**NRC FORM 313** (05-2022) 10 CFR 30, 32, 33, 34, 35, 36, 37, 39, and 40

**U.S. NUCLEAR REGULATORY COMMISSION**

# APPLICATION FOR MATERIALS LICENSE

**APPROVED BY OMB: NO. 3150-0120** **EXPIRES: 01/31/2023**

Estimated burden per response to comply with this mandatory collection request: 4.3 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the FOIA, Library, and Information Collections Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and the OMB Reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0120), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; e-mail: oira_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

**INSTRUCTIONS: SEE THE CURRENT VOLUMES OF THE NUREG-1556 TECHNICAL REPORT SERIES ("CONSOLIDATED GUIDANCE ABOUT MATERIALS LICENSES") FOR DETAILED INSTRUCTIONS FOR COMPLETING THIS FORM: http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1556/. SEND TWO COPIES OF THE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.**

**APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:**

MATERIALS SAFETY AND TRIBAL LIAISON BRANCH
DIVISION OF MATERIALS SAFETY, SECURITY, STATE AND TRIBAL PROGRAMS
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

**ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:**

**IF YOU ARE LOCATED IN:**

**ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA,**

**SEND APPLICATIONS TO:**

LICENSING ASSISTANCE TEAM
DIVISION OF RADIOLOGICAL SAFETY AND SECURITY
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD, SUITE 102
KING OF PRUSSIA, PA 19406-1415

**IF YOU ARE LOCATED IN:**

**ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:**

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

**IF YOU ARE LOCATED IN:**

**ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MISSISSIPPI, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING,**

**SEND APPLICATIONS TO:**

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
1600 E. LAMAR BOULEVARD
ARLINGTON, TX 76011-4511

RECRG 10 Jul '22 PM02:15

**PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTIONS.**

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- ☐ A. NEW LICENSE
- ☑ B. AMENDMENT TO LICENSE NUMBER 45-24974-01
- ☐ C. RENEWAL OF LICENSE NUMBER

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include zip code)*

ECS Mid-Atlantic, LLC
14026 Thunderbolt Place, Suite 100
Chantilly VA 20151

3. ADDRESS WHERE LICENSED MATERIALS WILL BE USED OR POSSESSED

14026 Thunderbolt place
Suite 100
Chantilly VA20151

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Mohamed Elbulok

| BUSINESS TELEPHONE NUMBER | BUSINESS CELLULAR TELEPHONE NUMBER |
|---|---|
| (703)471-3826 | (703)926-0793 |

BUSINESS E-MAIL ADDRESS
melbulok@ecslimited.com

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
   a. Element and mass number; b. chemical and/or physical form; and c. maximum amount which will be possessed at any one time.
6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.
7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE.
8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.
9. FACILITIES AND EQUIPMENT.
10. RADIATION SAFETY PROGRAM.
11. WASTE MANAGEMENT.

12. LICENSE FEES (Fees required only for new applications, with few exceptions*) *(See 10 CFR 170 and Section 170.31)*
***Amendments/Renewals that increase the scope of the existing license to a new or higher fee category will require a fee.**
FEE CATEGORY ____ AMOUNT ENCLOSED $ ____

**PER THE DEBT COLLECTION IMPROVEMENT ACT OF 1996 (PUBLIC LAW 104-134), YOU ARE REQUIRED TO PROVIDE YOUR TAXPAYER IDENTIFICATION NUMBER. PROVIDE THIS INFORMATION BY COMPLETING NRC FORM 531: https://www.nrc.gov/reading-rm/doc-collections/forms/nrc531info.html.**

13. CERTIFICATION. *(Must be completed by applicant) THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.*

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 37, 39, AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.
WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

| CERTIFYING OFFICER -- TYPED/PRINTED NAME AND TITLE | SIGNATURE | DATE |
|---|---|---|
| Mohamed Elbulok - RSO | M.I. Elbulok | 7/5/2022 |

## FOR NRC USE ONLY

| TYPE OF FEE | FEE LOG | FEE CATEGORY | AMOUNT RECEIVED | CHECK NUMBER | COMMENTS |
|---|---|---|---|---|---|
| | | | $ | | |
| APPROVED BY | | | | DATE | |

## 5-Radioactive Material

| Element | Chemical and/or physical form | Maximum amount that license |
|---|---|---|
| Cesium-137 | sealed sources(QSA Global Model CDCW556;Isotope Products Laboratories Models HEG-137,HEG-137-8M;CPN Int. Model CPN-131) | 140 millicuries total and no single source to exceed the maximum activity specified in the certificate of registration issued by the U.S Nuclear Regulatory Commission Or an Agreement State |
| Americium 241 | Sealed Sources (QSA Global Model AMN. V997; Isotope Products Laboratories Models Am 1.NO2, 3021,3027;CPN Int.Model CPN-131 | 700 millicuries total and no single source to exceed the maximum activity specified in the certificate of registratration issued by the U.S. Nuclear Regulatory Commission or an Agreement State. |
| Cobalt-57 | Sealed source to be used in RMD LPA Or Heuresis Pb200i field portable X-ray Fluorescence Analyzer to perform lead In paint inspections. | Not to exceed the maximum activity per device as specified in Sealed Source Device Registry (SSD); Total not to exceed 41 millicuries. |

11-Waste Management

Heuresis Corporation

330 Nevada Street

Newton , MA 02460 USA

# Certificate of Training

THIS ACKNOWLEDGES THAT

## Omer Duzyol

HAS SUCCESSFULLY COMPLETED:

**DOT, IATA AND NRC REQUIREMENTS FOR SHIPPING LIMITED QUANTITY RADIOACTIVE MATERIALS WITH RADIATION FUNDAMENTALS**

For 6 Hours of Specialized Instruction

SIGNED, *ALAN FELLMAN, PH.D., CHP*
NVS | DADE MOELLER TRAINING ACADEMY

12/31/2020

NVS
TRAINING ACADEMY

# Certificate of Training

**Awarded To**

## *Omer Duzyol*

Recognizing completion of 40 hours of specialized instruction in

## Radiation Safety Officer

**April 23, 2004**

Presented By

***Radiation Safety Academy***
481 North Frederick Avenue, Suite 302
Gaithersburg, Maryland 20877

AAHP has awarded this course 32 Continuing Education Credits, 2003-00-018
ABIH has awarded this course 4.5 CM Points, CM Approval # 04-185

Ray Johnson

Raymond Johnson, CHP, PE, RSO
Training Director

NETS

North East Technical Services, Inc.

Certifies that

# Mohamed I. Elbulok

Has successfully completed North East Technical Services, Inc. Radiation Safety Officer Training Course for Nuclear Gauges, in accordance with Nuclear Regulatory Commission and current US DOT regulations.

Training materials are maintained at:

North East Technical Services, Inc.
75 Aileron Court, Suite 4
Westminster, MD 21157

Date of Completion: June 9, 2010

Instructor: Douglas C. Sims

# HUMBOLDT SCIENTIFIC, INC.

## RSO Certification

HUMBOLDT

## *Mohamed I. Elbulok*

## HAS SUCCESSFULLY COMPLETED A CERTIFIED RADIATION SAFETY OFFICER COURSE

Subjects included were:

*RSO Duties and Responsibilities*
*Radiation Safety Practices*
*Regulatory Requirements*
*Dose/Shielding Requirements*
*Accidents/Storage*
*Regulatory Guidance (NUREG-1556, Vol. 1)*
*Transportation/HAZMAT Requirements*
*Risk*
*ALARA*
*Radiation Measurement*
*Operating and Emergency Procedures*
*Calibration and Maintenance*
*Record Keeping*

Date of Training: **May 8, 2007**
Location: **Manassas, VA**
Certificate Number: **7117**
HAZMAT Expiration Date: **May 8, 2010**

Instructor: Keith Earnshaw
Humboldt Scientific, Inc.
551-D Pylon Drive
Raleigh, NC 27606

# RADIATION SAFETY OFFICER TRAINING

# Certificate of Completion

This is to certify that

***MOHAMED ELBULOK***

---

has completed ECS' Radiation Safety Officer training for portable moisture density gauges and X-Ray fluorescent (XRF) devices. The 4-hour course was provided by ECS in accordance with ECS' Corporate Radiation Protection Program and covered ECS and Regulatory Requirements for:

- Duties of the RSO as defined in NRC document NUREG 1556 Volume 1, Rev. 2, Appendix D
- ALARA
- US-D.O.T. Haz-Mat transportation requirements
- Office-specific Radiation Safety Plans
- Dosimetry and exposure control, including dose limits for authorized users, declared pregnant workers and members of the public
- Gauge security and accountability in storage, during transportation and while in use
- ECS field audits
- Training for Authorized Users and Non-User Safety and Security awareness training
- Storage requirements for permanent and temporary sites
- Required surveys for storage, public dose, gauge receipt and incident management
- Requirements for service vendors and 3rd party transportation companies
- Emergency procedures
- Incident response and investigation
- Incident/Event reporting, including internally to ECS and to regulatory authorities
- Leak testing, calibration and gauge maintenance
- Semi-annual inventories
- Completing Annual Program Reviews, including review of checklist, and follow-up corrective action, plan revisions as needed
- ECS' Device Management Program (DMC)
- Record retention and file system

**December 14, 2020**
Date Completed

Instructor: Ronald Newman, CWI
Corporate Radiation Compliance Officer

ECS UNIVERSITY – SAFEY COLLEGE

# ECS CHANTILLY

## NUCLEAR GAUGE RADIATION SAFETY

REVISED December 2021

1

1

## PORTABLE NUCLEAR GAUGES


2

2

## TRAINING OVERVIEW

- Basic understanding of radiation.
- Knowledge of radiation safety.
- Uses of portable nuclear gauges.
- Basic nuclear gauge operations.
- Introduction to critical regulatory requirements.
- Familiarity with ECS' Radiation Safety Program.

3

3

## RADIATION SAFETY GOALS

- Keep exposures ALARA.
- Safe to ourselves.
- Safe to the general public.
- Comply with regulatory requirements:
  - There are plenty of them
  - Non-negotiable!

4

4

## THE PUNITIVE STUFF

- We are constantly subject to the **DOT**, Agreement State (**VDH**) or (**MDE**), and **NRC** inspections:
  - At the office
  - On the road
  - On the job site

5

5

## THE PUNITIVE STUFF (CONT'D)

- The penalties:
  - Significant fines
  - Administrative censure
  - Loss of operating license

Also results in:
One mad RSO & CRSO

6

6

## ENABLING OBJECTIVES

- Why we use nuclear gauges.
- How to use gauges safely:
  - Safe to ourselves
  - Safe to the public
- Concise understanding of atomic physics and radiation.
  - Types of ionizing radiation
  - **ALARA**
  - **Time, distance & shielding**

7

7

## ENABLING OBJECTIVES (CONT'D)

- **Nuclear Regulatory Commission** (**NRC**) rules and regulates:
- Agreement State, **Virginia Department of Health** (**VDH**) or **Maryland Department of The Environment** (**MDE**) rules and regulates:
  - Use
  - Storage
  - Transportation
- **Department of Transportation** (**DOT**) rules and regulates:
  - Transportation
  - Labels
  - Hazmat
  - Security

8

8

## ENABLING OBJECTIVES (CONT'D)

- Documentation.
- Control, accountability, and security.
- Actions if damaged or destroyed.
- Calibration.
- Introduction to gauge theory and operations.
- Gauge maintenance.
- Office Radiation Safety Plan.

9

9

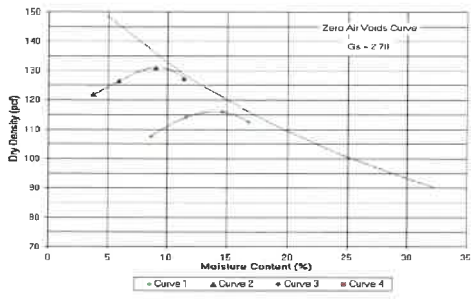
## USES at ECS

- Soils placement:
  - Density
  - Moisture content
- Asphalt density.
- Roof moisture surveys.
- Lead-based paint detection.

10

10

## SOILS DENSITY & MOISTURE CONTENT




11

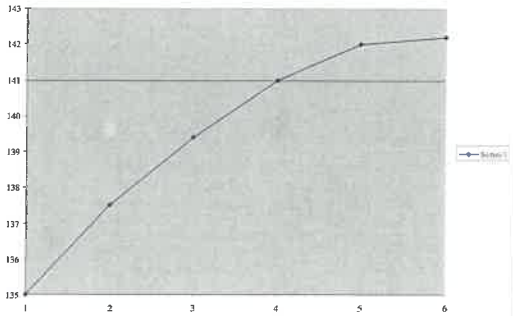
11

## SOIL COMPACTION

12

12

## ASPHALT COMPACTION




13

13

## ASPHALT COMPACTION

14

14

## ROOF MOISTURE


15

15

## OVERALL ADVANTAGES

- More accurate tests.
- Greater number of tests.
- Less disruptive of job sites.
- No or minimal damage to the surface tested.
- Ease of use.

16

16

## NUCLEAR GAUGE SAFETY

- Properly used, increased risk is trivial.
- As Low As Reasonably Achievable (**ALARA**) (or common sense).
- Controls:
  - **Time**
  - **Distance**
  - **Shielding**

17

17

## RADIATION IS EVERYWHERE

- Sources:
  - Solar/space
  - Natural (e.g., radon)
  - Plane trip
  - Medical x-rays
  - Weapons testing

18

18

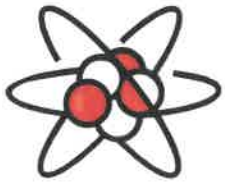
## RADIATION IS EVERYWHERE (CONT'D)

- The average american receives 250-350 milliRems (radiation equivalent in man) per year from existing sources.
- Allowable exposures:
  - Additional **5,000 mRem/year** for occupational exposures
  - **500 mRem** for embryo/fetus during declared pregnancy for authorized users
  - Adjacent public **100 mRem/year**

19

19

## RADIOACTIVITY



20

20

## IONIZING RADIATION

- A form of energy.
- Can affect biological functions.
- Decay of an unstable element or radioisotope.
- Four types:
  - **Alpha particles**
  - **Beta particles**
  - **Gamma radiation**
  - **Neutrons**

21

21

## ALPHA PARTICLES (α)

- Large particles.
- Little penetrating power.
- Travel about an inch in air.
- Stopped by sheet of paper or skin tissue.
- Minimal concern with sealed sources.

22

22

## BETA PARTICLES (β)

- Same mass and charge as an electron.
- Some penetration.
- Travels a few feet in air.
- Stopped by an inch of wood or a thin sheet of aluminum.
- Minimal concern with sealed sources.

23

23

## GAMMA RADIATION (γ)

- Electromagnetic rays.
- No mass or charge.
- Similar to x-rays.
- Travel hundreds of feet in air.
- Stopped by thick lead or concrete.
- Used for density measurements.

24

24

## NEUTRONS (η)

- Mass but no charge.
- Travels significant distances in air.
- Stopped by several feet of water, plastic, or concrete.
- Used for moisture measurements.

25

25

## PORTABLE GAUGES

- Cesium – 137 (Cs-137): Gamma source for density.
- Americium – 241/Beryllium (Am-241/Be): Neutron source for moisture.

26

26

## CURIE (Ci)

- Unit of activity.
- Curie based on decay rate of one gram of radium.
- Required on shipping papers.
- DOT requires S.I. units or Becquerel (Bq): 1 disintegration per second.
- Bequerel (Bq):
  - 10 mCi of Cs–137 = 370 MBq (Mega Bequerel)
  - 50 mCi of Am–241/Be= 1.85 GBq (Giga Becquerel)

27

27

## RADIOACTIVE HALF–LIFE

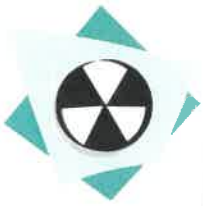
- Common measure in nuclear physics.
- Original activity (mCi) to decay 50 percent:
  - Cs–137: 30.6 years
  - Am–241/Be: 458 years
- Electronics updated daily to account for source decay.

28

28

## HEALTH SAFETY

- Roentgen: Unit of Exposure.
- RAD: Radiation Absorbed Dose.
- REM: Radiation Equivalent in Man.
- **Exposure vs. Contamination**



29

29

## DOSE RATE

- At 1 meter and un-shielded.

| Source | Activity | Dose Rate |
|---|---|---|
| CS-137 | 10 mCi | 3.3 mRem/hr |
| AM-241/Be | 50 mCi | 0.11 mRem/hr |

- **Time, distance and shielding.**

30

30

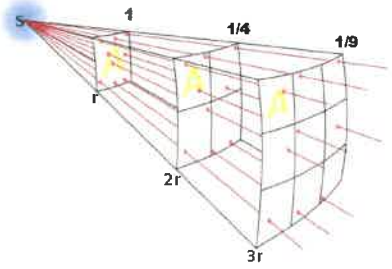
## TIME

Obviously, the more time spent around sources of radiation, the greater the radiation exposure.

31

31

## DISTANCE




°The closer we are, the more radiation exposure we receive.

32

32

## SHIELDING

° Shielding is a factor in reducing radiation exposure.

° **Dense materials help shielding gamma radiation.**

° Hydrogenous materials effective in shielding from neutron radiation.

33

33

## DOSE RATE EXAMPLE (TIME)

Situation:

1. Mid-trunk dose rate is approx. **0.5** mRem/hr.
2. **20** tests per day.
3. **3** minutes per test
4. **5** days per week

Solution:

Dose = **.5**mRem/hr x **20**tests/day x **3**min/test x **5**d/week
= **2.5** mRem for one week
= **130** mRem for a year

34

34

## DOSE RATE EXAMPLE (DISTANCE)

° **Doubling the distance reduces the dose rate to ¼** ("inverse square law").

° Decreasing the distance by ½, increases the dose rate 4 times.

° 10 mRem/hr at 1 meter⇔ 2.5 mRem/hr at 2 meters.

35

35

## REGULATORY PROGRAMS

° U.S. Nuclear Regulatory Commission (**NRC**).

° U.S. Department of Transportation (**DOT**).

° Virginia Department of Health (**VDH**).

° Maryland Department of the Environment (**MDE**).

° ECS Corporate Policy.

36

36

## CONTROL, ACCOUNTABILITY, & SECURITY

° Location must be known at all times:
- Sign out correctly
- Keep locked in vehicle when not using
- Watch where you park
- Constant surveillance when not secured
- Control during use
- Sign in correctly

37

37

## STORAGE SURVEILLANCE

38

38

## CONTROL, ACCOUNTABILITY, & SECURITY (CONT'D)

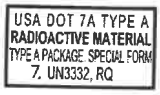
° Be mindful of security at all times:
- Theft:
  - ° About $6,000.00 each
  - ° Perceived vs. Actual value
- Keep case and vehicle locked
- Report any suspicious activity to Team Leader and RSO
- **Report theft or loss <u>immediately</u>**

39

39

## LOCAL TRANSPORTATION

° Governed by DOT regulations.
° Proper, secure, braced container.
° Chained & locked to vehicles.
° Maximize distance from driver.
° Required labels:
° Seals?


40

40

## SECURE FROM MOVING


Ratchet strap to stop movement

41

41

## REQUIRED LABELS


42

42

## SHIPPING CONTAINER

43

43

## LOCAL TRANSPORTATION (CONT'D)

- Transportation documents:
  - Copy of office's license
  - Office Radiation Safety Plan
  - **"Bill of Lading"**
  - Letter of authorization
  - Gauge's operating manual
  - Current leak test certification
- Carry your certification card!

44

44

## TRANSPORTATION DOCUMENTS

45

45

## LOCAL TRANSPORTATION (CONT'D)

- **Bill of Lading must be available/visible & within reach.**
- **On passenger seat when driving.**
- **On driver's seat when parked.**
- Don't leave gauge unattended unless properly secured.

46

46

## EMERGENCY RESPONSE

- Physical damage.
- Theft or loss.
- Fire.
- Incidental to an incident.

47

47

## PHYSICAL DAMAGE

- **Cordon off at least a 15-foot radius area.**
- **Call RSO immediately!!!!**
- If source, housing, and shielding are intact, repack and return to the office only if specifically authorized.

48

48

## THEFT OR LOSS

- **Call RSO immediately.**
- He or she will notify:
  - Police
  - Regulatory agency
  - Corporate RSO
- Details in Radiation Safety Plan.

49

49

## FIRE

- **Call 911.**
- Notify the RSO.
- Provide fire officer with the technical information contained in the Radiation Safety Plan.

50

50

## INCIDENTAL TO AN INCIDENT

- Example: traffic accident without damage to gauge or case but police officer sees radiation symbol.
- Politely provide the copy of your shipping documents:
  - Authorization to carry
  - Office's radioactive materials license
  - Nature and quantity of radioactive material
  - UN and DOT transportation codes

51

51

## PORTABLE NUCLEAR DENSITY/MOISTURE GAUGES

52

52

## REOCCURING GAUGE REQUIREMENTS

- Daily standardization checks.
- Semi-annual leak tests.
- Annual calibration.
- Semi-annual formal inventories.
- Constant control and supervision.

53

53

## STANDARDIZATION CHECK

54

54

## KEYBOARD

55

55

## STANDARDIZATION ("STANDARD COUNTS")

- Accounts for radioactive decay and aging of electronics over time.
- Required daily.
- Place gauge on standard block:
  - Do on flat level surface
  - Minimum of **30 feet** from other gauges
  - Minimum of **5 feet** from other objects
  - Handle in **SAFE** position

56

56

## "STANDARD COUNT" (CONT'D)

- Conduct and record daily.
- CPN gauges:
  - **"Dxi" and "Mxi" between 0.75 and 1.25**
- Troxler gauges:
  - **"Ds" and "Ms" show "P" for pass**
- If out of range:
  - Perform new count
  - After a couple of failing attempts contact supervisor/RSO

57

57

## MAINTENANCE

- **Keep it dry**:
  - Gauge
  - Case
- Wipe off dust and mud before repacking.
- Minimal other maintenance on your part.
- Notify RSO of any problems.

58

58

## SAFETY

- Radiation safety!!!
- Use hand trucks.
- Ask for help!!
- Watch your back!!
  - Don't strain your back
  - Watch areas around you

59

59

## RADIATION SAFETY PLAN

- Summarizes many regulatory requirements already addressed.
- RSO responsibilities.
- Individual responsibilities:
  - Documentation
  - Standard counts
  - Transportation
  - Safety
  - Security
  - Dosimeter
  - Proper operations

60

60

## RADIATION SAFETY PLAN (CONT'D)

- Dosimetry/"Film Badge":
  - Wear and store your badge properly
  - Exchange quarterly
  - Administrative dose limit of 250 mRem quarterly
  - Records are available
  - Report possible/actual pregnancy
  - Records maintained indefinitely

61

61

## DOSIMETERS

62

62

## RADIATION SAFETY PLAN (CONT'D)

- Storage:
  - At the office
  - At approved off-site locations
  - Never at home!!!
  - Never in car!!!

63

63

## "NUKE ROOM"

64

64

## CHECK FOR COMPONENTS

65

65

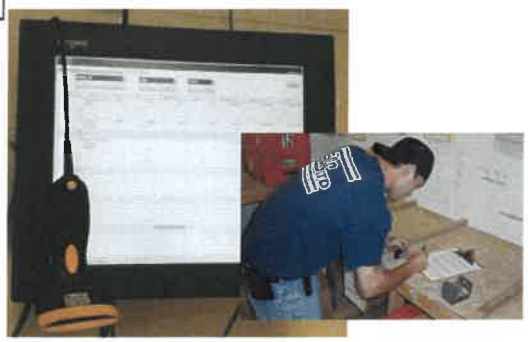
## RADIATION SAFETY PLAN (CONT'D)

- Control, accountability, and security:
  - Proper sign out
  - Triple locked when unattended
  - Keep under surveillance/never leave unattended
  - Stay within **10'** when using with an eye on it..!
  - Watch where you park

66

66

## SIGN–OUT CONTROL



67

67

## RADIATION SAFETY PLAN (CONT'D)

- Transportation:
  - Gauge braced/blocked to prevent movement
  - As far from driver as possible
  - Visible/available shipping documents
  - Proper shipping container with labels

68

68

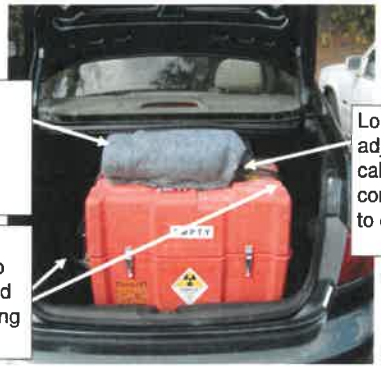
## RADIATION SAFETY PLAN (CONT'D)

- Transportation:
  - VDH requires that the handles are also locked!

69

69

## SEDAN SECURITY




70

70

## SUV/COVERED SECURITY


71

71

## PICK-UP SECURITY


72

72

## RADIATION SAFETY PLAN (CONT'D)

- Maintenance:
  - Keep clean
  - Keep dry
  - Account for components
  - Report problems
- Records:
  - Be thankful you're not the RSO
  - Carry transportation documents
  - Carry your radiation course certificate

73

73

## RADIATION SAFETY PLAN (CONT'D)

- Training:
  - Initial training/orientation
  - Most operational uses as part of Soils I
  - Annual refresher required per VDH
  - DOT hazmat training every 3 years

74

74

## RADIATION SAFETY PLAN (CONT'D)

- Emergency response:
  - Physical damage
  - Theft or loss
  - Fire
  - Key telephone numbers

75

75

## ABSOLUTES!

- **Wear <u>your</u> dosimeter correctly.**
- **Properly sign out gauge.**
- **Transport correctly.**
- **Never lose control.**
- **Always carry "Shipping Papers".**
- **Know emergency procedures.**
- **Return when work completed.**
- **Properly sign in gauge.**

76

76

## SECURE AND SIGN-IN

77

77

## QUESTIONS & REVIEW

78

78

# BACKGROUND INFORMATION

79

79

## 49 CFR 172.700, 701, 702 & 704

- Hazmat and security awareness training.
- Part of initial radiation safety training.
- Recurrent training at least every 3 years.
- Minimize hazards:
  - Proper transportation
  - Proper use
  - TDS
- Avoid incidents:
  - Constant control
  - Secured in vehicle

80

80

## SECURITY (49 CFR 172.700, TO 704)

- Actual risk minimal.
- Perceived value may be higher.
- Lock the case.
- Lock your vehicle.
- Watch where you park.
- Report any suspicious activity.
- Know security provisions of Radiation Safety Plan.

81

81

## REQUIREMENTS (APPENDIX D, NUREG-1556, VOL 1, REV 1)

- 1.5 to 2 hours of radiation and regulatory requirements:
  - Safe use
  - Radiation vs. Contamination
  - TDS
  - Control & Surveillance
  - Inventory
  - Inspections
  - Deliberate Misconduct

82

82

## REQUIREMENTS (APPENDIX D, NUREG-1556, VOL 1, REV 1) (CONT'D)

- 1.5 to 2 hours on portable gauge theory and operations:
  - Operating
  - Maintenance
  - Transportation
  - Emergency Actions
- Office Radiation Safety Plan.
- Examination (70%).

83

83

## REQUIREMENTS

- NRC Policy & Guidance Directive PG 2-07 required annual refresher training.
  - Operating and emergency procedures.
  - DOT requirements.
  - Changes in regulations or license conditions.
  - Audit deficiencies corrected.

84

84

# TRAINING AND AUTHORIZED USER LIST

Shipper/Owner:

**ECS Mid-Atlantic, LLC**
14026 Thunderbolt Place, Suite 100
Chantilly, Virginia 20151

Phone: 703-471-8400
Fax: 703-834-5527

Having completed the prescribed training in general radiation safety, US-DOT hazardous material transportation regulations, gauge operations and this office's radiation protection policy and procedures, the following ECS employees are authorized by ECS employees are authorized by ECS to use and transport the Heuresis XRF Analyzers:

- Bobby Rhett
- Israel Santana
- Gallardo Nuique
- Suhel Shafaat
- Taylor Michelitch
- Catherine Bourne
- Brian Wasserstein
- Lauren Kesslak
- Jennifer Turner
- Zach Harell
- Maria Reynozo
- Adam Truax
- Sheryll Metzger

Adam Truax

RSO Assistant

# Certificate of Training

## Adam Truax

Has completed the Viken Corporation training materials presented on the topic of Instrument Operator Training, Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

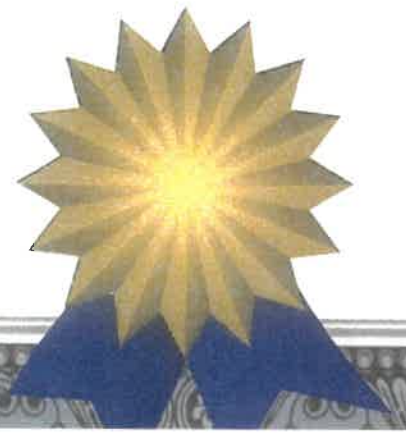
## Instrument Operator Training
## Viken Detection Corporation,
## Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Lauren E. Kesslak, CIH, CSP — Name

4/13/22 — Date

Project Manager — Title



I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Viken Detection Corporation.

Adam Truax — Name

4/13/22 — Date

# Certificate of Training

Has completed the Heuresis Corp. training materials presented on the topic of Instrument Operator Training, Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

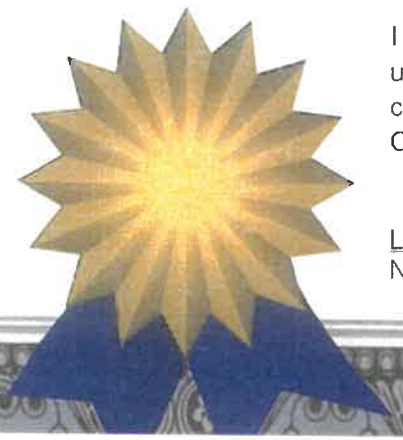
## Instrument Operator Training
## Heuresis Corporation, Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Adam Robison
Name

July 1, 2020
Date

Senior Director of Sales
Title



I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Heuresis Corporation.

Lauren Kesslak
Name

July 1, 2020
Date

# Certificate of Training

## Robert Rhett

Has completed the Viken Corporation training materials presented on the topic of Instrument Operator Training, Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

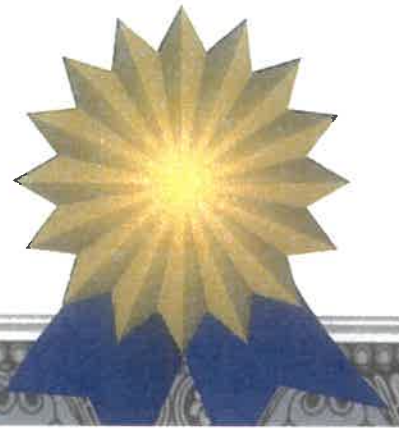
## Instrument Operator Training
## Viken Detection Corporation,
## Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Dianna Krass — Name

2/27/2018 — Date

Senior Project Manager — Title



I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Viken Detection Corporation.

Robert L. Rhett — Name

2/27/2018 — Date

# Certificate of Training

Has completed the Heuresis Corp. training materials presented on the topic of Instrument Operator Training, Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

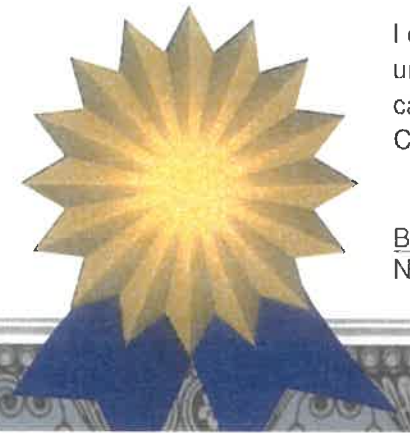
## Instrument Operator Training
## Heuresis Corporation, Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Adam Robison
Name

April 7th, 2019
Date

Senior Director of Sales
Title



I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Heuresis Corporation.

Brian Wasserstein
Name

April 7th, 2019
Date

# Certificate of Training

Has completed the Heuresis Corp. training materials presented on the topic of Instrument Operator Training, Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

## Instrument Operator Training
## Heuresis Corporation, Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Adam Robison
Name

April 7th, 2019
Date

Senior Director of Sales
Title

I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Heuresis Corporation.

Catherine Bourne
Name

April 7th, 2019
Date

# Certificate of Training

Has completed the Heuresis Corp. training materials presented on the topic of Instrument Operator Training. Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

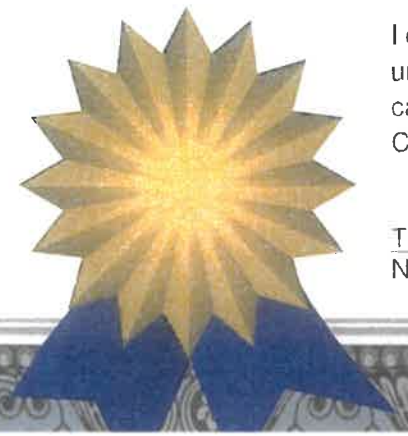
## Instrument Operator Training
## Heuresis Corporation, Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Adam Robison
Name

April 7th, 2019
Date

Senior Director of Sales
Title



I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Heuresis Corporation.

Taylor Michelitch
Name

April 7th, 2019
Date

# Certificate of Training

Has completed the Heuresis Corp. training materials presented on the topic of Instrument Operator Training, Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

## Instrument Operator Training
## Heuresis Corporation, Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Adam Robison
Name

April 7th, 2019
Date

Senior Director of Sales
Title

I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Heuresis Corporation.

Suhel Shafaat
Name

April 7th, 2019
Date

# Certificate of Training

Has completed the Heuresis Corp. training materials presented on the topic of Instrument Operator Training, Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

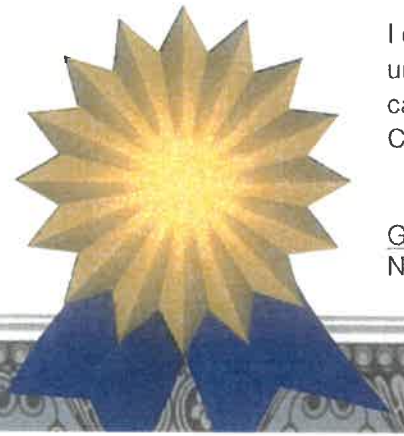
## Instrument Operator Training
## Heuresis Corporation, Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Adam Robison
Name

April 7th, 2019
Date

Senior Director of Sales
Title



I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Heuresis Corporation.

Gallardo Nuique
Name

April 7th, 2019
Date

# Certificate of Training

## Zach Harrell

Has completed the Viken Corporation training materials presented on the topic of Instrument Operator Training, Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

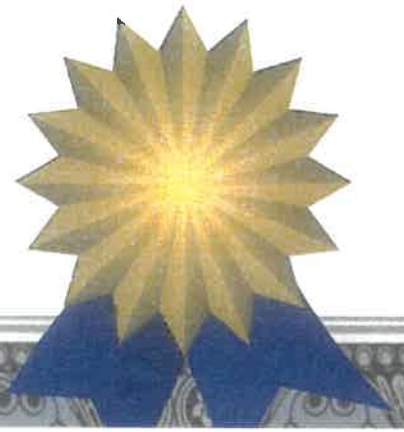
## Instrument Operator Training
## Viken Detection Corporation,
## Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Lauren E. Kesslak, CIH, CSP — Name

10/11/21 — Date

Project Manager — Title



I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Viken Detection Corporation.

Zach Harrell — Name

10/11/21 — Date

# Certificate of Training

## Maria Reynozo

Has completed the Viken Corporation training materials presented on the topic of Instrument Operator Training, Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

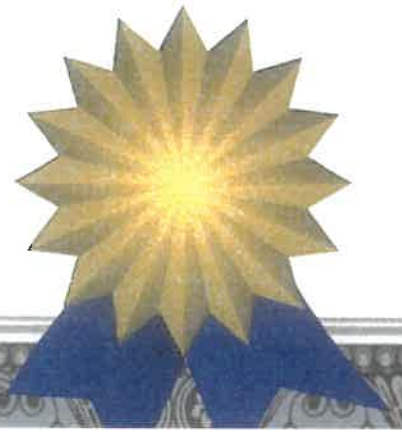
## Instrument Operator Training
## Viken Detection Corporation,
## Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Lauren E. Kesslak, CIH, CSP — Name

10/11/21 — Date

Project Manager — Title



I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Viken Detection Corporation.

Maria Reynozo — Name

10/11/21 — Date

# Certificate of Training

## Marcus Sobetsky

Has completed the Viken Corporation training materials presented on the topic of Instrument Operator Training, Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

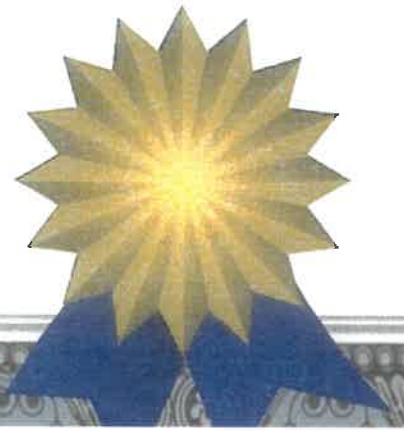
## Instrument Operator Training
## Viken Detection Corporation,
## Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Lauren E. Kesslak, CIH, CSP — Name

10/11/21 — Date

Project Manager — Title



I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Viken Detection Corporation.

Marcus Sobetsky — Name

10/11/21 — Date

# Certificate of Training

## Sheryll Metzger

Has completed the Viken Corporation training materials presented on the topic of Instrument Operator Training, Pb200i, with regards to the materials licensed by the Commonwealth of Massachusetts and the Nuclear Regulatory Commission.

## Instrument Operator Training
## Viken Detection Corporation,
## Pb200i

I confirm that the above named individual has received the training listed on this certificate.

Lauren E. Kesslak, CIH, CSP — Name

4/13/22 — Date

Project Manager — Title

I certify that I have received the stated training and understand the content presented. I understand that I can follow up this training with questions from Viken Detection Corporation.

Sheryll Metzger — Name

4/13/22 — Date

HEURESIS CORPORATION

## *Radiation Safety:*

Every Heuresis Pb200i Lead Analyzer is designed to be safe as possible. As with any device that produces ionizing radiation, you should follow basic radiation protection precautions to ensure the maximum safety for you and those around you.

The Heuresis Pb200i is approved for a 370 MB1 (10 mCi) $^{57}Co$ sealed radioisotope; typically, the device is supplied to customers with a 185 MBq (5 mCi) source. The radioactive material is contained in a sealed capsule (referred to as a "sealed source capsule"). The capsule is fully contained by the shutter mechanism and cannot be accidentally (or deliberately) removed from the device without disassembling the instrument.

The sealed source capsule is located in the instrument's snout. When the shutter is open, gamma rays and x-rays from the source are emitted in the forward direction from the front of the device.

There are two controls that need to be activated before the shutter will open. First, the proximity sensor at the front of the snout must be depressed. To do this, press the front of the instrument against the surface to be measured. Second, the trigger on the handle must be pressed. Opening the shutter starts the reading. Releasing the trigger or lifting the snout of the instrument from the sample so that the proximity sensor is not fully depressed, will stop a reading in progress.

In a PCS Mode where the measurement stops automatically, the shutter will automatically close when the reading is complete.

Caution: The proximity switch ~~must~~ be pressed before the trigger is pressed, or the shutter will not open. The shutter of the device will automatically close when a reading is complete, even if you continue to hold the instrument against the sample. The large majority of the instrument readings will take less than two seconds.

The Pb200i is designed so you cannot accidently open the shutter. For starters, the instrument requires a password to operate the shutter. Be sure to release the trigger before you remove the instrument from the surface being tested. If you accidentally keep the trigger depressed when you lift the instrument, the shutter will close automatically, as the proximity switch will not be activated.

The shutter should ~~only~~ be opened when the instrument is placed against the sample. Do not hold the sample to be measured, or any body parts, in the path of the gamma ray beam. When measuring a surface such as a wall or door, make sure no one is located within 1m (approximately 36") on the direct opposite side of the surface being measured.

During testing, a strong beam of radiation (gamma-rays and x-rays) is continuously emitted through the aluminum faceplate at the front of the Pb200i. Some radiation is produced at the front and top-front of the instrument. There is also negligible radiation where your hand holds the instrument.

**Warning:** Always treat radiation with respect. Do not put your hand on the front end of the Pb200i while taking a measurement. Never point the Pb200i at yourself or anyone else when the shutter is open.

**Caution:** When testing the exterior of a window from the inside of a room, avoid standing in the path of the Pb200i's radiation beam. The beam emits upwards from the front of the instrument.



Download The DataOps Guide
See How Companies Plan for Organizational, Procedural, and Technological Shifts
StreamSets

HEURESIS CORPORATION

**Typical dose rates (5 milliCurie [185 MBq] source)**
**with the shutter closed,**
**in milliREM/hr.,**
**are as follows:**

| | 5 cm | 30 cm | 100 cm |
|---|---|---|---|
| Left | 0.75 | 0.03 | <0.01 |
| Right | 0.48 | 0.025 | <0.01 |
| Top | 0.25 | 0.025 | <0.01 |
| Bottom | 0.55 | 0.025 | <0.01 |
| Front | 1.0 | 0.035 | <0.01 |
| Rear | 0.05 | 0.015 | <0.01 |

**Typical dose rates (5 milliCuries [185 MBq] source)**
**with the shutter open,**
**taking a reading on wood,**
**in milliREM/hr.,**
**are as follows:**

| | 5 cm | 30 cm | 100 cm |
|---|---|---|---|
| Left | 1.3 | 0.045 | <0.01 |
| Right | 1.7 | 0.06 | <0.01 |
| Top | 1.9 | 0.055 | 0.015 |
| Bottom | 0.70 | 0.04 | <0.01 |
| Rear | 0.20 | 0.025 | <0.01 |



Download The DataOps Guide
See How Companies Plan for Organizational, Procedural, and Technological Shifts
StreamSets

HEURESIS
CORPORATION

## *Operating Conditions & Other Safety*

Please follow these operating conditions when using the Heuresis Pb200i:

- Your organization's radiation safety officer (RSO) should set up and assign the passwords for and assigned by the RSO. users who can take measurements.N on-mandatory safety options for users can be mandated

To take a reading with the Pb200i, the instrument must be held against a surface. (The shutter will not open unless the proximity switch is activated. The shutter will close as soon as the Heuresis Pb200i is no longer pressed against a surface. The shutter will close at the end of each reading.)

- The shutter should be open only during a measurement.

- The shutter should be open only when the instrument is in use, taking a measurement.
  - Never point the Pb200i at yourself or anyone else when the shutter is open. Remember, the radiation can penetrate doors, walls, etc. No one should stand within 1m (approximately 36") of the wall opposite the measurement location.
  - The Heuresis Pb200i clearly indicates any time the shutter is open with red warning lights at the top and sides of the instrument. Always observe the status of the warning lights.
  - Always transport the device in accordance with the regulations of the jurisdiction in which you are located. Always transport the device in the hard plastic case supplied with the instrument. This case can be transported in a cardboard and foam over pack for additional protection. Be sure to use all transportation labels required by the regulatory jurisdiction(s) where you are travelling. For more information consult the Heuresis DOT training presentation.
  - Only those trained and authorized to use the Pb200i should operate the device. The Heuresis Pb200i must be under the control of an authorized user and stored in an authorized and secure location at all times.
  - When removing the instrument from its storage location, it is critical to maintain a log of dates and times removed and returned, location of use, and the name of the authorized user using the instrument. Include a comments section for noting any issues related to the instrument or its use.
  - The holster for the instrument contains shielding for emergency situations. If you suspect a problem with the instrument, such as the shutter staying open, place the instrument firmly in its holster. This ensures safe handling and protection against inadvertent exposure to radiation.



Download The DataOps Guide
See How Companies Plan for Organizational, Procedural, and Technological Shifts
StreamSets

## *Radiation Dosimetry*

Radiation dosimetry is worn to monitor radiation levels. It should be worn when required by your regulatory jurisdiction, company safety policy, or RSO. Typically several rounds of dosimetry are used, along with exposure time and use estimates to determine whether dosimetry should be discontinued. If no dosimetry is used, a written justification must be kept on file.

Dosimetry can be obtained for companies such as:

Radiation Detection Company

3827 Gateway Drive, Georgetown, TX 78626

Landauer Corporate Office
2 Science Road
Glenwood, IL 60425-1586

Dosimeters can be worn on a finger with a ring badge or on the body using a whole-body badge. Your organization should have an established dosimetry program to determine the required use and type of dosimeters. Always follow the instructions provided by the vendor when using dosimetry badges. Dosimeters should be returned to the vendor for analysis.

Dosimetry badges are changed on either a monthly or quarterly basis. The correct option depends on the dose received. If dosimetry is used, most users require a quarterly change – but this also depends on whether the user is receiving a dose from another source.

Electronic dosimeters can also be used to electronically display the dose. Electronic devices are sold by companies such as:

Canberra Industries, Inc.
800 Research Parkway
Meriden, CT 06450

Whatever method you select, be sure to maintain the proper records as mandated by your local regulatory agency. Be sure to check for the time required in your juristiction. Some regulators require that records are kept until the license is terminated, and then transferred to the regulatory agency.



Download The DataOps Guide
See How Companies Plan for Organizational, Procedural, and Technological Shifts.
StreamSets

## Leak Testing

A leak test must be performed at least every 12 months on the Heuresis Pb200i, as specified in the Registry of Radioactive Sealed Sources and Devices, Safety Evaluation of Device, No: MA-1397-D-101-B. Certain regulatory jurisdictions, especially States requiring a Specific License, may require leak tests every six months.

The leak test kit is provided by the laboratory that performs the leak test analysis. A leak test involves wiping the seams of the front of the instrument to assess whether radioactive material has leaked from the sealed source (extremely unlikely) and contaminated the outside of the instrument (Figure 111) State radiation control programs maintain lists of approved leak test laboratories.

Two options include:

Valley Safety Services Associates
330 Old Enfield Rd.
Belchertown, MA 01007

Troxler Electronic Laboratories, Inc.
3008 Cornwallis Road
P.O. Box 12057

Research Triangle Park, NC 27709
A copy of the leak test results must be kept on file at your primary location of storage. It is also useful to keep a copy of the leak test results with the instrument, as this may be required or desired in certain transport situations. Heuresis recommends keeping a copy of the leak test results inside the instrument transport case at all times.

It is important to maintain all leak test reports, even after expiration. Regulations vary on how long test results should be maintained, but Heuresis recommends keeping leak test results for a minimum of two years. Be sure to check your regulations to ensure compliance.

If the leak test expires on an instrument, the device must be taken out of use and placed in its secure storage location. The instrument must be clearly marked as unusable until a valid leak test is conducted. The instrument must have a valid leak test for transportation.

## Conducting the Leak Test

Following the instructions of the leak test kit, wipe the areas shown (Figure 137).



Download The DataOps Guide
See How Companies Plan for Organizational, Procedural, and Technological Shifts
StreamSets

# Performance Characteristic Sheet

**EFFECTIVE DATE:** **December 1, 2015**

**MANUFACTURER AND MODEL:**

Make: ***Heuresis***
Models: ***Model Pb200i***
Source: ***$^{57}$Co, 5 mCi (nominal – new source)***

## FIELD OPERATION GUIDANCE

**OPERATING PARAMETERS:**

Action Level mode

**XRF CALIBRATION CHECK LIMITS:**

| |
|---|
| 0.8 to 1.2 mg/cm$^2$ (inclusive) |

**SUBSTRATE CORRECTION:**

Not applicable

**INCONCLUSIVE RANGE OR THRESHOLD:**

| ACTION LEVEL MODE READING DESCRIPTION | SUBSTRATE | THRESHOLD (mg/cm$^2$) |
|---|---|---|
| Results not corrected for substrate bias on any substrate | Brick<br>Concrete<br>Drywall<br>Metal<br>Plaster<br>Wood | 1.0<br>1.0<br>1.0<br>1.0<br>1.0<br>1.0 |

# BACKGROUND INFORMATION

## EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in November 2015, with two separate instruments running software version 2.1-2 in Action Level test mode. The actual source strength of each instrument on the day of testing was approximately 2.0 mCi; source ages were approximately one year.

## OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

## XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm$^2$ in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm$^2$ film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

## SUBSTRATE CORRECTION VALUE COMPUTATION:

Chapter 7 of the HUD Guidelines provides guidance on correcting XRF results for substrate bias. Supplemental guidance for using the paint film nearest 1.0 mg/cm$^2$ for substrate correction is provided:

XRF results are corrected for substrate bias by subtracting from each XRF result a correction value determined separately in each house for single-family housing or in each development for multifamily housing, for each substrate. The correction value is an average of XRF readings taken over the NIST SRM paint film nearest to 1.0 mg/cm$^2$ at test locations that have been scraped bare of their paint covering. Compute the correction values as follows:

> Using the same XRF instrument, take three readings on a bare substrate area covered with the NIST SRM paint film nearest 1 mg/cm$^2$. Repeat this procedure by taking three more readings on a second bare substrate area of the same substrate covered with the NIST SRM.
>
> Compute the correction value for each substrate type where XRF readings indicate substrate correction is needed by computing the average of all six readings as shown below.
>
> For each substrate type (the 1.02 mg/cm$^2$ NIST SRM is shown in this example; use the actual lead loading of the NIST SRM used for substrate correction):
>
> Correction value = (1st + 2nd + 3rd + 4th + 5th + 6th *Reading*)/6 - 1.02 mg/cm$^2$
>
> Repeat this procedure for each substrate requiring substrate correction in the house or housing development.

## EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

**TESTING TIMES:**

In the Action Level paint test mode, the instrument takes the longest time to complete readings close to the Federal standard of 1.0 mg/cm$^2$. The table below shows the mean and standard deviation of actual reading times by reading level for paint samples during the November 2015 archive testing. The tested instruments reported readings to one decimal place. No significant differences in reading times by substrate were observed. These times apply only to instruments with the same source strength as those tested (2.0 mCi). Instruments with stronger sources will have shorter reading times and those with weaker sources, longer reading times, than those in the table.

| Mean and Standard Deviation of Reading Times in Action Level Mode by Reading Level | | |
|---|---|---|
| **Reading (mg/cm$^2$)** | **Mean Reading Time (seconds)** | **Standard Deviation (seconds)** |
| < 0.7 | 3.48 | 0.47 |
| 0.7 | 7.29 | 1.92 |
| 0.8 | 13.95 | 1.78 |
| 0.9 – 1.2 | 15.25 | 0.66 |
| 1.3 – 1.4 | 6.08 | 2.50 |
| ≥ 1.5 | 3.32 | 0.05 |

## CLASSIFICATION OF RESULTS:

XRF results are classified as **positive** if they are **greater than or equal** to the stated threshold for the instrument (1.0 mg/cm$^2$), and *negative* if they are *less than* the threshold.

## DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

This XRF Performance Characteristic Sheet (PCS) was developed by QuanTech, Inc., under a contract with the XRF manufacturer.

Search

HEURESIS CORPORATION

# Licensing of Heuresis Portable XRF Analyzers with Radioactive Sources

To use and possess a portable XRF device containing radioactive material in the United States, one must be licensed. There are two types of licenses that are available in most areas of the country: one is called general license, and the other is called a specific license.

## Specific Licensing

In jurisdictions where a specific license is required for isotope-based instruments, a specific license must be applied for and obtained prior to delivery of the device. In most states, if you are going to get specifically licensed, you will want to begin the application process at least 6 to 8 weeks prior to your expected delivery date. The best approach to applying for a specific license is to contact your state regulator (or the NRC if you are in a non-agreement state) and ask for copies of the application form and any application guidance documents they might have available. Review the application requirements and identify any supporting material or information you may need from Heuresis Corporation or elsewhere. Your Heuresis analyzer sales representative may have some tools (e.g., documents, guidance) to help you meet the application requirements of a specific state

We use cookies to help us give you the best experience on our site. You can find out more or switch them off if you prefer. However, by continuing to use the site without changing settings, you are agreeing to our use of cookies.

## General Licensing

Many of our customers acquire a Heuresis Corporation portable XRF device under the provisions of a general license (GL). A GL is a license that is issued automatically to the user by the regulator in their jurisdiction. There is no license application to fill out, and no license document is issued. Heuresis Corporation submits a report to your regulatory agency within 120 days of your receipt of the device identifying you as a new general licensee. If the device is distributed under a general license, then there is a label on the device that describes it as being generally licensed and contains basic information about the license requirements.

The Nuclear Regulatory Commission (NRC) has a number of helpful web sites dedicated to providing you with the information and tools you will need to operate in compliance under your general license. If you have questions about general licensing, these web sites are a great place to start.

## Transportation of Heuresis Portable XRF analyzers with Radioactive Sources

Radioactive material is considered a hazardous material (HAZMAT) for the purposes of transport. This means that the transportation of a portable XRF device containing radioactive material is regulated. In the United States, the regulatory authority for HAZMAT transport is the Department of Transportation (DOT). The Federal hazardous materials transportation law (49 U.S.C. § 5101 et seq.), is the basic statute regulating the transportation of hazardous materials in the United States. This law requires the training of ALL HAZMAT employees. The purpose is to increase a HAZMAT employee's safety awareness and be an essential element in reducing HAZMAT incidents. You can find additional information about the DOT's training requirement on their website using the following links:

- DOT Training Requirement
- DOT Training Q&A

We use cookies to help us give you the best experience on our site. You can find out more or switch them off if you prefer. However, by continuing to use the site without changing settings, you are agreeing to our use of cookies.

Search

Search

HEURESIS CORPORATION

We use cookies to help us give you the best experience on our site. You can find out more or switch them off if you prefer. However, by continuing to use the site without changing settings, you are agreeing to our use of cookies.

# RADIATION SAFETY PLAN
# ECS – CHANTILLY
# (Updated: February 2011)

## General

ECS Chantilly owns and operates numerous portable nuclear gauges to determine the moisture content or density of a variety of engineered materials as well as XRF analyzers for the detection of lead-based paint.

This plan addresses policies and requirements of both the U.S. Nuclear Regulatory Commission (NRC) and the Commonwealth of Virginia. On March 31, 2009, Virginia became an Agreement State for the control and licensing of radioactive materials on non-Federal land. The Virginia Department of Health (VDH) is the designated agency for overseeing the Commonwealth's Radioactive Materials Program (RMP). At the same time, the office does extensive work on military installations that are classified as "exclusive Federal jurisdiction." This plan attempts to smoothly integrate the Federal, the state, and corporate requirements into a single document that is adequate for routine use.

If used and maintained properly, these gauges present a low exposure risk to the operator, other ECS employees, and the general public. At the same time, however, the regulatory controls are strict.

This plan is intended to be an integral component in the overall Safety Program to ensure that test instruments containing radioactive sources are properly stored, secured, used, transported, maintained, and controlled at all times.

1. It restates the key items from the relevant NRC and U.S. Department of Transportation (DOT) Regulations, applicable requirements from the Virginia Radiation Safety Program, and the ECS Corporate Services Radiation Safety Program as they relate to portable nuclear gauges.
3. It restates the pertinent points from the Commonwealth of Virginia regulations addressing XRF lead paint analyzers.
4. It summarizes all of the actions and responsibilities of managers and operators to confirm that the letter and the intent of the Corporate Services Radiation Safety Program are met.

## Radiation Safety Officer

Use and possession of portable nuclear gauges is under the direction and supervision of the Chantilly Radiation Safety Officer (RSO). As a designated and trained representative of the office manager, the RSO is the single point of accountability and

responsibility between the NRC and the VDH and ECS Chantilly. The RSO is responsible for implementation of this Radiation Safety Plan.

Typical duties of the RSO and authorized users are listed in the Corporate Services Radiation Safety Program. The following responsibilities are repeated or restated for emphasis:

1. Ensures that the office's Radiation Safety Plan is fully coordinated with the office's current radioactive materials licenses, the original application documentation for each license, and the Corporate Services Radiation Safety Program.
2. Ensures that all authorized users are properly trained and proficient in gauge use, cleaning, accountability controls, transportation, security, and emergency procedures.
3. Schedules refresher (Annual Radiation Safety Refresher Training is a VDH requirement) and recurrent training as required, and maintains required training records.
4. Coordinates or completes formal semi-annual inventories, annual calibrations, semi-annual leak tests, and Annual Program Reviews. Actions are to be completed, documented, and archived in accordance with this Plan and the Corporate Services Radiation Safety Program.
5. Functions as a point of contact and gives assistance in case of an emergency. Notifies the NRC and/or the VDH and ECS Corporate Services immediately of incidents or accidents that could result in a release of radioactive material.
6. Maintains and monitors individual exposure records of authorized users. Highlights restricted levels for minors and declared pregnant women, and investigates exposures in excess of ECS' administrative dose limit for a quarter. Records will be maintained in a locked container due to Privacy Act protection.
7. Using calculations or measurements can fully demonstrate and document that the public and non-users are not exposed to more than 100 mRem in a year and more than 2mRem per hour in unrestricted areas. This applies to both the office storage locations as well as all temporary, job-site storage locations.
8. Maintains copies of and ensures compliance with current NRC, VDH, and DOT regulations.
9. Ensures that individuals or agencies receiving or being shipped gauges for calibration, maintenance, or disposal are properly licensed for that activity. This includes commercial shippers being used to transport gauges.
10. Establishes controls and procedures to ensure a reasonable degree of security and accountability for all gauges at all times.
11. Signs and maintains a formal document acknowledging the delegation of authority and acceptance of the responsibilities as the office's RSO (this is a Virginia requirement; there is no Federal equivalent). A template for a letter of delegation is attached.

12. Makes all appropriate entries (i.e., leak tests, calibration, Annual Program Reviews) to the FRED "Event Scheduler."

Individual Gauge Operator

1. Before removing the gauge from its place of storage, checks to make sure that the gauge source is in the shielded position, that the source rod is locked, and that the transport case is locked.

2. Signs the gauge out using the bar code system or the sign out sheet including the date(s) of use, name(s) of the authorized users who will be responsible for the gauge, and the jobsite(s) where the gauge will be used.

3. Completes a standardization check and the utilization log for the gauge being used.

4. Follows applicable DOT requirements when transporting the gauge. This includes both proper blocking and bracing to prevent the shipping case from moving and the proper display of transportation documents.

5. Exercises required control over the gauge at all times and maintains constant surveillance. Is never more than 10 feet from the gauge during use, and at no time is the gauge to be left unattended or in the possession of an unauthorized person. Always keep unauthorized persons away from the area where the gauge is to be used. Implements the required physical security provisions when the gauge is not under the direct control of the operator.

6. Assists operators of heavy equipment in seeing gauges and operators at construction sites. Reflective vests are required.

7. Understands that operator should not look under the gauge when the source rod is being lowered into the ground.

8. Does not touch the source rod with fingers, hands, or any part of the body, and always makes sure the source rod is in the shielded position and locked after measurements are made.

9. When not being used for field measurements, returning the gauge to its storage/transportation case in a secured storage location. Ensure that two independent and proper locking systems separate from the transportation case lock and the source rod lock are being used.

10. Wipes the gauge and case clean of any dirt, dust or mud prior to returning to the permanent storage location as soon as possible. Notifies the RSO of any maintenance issues/needs, and logs the gauge back in on the utilization log.

11. When using the equipment, wears the personnel monitoring device (dosimeter) assigned. Never wears another person's film badge. Never stores dosimeter near the gauge. When the operator is not using the equipment, the dosimeter will be kept in a radiation free, low heat area.

12. At all times, observes ALARA principles to minimize any dose received: As Low As Reasonably Achievable.

13. While the equipment is in the operator's possession, the operator will have the following documentation. Packets of these materials have been assembled and are stored with each gauge. Do not sign out a gauge if its appropriate packet of documents is not complete; notify the RSO if documents are missing.

    a. Copy of the "Bill of Lading." (current copies of the 5 "Bills of Lading" for the makes and models of gauges or hand are at pages V74-V78).
    b. Copies of the Office's License(s).
    c. Copy of this Radiation Safety Plan that includes emergency procedures and a telephone "call–down" list.
    d. Copy of Letter of Authorization from the RSO.
    e. Copy of the Gauge Operating Manual.
    f. Copy of the Current Leak Test Certificate.

14. Ensures the bill of lading is clearly visible on the front passenger seat of the vehicle.

## Annual Program Review

At intervals not to exceed 12 months the RSO will complete and document a comprehensive radiation program review to ensure that all procedures, policies, and practices are complete and correct.

The starting point for this review is to accomplish an audit using the checklist contained in the Corporate Services Radiation Safety Program. Additional information can be obtained from audits conducted by the Agreement State regulatory agency and/or the NRC.

The next step in the process is to ensure that corrective action for any noted deficiencies or discrepancies has in fact taken place and is formally documented.

The final step is to update the office's Radiation Safety Plan to incorporate or emphasize any lessons learned as a means to help minimize the likelihood of repeat deficiencies in the future.

Once this is accomplished, an appropriate entry will be made in the FRED "Events Scheduler."

## Leak Tests of Portable Nuclear Gauges

Leak tests shall typically be performed in accordance with the manufacturers' wipe-test procedures every 6 months or at any other prescribed interval specified in the radioactive materials license. Recently some Sealed Source and Device Registration Certificates are starting to show a 1 year interval. This is only acceptable if allowed by the office's license. Any device that has exceeded the authorized interval since its last leak test shall not be used or transported until the leak test has been performed and acceptable results are received.

If a leak test indicates the presence of 0.005 microcurie or more of removable contamination, ECS will immediately withdraw the portable nuclear gauge from use and will have it decontaminated, repaired, or disposed of in accordance with applicable regulations.

All leak test reports for an individual gauge shall be permanently stored in the gauge's equipment folder, and a copy of the current test results will be included in standard shipping package for that gauge when locally transported.

A required management system is now available from the FRED homepage. By going to the "Nuclear Density Gauge" page under "Quality Assurance Event Tracking," RSOs and Managers at all levels will be able to monitor the status of gauge calibration and required leak tests.

1. An alert is provided for gauges coming up for either event.
2. Past-due events will be displayed in red.
3. Care must be taken on entering the event interval for required leak tests. Even though some Sealed Source and Device Registration Certificates are allowing 1-year intervals, license conditions and/or Agreement State requirements may still mandate 6-month intervals.
4. Separate lines are available for other portable nuclear devices such as XRF lead paint analyzers and moisture survey gauges.

## Personnel Monitoring

As part of in–processing, all technicians who will likely be using test equipment utilizing sealed radioactive sources will be issued an individual dosimeter. The possession of a valid and current dosimeter is an absolute requirement for the use of a gauge.

Landauer Type J badges that monitor both Photon (X or Gamma Ray) and Beta radiation as well as neutron emissions will be used. Ring dosimeters will be used for XRF operators.

The RSO will establish a management system to confirm that applicable individuals are issued dosimeters, that all dosimeters are exchanged quarterly, that individual exposure records are properly reviewed, that appropriate investigatory and explanatory documents are produced, and that understandable files are permanently maintained. Individual sheets of the exposure reports will be initialed by the RSO confirmating a detailed review.

Some of the incidents or actions that need to be concisely addressed to support the integrity of our documentation include:

1. Investigation and corrective action if an employee exceeds the administrative dose limit of 250 mRem in any quarter.
2. Memo listing terminated employees to support why they are no longer on the monitoring program.
3. Memo indicating if terminated employees requested and were provided a copy of their exposure reports while employed by ECS Chantilly.
4. Memo documenting lost or missing dosimeters to explain a break in the chronological sequence of reports.
5. Notation of current employees who are removed from the dosimeter program due to extended assignments not involving the use of portable nuclear gauges.
6. Documentation if female employees indicate that they are pregnant in order to cause review criteria to be modified.

Exposure records have been determined to be protected by the Privacy Act and will be maintained in a locked area. This determination also requires that the RSO has undergone a suitable background check.

## Public and Non-User Exposure

Public dose determinations for the Chantilly office have been determined using actual dosimeter readings. The three people who regularly work closest to the nuclear gauge storage room are strength testing technicians in the concrete laboratory or an equipment maintenance technician in the tool room. In effect, all individuals are non-users, although two of the individuals are currently badged. All individuals are the

closest employees to the storage room and are at their work station most of the day. A record review of the individuals records demonstrates that thier exposure is less than 20 mRems per quarter or 80 mRems per year.

In addition, a diagram of the nuclear gauge storage room, to include the surrounding areas, has been developed. This diagram will be used on a quarterly basis to record readings with the radiation survey meter to confirm that when the majority of gauges are in storage, that there is no exposure in excess of 2 mRems per hour in unrestricted space. Copies of these forms will be maintained by the Chantilly Radiation Safety Officer for future review as appropriate.

## Calibration, Maintenance and Service

All calibrations, service and maintenance shall be done on an annual basis, or as required, in accordance with the manufacturer's operating manual.

Whether calibrations are accomplished at an ECS office or gauges are shipped to an individual or agency for calibration, a copy of the individual's or agency's authorizing license must be on hand and reviewed prior to the release of the gauge.

Calibration and maintenance records shall be maintained in each gauges equipment folder (see section on Records).

If any gauge is out of calibration or in excess of the calibration interval, it will be marked as "Out of Service" and not used until properly calibrated.

A required management system for tracking the status of gauge calibration is discussed in the section on leak tests above. This system combines event tracking for both calibration and leak tests.

## Storage

1. Portable nuclear gauges for the Chantilly office are primarily stored in the locked nuclear storage room at the ECS office in Chantilly, Virginia. Nuclear density gauges may be stored at job-site storage locations only if approved in writing by the Radiation Safety Officer

2. Portable nuclear gauges shall not be taken to an individual's home or stored in any other unapproved location to include being in a vehicle overnight.

3. Whenever temporary, job–site storage is desired or required, the project manager for the particular site should make a written request to the RSO. The RSO will personally inspect such storage locations to ensure adequate control and security systems are in place and that the requirements of this Radiation

Safety Plan are complied with. Approvals will be documented in detail to include photographs of security systems and required signs and notices. Documentation will include an appropriate public-dose survey of each location. Such sites will be visited and reviewed by the RSO on a regular basis.

4. When job-site storage is approved, the portable nuclear gauges can only be used at that site. They can not be further dispatched to other project locations.

5. Post required signs and notices adjacent to the storage area:

    a. NRC Form – 3 and Virginia equivalent, "Notice to Employees."
    b. A sign with "Caution– Radioactive Material" and the international symbol.
    c. A copy of the office's radiation license, radiation safety plan, and a copy of applicable regulations or a notice as to where these documents are located

6. Currently, Chantilly has no satellite offices. Accordingly, there is no need for a license amendment to include a secondary, permanent storage location.

**Control, Accountability, and Security**

It is essential that individuals involved with portable nuclear gauges be aware of and comply with all of the requirements for the control, accountability, and security of portable nuclear gauges.

The actual or approximate location of each gauge should be known at all times. The use and transportation of gauges shall be done with full regard for the possibility of loss or damage to the gauge and in compliance with the use and transportation requirements of the USDOT and the NRC. Additionally, documentation must be thorough regarding the disposition of each gauge and who is responsible for each gauge.

1. The first step in this process is the requirement for a daily inventory of gauges each morning.
    a. This will be completed by the RSO or his or her representative.
    b. All "on hand" gauges should be in their assigned position in the storage room and properly signed in. Gauge clip boards at vacant positions should clearly indicate gauges approved for job–site storage, gauges at approved agencies for calibration or repair, or other approved dispositions.
    c. Any deficiencies noted will immediately brought to the attention of the RSO and the Construction Testing Services Manager for investigation and resolution.

2. As gauges are signed out for the day, operators shall be extremely attentive in ensuring that proper procedures are complied with and that the required electronic entries properly completed.
   a. The operator must first gain access to the storage room and to the key for the assigned gauge. The required codes/keys will only be provided to operators who are authorized to use portable nuclear gauges and who possess and are wearing their individual dosimeter.
   b. Gauges not having current Leak Test and Calibration documents will not be checked out under any circumstances.
   c. Currently ECS Chantilly is using a prototype system for electronically signing out a portable nuclear gauge. The system interfaces with both ETHEL and Scheduling.

      A technician cannot sign out a gauge unless a work order for soil or asphalt compaction has been opened. Additionally, the technician will not be allowed to sign out a gauge if his or her initial radiation safety training or annual update is more than 12 months old. If both criteria are met, the technician will be allowed to have the unique bar code affixed to each gauge case scanned.

      The "scanning out" and "scanning in" processes will record the times, and the job order(s) will provide the destination. Subsequently, as the standard count process is completed and entered into ETHEL, this same information will be electronically integrated with the sign out/in information for subsequent filing.

   d. Deviations from these procedures will not be tolerated.

3. To repeat what is stated in other sections of this plan, gauges shall be properly secured in vehicles while being transported and the vehicles will be locked when the driver is not with the vehicle.
   a. To the maximum extent reasonable, unattended vehicles containing properly-secured portable nuclear gauges will be kept under surveillance.
   b. If surveillance of unattended vehicles is not practicable, the operator is expected to use a high degree of caution so as to park his or her vehicle in a reasonably secure area.
   c. Proper security includes two independent locking systems that prevent removal of the case containing the gauge by unauthorized individuals. One system must also prevent the case from being opened. These systems are in addition to the locks on the operating handle and the case.
   d. In addition to security requirements, transportation cases will be properly blocked and braced to prevent movement during shipping.

4. Control is also required while using portable nuclear gauges on job sites.
   a. Gauges shall **never** be left unattended on job sites for **any** reason unless they are properly secured in an approved location.
   b. Operators should have gauges under constant visual control and be within 10 feet of a gauge.
   c. Reasonable actions must be taken to alert heavy equipment operators as to the location of a gauge. This is essential to avoid gauges being damaged by heavy equipment. The wearing of reflective vests to increase visibility is mandatory.
   d. When gauges are not being used for a short period of time, they shall be placed and locked in their approved shipping containers.
   e. If the use of a gauge is complete, but the operator must remain on the site for other tasks, the gauge will be properly secured in its locked shipping container and will be properly secured in the operator's vehicle.

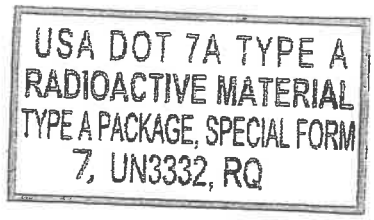
5. On return to the office the operator will:
   a. Confirm the cleanliness of the gauge and its case.
   b. Inform the RSO of any maintenance issues that must be resolved.
   c. Scan and record the gauge as "returned."
   d. Ensure the operating handle and case are locked and the locked case is then locked in its designated position in the storage room.

## Local Transportation

1. During transportation, the equipment shall be fully secured in the transporting vehicle and located away from personnel.
   a. When transported in a closed vehicle (car or van), the source rod shall be locked, the case shall be locked, the case will be locked to the vehicle in a manner that prevents the lid from being opened and the vehicle will be locked when the operator is not with the vehicle.
   b. When transported in an open bed vehicle (pick-up truck), the source rod shall be locked, the case shall be locked and the case securely fastened and locked to the truck bed during transport and when the operator is not with vehicle. Two independent locking systems are required to prevent removal of the shipping container or the gauge by unauthorized persons.
   c. Unless there is no reasonable alternative, nuclear gauges shall only be transported in the trunk of standard passenger vehicles or in the cargo area of SUVs.

2. In addition to security, the gauge in its transportation case will be properly blocked and braced to prevent movement.

3. The equipment will only be transported in an approved DOT Type A shipping container with all the required labels and markings (see diagram). Labels must be intact and readable.


4. During transportation, the operator shall have Shipping Papers on the seat adjacent to the driver describing the radioactive material with the proper nomenclature. The "Bill of Lading" must be clearly visible. The operator shall also carry proof of completion of a current radiation safety class.

5. Tamper-indicating seals as specified in USDOT regulations (49 CFR 173.412) are not required for portable nuclear gauges during local transportation from the office to a jobsite or from one jobsite to another. It is ECS' interpretation that this requirement is only necessary when shipping by common carrier or other commercial shippers.

## Commercial Shipping

1. When shipping by common carrier, the package shall be in compliance with 49 CFR 170-179.

2. If the need for shipment of gauges by a common carrier arises, tamper-indicating seals such as those used on first aid kits are required.

## Maintenance

1. Daily operator maintenance is limited to the exterior cleaning of the gauge as previously discussed. The operator will have received proper instruction on how to clean the gauge and will wear his/her assigned monitoring device when accomplishing this task.

2. No maintenance shall be performed in which the radioactive source is removed from the gauge. The gauge shall be returned to the manufacturer or an approved service center for this type of service.

3. The shipping case shall be periodically checked for damage, and to verify that all labels are present and readable.

## Records

The RSO shall maintain records sufficient to document implementation of the program and to demonstrate compliance with applicable requirements as described in appropriate Federal and Commonwealth regulations. These records will be maintained for the duration specified in NRC/VDH regulations or as specified in this plan, whichever is longer.

The RSO should maintain a complete set of files documenting compliance with the requirements and intent of this Program.

1. Copy of formal "Delegation of Authority" for the RSO.
2. Current required publications:
   a. NUREG-1556, Vol. 1, Rev. 1.
   b. Federal regulations listed on page 4-1 of NUREG-1556.
   c. Copy of Commonwealth of Virginia regulations covering lead paint analyzers.
   d. Commonwealth of Virginia Regulatory Guide EPI-720A, "Guidance for Portable Gauges or XRF devices."
   e. 12VAC5-481, "Virginia Radiation Protection Regulations."
3. Copy of current licenses, all previous amendments, as well as a copy of original license application.
4. Individual gauge equipment folders. A separate folder shall be permanently maintained for each portable nuclear gauge that is or was in the office's inventory. As a minimum, the folder shall document the gauges history from acquisition to ultimate disposal. If desired, maintenance and calibration documents can be removed and destroyed three years after disposal. Required documents include:
   a. The initial bill of sale and shipping documents.
   b. All calibration reports.
   c. All maintenance and/or repair records.
   d. All leak test reports.
   e. Copies of the gauge's ECS "Calibration Record" as required by the office's "Quality Systems Manual".
   f. Copy of correct Sealed Source and Device Registration Certificate.
   g. If applicable, copies of all investigation documents and reports associated with damaged or destroyed gauges.
   h. If applicable, disposal or transfer documentation.
5. Dosimetry records and any documentation on exposure limits being exceeded, on badges being replaced, and on terminated employees. Such records will be maintained in a locked container.

6. Storage room quarterly surveys (3 years).
7. Shipping records confirming proper disposition of dosimeters.
8. RSO, user, and non-user training records (may be stored with individual training documentation) (3 years).
9. Monthly folders holding paper copies of the electronic sign out sheets that include "standard count" information (3 years).
10. Calibration/leak test control records for portable gauges (3 years).
11. Calibration records for radiation survey meter.
12. Certificate of Type A shipping container performance tests (current).
13. Annual audits to include reports of corrective action (3 years).
14. Copies of formal, semi-annual inventories (5 years).
15. Copies of shipping documents and authorizing licenses of all individuals or agencies receiving gauges for maintenance, calibration, or repair (3 years).
16. Documentation for approved, job-specific storage locations to include public dose surveys.

## Training

All training related to the control, use and transportation of portable nuclear gauges will comply with both the NRC/VDH, and DOT requirements as summarized in the Corporate Services Radiation Safety Program. This training includes:

1. Radiation safety for non-users. Addressed in Appendix IV, "Hazard Communications and Radiation Safety for Non-Users," of the Corporate Services Safety Program.
2. Initial radiation safety and regulatory requirement training. This is required of all employees who will be using portable nuclear gauges prior to use.
3. Annual refresher training is required for all authorized users. Proper documentation is essential. Refresher training is typically conducted every January using the Safety Training Highlight titled "Radiation Safety Refresher."
4. Recurrent Hazmat training. The USDOT requires recurrent refresher training on the HazMat and security issues associated with transporting portable nuclear gauges every three years. As the required USDOT topics are included in the presentation for the annual class for "Radiation Safety Refresher," managing of this 3-year requirement is not needed.
5. RSO training: see Appendix D of NUREG-1556 and Virginia Regulatory Guidance EPI-720A.

## Emergency Response

1. Physical Damage

   a. If any moving equipment is involved, stop equipment movement until the extent of contamination, if any, can be established.
   b. Cordon off an area with at least a 15 foot radius around the incident.
   c. Call the RSO immediately and keep everyone at least 15 feet away from the gauge.
   d. The RSO will visually check the gauge and use the survey meter to determine the extent of the damage to the source(s), source housing(s), and shielding. If the source(s), source housing and shielding are intact and functional, the gauge can be removed from the site, returned to the shipping container, and shipped to the manufacturer for repair or replacement.
   e. If the integrity or location of the source(s) cannot be positively identified, the RSO will immediately notify the appropriate regulatory agency.
   f. The RSO shall follow the instructions of the regulatory agency.
   g. If the source rod is extended and bent, or the shield is damaged such that dose rates are likely to exceed those of an undamaged gauge, call the manufacturer for instructions before shipment.
   h. Inform the Corporate Services RSO as soon as practicable.
   i. RSO will document all actions taken and observations noted so that a detailed report can be prepared.

2. Theft or Loss

   a. Immediately notify the RSO. The RSO will immediately notify the appropriate regulatory agency, the local police, and the Corporate Services RSO.

3. Fire

   a. Call the Fire Department (911).

   b. Take action appropriate with a fire to protect personnel.

   c. Notify the RSO

   d. The RSO (or the authorized user for off–site storage locations) remains available to advise the fire fighters as to the nature, locations, and potential hazards of the radioactive materials.

| Melting Points: | Degrees F | Degrees C |
|---|---|---|
| Stainless Steel | 2550 | 1400 |
| Carbide | 2000 | 1090 |
| Aluminum | 1005 | 540 |
| Lead | 620 | 327 |
| Polyethylene | 257 | 125 |

Temperatures in an industrial fire will normally range from 500 degrees Fahrenheit at floor level to a high at the ceiling of 1400 to 1800 degrees Fahrenheit. The polyethylene and lead would melt in most fires, the aluminum only in a severe fire. The stainless steel capsule would not reach its melting point.

4. Call Down List

Emergency Telephone Numbers

Mohamed Elbulok- RSO: Work (703) 471-3826 ext. 346
Nextel (703) 926-0793 (164*24*22999)

Manol Andonyadis-
Chantilly Office Manager: Work (703)810-1230 ext. 230
Cell (703) 201-2541

Stan Murphy- Corporate Services RSO: Work (703) 834-1250 ext. 250
Nextel (703) 856-5099

Police or Fire: 911

NRC Operations Center (24 Hour): (301) 816-5100
Virginia EOC (24 hour): (804) 674-2400 or (800) 468-8892

Virginia RMP Office (Normal Hours): (804) 864-8150 or (800) 468-0138

# CPN MC1DR-P/MC3

(Updated February 2011)
**"BILL OF LADING"**
**(MATERIAL SAFETY DATA SHEET)**

RADIOACTIVE MATERIAL
SPECIAL FORM, UN 3332, RQ

**Cs-137, 370 MBq (10 mCi)**
**Am-241/Be, 1.85 GBq (50 mCi)**

RADIOACTIVE YELLOW-II LABEL
TRANSPORT INDEX 0.4
USA DOT 7A, TYPE A PACKAGE

## EMERGENCY PROCEDURES

IN THE EVENT OF AN ACCIDENT, PROTECT HUMAN LIFE FIRST, THEN THE EQUIPMENT AS FOLLOWS:

- LEAVE THE AREA (15 FEET MINIMUM).
- ROPE OFF AN AREA 15 FEET AROUND THE SOURCE(S)/GAUGE(S) AND KEEP ALL TRAFFIC OUT OF THE AREA.
- CALL MOHAMED ELBULOK at (703) 471-8400 IMMEDIATELY.

| 24 HOUR NRC OPERATIONS CENTER EMERGENCY NUMBER: *** (301) 816-5100 *** VIRGINIA 24 HOUR | EOC NUMBER: (804) 674-2400 OR (800) 468-8892 | VIRGINIA RMP OFFICE (804) 864-8150 OR (800) 468-0138 |
|---|---|---|

This is to certify that the above named materials are properly classified, described, packaged, marked & labeled, and are in proper condition for transport according to the applicable regulations of the DOT.

Shipper: _____
ECS, Chantilly
14026 Thunderbolt Place, Suite 100, Chantilly, VA 20151 (703) 471-8400 FAX (703) 834-5527

# TROXLER 3216

(Updated February 2011)
"BILL OF LADING"
(MATERIAL SAFETY DATA SHEET)

RADIOACTIVE MATERIAL
SPECIAL FORM, UN 3332, RQ

Am-241/Be, (40 mCi +/-10%)

RADIOACTIVE YELLOW-II LABEL
TRANSPORT INDEX 0.1
USA DOT 7A, TYPE A PACKAGE

## EMERGENCY PROCEDURES

IN THE EVENT OF AN ACCIDENT, PROTECT HUMAN LIFE FIRST, THEN THE EQUIPMENT AS FOLLOWS:

- LEAVE THE AREA (15 FEET MINIMUM).
- ROPE OFF AN AREA 15 FEET AROUND THE SOURCE(S)/GAUGE(S) AND KEEP ALL TRAFFIC OUT OF THE AREA.
- CALL MOHAMED ELBULOK at (703) 471-8400 IMMEDIATELY.

| 24 HOUR NRC OPERATIONS CENTER EMERGENCY NUMBER: | EOC NUMBER: | |
|---|---|---|
| *** (301) 816-5100 *** | (804) 674-2400 OR (800) 468-8892 | (804) 864-8150 OR (800) 468-0138 |

VIRGINIA 24 HOUR — VIRGINIA RMP OFFICE

This is to certify that the above named materials are properly classified, described, packaged, marked & labeled, and are in proper condition for transport according to the applicable regulations of the DOT.

Shipper: _____
ECS, Chantilly
14026 Thunderbolt Place, Suite 100, Chantilly, VA 20151 (703) 471-8400 FAX (703) 834-5527

# TROXLER 3440

(Updated February 2011)
"BILL OF LADING"
(MATERIAL SAFETY DATA SHEET)

RADIOACTIVE MATERIAL
SPECIAL FORM, UN 3332, RQ

**Cs-137, (8 mCi +/-10%)**
**Am-241/Be, (40 mCi +/-10%)**

RADIOACTIVE YELLOW-II LABEL
TRANSPORT INDEX 0.6
USA DOT 7A, TYPE A PACKAGE

## EMERGENCY PROCEDURES

IN THE EVENT OF AN ACCIDENT, PROTECT HUMAN LIFE FIRST, THEN THE EQUIPMENT AS FOLLOWS:

- LEAVE THE AREA (15 FEET MINIMUM).
- ROPE OFF AN AREA 15 FEET AROUND THE SOURCE(S)/GAUGE(S) AND KEEP ALL TRAFFIC OUT OF THE AREA.
- CALL MOHAMED ELBULOK at (703) 471-8400 IMMEDIATELY.

| 24 HOUR NRC OPERATIONS CENTER EMERGENCY NUMBER: *** (301) 816-5100 *** VIRGINIA 24 HOUR | EOC NUMBER: (804) 674-2400 OR (800) 468-8892 | VIRGINIA RMP OFFICE (804) 864-8150 OR (800) 468-0138 |
|---|---|---|

This is to certify that the above named materials are properly classified, described, packaged, marked & labeled, and are in proper condition for transport according to the applicable regulations of the DOT.

Shipper: _____
ECS, Chantilly
14026 Thunderbolt Place, Suite 100, Chantilly, VA 20151 (703) 471-8400 FAX (703) 834-5527

# TROXLER 4640 - B

(Updated February 2011)
"BILL OF LADING"
(MATERIAL SAFETY DATA SHEET)

RADIOACTIVE MATERIAL
SPECIAL FORM, UN 3332, RQ

Cs-137, 370 MBq (8 +/-1 mCi)

RADIOACTIVE YELLOW-II LABEL
TRANSPORT INDEX 0.2
USA DOT 7A, TYPE A PACKAGE

## EMERGENCY PROCEDURES

IN THE EVENT OF AN ACCIDENT, PROTECT HUMAN LIFE FIRST, THEN THE EQUIPMENT AS FOLLOWS:

- LEAVE THE AREA (15 FEET MINIMUM).
- ROPE OFF AN AREA 15 FEET AROUND THE SOURCE(S)/GAUGE(S) AND KEEP ALL TRAFFIC OUT OF THE AREA.
- CALL MOHAMED ELBULOK at (703) 471-8400 IMMEDIATELY.

24 HOUR NRC OPERATIONS CENTER EMERGENCY NUMBER: *** (301) 816-5100 ***

EOC NUMBER: (804) 674-2400 OR (800) 468-8892

(804) 864-8150 OR (800) 468-0138

VIRGINIA 24 HOUR

VIRGINIA RMP OFFICE

This is to certify that the above named materials are properly classified, described, packaged, marked & labeled, and are in proper condition for transport according to the applicable regulations of the DOT.

Shipper: M. I. Elbulok
ECS, Chantilly
14026 Thunderbolt Place, Suite 100, Chantilly, VA 20151 (703) 471-8400 FAX (703) 834-5527

# XRF DEVICE Certification Statement

**"THIS PACKAGE CONFORMS TO THE CONDITIONS AND LIMITATIONS SPECIFIED IN 49 CFR 173.424 FOR RADIOACTIVE MATERIAL, EXCEPTED PACKAGE INSTRUMENTS OR ARTICLES, UN2910"**

NEED TO VALIDATE CONTENT

Memo to: Radiation Safety Officer

From: Office Manager, ECS Mid-Atlantic (Chantilly)

Subject: Delegation of Authority

You, _____, have been appointed Radiation Safety Officer and are responsible for ensuring the safe use of radiation. You are responsible for managing the radiation protection program; identifying radiation protection problems; initiating, recommending, or providing corrective actions; verifying implementation of corrective actions; stopping unsafe activities; and ensuring compliance with the rule. You are hereby delegated the authority necessary to meet those responsibilities, including prohibiting the use of radioactive material by employees who do not meet the necessary requirements and shutting down operations where justified by radiation safety. You are required to notify management if staff do not- cooperate and do not address radiation safety issues. In addition, you are free to raise issues with the Virginia Department of Health, Radioactive Materials Program at anytime. It is estimated that you will spend ____ hours per week conducting radiation protection activities.

_____

Office Manager

I accept the above responsibilities.

_____

Signature of Radiation Safety Officer

cc: Affected department heads

Z:\work\safety\Radiation Safety V9 2-11.doc

ECS Mid-Atlantic, LLC
14026 Thunderbolt Place, Suite 100
Chantilly, VA 20151
703-471-8400

# XRF RADIATION SAFETY PROGRAM
# An Addendum to the ECS Chantilly Radiation Safety Plan

## Objective

The following Radiation Safety Program has been designed for compliance with the policies and regulations of the US Nuclear Regulatory Commission, Commonwealth of Virginia Department of Health (VDH), and Maryland Department of Environment (MDE). This plan has been developed as an addendum to the existing ECS Office's Radiation Safety Plan. The plan has been prepared to ensure that radiation exposure is as low as reasonably achievable (ALARA) and to guard against unwarranted exposure during the operation of the XRF analyzers.

This program applies to all employees of ECS Mid-Atlantic, LLC located at 14026 Thunderbolt Place, Suite 100, Chantilly, Virginia. Ms. Beverly Sedon has been assigned the position of Radiation Safety Officer (RSO) for the XRF analyzers. The RSO has primary responsibility for implementing the Radiation Safety Program. Mr. Mohamed Elbulok of ECS is the Radiation Safety Officer for the Chantilly ECS office location and is the head RSO for this location. The duties of the RSO are to ensure that the following procedures are adhered to and are in effect at all times as referenced below and by the ECS Office's Radiation Safety Plan.

1. Operation

   A. Only trained/certified personnel with full knowledge of state and federal regulations, emergency procedures and safe handling techniques regarding radiation protection shall operate, ship, receive, and have access to storage of XRF devices independently. All personnel are responsible for complying with the requirements of this Radiation Safety Program will report any and all incidents involving XRF devices to the RSO. Refresher training will be given to all certified operators on an annual basis. Individuals who are not trained on the use, transportation, or handling of the devices are not permitted to perform these activities independent of an authorized User.

   B. Users of the testing equipment will be issued individual dosimeter. These dosimeters are to be worn during use of the instruments, transporting, and handling. The dosimeters will be exchanged quarterly and individual records will be reviewed and maintained by the RSO. Users may request a copy of their results from the RSO. These records

are maintained within a locked area per the Privacy Act. Individuals who do not possess a personal individual dosimetry badge are not permitted to use, transport, or handle the XRF devices.

C. Sealed Source XRF devices will be leak tested on a semi-annual basis per manufacture's procedures using a wipe test analysis kit for sealed radioactive sources and as further defined by the ECS Office's Radiation Safety Plan. The collection of the wipe test sample will be performed by the RSO following the instruction provided in the leak test kit. Once received, leak test results for all sources in the device are reviewed and a copy placed on file. Any leak tests older that five months of the date of receipt will be repeated. Results should be included with the devices' paperwork and a copy placed on file.

D. Prior to removal of the device, the User will check that the components of the device for damage, locking systems, and will properly sign the log sheet for the devices prior to removing them from the storage location and again upon returning them to the office's storage location.

E. The User will exercise control of the device during transportation and use. The User is to maintain the device within their control at all times and maintains constant surveillance to no more than 10 feet from the device. At no time is the device to be left unattended or in the possession of unauthorized users. Users are not to disassemble the units; repairs are to be performed by the manufacturer or a certified repair facility. When not in use, the devices are to be secured in their transport case and properly locked to prevent theft. Ensure that two independent controls (locking systems) are engaged to prevent theft or unauthorized use.

F. Users are to observe ALARA principles at all times to minimize the dose received. ALARA – As Low As Reasonable Achievable

G. While the equipment is in the operator's possession, the operator will have the following documentation:

   a. Bill of Lading – Readily available and within reach
   b. A Copy of the Office Licenses
   c. Copy of the ECS Radiation Safety Plan(s)
   d. Letter of Authorization
   e. Copy of the Current Leak Test Certificate

2. Storage of XRF Devices

A. A daily sign-in/out log will be maintained at the storage room door to record the User and location of the XRF devices when removed from the storage location. The log will include the serial number of the device, operator, date, destination/job name.

B. The XRF will be stored in its manufacturer-provided, locked transportation case when not in use. Only authorized, certified, and

trained personnel will have access to storage room. The storage area will be labeled with appropriate international radiation symbol and "Caution Radioactive Material" sign. A notice indicating the location of the license, operating procedures, notice to employees and regulations will also be posted on the wall near the unit storage area.

C. The aforementioned area is the dedicated storage location for the XRF devices. No offsite storage locations are anticipated at this time and must be arranged and approved by the RSO prior to relocation. This will involve an amendment to the Office's NRC license.

3. Transportation

A. Only trained/certified personnel with full knowledge of state and federal regulations, emergency procedures, and safe handling techniques regarding radiation protection shall operate, ship, receive, and have access to storage of XRF devices. Unauthorized users (non-certified individuals) are not permitted to transport the devices. All appropriate labeling is to be maintained on the device's shipping container.

B. While the equipment is in the operator's possession, the operator will have the following documentation:

a. Bill of Lading – Readily available and within reach
b. A Copy of the Office Licenses
c. Copy of the ECS Radiation Safety Plan(s)
d. Letter of Authorization
e. Copy of the Current Leak Test Certificate

C. The XRFs must remain secured in the trunk of the car, in the case provided by the manufacturer, while in transit, and furthest from the operator/occupants in the vehicle. When transported in a vehicle without a trunk, the XRF must be secured in the back of the vehicle to prevent movement and undesired removal.

4. Emergency Procedures

A. Physical Damage
a. Cordon the area off 15 feet
b. Notify the RSO Immediately
c. Emergency contact information is listed on the Bill of Lading

B. Loss/Theft

a. Control, Accountability, and Security are essential to prevent loss or theft. Precautions should be taken to prevent loss or theft. When the XRF is not in use, lock it in the storage area or in the trunk of the car while in the field. Never, under any circumstances, leave the XRF unattended. Secured devices shall

ve two independent forms of cont to prevent the device from being stolen.

b. If the XRF is lost or stolen, notify the RSO immediately. The RSO must report the situation to the local police, state, and NRC immediately.

C. Fire

a. Call the Fire Department (911)
b. Notify the RSO

D. Emergency Telephone Numbers

| | |
|---|---|
| Police/Fire - | 911 |
| Mohamed Elbulk – RSO | **T** 703.471.8400 \| **D** 703.471.3826 \| **C** 703.926.0793 |
| Beverly Sedon – RSO | **T** 703.471.8400 \| **D** 540.785.6539 \| **C** 301.672.2096 |
| Bryan Layman<br>Chantilly Branch Manager – | **T** 703.471.8400 \| **D** 703.810.1232 \| **C** 571.237.0392 |
| NRC Operations Center – | 301.816.5100 |
| Virginia EOC – | 800.468.8892 |
| Virginia RMP Office – | 800.468.0138 |
| Heuresis Corporation - | 617.751.8286 |