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