles
- Non-Ionization

RADIATION UNITS & TERMINOLOGY

The Bohr Model
Protons
Neutrons
Electrons
Atomic Weight

TYPES OF RADIATION EMISSIONS AND X-RAY PRODUCTION

Types of Radiation
Radiation Protection Principles
Creating X-rays
Applications of X-rays
Industrial Applications of X-rays

- Units for Disintegrations
  - Radioactivity
  - Disintegration
  - Disintegration per Unit Time (dps, dpm)
  - Curie
  - Becquerel
  - Total Activity
  - Specific Activity/Activity Concentration
  - Background vs. Contamination

RADIATION EXPOSURE & EFFECTS

- Energy Disposition in Air
  - Interactions
  - Ionizations
  - Excitation
  - Energy Deposition in Air
  - Roentgen
  - Exposure Rates
- Energy Disposition in Matter
  - Dose
  - Linear Energy Transfer (LET)
- Energy Disposition in the Body
  - REM
  - Sievert
  - Dose rates
- Sources of Dose
  - External
  - Internal
  - Man-made and Natural
  - Medical Radiation
  - Radon
- Types of Dose
  - Acute
  - Fractionated
  - Chronic

- Types of Dose Effects
  - Somatic
  - Genetic
  - Teratogenic
- Variable in Dose Effects
  - Amount of Dose
  - Critical Organ
  - Type of Radiation
  - Individual Biological Variations
  - Radio sensitivity and Radio resistance
- Types of biological effects in The Cell
  - Types of Biological Variations
  - Radio sensitivity and Radio resistance
- Types of Risks
  - Definition
  - Comparisons with other types of risks
- Causes of dose
  - Stochastic
  - Non-Stochastic

RADIATION PROTECTION FACTORS

- ALARA As Low As Reasonably Achievable (ALARA)
- Time, Distance and Shielding
- Inverse Square Law
  - Practical Problem

MEASURING RADIATION AND PERSONNEL MONITORING

- Types of Portable Survey Meters
  - Ion Chamber
  - Geiger Mueller Probes
  - Scintillation Detectors
- Calibration of Radiation Survey Meters
- Monitoring External dose

- Personnel Monitoring Devices
  - OSLDs/TLDs/Film Badges
  - Pocket Dosimeters
- Active Monitors (reading real time)
  - Pocket Ion Chamber
- Principles of Exposure Control

ADMINISTRATIVE CONTROLS AND POSTINGS

- Radiation Protection Program
- Training of New Personnel
- Monitoring Options and Procedure
- ALARA Radiation Workers
- Notice to Employees
- Postings
- Radiation Detection

HANDHELD X-RAY UNITS

- X-ray
- Handheld Analyzers
  - Purpose
  - Safety Procedures/Features
  - Radiation Hazards
  - Precautions

EMERGENCIES

- Case Histories of X-ray Accidents
- Emergencies Producers