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To:	Lizette Roldan	**From:**	David Durkee
Fax:	(610) 337-5269	**Pages:**	6
Phone:	(610) 337-5237	**Date:**	2/23/07
Re:	Montclair NRC License Renewal	**CC:**	
	140094/ref 139355		

☐ **Urgent** x **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

● **Comments:**

Hello Ms. Roldan,

As requested, I am forwarding a copy of Ms. Amy Ferdinand's Radiation Safety Officer Training certificate along with a copy of the training syllabus. Please contact me if you have any questions.

Sincerely,

David Durkee

140094
NMSS/RGN1 MATERIALS-002

Certificate of Training

This is to certify that

Amy Ferdinand

completed 40-hour

Radiation Safety Officer Training

conducted the week of February 19, 2007
by Radcor, LLC

David J. Durkee
Radcor, LLC

RADIATION SAFETY OFFICER

COURSE OUTLINE

Prerequisite: None

1.THE ATOM

Atomic Structure
Elements
Isotopes

2.TYPES OF RADIATION

Radiation
Alpha Particles
Beta Particles
Gamma and X-rays
Neutrons
Units of Radiation Energy

3. RADIOACTIVITY AND DECAY

Radioactivity
Decay
Half-life: the rate of radioactive decay
  Decay constant
Decay Equation
Conservation of Mass, Charge, and Energy
Methods Of Radioactive Decay
Alpha decay
Beta decay
  Beta minus
  Positrons
Gamma rays
X rays
Isomeric transition
  Internal conversion
  Auger electrons
Electron capture
Chart of the Nuclides
Decay Data Tables
Radioactive Series

4.UNITS OF MEASURE

Radioactivity
The curie
Subunits of the curie
Radiation
Radiation exposure *vs.* radiation dose
Radiation exposure: the roentgen
Absorbed dose: the rad
Dose equivalent: the rem
Dose and dose rate
Determination of dose and dose rate
Source Activity *Vs.* Gamma Exposure Rate
Cpm *Vs.* Dpm
Specific Activity
SI Units

5. RADIATION INTERACTIONS WITH MATTER

Charged Particle Interactions
Ionization
Excitation
Bremsstrahlung
Photons
Photoelectric effect
Compton scattering
Pair production
Neutron Interactions
Fast/slow neutron interactions

6.BACKGROUND RADIATION

Introduction
Cosmic Radiation
Radioactivity of the Earth
Radioactivity Of Air
Radioactivity Of Water
Radioactivity in the Human Body
Artificial (Manmade) Radioactivity
Medical and dental exposures
Nuclear reactors
Transportation
Low level waste storage
Nuclear reactor accidents
Summary

7. APPLICATIONS

X Ray Machines
Production
Filtering
Medical Radionuclides
Diagnosis
Therapy (radiation oncology)
Linear accelerators
Nuclear Reactors
Boiling water reactor
Pressurized water reactor
Nuclear fuel
Safety
Radiation Sterilization
Other Industrial Sources
Isotopic neutron sources
Oil well logging
Level and density gauges

8. BIOLOGICAL EFFECTS

Introduction
Cell Damage
Acute And Delayed Effects
Somatic And Genetic Effects
Linear Or Threshold
Stochastic And Nonstochastic Effects
Summary

9.PERSONAL DOSIMETRY

Dose Limits
  Definitions
  10 CFR 20 occupational dose limits
Pregnant workers
Minors
Non-radiation workers
Violations
ALARA
Personal Dosimetry
Badge placement
Film badge
Thermoluminescent dosimeter (TLD)
Pocket ion chambers
Chirpers and alarming dosimeters
Neutron dosimeters
Control badges
Regulatory Guide 8.13

10.RADIATION DETECTION AND MEASUREMENT

Gas-filled Detectors
Pulse size considerations
Ionization chambers
Proportional counters
Limited proportionality region
Geiger-Müeller (GM)
Continuous discharge region
Solid State Detectors
Scintillation detectors
Semiconductor detectors
Detector Applications
Portable survey meters
  Calibration programs
Laboratory instruments
Portal monitors
Personnel contamination monitors
Whole body counters
Basic Radiation Spectroscopy
  Spectrometer
  Single and multi-channel analyzers

11.REGULATIONS AND GUIDES

History Of Protective Standards
ICRU, ICRP, and NCRP
Radiation exposure concerns
Basic recommendations
Federal policy
Regulating agencies
Other Organizations
Regulations And Guides
10 CFR 19
10 CFR 20
10 CFR 30
    10 CFR 40
10 CFR 70
10 CFR 71
10 CFR 74
    Regulatory guides
NUREGs
American National Standards Institute (ANSI) Standards
Information notices

12.EXTERNAL EXPOSURE CONTROL AND SURVEYS

ALARA
10 CFR 20
Current ALARA-related regulatory guides
Radiation Exposure Control
    Time
    Distance
    Shielding
Administrative Controls
    Radiation work permits
Access Control
10 CFR 20
Posting and Control
    10 CFR 20
Surveys
    10 CFR 20
Survey Form Contents
Regulatory Guide 8.21

13.DISTANCE AND SHIELDING

Distance
Point sources
Line sources
Plane sources
Shielding
Beta
Gamma
Neutron

14.CONTAMINATION CONTROL

Radiation Vs. Contamination
Survey Methods
Loose contamination
Total contamination
Wipe Test Evaluation
Statistical Considerations in a Counting Program
    Accuracy and precision
    Normal probability distribution
Standard deviation
Confidence levels
Minimum detectable count rate (MDCR)
Minimum detectable activity (MDA)
    Changing the MDA
Survey Frequency And Limits
Protective Clothing
Self-Frisk
Personnel Decontamination
Skin Dose Assessment
Skin dose calculation
Documentation
Survey Documentation
Posting and Control of Contaminated Areas
Equipment And Area Decontamination

15.AIR SAMPLING AND EVALUATION

Types Of Airborne Contaminants
Sample Collection
Air Sample Accuracy
Total sample volume
Efficiency of collection medium
Counting efficiency
Representative sample
Calculation Of Airborne Concentrations
Lower Limit Of Detection (LLD)

16.INTERNAL EXPOSURE CONTROL AND DOSE ASSESSMENT

ALARA
Annual Limit On Intake (ALI)
Derived Air Concentration
  Derived air concentration-hour
Assessing Body Burden
Bioassay Methods
Whole body counting
Radiourinalysis
Fecal analysis
Bioassay Programs
Calculating Internal Dose
Examples of Dose Calculations
Removing Internal Contamination
Required Postings
Airborne radioactivity area
Regulatory Guide 8.20
Regulatory Guide 8.32

17.RADIOACTIVE MATERIAL HANDLING, CONTROL AND DISPOSAL

Definitions
Sealed source
Source material
  Special nuclear material
Regulations And Procedures
10 CFR 20
10 CFR 30
10 CFR 40
10 CFR 70/74
Exempt vs. Nonexempt Quantities of Radioactive Material
Responsibilities
Use And Precautions
Labeling
Master Index
Leak Testing
Storage Limitations
Disposal
Receiving Packages
Container Labels
Exemptions From Labeling Requirements
Disposal Of Empty Radioactive Material Containers
Storage And Control
Posting
Exceptions From Posting Requirements
Loss or Theft of Licensed Material
Industry Events
Radioactive Waste - Definition
Radwaste Minimization
Radwaste Treatment
Storage for decay
Evaporation
Dilution and release
Filtration and deionization
Incineration
Compaction
Solidification
Waste Disposal
  Disposal facilities
Packaging
Physical form
  Strong tight containers
Type A containers
Type B containers
Warning labels on packages
  Contamination limits on packages
Radiation limits during transport
Vehicle placarding
Other methods
Source Handling Incidents
NRC Information Notice 88-32
NRC Information Notice 90-35
Emergency Planning

18.LICENSE REQUIREMENTS AND THE RADIATION PROTECTION PROGRAM

Radiation Protection Program
  ALARA
  Procedures
  Training
  Document Posting
  Surveys
  Legal Aspects
Procedural Compliance