



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: September 22, 2015

Subject: RPP Functional Element Area, External Dosimetry Program

The Topical Appraisal is attached.

Topical Appraisal - RPP Functional Element Area, External Dosimetry program

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 835.401(a), 402(a), (b), Chapter 6.0 of Guide 441-1C.

2.0 Dates

September 14-16, 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.

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 835.401(a), 402(a), (b), Monitoring of Individuals and Areas requirements have been placed in the matrix below. The Compliance/Comment column points to the documentation and coverage of the rule. Yellow shading indicates areas for improvement.

<i>Subpart E– Monitoring of Individuals and Areas</i>	
§ 835.401 General requirements.	Compliance/ Comments
(a) Monitoring of individuals and areas shall be performed to: (1) Demonstrate compliance with the regulations in this part; (2) Document radiological conditions; (3) Detect changes in radiological conditions; (4) Detect the gradual buildup of radioactive material; (5) Verify the effectiveness of engineered and administrative controls in containing radioactive material and reducing radiation exposure; and (6) Identify and control potential sources of individual exposure to radiation and/or radioactive material.	<p>Procedure 10202.008, Control of Radioactive Contamination, page 9: Area surveys shall be performed to document radiological conditions in the workplace, detect changes in radiological conditions, detect the gradual buildup of radioactive materials in the workplace, and verify the effectiveness of engineering and process controls in containing radioactive materials.</p> <p>Procedure 10202.008, Control of Radioactive Contamination, Page 7: At a minimum, individuals exiting contaminated areas should be monitored, using either portable or automated devices.</p> <p>Procedure 10202.010, Radiological Work Permits, This document is guidance for work planning related to worker radiological protection at Ames Laboratory and completion of Radiological Work Permits in support of research and Facilities and Engineering Services work throughout the site.</p>

<p>(b) Instruments and equipment used for monitoring shall be:</p> <ol style="list-style-type: none"> (1) Periodically maintained and calibrated on an established frequency; (2) Appropriate for the type(s), levels, and energies of the radiation(s) encountered; (3) Appropriate for existing environmental conditions; and (4) Routinely tested for operability. 	<p>Procedure 10202.008, Control of Radioactive Contamination, page 7: The instruments used for monitoring should be capable of detecting contamination at or below the values provided in Appendix D of 10 CFR 835.</p> <p>Procedure 10202.011, Calibration of Portable Survey Instruments, page 2: Prior to formal annual calibration at the instrument manufacturer, independent calibration vendor or at Iowa State University EH&S, the following inspections and tests are performed, as necessary by Health Physics staff:</p> <p>page 3: Graph or table of calibration factors, where necessary, for each type of radiation for which the instrument may be used (including the relationship of the scale reading to the measurement units, if the units are not on the scale);</p> <p>Procedure 10202.060, Conducting Contamination and Area Monitoring Surveys, section 4.0: Perform a response check to determine if the instrument is within $\pm 10\%$ of the normal response to a check source, if a check source is available.</p>
<p>§ 835.402 Individual monitoring.</p>	
<p>(a) For the purpose of monitoring individual exposures to external radiation, personnel dosimeters shall be provided to and used by:</p> <ol style="list-style-type: none"> (1) Radiological workers who, under typical conditions, are likely to receive one or more of the following: <ol style="list-style-type: none"> (i) An effective dose of 0.1 rem (0.001 Sv) or more in a year; (ii) An equivalent dose to the skin or to any extremity of 5 rems (0.05 Sv) or more in a year; (iii) An equivalent dose to the lens of the eye of 1.5 rems (0.015 Sv) or more in a year; (2) Declared pregnant workers who are likely to receive from external sources an equivalent dose to the embryo/fetus in excess of 10 percent of the applicable limit at § 835.206(a); (3) Occupationally exposed minors likely to receive a dose in excess of 50 percent of the applicable limits at § 835.207 in a year from external sources; (4) Members of the public entering a controlled area likely to receive a dose in excess of 50 percent of the limit at § 835.208 in a year from external sources; and (5) Individuals entering a high or very high radiation area. 	<p>Procedure 10202.036, External Dosimetry Program Implementation. This procedure provides instructions to Health Physics Group (HPG) personnel regarding the issuing, distributing, and collecting of external dosimeters. This procedure in part is the implementation of the Radiation Protection Program (RPP) functional element, external dosimetry, the regulatory provisions of which are detailed in 10 CFR 835.401 (a), 402(a), (b). More 10 CFR 835 direct language needs to be placed into procedure 10202.036.</p>
<p>(b) External dose monitoring programs implemented to demonstrate compliance with § 835.402</p> <p>(a) shall be adequate to demonstrate compliance with the dose limits established in subpart C of this part and shall be:</p> <ol style="list-style-type: none"> (1) Accredited, or excepted from accreditation, in accordance with the DOE Laboratory Accreditation Program for Personnel Dosimetry; or (2) Determined by the Secretarial Officer responsible for environment, safety and health matters to have performance substantially equivalent to that of programs accredited under the DOE Laboratory Accreditation Program for Personnel Dosimetry. 	<p>Plan 10202.004, Radiation Protection Program, page 7: The external dose monitoring program demonstrates compliance with the dose limits established in subpart C based on the dosimetry provider's accreditation with the National Voluntary Laboratory Accreditation Program for Personnel Dosimetry, as Ames Laboratory has been granted an exception by the DOE to the DOELAP accreditation requirement. See Attachment Two: USDOE, letter of Exception to DOELAP Accreditation for Ames Laboratory.</p>

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 currently being reviewed. 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. Matrixes were developed, and while completing the matrix 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 the Ames Laboratory Radiological Safety Program Description.
- *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 being revised. 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.
- *ALARA Policy* (10202.001), Rev. 5.1, the procedure was last revised 05/10/2013. It is due for update 02/01/2016. No issues noted.
- *Radiological Work Permit Procedure* (10202.010), implemented 01/15/2015. Document was created per the June 2014 RPP assessment corrective action plan. It is due for update 01/15/2018. No issues noted.
- *External Dosimetry Technical Basis Document* procedure (10202.036), Rev. 4, was last updated 06/01/2013. It is due for update 06/01/2016.
- *USDOE, letter of Exception to DOELAP Accreditation for Ames Laboratory* was submitted for approval May 27, 2008. The Ames Laboratory external dosimetry program has been granted an exception to DOELAP accreditation in accordance with 10 CFR 835.402(d)(1). See attachment two: USDOE, letter of Exception to DOELAP Accreditation for Ames Laboratory. The last submittal was 05/27/2008. There is no expiration date noted on the exception letter. Contact site office to determine if a resubmittal is necessary.
- *Quarterly Radiological Survey procedure* (10202.055), Rev. 5, was last updated 05/01/2013. It is due for update 05/01/2016. Next review cycle more detail should be placed into the document describing actions on the occasion when radiological contamination is detected. And an after action report in a form of a radiological survey.
- *Memo to Female Radiological Workers form* (10202.007), Rev 0, inception was 10/01/2014. It is due for update 10/01/2019. The document was in existence prior to inception date, was being issued to new radiological workers but was not a formal document. No issues noted.
- *Employee Radiation Dosimetry Badge Agreements and Commitments form* (10202.037), Rev 3, last updated 05/15/2012. It is due for update 05/15/2017. No issues noted.

- *Ames Laboratory Dosimetry Authorization form* (10202.038), Rev. 0, last updated 02/01/2013. It is due for update 02/01/2018. No issues noted.
- *Exchange of Quarterly TLD Badges form* (10202.021), Rev. 4, last updated 09/01/2015. It is due for update 09/01/2020. No issues noted.
- *Occupational Radiation Exposure Records form* (10202.034), Rev. 2, last updated 09/01/2015. It is due for update 09/01/2020. No issues noted.

3.3 Training

None required.

3.4 Personnel Interviewed

None identified.

4.0 Assessment Results & Discussion

Researchers who use x-ray systems are required to wear two extremity (ring) dosimeters, one on the left hand and one on the right hand. Radiological Workers (RW) are required to wear their dosimetry while placing a sample into or removing a sample from the x-ray system target area. RWs authorized to bypass the safety interlocks of their respective x-ray system are required to wear a whole body dosimeter in addition to extremity ring badges. Radioactive material RWs are required to wear whole body dosimeters. All FE&S crafts personnel are required to wear whole body dosimeters during their work shift.

There are 145 active dosimetry participants as of 9-22-2015. Dosimeters are exchanged on a quarterly cycle. Records from the previous calendar year, (CY), indicate there were no declared pregnant workers. There is therefore no fetal monitoring record to review. For January 1, 2015 to September 22, 2015 there have been three dose history requests. For individual monitoring records reported under 10 CFR 835 for CY2014 see attachment three, Radiation Exposure Monitoring System, 2014 submittal. The data shows that 162 persons were monitored in CY2014. Of those persons monitored 33 had measurable total effective dose (TED) less than 100mrem. The remaining 129 individuals had no measurable exposure. The collective TED was reported as 873mrem. RW radiation exposures at Ames Laboratory are well below the 10 CFR 835 limits, table A below.

Table A.

Population	Dose Quantity	10 CFR 835 Occupational Dose Limit
Occupationally exposed workers	Total Effective Dose [‡]	5 rem (0.05 Sv)
	The sum of the equivalent dose (ED) to the whole body for external exposures and the committed equivalent dose to any organ or tissue other than the skin or the lens of the eye	50 rem (0.5 Sv)
	Equivalent dose to the lens of the eye	15 rem (0.15 Sv)
	Equivalent dose to the skin or any extremity + the committed equivalent dose to the skin or	50 rem (0.5 Sv)

	any extremity	
Population	Dose Quantity	10 CFR 835 Occupational Dose Limit
Declared pregnant workers	Equivalent dose to the embryo/fetus	500 mrem (5 mSv) over the period of gestation
Occupationally exposed minors	Total Effective Dose	100 mrem (1 mSv)
	The sum of the equivalent dose (ED) to the whole body for external exposures and the committed equivalent dose to any organ or tissue other than the skin or the lens of the eye	5 rem (0.05 Sv)
	Equivalent dose to the lens of the eye	1.5 rem (0.015 Sv)
	Equivalent dose to the skin or any extremity + the committed equivalent dose to the skin or any extremity	5 rem (0.05 Sv)
Members of the public	Total Effective Dose	100 mrem (1 mSv)

4.1 Strengths

None noted

4.2 Noteworthy Practices

None noted.

4.3 Findings

Opportunity for Improvement one, OFI-1, The Ames Laboratory external dosimetry program has been granted an exception to DOELAP accreditation in accordance with 10 CFR 835.402(d)(1). See attachment two: USDOE, letter of Exception to DOELAP Accreditation for Ames Laboratory. The last submittal was 05/27/2008. There is no expiration date noted on the exception letter. Contact site office to determine if a resubmittal is necessary

Opportunity for Improvement two, OFI-2, Procedure 10202.036, External Dosimetry Program Implementation, provides instructions to Health Physics Group (HPG) personnel regarding the issuing, distributing, and collecting of external dosimeters. This procedure in part is the implementation of the Radiation Protection Program (RPP) functional element, external dosimetry, the regulatory provisions of which are detailed in 10 CFR 835.401 (a), 402(a), (b). More 10 CFR 835 direct language needs to be placed into procedure 10202.036 and within the Laboratory's RPP. This administrative shortfall was noted in the RPP June 2014 DOE Radiation Protection Program Assessment, level 2 finding, F2-1, the Laboratory's RPP is currently being reviewed. 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. Matrixes were developed, and while completing the matrix 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. Administrative shortfalls are being addressed in the update and rewrite of the Lab's RPP.

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 835.401(a), 402(a), (b), Monitoring of Individuals and Areas requirements. Exposure data validates the program that is maintaining radiation worker exposures ALARA. Administrative shortfalls are being addressed in the update and rewrite of the Lab's RPP.

6.0 Attachments

Attachment One: List of RPP documents

Attachment Two: USDOE, letter of Exception to DOELAP Accreditation for Ames Laboratory

Attachment Three: Radiation Exposure Monitoring System, 2014 submittal

Attachment One- List of RPP Documents

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
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.

Attachment One- List of RPP Documents

DocNum	DocType	Current Title
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
10202.055	Procedure	Quarterly Radiological Survey
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



U.S. Department of Energy

Office of Health, Safety and Security Office of Corporate Safety Analysis

MEMORANDUM FOR CYNTHIA K. BAEBLER
MANAGER
AMES SITE OFFICE

FROM: STEVEN ZOBEL *Steven Zobel*
DOELAP ADMINISTRATOR
OFFICE OF CORPORATE SAFETY ANALYSIS

DATE: March 3, 2011

SUBJECT: Exception to DOELAP Accreditation for Ames Laboratory

This is in response your May 27, 2008, letter that forwarded and supported a February 28, 2008, request from Iowa State University (ISU), the Ames Laboratory contractor, for exception to accreditation by the Department of Energy Laboratory Accreditation Program (DOELAP) for the Laboratory's external dosimetry program. The request addressed the criteria for exception described in Technical Standard DOE-STD-1111-98, *The Department of Energy Laboratory Accreditation Program Administration*.

I have reviewed the ISU submission and found that it sufficiently met the conditions prescribed in the Technical Standard. The Ames Laboratory external dosimetry program is therefore granted an exception to DOELAP accreditation in accordance with 10 C.F.R. Part 835.402(b)(1) and this exception is retroactive to the date of your memorandum.

I regret any inconvenience this delay may have caused. Please contact me if you have any questions or if the status of the Laboratory's external dosimetry program needs to change.

cc: Charles Lewis, HS-31
Laird Bean, DOE-ID
Michael McGuigan, ISU

Attachment Three – Radiation Exposure Monitoring System, 2014 submittal

REMSView Distribution Output

Run date: 04/01/2015
 Organization Code: 1000503 -- Ames Laboratory (Iowa State)
 Input file name: Y:\CER-REIRS\REMS\DATA\DATASUBM\Rem2014\Submtls\D14048.dat

Exposure Range (mrem)	Count	TED
No measurable exposure	129	0
Measurable < 100	33	873
100 - 250	0	0
250 - 500	0	0
500 - 750	0	0
750 - 1000	0	0
1000 - 2000	0	0
2000 - 3000	0	0
3000 - 4000	0	0
4000 - 5000	0	0
5000 - 6000	0	0
6000 - 7000	0	0
7000 - 8000	0	0
8000 - 9000	0	0
9000 - 10000	0	0
10000 - 11000	0	0
11000 - 12000	0	0
>= 12000	0	0

Number with Measurable TED: 33
 Total Monitored: 162
 Total Collective TED (mrem): 873
 Total CED: 0
 Total CEgD: 0
 Num Individuals with Uptake: 0

Validation Status
 Errors: 0
 Warnings: 0

