



THE Ames Laboratory
Creating Materials & Energy Solutions
U.S. DEPARTMENT OF ENERGY

Environment, Safety, Health & Assurance

Interoffice Communication

G40 TASF

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To: Sean Whalen, Manager ESH&A
cc: Shawn Nelson, Assistant Manager ESH&A
Topical Appraisal 2015

From: Michael McGuigan, Radiation Safety Officer, ESH&A

Date: April 27, 2015

Subject: RPP Functional Element Area, Sealed Radiological Source Accountability and Control

The Topical Appraisal is attached.

Topical Appraisal - RPP Functional Element Area, Sealed Radiological Source Accountability and Control

1.0 Scope

This topical appraisal was conducted to review the Laboratory's RPP functional element area, Sealed Radiological Source Accountability and Control Requirements, 10 CFR 835, Subpart M, Chapter 15.0 of Guide 441.1-1C.

2.0 Dates

March 9-12, 2015

3.0 Methodology

The Laboratory's Radiation Protection Program's organization was reviewed within The Ames Laboratory's administrative and safety oversight system. Applicable regulations, guidance, and standards were reviewed to assure that the Laboratory is meeting current industry standards. The Sealed Source Leak Tests, Training Programs and Training Status were also reviewed. To ensure there is no disconnect between the users and oversight, an interview was performed with one Rad user.

3.1 References

The following references were reviewed for this appraisal:

- Title 10 of Code of Federal Regulations, Part 835 (10 CFR 835), *Occupational Radiation Protection*,
- DOE Guide 441.1-1C, *Radiation Protection Programs Guide, Chapter 12.0*
- DOE Standard 1098-2008 Ch1, *Radiological Control*,

The regulatory requirements from 10 CFR 83, Subpart M, Sealed Radioactive Source Control requirements, have been placed in the matrix below. The Compliance/Comment column points to the documentation and coverage of the rule.

<i>Subpart M - Sealed Radioactive Source Control</i>	
<i>§ 835.1201 Sealed radioactive source control.</i>	<i>Compliance/Comment</i>
Sealed radioactive sources shall be used, handled, and stored in a manner commensurate with the hazards associated with operations involving the sources.	RPP 10202.004, Section 8.0, Radiation Safety Training, "Individuals who work with sources of ionizing radiation are provided with appropriate training commensurate to the hazards prior to beginning work with radioactive materials or devices that contain, emit and/or generate radiation." RPP 10202.004, Section 12.0, Radioactive Material, subsection titled, Security, Storage and Transfer..., covers said topic areas over sealed radioactive sources.

§ 835.1202 Accountable sealed radioactive sources.	
<p>(a) Each accountable sealed radioactive source shall be inventoried at intervals not to exceed six months. This inventory shall:</p> <p>(1) Establish the physical location of each accountable sealed radioactive source;</p> <p>(2) Verify the presence and adequacy of associated postings and labels; and</p> <p>(3) Establish the adequacy of storage locations, containers, and devices.</p>	<p>Procedure 10202.015 5.3: Source Inventory and Leak Testing Requirement, Accountable sources must be inventoried every six months, The inventory must establish physical location, verify the presence of proper postings and labels, and establish the adequacy of storage location, containers and devices,</p>
<p>(b) Except for sealed radioactive sources consisting solely of gaseous radioactive material or tritium, each accountable sealed radioactive source shall be subject to a source leak test upon receipt, when damage is suspected, and at intervals not to exceed six months. Source leak tests shall be capable of detecting radioactive material leakage equal to or exceeding 0.005 μCi.</p>	<p>Procedure 10202.015 5.3: Source Inventory and Leak Testing: Requirement: Accountable sources leak test are required upon receipt, when damage is suspected, and every six months, h. Select an instrument with a MDA of at least 0.005 μCi for the radionuclide of interest and ensure that its calibration is current.</p>
<p>(c) Notwithstanding the requirements of paragraph (b) of this section, an accountable sealed radioactive source is not subject to periodic source leak testing if that source has been removed from service. Such sources shall be stored in a controlled location, subject to periodic inventory as required by paragraph (a) of this section, and subject to source leak testing prior to being returned to service.</p>	<p>Procedure 10202.015 5.3: Source Inventory and Leak Testing: Requirement: Accountable sources are not required to be leak tested if the source has been removed from service. Stored sealed sources must be located in a controlled area, be inventoried periodically and be subjected to leak testing prior to being returned to service.</p>
<p>(d) Notwithstanding the requirements of paragraphs (a) and (b) of this section, an accountable sealed radioactive source is not subject to periodic inventory and source leak testing if that source is located in an area that is unsafe for human entry or otherwise inaccessible.</p>	<p>Procedure 10202.015 5.3: Source Inventory and Leak Testing: Requirement: Accountable sources are not subject to periodic inventory and source leak testing if that source is located in an area that is unsafe for human entry or otherwise inaccessible.</p>
<p>(e) An accountable sealed radioactive source found to be leaking radioactive material shall be controlled in a manner that minimizes the spread of radioactive contamination.</p>	<p>Procedure 10202.015 5.3: If the wipe test activity is 0.005 μCi or greater, notify the Radiation Safety Officer and the Source Custodian, so that the source can be withdrawn from use and disposed of properly. Isolate the damaged or leaking source to minimize the spread of contamination and package for disposal.</p>

Records are maintained to evaluate compliance with the requirements of 10 CFR 835.1201 and 10 CFR 835.1202 for sealed radioactive source control, inventory, and source leak tests [10 CFR 835.704(f)]. See attachments, Sealed Source Leak Test form, Accountability and HP Survey form, two, three and four. All survey records are recorded in the HP survey database and hardcopies of leak test surveys are maintained in G40 TASF. Archived surveys are assigned to the Records Coordinator.

Sealed source radiological workers are required to be participants in the Laboratory's radiation dosimetry program. These workers are issued extremity rings, and are monitored with whole body dosimeters. Dosimeters are collected and analyzed quarterly. At the time of this assessment, the Laboratory had two Radiological Worker sealed radiological source users. For the monitoring period of CY2014, researcher number one received a total effective dose of 98mrem. For the same monitoring period, researcher number two received a total effective dose of 56mrem. The extremity and ring badges had non-detectable exposure.

3.2 Program Documentation

The following programmatic documents were reviewed:

- *Radiation Protection Program Plan* (10202.004), due for review 07-01-2016
As a result of the June 2014 DOE Radiation Protection Program Assessment, level 2 finding, F2-1, the Laboratory's RPP is in a rewrite phase. The finding stated that the Laboratory's RPP document does not address each §835 requirement. A matrix was developed to demonstrate whether all §835 requirements are being adequately addressed by the current RPP. The Laboratory also committed to developing additions/updates to the RPP as necessary and assuring the matrix will demonstrate compliance with §835 requirements. The June 2014 assessment team advised that exact wording from §835 should be imbedded in the RPP and/or supporting documentations. A matrix was developed and while accomplishing this action gaps in administrative coverage were identified. Exact wording from §835, in entirety, are not present within the Ames Laboratory's RPP and/or supporting documentation. To correct the finding and improve the program exact wording from §835 is being inserted into The Ames Laboratory RPP, and an Ames Laboratory Radiological Safety Program Description documents is being developed.
- *Ames Laboratory ESH&A Program Manual* (10200.002),
The Laboratory's Environment, Safety, Health & Assurance Program Manual (Safety Manual) was last updated in 2011. The Safety Manual is in a rewrite phase. Subject Matter Experts have been assigned sections to update the Safety Manual. The Laboratory's RSO is assigned section 7, Radiological Protection Program. Section 7 is under review and is being updated.
- *Sealed Radioactive Source Accountability and Control Procedure* (10202.015), the procedure was last updated 07/2013. It was due for update 03/01/2015. This procedure is past its review date. The procedure is under review at this time.

3.3 Training

Persons working with sealed radioactive source are radiological workers as per the definition within 10 CFR 835.2(a). These individuals are trained in accordance with 10 CFR 835.901(b) prior to unescorted assignments as a radiological worker. Ames Laboratory had two sealed source users at the time of this appraisal. At the time of this assessment, both radiological workers were up-to-date on training.

At the time of this review additional training was being considered for sealed radiological source users. Ames Laboratory has x-ray system users training and radiological material users training. The Iowa State University (ISU), Environmental Health and Safety (EHS) Office has computer based training for sealed radiological source users. Ames Laboratory sealed source users were asked to take this CBT and to provide feedback.

3.4 Personnel Interviewed

Serguei Budko, Ames Laboratory Scientist was interviewed. Dr. Budko indicated that sealed source users need additional training specific to sealed source usage. Dr. Budko was asked to review the ISU, Environmental Health & Safety computer based training for sealed radiological sources. After review he felt that the training was helpful and would be a good addition to the training needs for sealed source users.

4.0 Assessment Results & Discussion

Ames Laboratory has one accountable sealed radiological source. An accountable source per 10 CFR 835.2, Definitions, “*Accountable sealed radioactive source means a sealed radioactive source having a half-life equal to or greater than 30 days and an isotopic activity equal to or greater than the corresponding value provided in appendix E of this part.*”

The one accountable source is a 50mCi Co-57 (activity at 8/15/2014) for a Mossbauer Spectroscopy system. The Ames source was submitted to the USDOE Radiological Source Registry and Tracking database on 8/27/2014. The half-life of Co-57 is 271.79 days. The activity as of March 12, 2015 was 29.34mCi.

According to 10 CFR 835.1202(b), “. . . each accountable sealed radioactive source shall be subject to a source leak test upon receipt, when damage is suspected, and at intervals not to exceed six months.” Initial leak test was conducted on receipt of the source, 08/14/2014. The most recent leak test was conducted on 02/12/2015. Sealed source leak test indicated no radiological contamination, and no issues.

4.1 Strengths

None noted

4.2 Noteworthy Practices

None noted.

4.3 Findings

Level 3 Finding, Training was added as a requirement for Ames Laboratory Radiological Workers who use sealed radiological sources. Ames Laboratory has x-ray system user training and radiological material user training but does not have sealed radiological source specific training. The Iowa State University, Environmental Health and Safety Office has computer based training for sealed radiological source users. The Training Office has started the process to officially add the ISU, EHS sealed radiological source CBT to CyberTrain. The two Ames Laboratory sealed source users have taken the ISU, EHS, CBT course.

Level 3 Finding, Sealed Radioactive Source Accountability and Control Procedure (10202.015) was last updated 07/2013. It was due for update 03/01/2015. This procedure is past its review date. The procedure is under review at this time.

5.0 Overall Conclusions

Ames Laboratory is fulfilling its obligations pertaining to Radiation Protection Program organization for implementing a program that meets DOE, 10 CFR 835, subpart M, Sealed Radioactive Source Control by keeping RW's radiation exposure ALARA.

6.0 Attachments

Attachment One: List of RPP documents

Attachment Two: Health Physics Survey Report, Form 10202.029

Attachment Three: Sealed Source Inventory Form 10202.023

Attachment Four: Sealed Source Accountability Form 10202.024

DocNum	DocType	Current Title
10202.043	Form	MC&A Check List
10202.021	Form	Exchange of Quarterly TLD Badges
10202.034	Form	Occupational Radiation Exposure Record
10202.016	Form	Radiological Work Permit Guidance and Checklist
10202.025	Form	RWP Summary & Close Out Form
10202.047	Form	Radiological Material Datapage
10202.018	Form	General RWP Format Template
10202.044	Form	Lost Dosimeter Report
10202.041	Form	Materials Balance Area Inventory and Report Form
10202.019	Form	Specific RWP Format Template
10202.006	Form	Checklist for Initiating the use of Rad Mat/Rad Pro devices
10202.012	Form	Radiation Survey Instrument Training (AL-157)
10202.024	Form	Sealed Source Accountability Form
10202.028	Form	Ames Laboratory Air Monitoring Record
10202.023	Form	Sealed Source Inventory Form
10202.022	Form	Analytical X-Ray System Inspection and Survey Record
10202.042	Form	MC&A Nuclear Material Transfer Form
10202.003	Guide	Rad Worker Study Guide for Support Staff
10202.002	Manual	Radiological Worker Study Guide
10202.002	Plan	Materials Control and Accountability Program Plan
10202.001	Plan	Internal Radiation Dosimetry Contingency Plan
10202.005	Plan	External Dosimetry Technical Basis Document
10202.012	Policy	Walk Down of Posted General Radiological Work Permits
10202.015	Procedure	Sealed Radioactive Source Accountability and Control
10202.031	Procedure	Health Physics Group Review of Service Order Requisitions
10202.008	Procedure	Control of Radioactive Contamination
10202.064	Procedure	Facility Categorization for Radiological Material
10202.011	Procedure	Calibration of Portable Survey Instruments
10202.016	Procedure	Posting and Labeling for Radiological Control
10202.021	Procedure	Workplace Air Monitoring
10202.036	Procedure	External Dosimetry Program Implementation
10202.060	Procedure	Conducting Contamination and Area Monitoring Surveys
10202.014	Procedure	Receipt, Transfer, & Shipment of Radioactive Materials
10202.001	Charter	ALARA Committee Charter
10202.002	Charter	Laser Safety Committee Charter
10202.003	Form	Application for Use of Radioactive Materials
10202.005	Form	Application for Use of Radiation Producing Devices
10202.008	Form	Declaration of Pregnancy

DocNum	DocType	Current Title
10202.033	Form	Dosimetry History Request Form
10202.037	Form	Employee Radiation Dosimetry Badge Agreements and Commitments
10202.038	Form	Ames Laboratory Dosimetry Authorization Form
10202.048	Form	RW I/II (AL-207) Practical Factors Exam Employee Sign-off Record.
10202.049	Form	Laser Hazard Assessment Form
10202.052	Form	Rad Worker II (Rad Materials) Learning Assessment b (AL-077) Learning Assessment "General Employee Radiological Training (GERT) (AL-074)
10202.054	Form	(AL-074)
48202.014	Form	Laser User Authorization Form
10202.001	Guide	Radiation Safety Study Guide for Users of Radiation Generating Devices
10202.001	Procedure	ALARA Procedure
10202.001	Handout	Standard for Protection Against Radiation - Notice
10202.002	Handout	Radiation Protection Program
10200.002	Manual	ESH&A Manual "Radiation Protection"
10202.002	Manual	Radiological Worker Study Guide
10202.004	Plan	Radiation Protection Program (RPP)
10202.001	Policy	ALARA Policy

Attachment Two – Health Physics Survey Report Form 10202.029



Entered in Survey Database

Health Physics Survey Report

Report ID Number: _____

Room # _____ Building _____ Area Surveyed: _____

Surveyed By: _____ Date Surveyed: _____

Surveys Made: Instrument _____ Smear _____ Gamma Spect _____

Portable Instrument Data

Survey Type: α _____ β _____ γ _____ Instrument: _____ Serial # _____ MDA _____
Battery Check Within Range _____ Source Response Check Within Range _____ Background _____

NA

Survey Type: α _____ β _____ γ _____ Instrument: _____ Serial # _____ MDA _____
Battery Check Within Range _____ Source Response Check Within Range _____ Background _____

NA

Gamma Spect. Ortec DSPEC High Purity Germanium Detector Serial #6033

Electrets/Air Sampling _____

Smear Counter Data

Counter Unit: Oxford LB5100 Serial # 34346 Date Counted: _____

α EFF = _____ % @ 1440 Volts With _____ Cpm Background

β EFF = _____ % @ 1440 Volts With _____ Cpm Background

Sample Area/Volume: 100 cm² or _____

Instrument Survey Results:

All Areas surveyed are less than Appendix D Value

Areas above Appendix D Values

NA

Smear Survey Results:

All Areas surveyed are less than Appendix D Value

Areas above Appendix D Values

NA

Results:

Disposition:

Attachments:

Analyzed by: _____ Date: _____

ESH&A Health Physics Technician

Reviewed by: _____ Date: _____

ESH&A Radiation Safety Officer

Form 10202.029

ESH&A, 294-2153

Revision 5 Effective Date 04-15-13

Attachment Three – Sealed Source Inventory Form 10202.023



Sealed Source Inventory Form

1. SOURCE DESCRIPTION		
Ames Laboratory Identification: _____ Source Model: _____ Serial Number: _____		
Radionuclide(s): _____ Manufacturer: _____		
Radiation Type: _____ Chemical Form: _____ Physical Form: (solid) (liquid)		
Original Activity: _____ Date of Original Assay: ____ / ____ / ____		
Physical Description: _____		
Containment: _____		
Initial Radiation Reading _____ at Reference Distance: _____		
2. SOURCE STATUS		
Status change (Check one or more): _____ Date of Update: ____ / ____ / ____		
<input type="checkbox"/> New source – initial entry	<input type="checkbox"/> Active – in use	<input type="checkbox"/> In storage
<input type="checkbox"/> New Custodian	<input type="checkbox"/> Source integrity failed	<input type="checkbox"/> Lost
<input type="checkbox"/> Awaiting disposal	<input type="checkbox"/> Disposed	
<input type="checkbox"/> Transferred to new location on-site (update section 4)		
<input type="checkbox"/> Transferred off-site Destination: _____ Shipping No.: _____		
3. SOURCE CUSTODIAN		
Custodian's Name: _____ Employee Number: _____		
Address: _____ Phone Number: _____ E-mail Address: _____		
4. SOURCE LOCATION AND USE		
Group _____	Building _____	Location (e.g., Room, Beam Line or Experiment) _____
Use: _____ Check If Installed In Device: <input type="checkbox"/>		
Device Description: _____		
Device Model: _____ Device Serial Number: _____		
5. INITIAL INVENTORY / LEAK TEST		
Initial Inventory/Leak Test performed: <input type="checkbox"/> YES <input type="checkbox"/> NO		
(If Yes) Sealed Radioactive Source Accountability Form attached: <input type="checkbox"/>		

Attachment Four – Sealed Source Accountability Form 10202.024



Sealed Source Accountability Form

SOURCE DESCRIPTION	
Radionuclide(s): _____	
Original Activity: _____	Ames Laboratory Identification: _____
INVENTORY CHECK	
<input type="checkbox"/> Physical Location Verified: Building: _____ Location: _____ <input type="checkbox"/> Postings and Labels Adequate <input type="checkbox"/> Storage Locations and Containers Adequate	
Description of Any Problems: _____	
Inventory Not Done Because Source is in Inaccessible <input type="checkbox"/> or Unsafe <input type="checkbox"/> Location	
Name of Verifier: _____	
Signature _____	Date _____
LEAK TEST	
Instrument Type: _____ Instrument ID Number: _____	
Calibration Date: _____	
Minimum Detectable Activity: _____	
Description of Test:	
<input type="checkbox"/> Swipe of Source	<input type="checkbox"/> Swipe of Container
<input type="checkbox"/> Swipe of Device	<input type="checkbox"/> Other: _____
Total Counts: _____ Background Counts: _____	
Net Counts: _____ Net Activity: _____	
Net Activity Less Than 0.005 mCi: <input type="checkbox"/> YES <input type="checkbox"/> NO	
Leak Test Not Done Because Source is in Inaccessible <input type="checkbox"/> or Unsafe <input type="checkbox"/> Location	
Name of Surveyor: _____	
Signature _____	Date _____