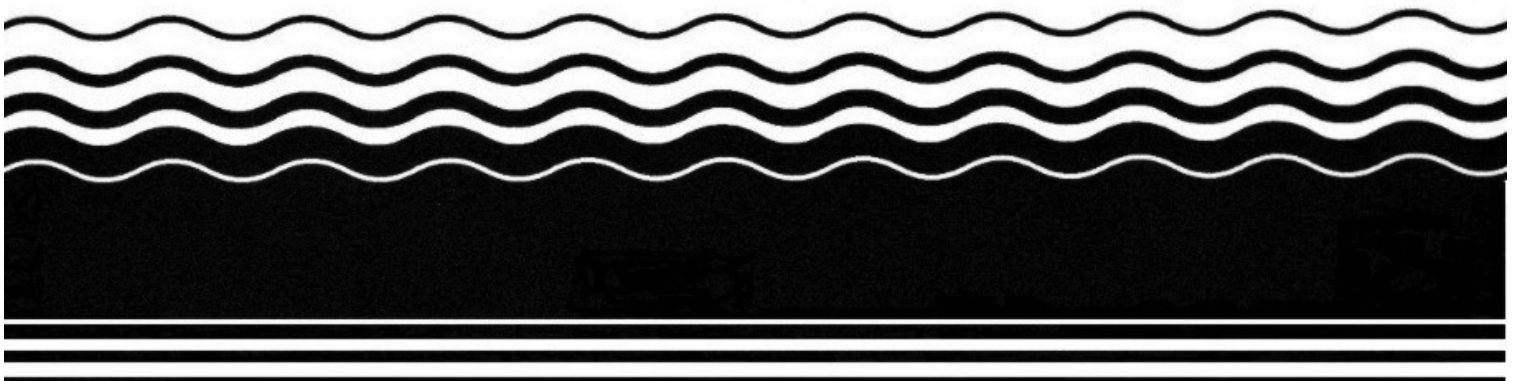

Superfund



Advanced Radiation Safety For EPA Emergency Responders

Student Manual





Why Are You Here

- To help meet your radiation safety training requirements for U.S. EPA Emergency Responders.
- Basic, Advanced, and Refresher radiation safety training are requirements; and are documented in SHEMP 38, the Emergency Responder H & S Manual, and Regional CORE National Approach to Response (NAR).

Introduction

- Participants who attend this course are expected to have met the basic radiation safety training (BRST) requirements for emergency responders.
- Employees should complete BRST before, or at the time of his/her enrollment into the personal monitoring program.

Introduction / Course Objectives

Introduction

This course is designed to meet the advanced radiation safety training (ARST) requirements for emergency responders as stated in U.S. EPA Safety, Health and Environmental Management Program (SHEMP) Guide 38 - Radiation Safety and Health Protection Program, and the U.S. EPA Emergency Responder Health and Safety Manual – Radiation Safety Program.

Introduction

Emergency Responders must complete ARST prior to (1) entering an emergency response situation in which ionizing radiation might be encountered or (2) managing a removal site where the potential for the presence of ionizing radiation exists.

Introduction

- ⚠ EPA Radiation Safety Refresher Training is required every two years.
- ⚠ For EPA facilities with an NRC license, annual refresher training may be required.
- ⚠ All required EPA radiation safety training courses also require the successful completion of an exam with a passing score of 80 percent or higher.

Introduction / Course Objectives

Course Materials

- Student Registration Card
- Course Agenda
- Student Evaluation Form
- Student CD
- Course Exam

Course Objectives

- Discuss procedures and techniques that have been established for using radiation detection equipment.
- Discuss initial site surveys, and perform radiation surveys safely.
- Implement procedures for securing expert radiation safety or health physics assistance.

Course Objectives

(continued)

- Identify work practices and supervisory techniques that can be used to ensure employee exposure is as low as reasonably achievable.
- Discuss procedures for allowing exposures that may exceed the Administrative Control Level of 500 mrem per year.
- Identify EPA radiation response resources and assets.

Radioactive Sources Used In This Course

- ☼ ^{60}Co – beta/gamma
- ☼ ^{137}Cs – beta/gamma
- ☼ ^{230}Th – alpha/gamma
- ☼ ^{241}Am – alpha/gamma
- ☼ ^{204}Tl – beta
- ☼ ^{90}Sr – beta
- ☼ ^{99}Tc – beta

Source Use and Health-Related Considerations

Instructional methods include the use of low level radioactive sources. Participants should be aware that, at arms length from any of the sources, there is virtually no exposure to participants.

The actual dose to participants from exposure to the radioactive sources for all practical purposes is negligible.

For your safety . . .

Please speak with the Course Director regarding any health concerns that may prohibit your direct participation in course exercises.

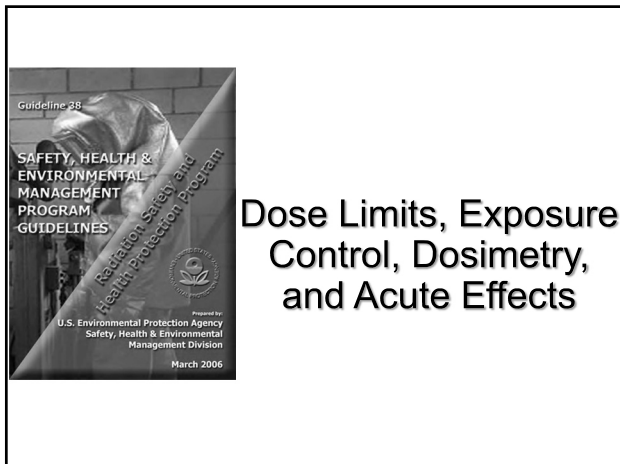
Introduction / Course Objectives

Please...

In consideration of
your fellow students
and the instructors,
please silence all cell
phones and pagers











Student Performance Objectives

- ♣ State the three principles of the dose limitation system
- ♣ Identify the exposure limits for occupational workers
- ♣ State at least one dose limitation technique
- ♣ Explain the difference between internal and external dosimetry

Student Performance Objectives

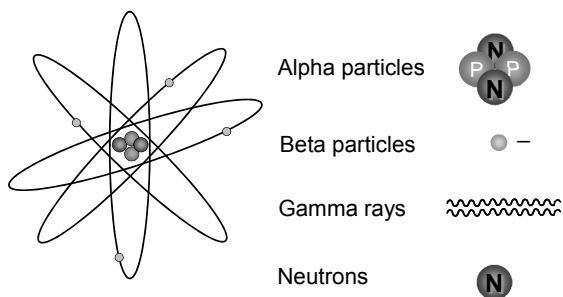
(continued)

-  Describe EPA external exposure dosimetry requirements
-  Describe EPA internal exposure monitoring provisions
-  Describe EPA dose recording requirements
-  Explain the significance of the EPA turnback levels

Radiation Review



Types of Ionizing Radiation



Types of Ionizing Radiation

(continued)



Alpha Particles

- Non penetrating – typically stopped by clothing or dead layer of skin
- Not a an external exposure hazard
- Considered an internal hazard – damaging if alpha emitting material inhaled or ingested
- Of most concern as airborne contamination (inhaled or deposited on food and ingested)

Types of Ionizing Radiation

(continued)



Beta Particles

- Moderately penetrating – may penetrate skin or lenses of eye
- Shielded by PPE (e.g., gloves, safety glasses, face shield)
- External skin-dose hazard
- Most damaging if beta emitting material inhaled or ingested

Types of Ionizing Radiation

(continued)



Gammas and X-rays

- Highly penetrating – may penetrate to expose internal organs
- Shielding requires dense materials such as lead, steel, high-density concrete
- Whole body hazard
- Gamma emitting radionuclides are a hazard externally and when inhaled or ingested

Types of Ionizing Radiation

(continued)



Neutrons

- Highly penetrating
- Shielding requires materials containing hydrogen, e.g., water, paraffin, and plastics
- Typically encountered at operating nuclear reactors, in neutron sources, or accelerators
- Typical industrial uses may include well logging sources and moisture density gauges

Units of Dose Measurement



Roentgen (R): A measure of charge produced in air by "X" and "gamma" rays. Used as an exposure measurement



rad (absorbed dose): the amount of energy absorbed in material (usually tissue)



rem (dose equivalent): the product of the number of rads times the quality factor (QF)

Quality Factor

A numerical value multiplied by the absorbed dose (rad) to determine the dose equivalent (rem).



rad x QF = rem



gamma: QF = 1; 1 rad x 1 = 1 rem



beta: QF = 1; 1 rad x 1 = 1 rem



neutron: QF = 10 (unknown energy);
1 rad x 10 = 10 rem

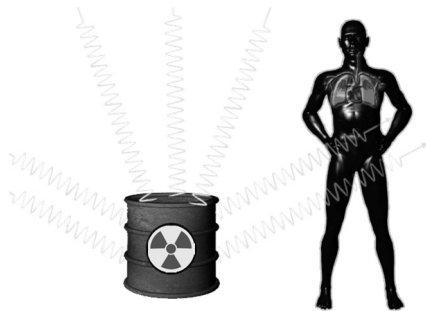


alpha: QF = 20; 1 rad x 20 = 20 rem

Radiation Exposure

- ☞ Radiation exposure relates to ionizing radiation interacting with the body
- ☞ Being exposed to radiation does not normally make an individual radioactive
- ☞ An individual exposed to radiation is not a hazard to others and cannot spread radiation

Radiation Exposure



Radioactive Contamination

- ☞ Contamination is radioactive material present where it isn't wanted
- ☞ Radioactive contamination emits radiation and can result in radiation exposure
- ☞ Contact with contamination can contaminate an individual or equipment and spread contamination to "clean" areas
- ☞ Contamination can be on a surface; mixed throughout a medium, such as soil or water; or suspended in the air
- ☞ Contamination can lead to external and internal contamination

Radioactive Contamination





Internal Contamination



DOSE LIMITATION



Dose Limits Origins

- ♣ International Commission on Radiological Protection (ICRP)
- ♣ National Council on Radiation Protection and Measurements (NCRP)
- ♣ Radiation Protection Guidance for Federal Agencies for Occupational Exposure (52 FR 2822)
- ♣ U.S. EPA Safety, Health and Environmental Management Program (SHEMP) Guideline 38, "Radiation Safety and Health Protection Program"

U.S. EPA Dose Limitation



Guidelines Established in:

U.S. EPA Safety, Health and Environmental Management Program (SHEMP): Guide 38 – "Radiation Safety and Health Protection Program"

Dose Limitation System

- Based on three principles:
- Justification – No planned exposure without expectation of benefit
- Optimization - must make a sustained effort to keep individual and occupational doses ALARA
- Limitation – occupational doses should not exceed Administrative Control Levels

Administrative Control Level

- Administrative Control Level (ACL)
- Established for U.S. EPA employees enrolled in program
- ACL of 500 mrem/year
 - any 12 consecutive months
 - limit radiation to 500 mrem for any 12-month period

ACL Waivers and Exceptions

- Applicable during emergency response
- Critical work - 5 rem
- Single planned event to protect valuable property - 10 rem
- Life-saving or protecting large populations - 25 rem
- Life-saving or protecting large populations (voluntary) - >25 rem

Note: Refer to SHEMP guide 38 pages 25 through 27 for information on waivers and exceptions

ACL Waivers and Exceptions

(continued)

Work performed under a waiver becomes part of the employee's cumulative dose record, but is not included in the 12-month ACL calculation.

Action Reference Level

- AA Action Reference Level (ARL)
- AA Established for U.S. EPA employees
- AA ARL of 50 mrem/quarter
- AA An ARL exceedance requires an investigation
- AA May be an indicator of poor practices or procedures
- AA Not a dose limit

Dose Limit for Pregnant Workers

- AA Can be applied to any female worker with reproductive concerns who declares pregnancy in writing
- AA Can not legally restrict activities if not declared
- AA Voluntary participation, can revoke at anytime
- AA No change in ACL or ARL (per gestation period)
- AA Increase monitoring from quarterly to monthly
- AA Self-reading dosimeter required

ALARA

- ☼ ALARA (As Low As Reasonably Achievable)
Principle that radiation doses should be kept to a minimum using all reasonable methods
- ☼ Time - limit the time of exposure
- ☼ Distance - maximize the distance between an individual and the source of radiation
- ☼ Shielding – use appropriate radiation absorbing material (shielding) to reduce personnel exposure

Emergency Exposure Guidance "Turnback Levels"

Time Period	Stop-and-Check	Condition
Early Phase	10 R/h	Voluntary, with supervisor review, for lifesaving or critical actions ONLY – evaluate anticipated doses against dose limits above
Intermediate Phase	1.5 R/hr	Dose management imperative
Late or Recovery Phase	Site-specific according to site health and safety plan	EPA Action Reference Level: 50 mrem/quarter and Administrative Control Level: 500 mrem/year

Important: Dose Management should begin at 1 millirem per hour (1 mR/hr)

Emergency Exposure Guidance (Dose Management)

- ☼ Dose Management should always begin at 1 millirem per hour (1 mR/hr)
- ☼ This guidance is directed in SHEMP guide 38, page 27 and Appendix C; and also in the Radiation Chapter of the Emergency Responder H&S Manual, Appendix J
- ☼ This guidance could be set even lower at supervisor or health physics discretion

Respiratory Protection and Surface Contamination Levels

- SHEMP 38, Appendix C contains
 - surface contamination turnback levels
 - respiratory protection requirements
 - protective clothing requirements
- Measuring fixed surface contamination in radiation fields may not be possible

DOSIMETRY

Dosimetry Requirements

- Any individual who is issued a dosimeter by the EPA is required to wear it at all times when in any EPA work area with a potential for radiation exposure levels above background.
- Dosimeters issued by the EPA must be worn while on EPA business.
- When not in use, they must be appropriately stored to prevent damage and inadvertent exposure.

Thermoluminescent Dosimeters

- Thermoluminescent dosimeter (TLD) – standard device used for personnel monitoring by EPA
- TLDs are the dosimeters of record
- Monitor external exposure – standard TLDs indicate whole-body exposure
- TLDs typically used by EPA monitor gamma, x-ray, and some beta radiation



Thermoluminescent Dosimeters (continued)

- Passive devices – they do not provide a real-time dose measurement
- Typically worn for one calendar quarter then read to determine dose and exchanged for new TLDs
- May be exchanged more frequently under special circumstances

Special Dosimeters

- Special TLDs sensitive to neutrons and alpha radiation may be used in some circumstances.
- Extremity TLDs (ring, wrist) may be used to monitor extremities (hand, feet) exposure.
- Self-reading dosimeters that provide real-time indication of exposure may be used.
- Self-reading dosimeters may be equipped with alarms to indicate elevated exposures.

Self-Reading Dosimeters

- ☼ Pocket ion chamber or electronic
- ☼ Not the dosimeter of record
- ☼ Electronic SRDs can have dose and dose-rate alarms set by Radiation Safety Officer
- ☼ EPA standard SRD is Siemens EPD Mk2 with 50 mrem and 25 mrem/hr default alarms

Self-Reading Dosimeters (continued)



Pocket ion chamber (SRPD)

Electronic personal dosimeter (EPD)



Handling a Dosimeter

- ☼ Wear standard dosimeter between neck and waist, unless directed otherwise by RSO
- ☼ Wear TLD with sensitive side away from body (check with RSO, if uncertain)
- ☼ Do not wear another person's dosimeter
- ☼ Do not wear TLD outside of work area

Handling a Dosimeter

(continued)

- AA When not in use, store TLD in area with background levels of radiation
- AA Do not allow TLD to be x-rayed (metal detectors are OK)
- AA Never put TLDs in checked baggage.
- AA Store control TLDs with others in a background area
- AA Do not store control TLDs in a lead shield

Internal Dosimetry

- AA An internal dose can be received through inhalation, ingestion, or dermal contact with radioactive materials
- AA TLDs do not measure internal dose
- AA Internal exposure monitoring instituted under special circumstances (e.g., very high airborne concentrations)
- AA Internal dosimetry includes whole-body counting and bioassay (bioassay may include blood, urine, and feces samples)

Visitor Dosimetry

- AA Visitors to a radiological work area may include non-enrolled EPA employees
- AA Must sign a consent form
- AA Must wear a dosimeter
- AA EPA must notify visitor if TLD records a dose

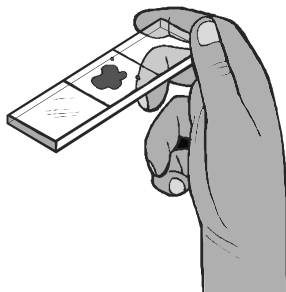
Dosimeter Use Log

- Maintained by radiological worker to collect information for investigations
- Minimal content: date and location of entries into radiological areas
- Recommended for all excursions into radiologically controlled areas
- When an ARL has been exceeded and the cause remains undetermined, the log is mandatory

Dosimetry Records

- Administrative infrastructure for dose recordkeeping provided by the Safety, Health, and Environmental management Division (SHEMD) of the Office of Administration and Resource Management (OARM)
- SHEMD provides quarterly (or more frequent) notice of dose to all enrolled employees and visitors

Acute Biological Effects



Acute Effects of High Radiation Doses

- AA Acute dose is received in a short period; typically less than one day
- AA Acute dose of less than 5 rem is generally considered to have no short-term effect
- AA Acute doses may also lead to long term effects such as cancer, teratogenic and genetic mutations

Acute Effects – SHEMP Guide 38, Appendix C, Table 5

Table 5

Table 5: Potential Biological Effects of High Doses of Radiation in a Short Time Frame		
Dose (Rad)*	Dose	Potential Biological Effects
1,000	1,000,000 mR	death due to central nervous system damage within hours
350	350,000 mR	No treatment: death within 60 days for 50% of exposed population (with treatment, up to 800 Rad)
300	300,000 mR	female sterility
200	200,000 mR	male sterility
100	100,000 mR	nausea
25	25,000 mR	detectable blood changes
15	15,000 mR	temporary decreased sperm count

*For x and gamma radiation, Rad ~ rem ~ Roentgen (R). Note that these are total doses that if received over a very short timeframe, may manifest harmful biological effects. If large doses are received over longer timeframes, biological effects may or may not be manifested.

Acute Effects of High Doses

Dose (rad)	Health Effect	Time to Onset and Recovery
5 – 25	No clinical effects; minor short-term changes in blood chemistry.	
25 – 100	Short-term reduction of some types of blood cells; mild nausea and fatigue at higher doses; disabling injury uncommon.	Observable effects, if any, within 2 - 3 weeks; recovery within a few weeks after onset.
100 – 200	Nausea, fatigue, diarrhea, vomiting (at higher doses), long-term blood changes.	Some effects within days; others within 2 weeks. Recovery typically within a few weeks.
200 – 300	Appetite loss, general malaise, sore throat, pallor, diarrhea, and moderate emaciation.	Some effects first day; others after about 2 weeks. Recovery within about 3 months.

Acute Effects of High Doses (continued)

Dose (rad)	Health Effect	Time to Onset and Recovery
300 – 600	More severe, bleeding, inflammation of mouth and throat, and emaciation; possible death (up to 50%)	Effects first day to 2 weeks. Some deaths within 2 - 6 weeks; survivors recover in about 6 months
600 – 1,000	Destruction of intestinal lining, internal bleeding and death (up to 100%).	Some effects within hours, death as early as 1 - 2 weeks.
2,000	Above acute effects, damage to central nervous system, loss of consciousness, and death (about 100%).	Effects within hours, death may occur within days.

Effects of Chronic Radiation Dose

- ☞ Small amounts of radiation received over a long time period (may result in cancer)
- ☞ Body has time to repair damage

QUESTIONS ?



Student Performance Objectives

- ☼ List at least two components of radiation detection instruments
- ☼ Identify at least two major types of radiation detection instruments
- ☼ Identify and describe the following components of a gas ionization detector: anode, cathode, and window
- ☼ Identify the six-region pulse height curve, and identify the three regions used for radiation detection

Student Performance Objectives

- ☼ Identify characteristics of the Geiger-Mueller counter
- ☼ Describe scintillation detectors
- ☼ Identify at least two major factors for selecting proper radiation monitoring instruments

Basic Components of Radiation Instruments

- ☼ Sensing element
 - Detector
- ☼ Indicating element
 - Meter
 - Speaker
 - Alarm
- ☼ Power supply

Types of Radiation Detection Instrumentation

- ☼ Gas ionization
- ☼ Scintillation
- ☼ Semiconductor

Radiation Interaction with Radiation Detection Instruments

- ☼ Ionization
 - Radiation interactions result in free electrons
 - The electrons are attracted toward the positive electrode (anode)

Radiation Interaction with Radiation Detection Instruments



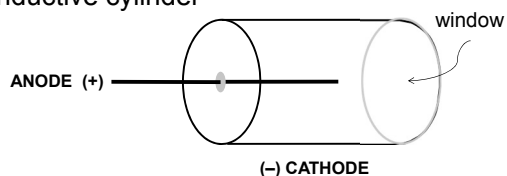
Excitation

- Radiation interactions cause electrons from an inner shell to jump to an outer shell
- The electrons drop back to their original shell, and photons are emitted
- The photons are detected by a photomultiplier tube

Gas Ionization Detectors Principles of Operation

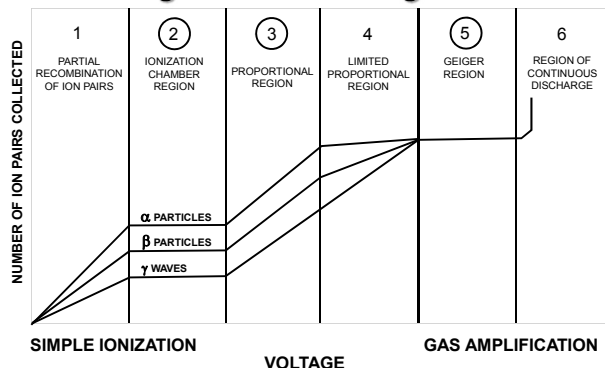


Detector – a gas filled, electrically conductive cylinder



Window – allows penetration by particles

Gas Ionization Detectors Six Region Pulse Height Curve



Ion Chambers

- ☢ Operate in the Ionization Chamber Region of the Pulse - Height Curve
- ☢ Advantages
 - Good for exposure monitoring
 - Can differentiate types of radiation
 - Designed to be easily portable
- ☢ Disadvantages
 - Least sensitive type of gas detector

Proportional Counters

- ☢ Operate in the Proportional Region of the Pulse - Height Curve
 - Can differentiate between alpha, beta, and gamma radiation
 - Need stable HV power supply
- ☢ Sealed proportional counters
- ☢ Gas flow proportional counters

Geiger-Mueller Counters

- ☢ Gas-Filled detector that operates in the Geiger Region of the Pulse-Height Curve
 - Advantages
 - ✓ Inexpensive: more simple HV and amplification
 - ✓ Easy to operate
 - ✓ Reliable
 - ✓ Can detect alpha, beta, and gamma
 - ✓ Very sensitive to beta
 - ✓ Less sensitive to gamma but still acceptable

Geiger-Mueller Counters

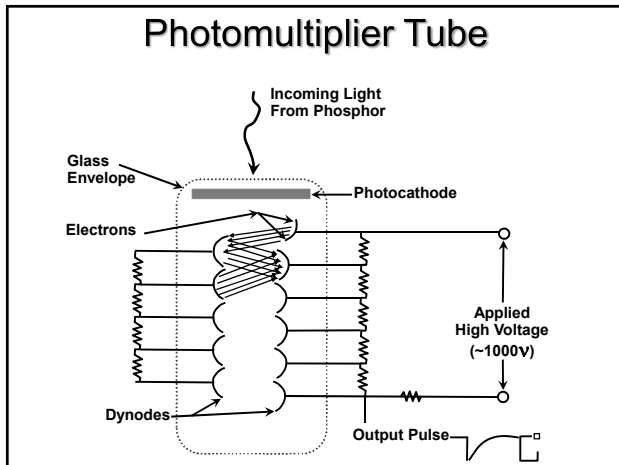
- Disadvantages
 - ✓ Cannot distinguish beta, gamma (except when using a beta shield on the detector window)
 - ✓ Must be quenched to prevent continuous discharge

Scintillation Detectors

Ionizing radiation interacting with certain phosphors in the detector creates emissions of visible light photons

Types of Scintillation Detectors

- ☼ Inorganic
 - NaI: Detects gamma and x-ray
 - ZnS: Detects alpha
 - ☼ Liquid organic
 - Used for low energy beta emitters
 - Counting efficiency approaches 100%
 - ☼ Plastic
- All require photomultiplier tube



Semiconductor Detectors

- ⚠ Made from diode-like materials
- ⚠ Collect electron-hole pairs
- ⚠ Used for spectroscopy
- ⚠ Most types require liquid-nitrogen temperatures
- ⚠ Primarily laboratory instruments, but some are for field use by experts
- ⚠ Examples: HPGe, Si(Li), silicon diodes

Considerations for Selecting Instruments

- ⚠ Type of radiation
- ⚠ Purpose of measurement
- ⚠ Range/sensitivity
- ⚠ Accuracy/precision
- ⚠ Energy resolution

Survey Instrument Selection

Type of Radiation

- ☼ Alpha: proportional counter, ZnS scintillator
- ☼ Beta: proportional counter, G-M tube, liquid scintillation
- ☼ Gamma: G-M tube, ion chamber, NaI
- ☼ Neutron: BF3 proportional counter

Instrument Selection

Purpose of Measurement

- ☼ Exposure rates: ion chamber, G-M, NaI
- ☼ Quantify contamination: proportional counter, G-M, ZnS

Instrument Selection

Range/Sensitivity

- ☼ Low intensity exposure: NaI, G-M
- ☼ High intensity exposure: ion chamber, G-M

Instrument Selection

Accuracy/Precision

- ☞ Detection versus measurement
- ☞ Sensitivity and lower limit of detection
 - Field instruments
 - Laboratory instruments

Instrument Selection

Energy Resolution

- ☞ The ability of a detection system to separate or identify two nearly identical energies.
- ☞ Important for isotope identification and quantification

Instrument Selection

Energy Resolution

- ☞ Ion chamber: no resolution
- ☞ Gas proportional counter: poor resolution
- ☞ NaI: good resolution
- ☞ HPGe: excellent resolution
- ☞ Most others: no resolution

General Instrument Detection Property



Dead Time

- The minimum time required between radiation interactions with the detector for them to be registered as two separate pulses

Getting the Right Answer

Calibration



Instrument calibration

- Meter to read correctly in cpm, dpm, and exposure rates
- Performed by specialists



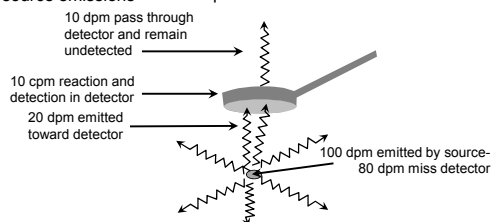
Efficiency calibration

- Relates cpm to dpm
- Performed by user when needed

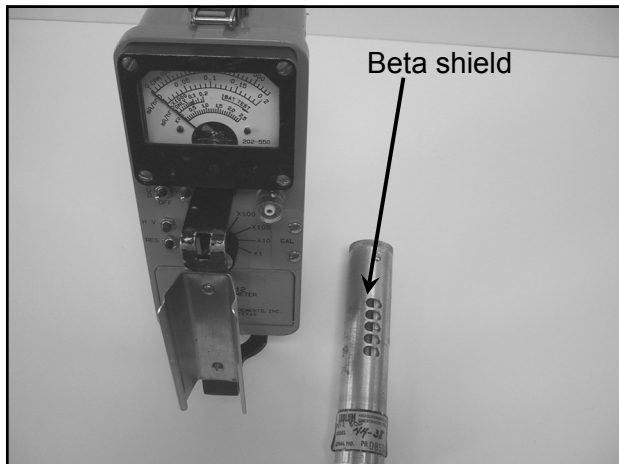
Instrument Efficiency

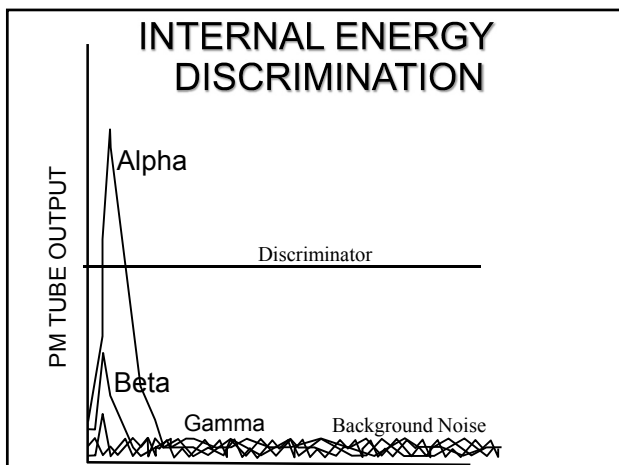
Absolute efficiency

$$E_a = \frac{\# \text{ pulses recorded}}{\# \text{ of source emissions}} = \frac{10 \text{ cpm}}{100 \text{ dpm}} = 0.1$$



Some detectors use an
External Absorber
for energy discrimination










RADIATION DETECTION INSTRUMENTS

National Buy List:

- Equipment procurement initiative
- Provide upgrade to radiation detection instrumentation
- Designed to bring consistency (standardization) throughout U.S. EPA Regions
- Periodically updated (refer to EPA-ERTG)

Equipment Operating Guides

-  Emergency Response Technical Group (ERTG) provides equipment updates and guidance. Website: epaossc.org
-  Radiological Response Standard Operating Procedures (RRSOP)
-  Course CD – References
 - EOGs
 - QSGs
 - RRSOPs

RADIATION DETECTION INSTRUMENTS

On national buy list:

- ☛ Ludlum Model 192 microR meter
 - Low level gamma dose rate meter
 - Internal 2" x 1" NaI detector
 - Has visual and audible alarm functions

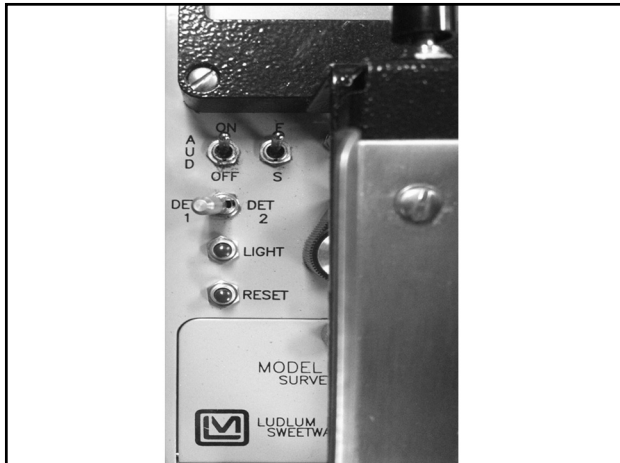


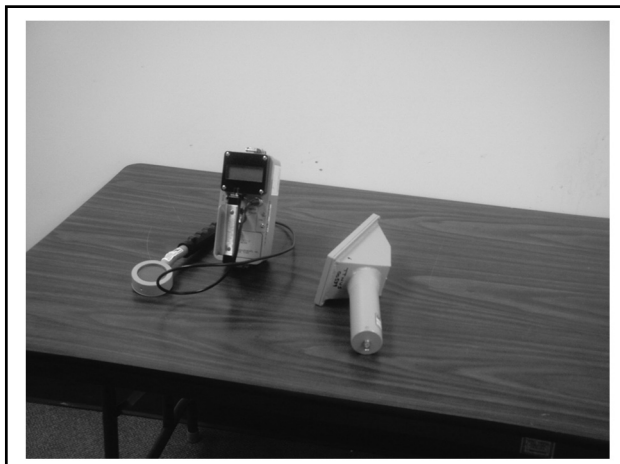
RADIATION DETECTION INSTRUMENTS

On national buy list:

- ☛ Ludlum Model 2241-2 Scaler/Ratemeter
 - Ludlum Model 44-9 pancake GM detector
 - Ludlum Model 43-90 alpha scintillation detector

Radiation Detection Instruments





RADIATION DETECTION INSTRUMENTS

National buy list upgrade:

- AA Ludlum Model 2241-3
 - Det. 1, model 133-2 high range gamma G-M probe, up to 1 R/hr (Red Dot)
 - Det. 2, model 44-9 G-M pancake probe, cpm (Yellow Dot)
 - Det. 3, model 43-90, ZnS alpha scintillation probe, cpm (Blue Dot)
 - Det. 4, model 44-10 NaI gamma scintillation probe, cpm (White Dot)

Ludlum Model 2241-3





Ludlum Model 133-2



Ludlum Model 44-9



Ludlum Model 43-90



Ludlum Model 44-10



Radiation Detection Instruments



RADIATION DETECTION INSTRUMENTS

On national buy list:

- ☢ Thermo Eberline RO-20
air ionization chamber
 - High level gamma dose rate meter
 - Range 0-50 R/hr
 - Sliding shield for beta measurements
(thin beta window composed of two
layers of aluminized polycarbonate)



Radiation Detection Instruments







RADIATION DETECTION INSTRUMENTS

On national buy list:

- ☢ Ludlum Model 15 alpha, beta, gamma, and neutron detector
 - With Ludlum Model 44-7 alpha, beta, gamma detector
 - With BF_3 proportional neutron detector



RADIATION DETECTION INSTRUMENTS

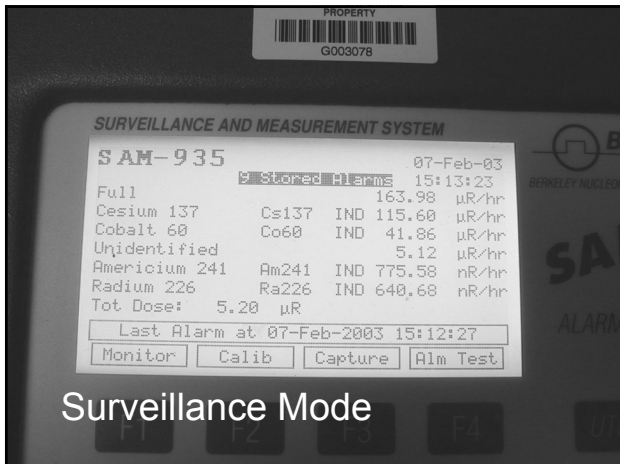
On national buy list:

- ☢ BNC Model SAM-935
 - With 2" x 2" external NaI detector
 - Radionuclide identification
 - Can be equipped with neutron detector, but high cost (\$4500)

Radiation Detection Instruments



SAM - 935



Surveillance Mode

SAM-940

National buy list upgrade:

- ☛ Portable radioisotope identification (RID) system
- ☛ Detects and identifies multiple nuclides
- ☛ Provides quantified results



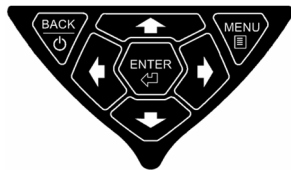
SAM-940

- Uses 8 AA-size 1.5-volt rechargeable batteries
- Batteries are in a removable tray
- Data stored on a Compact Flash memory card



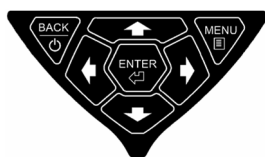
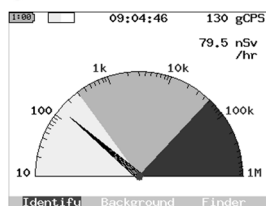
One-Hand Keypad Operation

- Designed to be operated with the thumb of the same hand holding the instrument
- Accessible to workers wearing PPE



Easier Operation

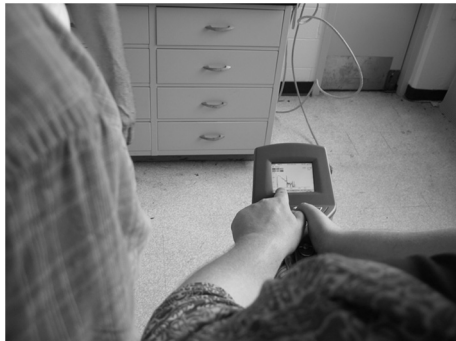
- Pressing the LEFT and RIGHT keys, you can move the highlighting among the Soft Keys (Identify, Background and Finder)
- Pressing the ENTER key will perform the action specified by the currently highlighted soft key



SAM - 940



SAM - 940



RADIATION DETECTION INSTRUMENTS

On national buy list:

- ☛ Ludlum Model 3030 dual alpha/beta counter
 - Detector is zinc sulfide adhered to plastic scintillation material
 - Can analyze gross alpha and beta simultaneously
 - Counts up to 2" diameter air sample filter and 2" diameter smear/swipe sample paper

ALPHA / BETA SAMPLE COUNTER



QUESTIONS
?



Student Performance Objectives

- ⚠ Discuss the purpose of conducting surveys.
- ⚠ List the four categories of field surveys.
- ⚠ Identify the applicability of the survey types.
- ⚠ List the types of remediation surveys.
- ⚠ Discuss the purpose of SOPs.
- ⚠ Identify one source of EPA-accepted SOPs.
- ⚠ Define ALARA and how it relates to work practices.

Field Surveys

Purpose of Surveys

- ☼ Determine if radioactive materials are present
- ☼ Identify types and levels of radiation
- ☼ Identify isotopes and quantify activity
- ☼ Delineate location and concentrations of radioactive materials
- ☼ Establish radiological and access controls
- ☼ Accurately document all survey results

Commonly Encountered Radionuclides

Commonly Encountered Radionuclides				
Name	Atomic Number	Radiation Type		
		Alpha	Beta	Gamma
americium-241	95	☼		☼
cesium-137	55		☼	☼
cobalt-60	27		☼	☼
iodine-129 & -131	53		☼	☼
plutonium	94	☼	☼	☼
radium	88	☼		☼
radon	86	☼		
strontium-90	38		☼	
technetium-99	43		☼	☼
tritium	1		☼	
thorium	90	☼		☼
uranium	92	☼		☼

Note: Where an element is listed rather than an individual radionuclide, the element has several radioactive isotopes of interest.

Survey Methods

- ☼ General Area Radiation Surveys
- ☼ Contact Radiation Surveys
- ☼ Contamination Surveys
- ☼ Air Monitoring

Types of Field Surveys

- ☢ Operational Survey
- ☢ Release Survey
- ☢ Remediation Survey
- ☢ Special Survey

Operational Surveys

- ☢ Routine investigations
- ☢ Establish quantities of known radionuclides
- ☢ Contamination monitoring
- ☢ Used to establish boundaries, postings, and controls

OSCs Common Radiation Role

- ☢ Initial emergency response
 - Investigate site history
 - Check for radiation, radioactive contamination, and identification
 - Define and isolate areas of radioactivity
 - Seek health physics support

Initial Response/Entry Surveys

- ☞ Establish turnback limits prior to entry
- ☞ Enter with survey instrument on the lowest readable scale, then scale up as necessary
- ☞ Establish an outer boundary for access control then work inward
- ☞ Survey for contamination as you go
- ☞ Establish air sampling locations

Initial Site Entry

- ☞ Monitoring - OSHA 29 CFR 1910.120(c)(6), and (Subpart H: Hazardous Materials) Hazardous waste operations and emergency response:
 - When the potential exists for ionizing radiation or IDLH
 - When the site information is not reasonably sufficient to eliminate this condition
- ☞ 29 CFR 1910.120(c)(6)(i)
 - Monitoring with direct reading instruments for hazardous levels of ionizing radiation

Initial Site Entry

- ☞ EPA "Standard Operating Safety Guides" (Publication 9285.1-03, June 1992) – Chapter 2.2.3 Initial Site Entry
 - When the potential exists for ionizing radiation or IDLH
 - When the site information is not reasonably sufficient to eliminate this condition
 - Exhibit 2-7, Monitoring Requirements: "Monitoring with direct reading instruments for hazardous levels of ionizing radiation"

Release Surveys

- ☢ ☢ Monitor items from a contaminated area
- ☢ ☢ Determine if acceptable for unconditional release
- ☢ ☢ Release limits near background
- ☢ ☢ Instruments must be calibrated and have a known detection limit

Remediation Surveys

- ☢ ☢ Scoping surveys – used to confirm the presence of radioactive materials
- ☢ ☢ Characterization surveys – used to identify and quantify radioactive materials to minimize planning uncertainty
- ☢ ☢ Removal action surveys – monitor progress
- ☢ ☢ Final/release surveys – confirm remediation effective

Removal Surveys

- ☢ ☢ Facilitate excavation
- ☢ ☢ Identify contaminated soil
- ☢ ☢ Avoid excavation of clean soil
 - Minimize waste volume
- ☢ ☢ Locate “hot spots”
- ☢ ☢ Control worker exposures

Excavation Volume Estimates

- ☼ Surface area extent, walk-over gamma survey
- ☼ Depth of contamination w/bore hole and thin sodium iodide (NaI) probe
- ☼ Background determination
- ☼ Emphasis on “gray region”, i.e. border areas of disposal

Real-time Excavation Support

- ☼ Surveys performed as excavation in progress
- ☼ Provide direction to excavation team
- ☼ Ensure removal of contaminated soil
- ☼ Identify “hot spots” and contaminated debris
- ☼ Limit over-excavation

Wrong Way



Right Way



Right Way



Indoor Surveys

- ☢ Gamma walk-thru
- ☢ Portable gamma survey meter
- ☢ Contamination survey meter
 - Alpha-beta probes
- ☢ Removable contamination swipes
- ☢ Radon monitors
- ☢ Two primary purposes
 - Identify and monitor personnel hazards
 - Define scope of remediation

Initial Site Surveys







Clean-up Confirmation

- ☼ MARSSIM (Multi-Agency Radiation Survey and Site Investigation Manual)
- ☼ MARSSIM provides guidance for planning, implementing, and evaluating environmental and facility radiological surveys
- ☼ Defines approach for confirmation of clean-up – Final Status Survey
- ☼ MARSAME (Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual) is used for free releasing items

Special Surveys

- ☼ Support miscellaneous activities
- ☼ Air monitoring during dust-generating activities
- ☼ Area and personnel contamination surveys
- ☼ Pre-operational surveys (e.g., define background)
- ☼ Source leak tests
- ☼ Transportation surveys



Radiological Response Standard Operating Procedures (RRSOPs)

Overview of RRSOPs




- ☢ EPA-accepted procedures.
- ☢ Consistent with Federal Radiological and Assessment Center (FRMAC) procedures
- ☢ Provide uniformity of actions across all EPA regions
- ☢ Personnel expected to follow RRSOPs; deviation only with management permission

Overview of RRSOPs (continued)

- ☢ RRSOPs augmented by Quick Start Guides
- ☢ Quick Start Guides describe how to put instruments into operation
- ☢ Quick Start Guides are intended for field use
- ☢ SOPs are more specific and directive




RRSOP Series

Procedures organized into nine series:

-  1000 to 1999 Series – Office and Administrative Procedures
-  2000 to 2999 Series – Sampling Procedures (Collection Procedures)
-  3000 to 3999 Series – Instrument Operating Procedures

RRSOP Series

(continued)

-  4000 to 4999 Series – Calibration Procedures (Equipment and Instruments)
-  5000 to 5999 Series – Sample Preparation
-  6000 to 6999 Series – Field Analytical Procedures

RRSOP Series




(continued)

-  7000 to 7999 Series – Data Validation and Data Verification Procedures
-  8000 to 8999 Series – Health and Safety Procedures
-  9000 to 9999 Series – Miscellaneous Procedures


Work Practices

(As Low As Reasonably Achievable - ALARA)

ALARA Practices

-  Maintain exposures As Low As Reasonably Achievable (ALARA)
-  Time, Distance and Shielding
-  Use work practices to limit exposures
 - Use respiratory protection and PPE
 - Use remote instruments and handling equipment
 - Use shielding when possible

ALARA Practices

-  Use work practices to limit exposures
 - Avoid touching debris in a contaminated area
 - Limit exposure time by rotating personnel
 - If possible move victims to an uncontaminated triage area

QUESTIONS
?



Student Performance Objectives

- ☛ Interpret information provided on radiological postings
- ☛ List at least three radiological areas
- ☛ Explain the difference between radiation area and contamination area

Posting Overview

- ☛ Postings alert workers and members of the public to the presence of radiological hazards.
- ☛ Uniform posting *across agencies* avoids misunderstanding.
- ☛ Postings provide valuable information to emergency responders *for initial entry*.

Posting Overview

AA Posting Requirements:

- NRC: 10 CFR 20.1902
- OSHA: 29 CFR 1910.1096
- DOE: 10 CFR 835.601

AA Conventions

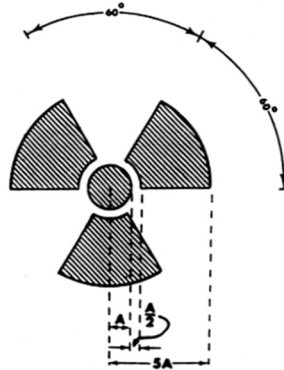
- Colors: magenta or black on yellow
- Three blade design – trefoil



Radiation Symbol

AA Design

- standard geometry
- 10 CFR 20.1901





Areas Requiring Posting

AA Six Area Types Require Posting

- Radiation Area
- High Radiation Area
- Very High Radiation Area
- Airborne Radioactivity Area
- Radioactive Materials Area
- Contamination Area



Radiological Area Posting Requirements

Radiation Area

-  Dose equivalent of >0.005 rem in 1 hour at 30 centimeters from the radiation source or any surface that radiation penetrates
-  Perimeter barriers: rope, chain, fence, or wall





High Radiation Area

-  Dose equivalent of >0.1 rem in 1 hour at 30 centimeters from the radiation source or any surface that radiation penetrates
-  Perimeter barriers: fence, wall, with locked or guarded entry





Very High Radiation Area

-  Absorbed dose of >500 rads in 1 hour at 1 meter from the radiation source or any surface that radiation penetrates
-  Perimeter barriers: fence, wall, with locked or guarded entry





Radiological Area Posting Requirements

Airborne Radioactivity Area

-  Airborne concentrations > derived air concentrations (DAC) specified in Appendix B to 10 CFR 20, or weekly intake of 0.6% of the annual limit on intake (ALI), or 12 DAC-hours
-  Perimeter barriers: rope, chain, fence, or wall




Radioactive Materials Area

-  Quantity of radioactive material > 10 times the quantity specified in Appendix C to 10 CFR 20
-  Perimeter barriers: rope, chain, fence, or wall



Contamination Area

-  Posted where radioactive surface contamination (loose or fixed) exceeds the limits for an uncontrolled area



Radiological Area Posting Requirements

Container Labels

☞ Must have label with radiation symbol and the words "Caution or Danger Radioactive Material", with sufficient information for handlers of containers to minimize exposure, such as:

- Radionuclide(s) present
- Activity
- Date
- Radiation level
- Kind of material

Posting/Labeling Exceptions

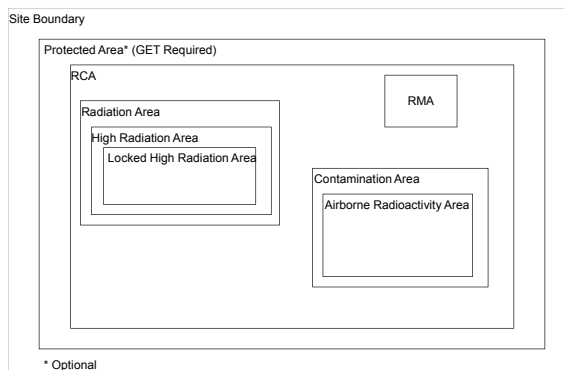
☞ Exceptions to posting and labeling requirements are defined in 10 CFR 20 (NRC) or 10 CFR 835 (DOE).

☞ Details of allowable exceptions defined in the following:

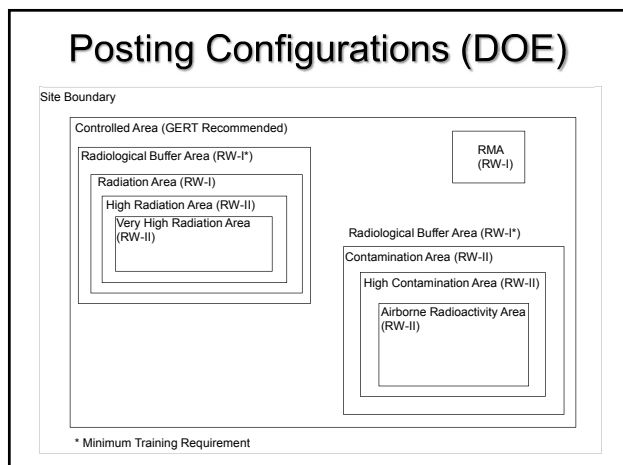
- Posting exceptions - 10 CFR 20.1903 or 10 CFR 835.604
- Labeling exceptions – 10 CFR 20.1905 or 10 CFR 835.606

☞ Exceptions generally require that access to areas or radioactive materials be well controlled with authorized personnel in attendance.

Posting Configurations (NRC)



Radiological Area Posting Requirements







Radiological Area Posting Requirements

Fernald



Fernald



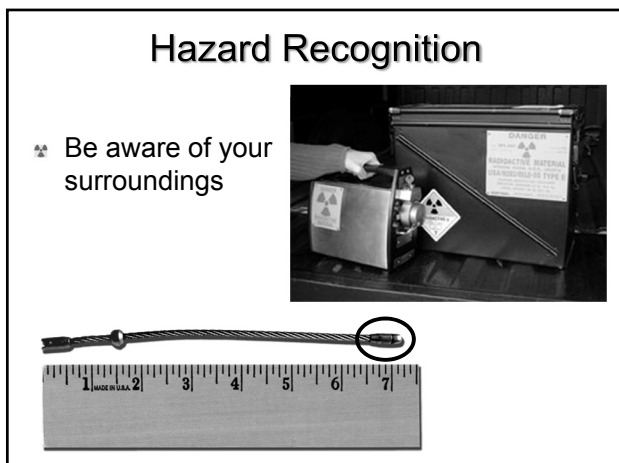
Fernald



Radiological Area Posting Requirements







QUESTIONS
?

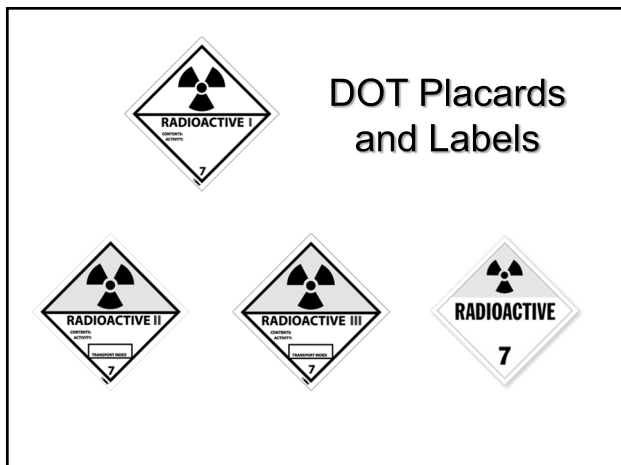


Student Performance Objectives

- ☞ Identify agencies that have promulgated radioactive materials shipping regulations.
- ☞ State the DOT radioactive materials hazard classification number.
- ☞ Define the DOT “limited quantity” of radioactive materials in a shipment.
- ☞ Describe the three types of radioactive materials package labels.

Student Performance Objectives
(continued)

- ☞ Define an “excepted package.”
- ☞ Identify the labeling for an excepted package.
- ☞ Describe the DOT placarding requirements for radioactive materials.



Agencies Regulating Radiological Material Shipment

- ⚠️ Nuclear Regulatory Commission
- ⚠️ Department of Transportation
- ⚠️ Department of Energy
- ⚠️ U.S. Postal Service
- ⚠️ The various states

Principle Regulators

- ⚠️ Department of Transportation: detailed regulations covering all aspects of radioactive material transport (packaging, shipper and carrier responsibilities, documentations, radioactivity level classifications)
- ⚠️ Nuclear Regulatory Commission: special packaging requirements for higher level quantities (not covered in this lecture)

DOT Radioactive Material Shipping Regulations

- 49 CFR 173, Subpart I (§§ 173.401 – 173.477) Class 7 (Radioactive) Materials
- 49 CFR 174, Subpart K (§§ 174.700 – 174.750) Detailed Requirements for Class 7 (Radioactive) Materials
- 49 CFR 175, Subpart C, (§§ 175.700 – 175.706) Specific Regulations Applicable According to Classification of Material

DOT Radioactive Material Shipping Regulations (continued)

- 49 CFR 176, Subpart M (§§ 176.700 – 176.720) Detailed Requirements for Radioactive Materials
- 49 CFR 177, Subpart B, (§§ 177.842) Class 7 (Radioactive) Material
- 49 CFR 178, Subpart K (§§ 178.350 – 178.360) Specifications for Packagings for Class 7 (Radioactive) Materials

International Atomic Energy Agency

- Provides consistent basis for regulating radioactive material transport internationally
- U.S. regulations are consistent with IAEA regulations

DOT Hazard Classes

- Class 1: Explosives
- Class 2: Gases
- Class 3: Flammable Liquids and Combustible Liquids
- Class 4: Flammable solids, spontaneously combustible materials, and water-reactive substances
- Class 5: Oxidizing substances and organic peroxides

DOT Hazard Classes
(continued)

- Class 6: Toxic substances and infectious substances
- Class 7: Radioactive materials
- Class 8: Corrosive substances
- Class 9: Miscellaneous hazardous materials

Radioactive Material Shipping Quantities

- ☼ Non-radioactive - Material less in concentration and total activity than values provided in 49 CFR 173.436 is not considered radioactive for transportation purposes.
- ☼ Limited Quantity – An amount sufficient to be considered radioactive (see above) but not exceeding specified fractions (49 CFR 173.425) of the radionuclide-specific A1 or A2 values of 49 CFR 173.435. Shipped in “strong tight” containers.

Radioactive Material Shipping Quantities (continued)

- ☞ Type A Quantity – Amounts less than or equal to the A1 or A2 values (depending on the form) but greater than one thousandth of the value require a Type A package.
- ☞ Type B Quantity – Amounts greater than the A1 or A2 value (depending on the form) but less than or equal to 3000 times these values, require a Type B package.

Radioactive Material Shipping Quantities (continued)

- ☞ Highway Route Controlled - If the amount is greater than 3000 times the A1 or A2 value (depending on controlled the form) but less than 27,000 curies, then the material is a highway route controlled quantity, which requires a Type B package, and the carrier must have special training. State officials must be notified if the material is radioactive waste.

Packaging

Packaging is outside the scope of this class, but the following definitions are provided:

- ☞ A strong tight container is designed to survive normal transportation handling.
- ☞ Industrial packages meet requirements of 49 CFR 173.411.
- ☞ A Type A container is designed to survive normal transportation handling and minor accidents.
- ☞ Type B containers must be able to survive severe accidents.

Expected EPA Shipments

- ☞ Potential exists for all types of radioactive materials, from limited quantities to highway route controlled quantities, to be shipped from EPA-managed sites.
- ☞ Shipping radioactive materials greater than limited quantities is a complex process requiring specialized expertise – that is – by a vendor.
- ☞ EPA personnel would likely ship only limited quantity samples, sealed sources, instruments, and articles.

Package Labeling

- ☞ Labels indicate the type of hazard inside the package.
- ☞ The selected label depends on the radiation outside the package.
- ☞ Labels must be placed on two opposite sides of the package.

Label: White I



- ☞ Surface radiation level does not exceed 0.5 millirem per hour
- ☞ Must record contents by radionuclide and activity
- ☞ Dose rate at one meter is not necessary to be recorded.

Label: Yellow 2



- ☼ Surface radiation level: does not exceed 50 millirem per hour
- ☼ Radiation at 1 meter (transport index): does not exceed 1 millirem per hour
- ☼ Must record the transport index, contents, and activity on the label

Label: Yellow 3



- ☼ Surface radiation level exceeds 50 millirem per hour OR radiation at 1 meter (transport index) exceeds 1 millirem per hour
- ☼ Must record the transport index, contents, and activity on the label

Excepted Packages

- ☼ A limited quantity package is excepted from requirements for labeling, except for the UN identification number marking.
- ☼ 49 CFR 172.101 identifies the UN number as UN 2910.
- ☼ The outside of the inner packaging or, if there is no inner packaging, the outside of the packaging itself must bear the marking "Radioactive."

UN 2910 Label



Vehicle Placarding

- Placards must be placed on each side and end of the vehicle
- Required for cargo containing Yellow-3 labels

Regulation Vehicle Placard



- Only one type of placard is available.
- No information is needed to be written on placard.

Potential Dose Rates

- ☢ ☢ Must be less than 200 millirem per hour on contact except for “exclusive use” vehicle
- ☢ ☢ For “exclusive use” vehicle limited to 1,000 millirem per hour on contact with package
- ☢ ☢ For “exclusive use” vehicle limited to 200 millirem per hour on outer surfaces of vehicle

Potential Dose Rates (continued)

- ☢ ☢ For “exclusive use” vehicle limited to 10 millirem per hour at 2 meters from vehicle
- ☢ ☢ In the cab, less than 2 millirem per hour
- ☢ ☢ If packages damaged, dose rates could be higher and contamination possibly present

Definition: Exclusive Use

Exclusive use means sole use by a single consignor of a conveyance for which all loading and unloading is carried out in accordance with the direction of the consignor or consignee. The consignor and the carrier must ensure that any loading or unloading is performed by personnel having radiological training and resources appropriate for safe handling of the consignment. The consignor must provide to the initial carrier specific written instructions for maintenance of exclusive use shipment controls.

Shipping by U.S. Postal Service

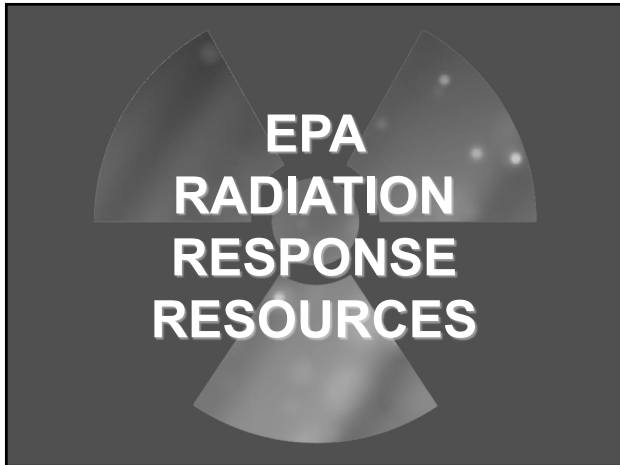
- ☞ The postal service only accepts limited quantity packages.
- ☞ The postal service defines limited quantities as exactly one tenth of the DOT limited quantity limits.

Caution!

- ☞ Radioactive materials shipping requirements are complex.
- ☞ More detailed training or use of a shipping specialist is strongly recommended.
- ☞ This lecture was simplified. There are many nuanced conditions that have not been covered.

QUESTIONS

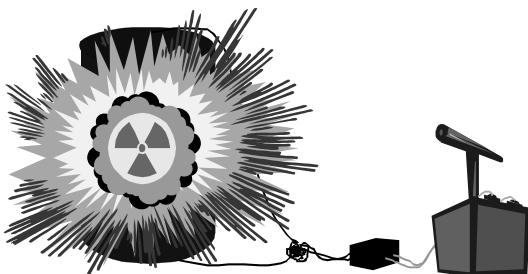
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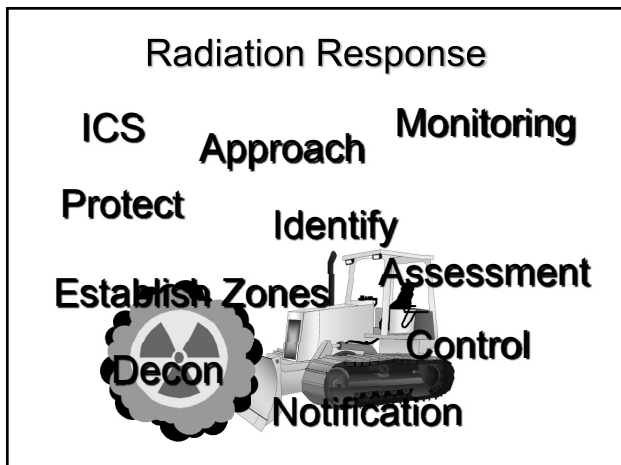


Student Performance Objectives

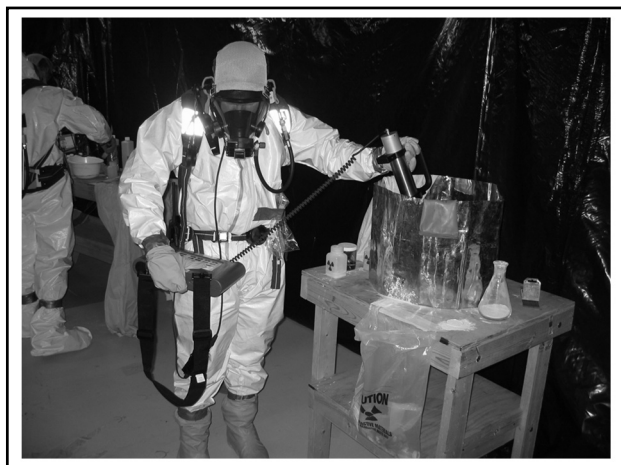
- ☢ Identify at least one of the EPA's radiation response resources
- ☢ Identify the primary mechanism through which ORIA responds to radiological emergencies and accidents
- ☢ Identify at least one RERT capability

Radiation Response









Office of Air and Radiation (OAR)

- ☼ Develops national programs, technical policies, and regulations for controlling air pollution and radiation exposure
- ☼ Radiation Protection Program
 - protect the public and environment from radiation exposure

EPA Radiation Response Resources

- ☼ EPA employs a combination of specially trained regional/headquarters staff:
 - Office of Radiation and Indoor Air (ORIA)
 - Radiological Emergency Response Team (RERT)
 - Regional Health Physicists (HP)
 - National Center for Radiation Field Operations (NCRFO), formerly “Radiation and Indoor Environments National laboratory (R&IENL)”
 - National Analytical Radiation Environmental Laboratory (NAREL), formerly “National Air and Radiation Environmental Laboratory (NAREL)”

EPA Radiation Response Resources (Con’t)

- RadNet, formerly “Environmental Radiation Ambient Monitoring System (ERAMS)”
- Environmental Response Team (ERT)
- CBRN Consequence Management Advisory Team (CMAT), formerly “National Decon Team (NDT)”
- Radiation Task Force Leaders (RTFL)
- On-Scene Coordinators (OSCs)

Office of Radiation and Indoor Air (ORIA)

- ☞ Works closely with the EPA's Superfund Program
- ☞ Have radiation consultants (HP), and response capabilities
- ☞ Maintains EPA's RERT and radiological laboratory operations


EPA's Radiological Laboratories

- ☞ EPA's analytical laboratory and field operation functions were reorganized and consolidated
- ☞ Reorganized in January 2013
 - National Analytical Radiation Environmental Laboratory (NAREL) at Maxwell Air Force Base-Gunter Annex in Montgomery, AL
 - National Center for Radiation Field Operations (NCRFO) in Las Vegas, NV

National Analytical Radiation Environmental Laboratory (NAREL)

- ☞ Provides radiological analytical services
- ☞ ORIA's analytical operation function consolidated and managed out of NAREL
- ☞ (Previously) EPA's only laboratory with in-house mixed waste analytical capability

National Analytical Radiation Environmental Laboratory (NAREL)

-  NAREL operates RadNet
- Sampling stations in many states that regularly collect air particulate, surface water, drinking water, precipitation, and milk samples for radioactivity analyses
 - RadNet Deployables
 - Managed by NCRFO
 - 40 units (20 at NAREL and 20 at NCRFO)



NAREL



NAREL





RadNet Deployable Unit

Components

- ✱ High Volume Air Sampler
- ✱ Low Volume Air Sampler
- ✱ Gamma Exposure Instrument
- ✱ Power Distribution Panel
- ✱ Satellite Telemetry
- ✱ Data Logger
- ✱ PDA
- ✱ Platform/pallet
- ✱ GPS
- ✱ Weather Station



EPA Radiation Response Resources



EPA Special Teams

- ☼ Radiological Emergency Response Team (RERT)
- ☼ Environmental Response Team (ERT)
- ☼ Chemical, Biological, Radiological, and Nuclear Consequence Management Advisory Team (CBRN CMAT)
- ☼ http://www.epa.gov/osweroe1/content/partners/special_teams.htm



The Radiological Emergency Response Team (RERT)

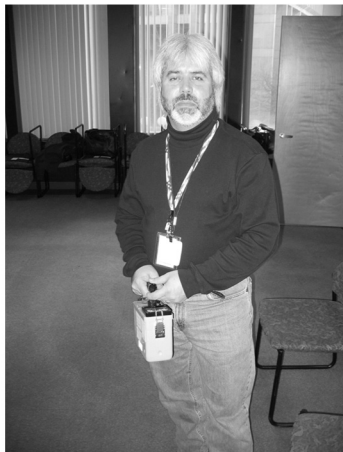
- ☼ A designated special response force
- ☼ Primary mechanism through which ORIA responds to radiological emergencies and accidents
- ☼ Works with federal, state, and local agencies

The Radiological Emergency Response Team (RERT)

- ☼ RERT capabilities include:
 - ✓ Environmental monitoring and sampling
 - ✓ Performing analytical services
 - ✓ Providing advice and guidance to ensure public health and safety
 - ✓ Radiological emergency response
 - ✓ Mobile radiation response (laboratory and field operations)

RERT-NAREL

Team
Commander



National Center for Radiation Field Operations (NCRFO)

- ▲▲ ORIA's field operation function consolidated and managed out of NCRFO
- ▲▲ Has mobile support vehicles to provide emergency response, command, monitoring, sampling, and field analytical services
- ▲▲ Assesses sites contaminated with radioactive material

National Center for Radiation Field Operations (NCRFO)



RERT-
NCRFO

Team
Commander



RERT-NAREL



RERT Sampling Kit







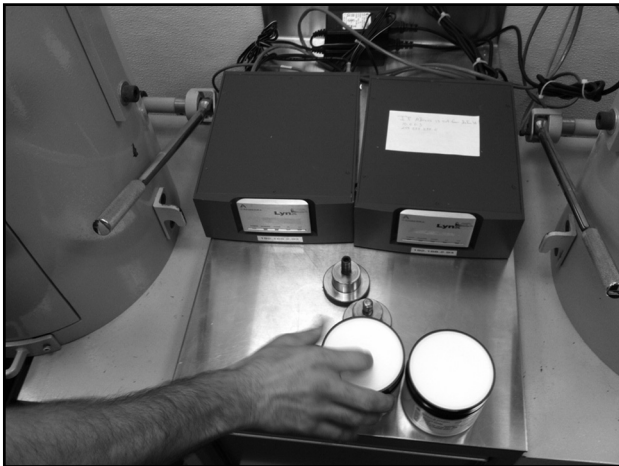
RERT-MOBILE

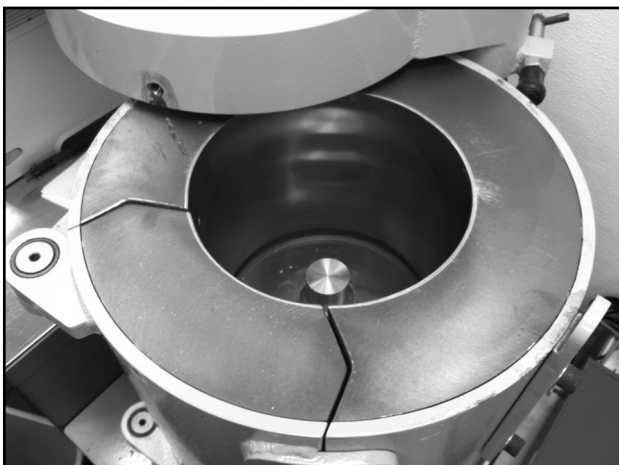




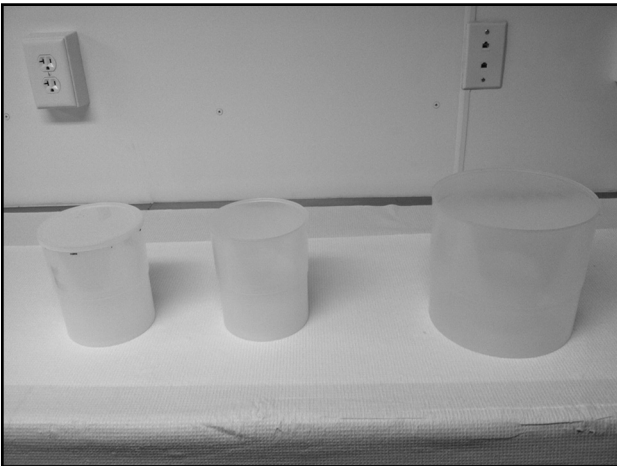
EPA Radiation Response Resources

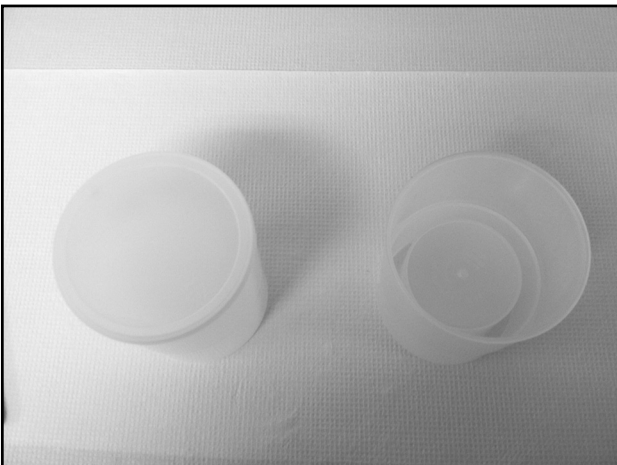


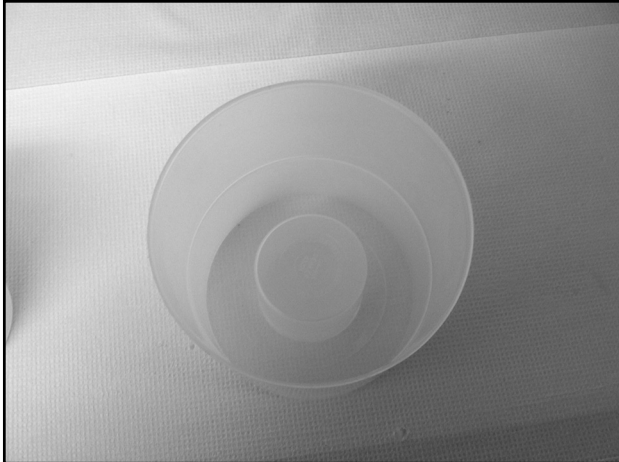
















EPA Radiation Response Resources



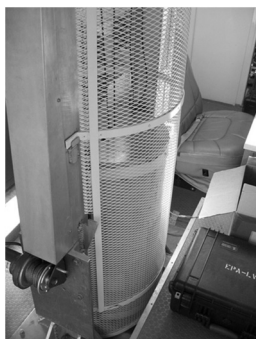




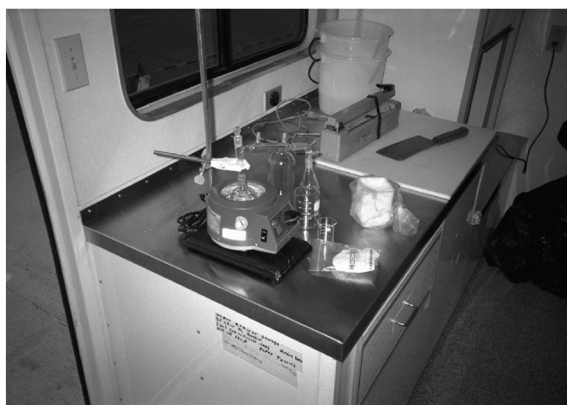
Scanner Van



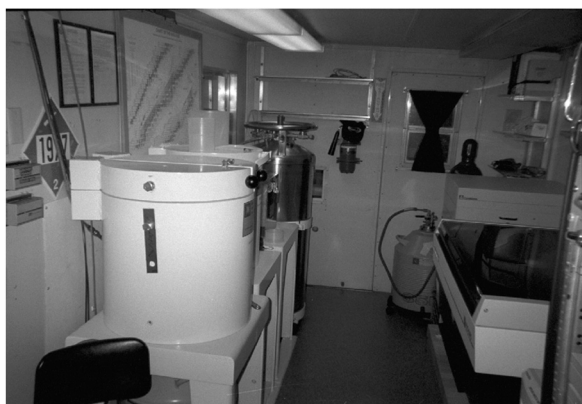
4" by 16" NaI detector



RERT-MOBILE



RERT-MOBILE

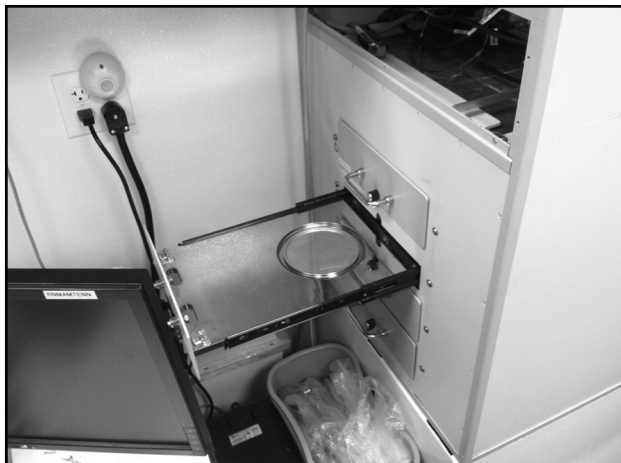


EPA Radiation Response Resources









Environmental Response Team (ERT)

ERT is comprised of skilled experts who provide on-scene assistance "round the clock" to deal with environmental emergencies.

ERT Offices

- ☢ Edison, New Jersey
- ☢ Las Vegas, Nevada
- ☢ Cincinnati, Ohio/Erlanger Kentucky

ERT/CMAT Response Facility Erlanger, Kentucky



ERT Response Facility Erlanger, KY

Radiation Response

- ☛ On-site radiation detection and measurement
 - Exposure Monitoring
 - Contamination Surveys and Sampling
 - Air Sampling
 - Real Time Gamma Spectroscopy
 - Mobile response capability

ERT-Health Physicist (HP)

Erlanger, Kentucky



ERT
Erlanger, KY

Radiation Response



ERT-Erlanger, KY
Radiation Response Kit



ERT-Erlanger, KY
Radiation Response Kit



ERT-Erlanger, KY
Contamination Kit



**ERT
Erlanger, KY**
Radiation Response



**ERT
Erlanger, KY**
Mobile Command Post



ERT Erlanger, KY

Response Vehicle


- ☛ Internal electric generator
- ☛ Self-contained sampling hood with HEPA filters
- ☛ Transports equipment and supplies



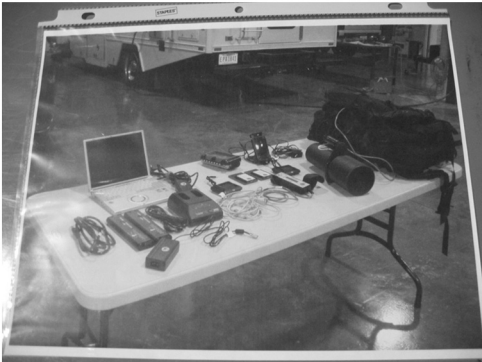
ERT Erlanger, KY



ERT Erlanger, KY

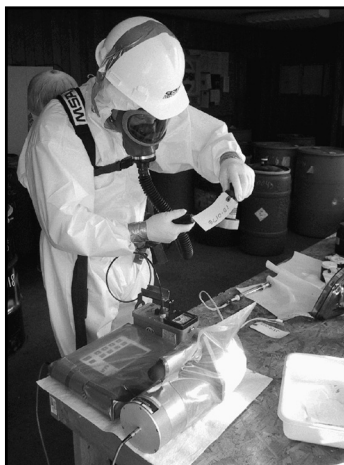


ERT
Erlanger, KY



ERT
Erlanger, KY





ERT
Radiation
Response



CBRN Consequence Management Advisory Team (CMAT)

- Latest science and technology to the field
- Has two in-house Health Physicists
- Provide tactical options for the response community
- OEM lead for CBRN homeland security initiatives related to consequence management operations planning
- ASPECT

CBRN Consequence Management Advisory Team (CMAT)

- ASPECT plane (Airborne Spectral Photometric Collection Technology)
- Provides 24/7 emergency response capability
- Any EPA OSC can directly order the deployment of the ASPECT



Radiation Task Force Leader (RTFL)

- Group II EPA Response Support Corps (RSC) members with special radiation response training certified by the EPA
- Work within the ICS structure as a Task Force Leader reporting to a Division/Group Supervisor
 - Leads tactical work assigned to the Radiation Task Force (RTF)
 - Other duties as assigned

RTFL Training



RTFL Training



RTFL Training



RTFL Training



RTFL Training



RTFL Training



QUESTIONS
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Student Performance Objectives

- Identify at least two major EPA national resources
- Identify at least three regional responsibilities
- Understand how to obtain regional radiation support
- Identify at least one Internet radiation resource

EPA Radiation Protection

- EPA is the primary Federal agency mandated to protect public health and the environment from harmful and avoidable exposure to radiation.
- Major activities:
 - Homeland security/ emergency response
 - Public protective action recommendations
 - Cleanup/waste management
 - Emissions regulation
 - RadNet
 - Science and technology
 - Information and outreach

Regional Radiological Responsibilities

- Maintain Radiological Expertise
 - ORIA Regional Radiation Program Manager
 - Regional Health Physicist
- Explain radiological issues and risk
 - EPA Regional management
 - Local government officials
 - Media
 - Public
- Provide radiological technical support to federal agencies and state radiation protection programs
- Provide protective action recommendations

Regional Radiological Responsibilities

- Lead on radiation health and safety in the Region
- Provide advice and technical support for cleanup of radiological sites
- Work with local responders to prepare and implement emergency actions
- Lead on radon issues in the region
- Works with operation of fixed RadNet stations in Region

Regional Radiological Responsibilities

- Regulate radioactive air emissions, and oversee state NESHAPS program to ensure compliance
- Oversee state programs and compliance with the national drinking water standards for radiation
- Review state/county radiological emergency preparedness plans
- Assist EPA emergency responders regarding radiological issues

Regional Roles

ORIA Regional Program Manager Responsibilities

- An ORIA Program Manager and Regional Radiation Program are present in each region, but resources vary
- Duties include:
 - Development of a Regional Radiation Program
 - Coordination with regional OSCs
 - Leading EPA's involvement in FEMA's REP Program
 - Coordination with RERT Commanders on notifications
 - Maintaining staff readiness

Regional Roles

- Regional Radiation Liaison
 - Coordinates between the regional radiation program and the Radiological Emergency Response Team (RERT)
 - Participates in the RERT (Designated core RERT position "Support Team" member)
 - Coordinates with federal, state, and local radiation programs
 - Coordinates with regional radiation resources
 - Works directly with the Regional Emergency Operations Center

Regional Roles

- Regional Radiation Advisor
 - Provides radiological technical advice to regional OSCs, regional management, and other personnel as needed
 - Provides technical and backup support for other regions per an MOA
 - Participates in Headquarters workgroups, initiatives, and policy development

Region Key Radiation Contacts

Name
Office
Address
Phone Number
Email Address

Internet Radiological Resources

- EPA Resources
 - EPA Headquarters Radiation Page – <http://www.epa.gov/radiation>
 - EPA Superfund Radiation Page – <http://www.epa.gov/oerrpage/superfund/health/contaminants/radiation/index.htm>
 - EPA Radionuclides in Drinking Water Rule – <http://www.epa.gov/safewater/radionuclides/regulation.html>
 - EPA Rad NESHAPS – <http://www.epa.gov/radiation/neshaps/index.html>

Internet Radiological Resources

EPA Resources – continued

- EPA Radiation Guidance for CERCLA – <http://www.epa.gov/oerrpage/superfund/health/contaminants/radiation/index.htm>
- EPA Non-Superfund Radiation Documents – <http://www.epa.gov/oerrpage/superfund/health/contaminants/radiation/nonoswer.htm>
- RadNet – <http://www.epa.gov/radnet>
- RadTown USA – <http://www.epa.gov/radtown>

Internet Radiological Resources

Other Federal Agency Resources

- Radiation Emergency Assistance Center / Training Site (REAC/TS) – <http://orise.ornl.gov/reacts/>
- U.S. National Nuclear Security Administration Office of Emergency Operations – <http://nnsa.energy.gov/aboutus/ourprograms/emergencyoperationscounterterrorism>
- Federal Radiological Monitoring and Assessment Center (FRMAC) – <http://nnsa.energy.gov/aboutus/ourprograms/emergencyoperationscounterterrorism/respondingtoemergencies/co-nsequencemanagem-1>

Internet Radiological Resources

Other Federal Agency Resources – Continued

- FEMA Radiological Emergency Preparedness Program – http://www.fema.gov/about/divisions/thd_repp.shtm
- U.S. Centers for Disease Control and Prevention, Radiation Emergencies – <http://www.bt.cdc.gov/radiation/>
- U.S. OSHA, Radiological Dispersal Devices (RDD) / Dirty Bombs – http://www.osha.gov/SLTC/emergencypreparedness/rdd_t ech.html
- U.S. Food and Drug Administration, Radiation Emitting Products – <http://www.fda.gov/Radiation-EmittingProducts/default.htm>

Internet Radiological Resources

Other Federal Agency Resources – Continued

- U.S. Nuclear Regulatory Commission – <http://www.nrc.gov/>
- Los Alamos National Laboratory Off-site source Recovery Program – <http://osrp.lanl.gov/>
- U.S. Department of Energy (DOE), Office of Health, Safety and Security (HSS) – <http://www.hss.doe.gov/>
- Uniformed Services University of the Health Sciences, Radiological Dispersal Device / Radiological Terrorism Web Page – http://rad.usuhs.mil/rdd/usuhs_rdd.html

Internet Radiological Resources

Other Information Resources

- ORAU's Comprehensive List of Health Physics Resources – <http://www.ornl.gov/environmental-assessments-health-physics/capabilities/health-physics/hp-resources.aspx>
- Conference of Radiation Control Program Directors (CRCPD) – <http://www.crcpd.org/>
- Health Physics society – <http://www.hps.org/>

QUESTIONS
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