



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 E. LAMAR BLVD
ARLINGTON TX 76011-4511**

Licensee: Acuren USA
Facility: Main office in Anchorage, Alaska, and Field Office in Kenai, Alaska
License No.: 50-32443-01
Docket No.: 030-38596
EA-15-173

PREDECISIONAL ENFORCEMENT CONFERENCE SUMMARY

On May 12, 2016, representatives of Acuren USA met with NRC personnel in the Region IV office in Arlington, Texas, to discuss the apparent violations identified in NRC Inspection Report Number 030-38596/2014-001. The conference was held at the request of the licensee.

The licensee presented a summary of the direct, contributing and root causes for the apparent violations and their corrective actions. The corrective actions presented by the licensee during the PEC that the Region considers important includes: 1) 100% retraining of all industrial radiography employees, 2) performance of approximately 3600 field audits of radiography crews since the event on April 10, 2014, and 3) the assignment of a permanent radiation safety director at the Anchorage office (radiographic operations are no longer conducted at the Kenai field office).

The attendance list is attached to this summary.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this summary and its enclosure will be made available to the Public.

Attachments:

Attendance List

Presentation

ATTENDANCE LIST

PREDECISIONAL ENFORCEMENT CONFERENCE

Acuren USA

May 12, 2016

NAME	COMPANY / POSITION TITLE
Ray Kellar	USNRC / BC
JAMES THOMPSON	USNRC / SENIOR INSPECTOR
FRANK NABIE	ACUREN / DIRECTOR OPERATIONS
Larry Auer	Acuren COO
Adam Bozek	Acuren General Counsel
Chris Dixon	Acuren RSD
BRUCE F KARIE	DIRECTOR RADIATION SAFETY
John Kramer	NRC, Senior Enforcement Specialist
MARK SHAFFER	NRC / RIV DNMS DIRECTOR
MICHELE BURGESS	NMSS
SUE WOODS	OE
SOPHIE HOLIDAY	NMSS
LORRAINE BAER	OGC

**NRC Inspection Report 030-38596/2014-001 and
Investigation Report 04-2014-043**

Pre-Decisional Enforcement Conference

May 12, 2016

ATTENDEES

- **Larry Ames**
Chief Operating Officer
- **Frank Noble**
Regional Director of Operations Analytical Services & Alaska
- **Bruce Karie**
Corporate Director of Radiation Safety
- **Chris Dixon**
Regional Analytical Services & Alaska RSO
- **Adam Bozek**
General Counsel

INTRODUCTION

- Licensee Response
- Timeline
- Incident Investigation
- Root Cause Analysis
- Short Term Actions
- Long Term Actions
- Summary

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LICENSEE RESPONSE

- Do not dispute that violations occurred
 - Acuren believes that these violations are unique; however, they were not willful, nor indicative of the company's commitment to the rules and regulations
- Full cooperation with NRC investigation
 - Mutual participation in reenactment
- Continual dialog with NRC during internal investigation, root cause analysis, and corrective action plan
- Acuren has an ongoing commitment to radiation safety
 - Safety is our number one corporate value
 - Corrective actions were prompt and complete
 - Actions were taken throughout the entire Acuren organization
- Leadership is committed to continuous improvement of our safety culture

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TIMELINE

4/10/2014	Initial NRC inspection
4/10/2014	Acuren ceased radiographic operations at the Kenai Facility
4/10/2014	Acuren internal investigation commenced
4/14/2014	NRC follow up inspection
4/18/2014	"Golden Rules of Radiography" policy implemented
4/24/2014	Acuren ceased all radiographic operations under Acuren USA license. NRC issued confirmatory action letter
4/25/2014	Full time redundant RSO support dispatched to AK
5/4/2014	Director completed review of radiation protection program for Acuren USA licensed activities

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TIMELINE (Continued)

5/5/2014	Reenactment conducted under NRC supervision
5/28/2014	Replaced local facility Radiation Safety Officer
8/22/2014	NRC accepted CAL response
8/20/2014	Employee engagement survey Acuren Inspection Inc.
9/23/2014	"Buddy Check" verification system initiated
10/30/2014	"Barrier Control" training module
1/15/2015	ROEM and radiation procedures revamped
9/15/2015	Safety Culture Policy statement and video issued
11/2015	Employee engagement survey in Acuren USA
1/28/2016	Exit interview
3/24/2016	NRC issued letter of apparent violations

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INCIDENT INVESTIGATION

- Reviewed radiographic documentation
- Initial calculations and diagram of shooting area
- Review historic dose records
- Interviews conducted
 - Radiographic personnel
 - Local RSO
 - Local management
 - Senior management
 - Occupants and tenants
- Conducted re-enactment to calibrate initial calculations and findings
- Applied calculations to radiographic operations at the Kenai and Anchorage facilities from Jan 2013 to April 2014

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ROOT CAUSE ANALYSIS

- Root Cause / Contributing Factors
 - Management focused on redistribution and allocation of resources.
 - Failure to define new roles and responsibilities during transition
 - Allocation of time for program activities
 - Radiation Safety Program
 - ROEM was not explicit in detailing procedures for indoor/outdoor operations
 - Daily radiation report did not differentiate actual dose rates verses calculated dose rates
 - Program did not clearly define the lead radiographer
 - Safety Culture
 - Lack of clearly define "Zero Tolerance" policy regarding radiation safety
 - Human Behavior
 - Non-routine activity

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SHORT TERM CORRECTIVE ACTIONS

- Local incident investigation
- Immediate stand down
- Review of similar situations throughout the entire Acuren organization
- Review of Lessons Learned
- Voluntary shut down of radiographic operations by RSO
- Comprehensive field audits throughout the organization

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SHORT TERM CORRECTIVE ACTIONS CONT'D

- Senior leadership members engaged directly with all Radiation Safety Officers to re-enforce radiation safety program support
- 100% redundant reviews of the Acuren USA activities were conducted on a full time basis by RSOs outside of the region
- Director of Radiation Safety dedicated 40 hours a month on-site In Acuren USA
- Generated a comprehensive Team to conduct investigations and corrective actions of the radiation program

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LONG TERM CORRECTIVE ACTIONS

- COO issued letter regarding "Safety Culture"
 - Ensured all Acuren personnel understand the magnitude and importance of a great "Safety Culture"
 - Emphasized senior leadership's commitment to safety as our number one value
 - 100% review by all Acuren personnel
- Created "Safety Culture Policy" and video
 - Utilizing the NRC 9 attribute model
 - Outlined all necessary elements for a successful policy
 - Initiated from the most senior leadership and handed down throughout the entire organization
 - 100% participation

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LONG TERM CORRECTIVE ACTIONS (CONT'D)

- Created "Golden Rules" , "Barrier Control Training" and "Buddy Check"
 - Important to reset radiation safety focus
 - Express the importance to fundamental radiation safety
 - 100% testing and review by radiographic personnel
 - Express importance of the basics of radiation safety
- Conducted In-Depth Root Cause Analysis
 - Identifying all underlying contributing factors
 - Utilized to prevent reoccurrence and provide lessons learned

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LONG TERM CORRECTIVE ACTIONS (CONT'D)

- Hired a 100% dedicated compliance individual for Acuren USA
- Conducted employee engagement surveys
- Added additional radiation safety resources and reset organizational structure
- Senior Leadership Team formulated to monitor the radiation program bi-weekly (understanding the pulse of the program)
- Computer based program to monitor radiation program

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SUMMARY

- Result of corrective actions are:
 - Significant improvement in our robust safety culture
 - 3600 field audits subsequent to the event from April 1 thru December 31, 2014 resulted in no significant deficiencies.
 - Acuren is a more resilient, safer company today because of corrective actions
- Ongoing leadership commitment to safety values & actions
 - Embrace the nine safety culture traits
 - Cross pollinate ideas across our companies and countries
 - Increased senior leadership radiation safety oversight
 - Radiation Safety is the most important activity in our enterprise

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Appendix “C”

COO Letter Safety Culture



ROCKWOOD®

FROM: John Lockwood

RE: Safety Culture

Safety culture is nothing new.

It is something that comes naturally to those organizations who have a strong safety record. It consists of core values and behaviors.

Safety Culture is a commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment. Safety always takes precedence. It is our job to take the necessary steps to promote a positive safety culture by fostering nine specific areas of thinking, feeling, and behaving which emphasize safety.

These traits include:

- **Emphasizing leadership safety values and actions**
- **Self-identifying problems and resolving them**
- **Having personal accountability**
- **Having effective work processes**
- **Fostering continuous learning**
- **Having a process for raising concerns**
- **Effectively communicating issues involving safety**
- **Establishing and maintaining a respectful work environment**
- **Stressing the importance of having a questioning attitude**

I am very proud of our safety record, and that the protection of our employees and those around us is paramount in everything we do. As an organization, we fully endorse our safety culture policy and it is our expectation that all of our employees support it as well and continually demonstrate it during our everyday activities. It is essential that safety comes first. Should you identify a safety issue during your daily activities that you cannot resolve, it is our expectation that you cease your work and immediately contact your supervisor. In the area of Radiation Safety, following our Golden Rules of Radiography and respecting the source are ways to ensure your safety as well as the safety of your coworkers and others around us.

We have put together a short video that describes how we implement safety culture on a routine basis. Please take the time to view this important video and discuss it with your supervisor.


Remember, it is everyone's responsibility to perform their duties in as safe a fashion as possible.

As time goes on, you will be hearing more about safety culture but in the meantime should you have any questions or thoughts on safety culture please discuss with you supervisor. Remember safety is everyone's responsibility and has precedence over everything we do.



Appendix “D”


“Golden Rules”



ACUREN

GOLDEN RULES OF RADIOGRAPHY

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Introduction


Acuren Inspection Inc. provides radiographic inspection services to a broad range of industries in a variety of environments.

We have a responsibility to our employees, clients, the general public and our country to perform these inspection services with the highest levels of integrity and safety.


This presentation is designed to inform you about Acuren's GOLDEN RULES FOR RADIOGRAPHY regarding safe working practices while performing radiography.

If you have any question regarding the material, rules, regulations, reasons or consequences described in this presentation, contact your RSO or any of the Radiation Safety Directors for assistance.

Acuren Inspection radiographers work safely and by the rules every day, everywhere.



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Our Safety Culture



Acuren promotes actions that contribute to a strong safety culture by all of us who are involved in working with radioactive materials.

Our leaders and employees are expected to model behaviors demonstrating a strong safety culture which include the following:

- Communicate the importance of our safety culture
- Demonstrate behavior that supports our safety culture
- Challenge others contribute to our safety culture
- Motivate others to exhibit behaviors that supports our safety culture

With this in mind, here are our Golden Rules for Radiography



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A Division of Rockwood

ACUREN GOLDEN RULE #1



**ALWAYS WEAR YOUR LANDAUER
FILM BADGE.**

THIS IS A REGULATION DESIGNED TO KEEP YOU SAFE



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ACUREN GOLDEN RULE #2



ALWAYS PERFORM 360° SURVEYS AFTER EVERY SHOT

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ACUREN GOLDEN RULE #3



ALWAYS CHECK BATTERIES IN SURVEY METER AND CHECK FOR PROPER RESPONSE AGAINST KNOWN RADIATION SOURCE

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ACUREN GOLDEN RULE #4



**ALWAYS WEAR RATE ALARM &
DOSIMETER. MUST TEST RATE
ALARM DAILY AND ZERO YOUR
DOSIMETER DAILY.**

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ACUREN GOLDEN RULE #5



**ALWAYS ENSURE THAT YOUR PPE
HAS A CURRENT CALIBRATION**

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ACUREN GOLDEN RULE #6



**ENSURE YOUR TRUCK ALARM &
ENGINE DISABLER ARE WORKING
PRIOR TO TRANSPORTING
RADIOACTIVE MATERIAL.**

**THIS IS A REGULATION DESIGNED TO PROTECT
AMERICA**



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ACUREN GOLDEN RULE #7



**IMMEDIATELY REPORT ALL
RADIATION INCIDENTS, NEAR
MISSES AND EQUIPMENT DAMAGE
TO YOUR RSO.**

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ACUREN GOLDEN RULE #8



**RADIOGRAPHERS ARE
RESPONSIBLE FOR THE SAFETY
OF THEIR ASSISTANTS. THEY
MUST ALWAYS MAINTAIN DIRECT
VISUAL SURVEILLANCE WHEN
USING RADIOACTIVE MATERIAL**

**THIS IS A REGULATION DESIGNED TO KEEP YOU
AND YOUR ASSISTANT SAFE**



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ACUREN GOLDEN RULE #9



**ALWAYS AFFIX NEW TRANSPORT
INDEX LABEL TO CAMERA AND
TRANSPORT BOX EVERY DAY.**

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ACUREN GOLDEN RULE #10



**ALWAYS PROVIDE ACCURATE,
LEGIBLE INFORMATION ON DAILY
RADIATION REPORTS AND
SHIPPERS DECLARATION.**

THIS IS A REGULATION/DOT REGULATION



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**FAILURE TO COMPLY WITH ANY
GOLDEN RULE CAN RESULT IN
SUSPENSION AND/OR TERMINATION**



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Appendix “E”

“Barrier Control”



Establishing Control of Radiation Areas

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General



- Walk down the area and become familiar with other activities in the area.
- Identify all access points into the Radiation Area.
- Ensure the crew can adequately control the area. If unable stop the job until adequate controls can be established.
- The most effective means to control the radiation area is Direct and Constants Surveillance by all radiographic personnel.

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General Public



- The general public includes everyone that is not in Acuren Inspection's radiation protection program.

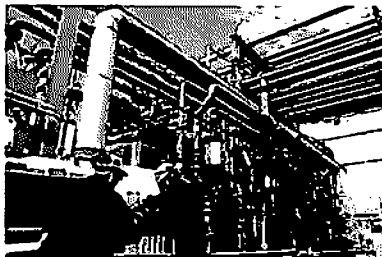
- The Federal limit for ionizing radiation a members of the general public may receive is:

The dose in any unrestricted area from external sources, shall not exceed 0.002 rem / 2 millirem in any one hour, and the total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem / 100 millirem in a (10 CFR Part 21.1301) year.

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Who's your general public?



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Calculations



Calculations shall be made utilizing the Inverse Square Law:

$$I_1 = \frac{I_2 \times D_2^2}{D_1^2}$$

I_1 = INTENSITY 1 (EMISSIVITY FACTOR / HOUR OF THE ISOTOPE MULTIPLIED BY THE NUMBER OF CURES)

= DISTANCE 1 SQUARED (EMISSIVITY FACTORS ARE GIVEN AT A DISTANCE OF 1 FOOT)

= INTENSITY 2 (.002 REM / HOUR OR .1 REM / HOUR)

= DISTANCE 2 SQUARED

(3 VARIABLES MUST BE KNOWN TO COMPLETE THIS EQUATION)
NOTE: THE OPPOSITE OF SQUARE IS SQUARE ROOT

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Sign Postings Required



Signs utilized to post the Unrestricted Area / Radiation Area and the High Radiation Area must comply with the regulatory requirements.



- The Unrestricted Area shall be posted at .002 rem / 2 millirem per hour.
- The High Radiation Area shall be calculated and posted at .1 rem / 100 millirem.



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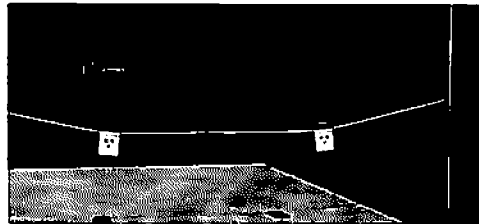
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Mandatory Physical Boundary



Physical barrier **SHALL** be established as a minimum when the following circumstance exist:

1. 3D access can be gained into the radiation area.
2. All residential areas.
3. Congested public areas.
4. Inside of buildings.
5. Obstructed views to all access points.



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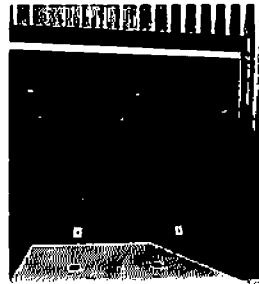
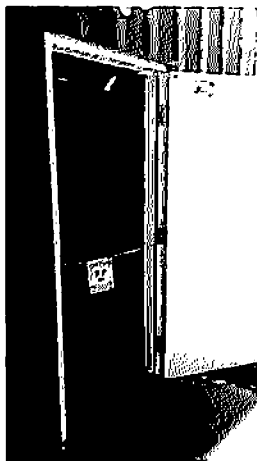
Congested Areas



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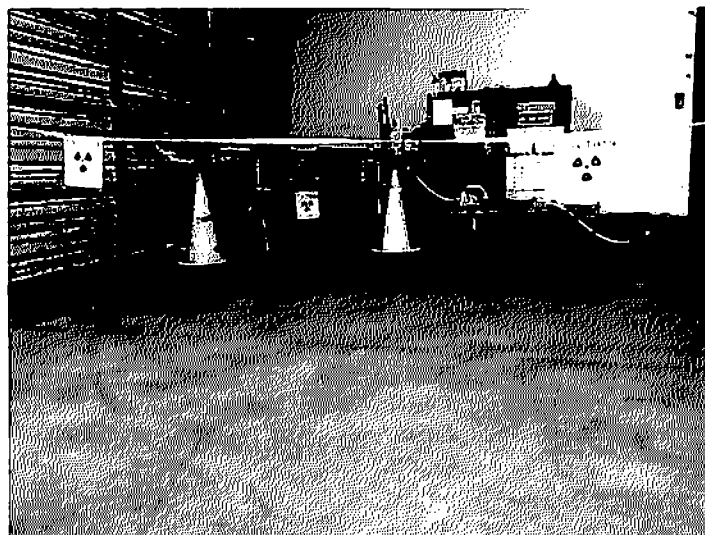
Posting Radiation Area



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Posting Radiation and High Radiation Area



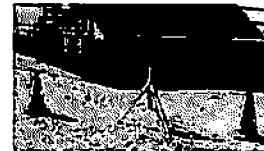
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Establishment of Radiation Area utilizing Physical Barriers



- A physical barrier is the primary method to establish the radiation area.
- Physical barriers shall be established utilizing Radiation rope or Radiation tape. Traffic cones can be utilized only to enhance the physical barrier.
- Radiation signs shall be conspicuously posted on the barrier to detour unauthorized access to the radiation area. (signs and ropes do not prevent unauthorized entry. Radiographic personnel do!)
- Constant surveillance shall be maintained during all radiographic exposures.
- Established barriers shall be physically surveyed during the first radiographic exposure. If needed re-adjust the barrier as needed and conduct additional radiation surveys of the physical barriers. These measurements shall be recorded on the Daily Radiation Report prior to continuing radiographic operations.



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Establishment of High Radiation Area



The High Radiation area shall be established utilizing the inverse square law.



1. Sign postings (2) shall be made identifying the High Radiation area, the signs must conform to the regulatory requirements.
2. Visual control of the High Radiation area shall be maintained at all times.
3. No actual physical measurement of the area is required to be taken, since this would result in unnecessary exposure to radiographic personnel.

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High Radiation Area



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Establishment of Radiation Area utilizing Traffic cones




Traffic Cones with Radiation Area signs
maybe utilized in lieu of physical barriers
**only in remote circumstances provided
all of the following criteria is met.**


1. A visual of 360 degrees of the entire radiation area can be maintained from where the source will be manipulated.
2. The area is not congested with members of the general public, and is not in an area that mandatory physical barriers are required.
3. There is adequate reaction time to retract the source to the shielded position should a member of the general public approach the radiation area.

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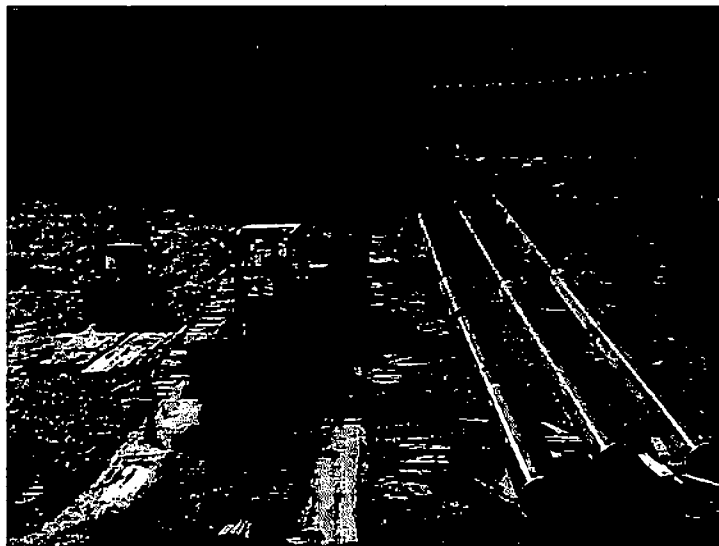
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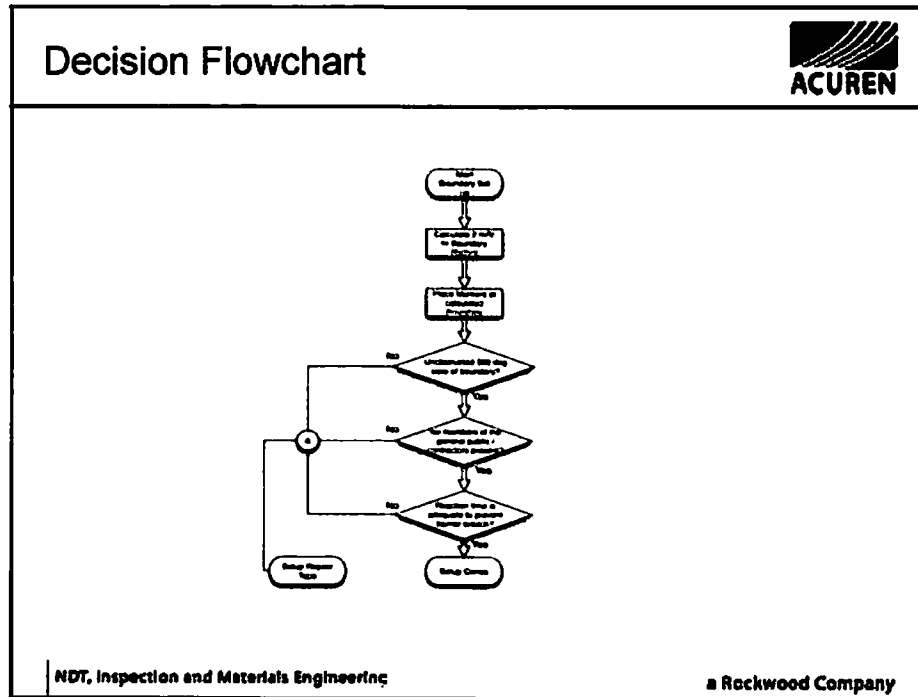

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“When in doubt rope it out”

[John Lockwood August 2014]


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Appendix

“F”


“Buddy Check”



Radiographer Cross Check (Buddy Check)

Job Hazard Analysis for Radiographic operations

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Introduction

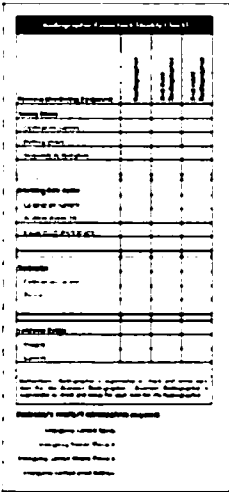
As an enhancement of the Job Hazard Analysis Form (JHA) we have added a section specific to the hazards of performing radiography. This panel is broken up into the following major sections:

- Personal Monitoring Equipment (PME)
 - Survey Meter
 - Alarming Rate Meter
 - Dosimeter
 - Landauer Badge

This PME is required to mitigate the risk of overexposure to radiation from either gamma or X-Ray sources.

We are requiring the use of a buddy or cross check to insure that each radiographic team member is fully and properly protected.

- Radiographer and any/all Assistant Radiographer check boxes are to be completed on all JHA's where Radiography is performed.



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Survey Meter



We are requiring the following buddy or cross checks on the survey meters used to monitor the level of radiation present during radiographic operations:

- **Calibration current:**
 - Look at the calibration sticker on the survey meters to be used. The following information must be present and legible:
 - Calibration date (current, not expired)
 - Next due date
 - Signature or initials
- **Battery Check:**
 - Set the dial on the survey meter to battery test position
 - Batteries must be clearly within the acceptable range.
- **Responds to Radiation:** Check against a source or exposure device (camera) surface to verify the meter responds to radiation.

If any of the above checks fails, you must indicate on the JHA and stop radiographic operations until a properly functioning survey meter can be brought to the site.

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Alarming Rate Meter



We are requiring the following buddy or cross checks on the survey meters used to monitor the level of radiation present during radiographic operations:

- **Calibration Current**
 - Look at the calibration sticker on the survey meters to be used. The following information must be present and legible:
 - Calibration date (current, not expired)
 - Next due date
 - Signature or initials
- **Activate the test function on the Alarming Rate Meter by inserting a tool (paper clip, or other small diameter rod) onto the test button / port. You should insure that the following alarms are functional:**
 - **Audible Alarm OK**
 - Can be easily heard in the presence of existing background noise.
 - **Visual (LED) Alert Bright**
 - Can be easily seen in the presence of existing lighting.

If any of the above checks fails, you must indicate on the JHA and stop radiographic operations until a properly functioning alarming rate meter can be brought to the site.

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Dosimeter



We are requiring the following buddy or cross checks on the survey meters used to monitor the level of radiation present during radiographic operations:

- Calibration Current
 - Look at the calibration sticker on the survey meters to be used. The following information must be present and legible:
 - Calibration date (current, not expired)
 - Next due date
 - Signature or initials
- Zero'd
 - Make sure that each Dosimeter is properly zero'd.

If any of the above checks fails, you must indicate on the JHA and stop radiographic operations until a properly functioning dosimeter can be brought to the site.

A detailed view of a calibration sticker for a survey meter. It includes fields for 'Survey Meter', 'Calibration Date', 'Next Due Date', and 'Signature'. There is also a section for 'Remarks' and a 'Zero'd' checkbox. The sticker is titled 'Radiographic Survey Meter Calibration Sticker'.

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Landauer Badge



We are requiring the following buddy or cross checks on the survey meters used to monitor the level of radiation present during radiographic operations:

- Present
 - Badges are to be worn at all times when performing radiographic operations and during transportation of radioactive materials. Badges shall be presented upon demand for inspection.
- Current
 - Badges are exchanged on a calendar monthly basis. Badge worn shall be for the current month.

If any of the above checks fails, you must indicate on the JHA and stop radiographic operations until the current months landauer badge can be brought to the site.

A detailed view of a calibration sticker for a survey meter, identical to the one in the Dosimeter section. It includes fields for 'Survey Meter', 'Calibration Date', 'Next Due Date', and 'Signature'. There is also a section for 'Remarks' and a 'Zero'd' checkbox. The sticker is titled 'Radiographic Survey Meter Calibration Sticker'.

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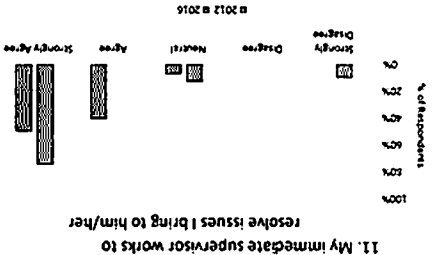
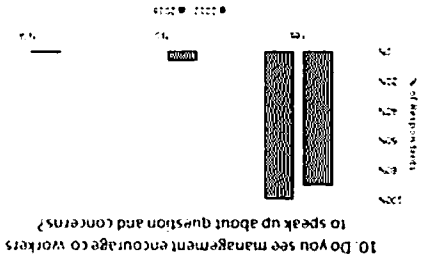
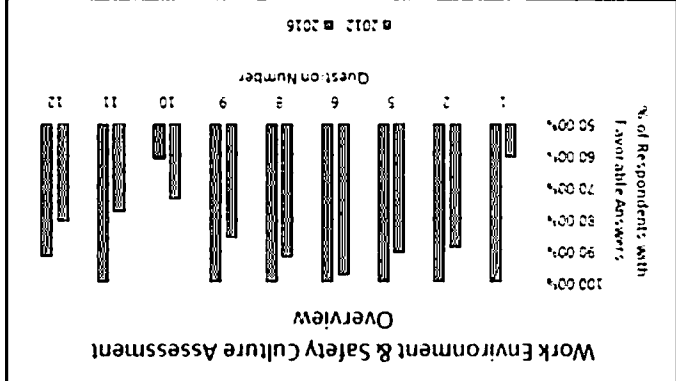
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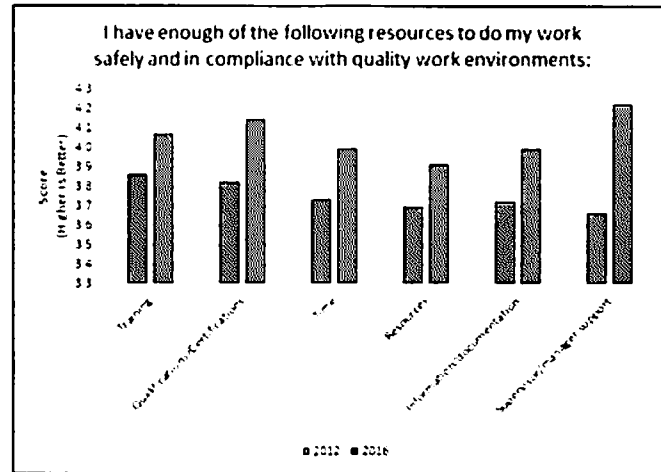


Appendix “G”

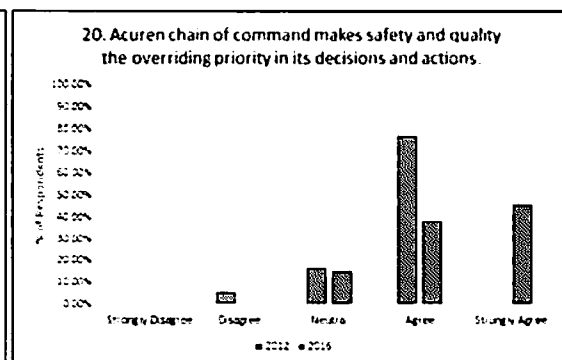
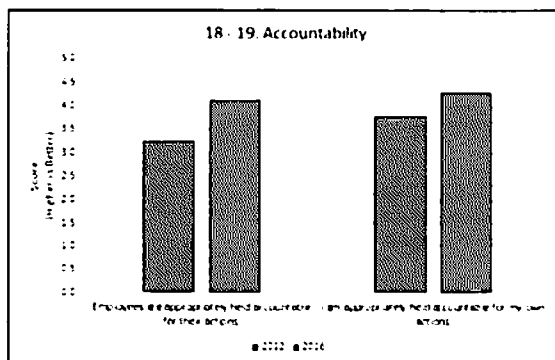
Employee Engagement Survey

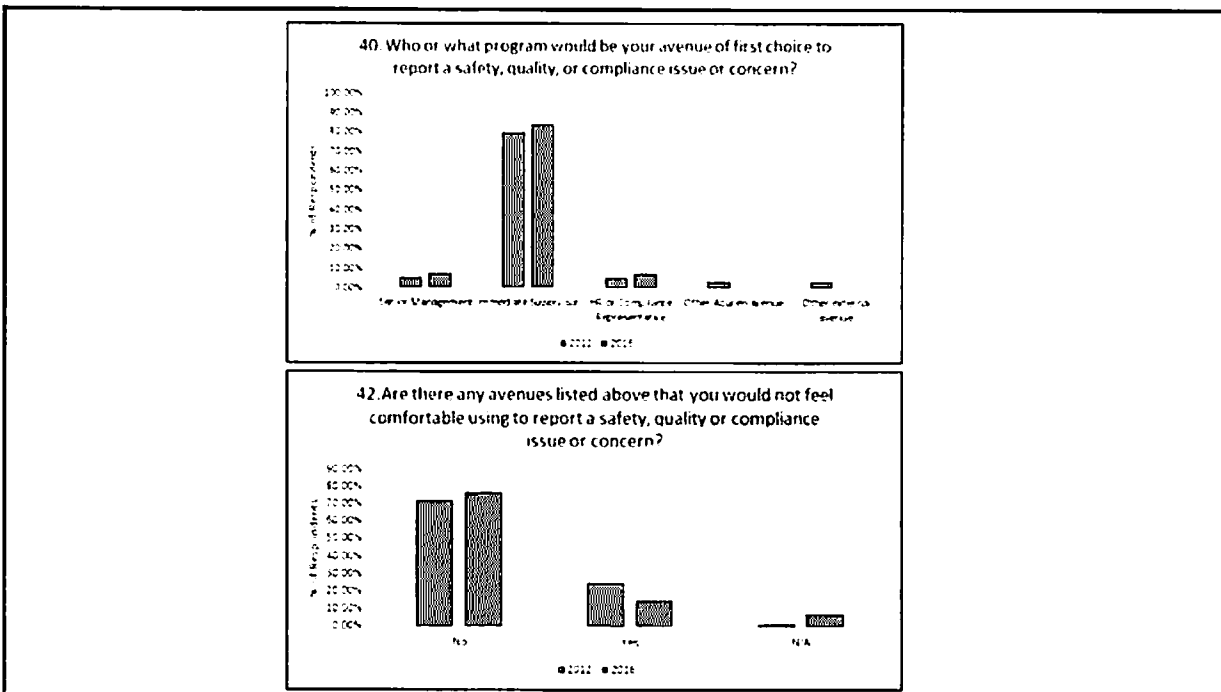
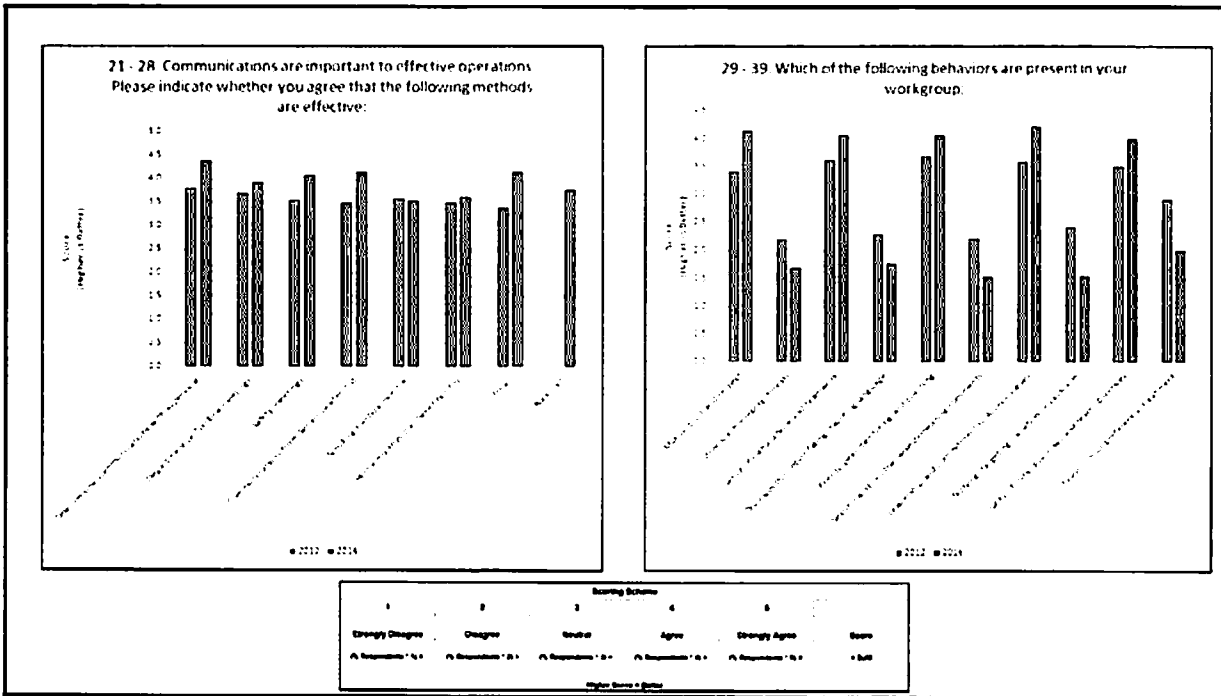
12	Do you regularly receive the information needed to perform the required requirements of your job?
11	Can you raise a non-safety related concern or HR concern without having retaliation?
10	Can you raise a safety-related concern without having retaliation?
9	Can you raise a safety-related concern without having retaliation?
8	Can you raise a safety-related concern without having retaliation?
7	Can you raise a safety-related concern without having retaliation?
6	Can you raise a safety-related concern without having retaliation?
5	Can you raise a safety-related concern without having retaliation?
4	Can you raise a safety-related concern without having retaliation?
3	Can you raise a safety-related concern without having retaliation?
2	Can you raise a safety-related concern without having retaliation?
1	Can you raise a safety-related concern without having retaliation?





Scoring Scheme					
1	2	3	4	5	
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Score
(% Respondents * 1) =	(% Respondents * 2) =	(% Respondents * 3) =	(% Respondents * 4) =	(% Respondents * 5) =	• SUM
Higher Score = Better					







Appendix “I”

New DRR Design and Instructions

DAILY RADIATION REPORT - GAMMA RADIOGRAPHY


 Customer 1
 Location City 4 State 5

 Report 2 of 3
 Vehicle 6
 Date 7
☒ 8 Transportation Only ☒ 9 Device Not Used/In Temp. Vehicle Storage From This Date To:

RADIOGRAPHIC PERSONNEL

Lead Radiographer <u>10</u>				Radiographer/Asst. <u>10</u>				Radiographer/Asst. <u>10</u>			
Dosimeter	<u>11</u>	Due	<u>12</u>	Dosimeter	<u>11</u>	Due	<u>12</u>	Dosimeter	<u>11</u>	Due	<u>12</u>
Dosimeter Start	<u>13</u> mR	Dosimeter End	<u>14</u> mR	Dosimeter Start	<u>13</u> mR	Dosimeter End	<u>14</u> mR	Dosimeter Start	<u>13</u> mR	Dosimeter End	<u>14</u> mR
Total Exposure	<u>15</u> mR	TLD/Badge#	<u>16</u>	Total Exposure	<u>15</u> mR	TLD/Badge#	<u>16</u>	Total Exposure	<u>15</u> mR	TLD/Badge#	<u>16</u>
Rate Alarm	<u>17</u>	Due	<u>18</u>	Rate Alarm	<u>17</u>	Due	<u>18</u>	Rate Alarm	<u>17</u>	Due	<u>18</u>
Alarm Check	<u>19</u>	Battery Check	<u>20</u>	Alarm Check	<u>19</u>	Battery Check	<u>20</u>	Alarm Check	<u>19</u>	Battery Check	<u>20</u>

SURVEY METERS

Survey Meter #1				Survey Meter #2				Survey Meter #3			
Serial#	<u>21</u>	Model #	<u>27</u>	Serial#	<u>21</u>	Model #	<u>27</u>	Serial#	<u>21</u>	Model #	<u>27</u>
Maint. Due	<u>22</u>		<u>28</u>	Maint. Due	<u>22</u>		<u>28</u>	Maint. Due	<u>22</u>		<u>28</u>
Calibration Due	<u>23</u>		<u>29</u>	Calibration Due	<u>23</u>		<u>29</u>	Calibration Due	<u>23</u>		<u>29</u>
Battery Level	<u>25</u>	Response Check	<u>26</u>	Battery Level	<u>25</u>	Response Check	<u>26</u>	Battery Level	<u>25</u>	Response Check	<u>26</u>

EXPOSURE DEVICE

Camera Serial #	<u>31</u>	<input checked="" type="checkbox"/> 32 Daily Inspection OK
<input checked="" type="checkbox"/> 33 Sentinel Model 880	<input checked="" type="checkbox"/> 34 Sentinel Model 680	
<input checked="" type="checkbox"/> 36 37	<input checked="" type="checkbox"/> 35 Sentinel Model 778	
<input checked="" type="checkbox"/> 36 37		

ISOTOPE

Capsule Serial #	<u>38</u>	Curies	<u>39</u>
<input checked="" type="checkbox"/> 40 Ir-192 (Model A424-S)	<input checked="" type="checkbox"/> 41 Co-60 (Model A424-14)		
<input checked="" type="checkbox"/> 42 Sc-75 (Model A424-25W)	<input checked="" type="checkbox"/> 43 Co-137 (Model 77302)		
<input checked="" type="checkbox"/> 44 45			

EXPOSURE INFORMATION & POSTINGS

<input checked="" type="checkbox"/> 46 Radiation Area	<input checked="" type="checkbox"/> 48 Rope	<input checked="" type="checkbox"/> 50 Collimator	<u>51</u> HVL	<input checked="" type="checkbox"/> 61 Below Ground	<u>62</u> ft	<input checked="" type="checkbox"/> 63 Above Ground	<u>64</u> ft
<input checked="" type="checkbox"/> 47 High Radiation Area	<input checked="" type="checkbox"/> 49 Cones	<u>52</u>	# of Signs Posted				
Exp. Time	<u>53</u>	# of Exposures	<u>54</u>	65			
Exp. Time	<u>53</u>	# of Exposures	<u>54</u>				
Max. min/hr exposure	<u>55</u> min/hr	A	<u>59</u> ft. <u>60</u> mR/hr				
Max. Dose Rate Allowed	<u>56</u> mR/hr	B	<u>59</u> ft. <u>60</u> mR/hr				
Max. Dose Rate Allowed = 60 / (Max. min/hr) x 2		C	<u>59</u> ft. <u>60</u> mR/hr				
Distance to 2 mR/hr	<u>57</u> ft	D	<u>59</u> ft. <u>60</u> mR/hr				
Distance = $\sqrt{(CI \times Intensity \times HVL) / 2}$		E	<u>59</u> ft. <u>60</u> mR/hr				
Distance to 100 mR/hr	<u>58</u> ft	F	<u>59</u> ft. <u>60</u> mR/hr				
Distance = $\sqrt{(CI \times Intensity \times HVL) / 100}$		G	<u>59</u> ft. <u>60</u> mR/hr				
		H	<u>59</u> ft. <u>60</u> mR/hr				

Visual and operational inspections have been performed on all radiographic equipment prior to the start of Radiographic Operations, including the exposure device, survey instruments, transport/storage containers, personal monitoring devices, and all associated equipment used in conjunction with any equipment listed on this document. These checks were to ensure that:

- 1- the equipment is in good working condition
- 2- the source was adequately shielded in the radiographic exposure device after the termination of each exposure.
- 3- required labeling was present and legible prior to and during transportation.
- 4- the survey instruments were checked to radiation response to a known source prior to leaving the storage facility.

CAMERA SURVEYS

Removal from storage	<u>66</u> mR/hr
After last exposure	<u>67</u> mR/hr
Returned to storage	<u>68</u> mR/hr

Radiographer Signature

Date

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DAILY RADIATION REPORT

GAMMA (GENERAL INFORMATION)

1. Customer/client name
2. Current page number
3. Total number of pages
4. Job site location – City
5. Job site location – State
6. Transporting vehicle number
7. Date of first use
8. Checkbox – No RT was done, only transported
9. Checkbox – No RT was done, Vehicle (6) was used as temporary storage to stated date

RADIOGRAPHIC PERSONNEL INFORMATION

10. Lead/Radiographer/Assistant name (First initial. Last name as a minimum)
11. Pocket dosimeter serial number
12. Pocket dosimeter calibration due date (Clearly noted on affixed sticker)
13. Pocket dosimeter reading at start of shift when charged
14. Pocket dosimeter reading at the end of the shift
15. Total calculated dose (Box 14 – Box 13 = Box 15)
16. TLD/Film badge serial number
17. Rate alarm meter serial number
18. Rate alarm meter calibration due date (Clearly noted on affixed sticker)
19. Rate alarm sound acceptable (Loud and steady)
20. Rate alarm battery acceptable (Stays illuminated while button is pressed; 10-15 sec)

SURVEY METERS INFORMATION (List ALL meters, 2 minimum)

21. Survey meter serial number
22. Survey meter quarterly maintenance due (Clearly noted on affixed sticker)
23. Survey meter calibration due (Clearly noted on affixed sticker)
24. ...oops...
25. Survey meter battery level at start of shift as it reads on the scale (7.2, 7.8, etc.)
26. Survey meter response check when checked against a known source at start of shift
27. Checkbox – ND-2000
28. Checkbox – ND-3000
29. Checkbox – Other model used
30. Survey meter model number

EXPOSURE DEVICE INFORMATION

31. Exposure device serial number
32. Checkbox – Daily Inspection and maintenance performed and acceptable prior to use
33. Checkbox – Sentinel Model 880
34. Checkbox – Sentinel/Amersham Model 680
35. Checkbox – Sentinel Model 773
36. Checkbox – Other model used
37. Manufacturer and model number of device

DAILY RADIATION REPORT (CONTINUED)

RADIOACTIVE ISOTOPE INFORMATION

38. Holder/Capsule serial number (As listed on Source Certificate/Decay Chart)
39. Current activity in Curies at time of use (As listed on Source Certificate/Decay Chart)
40. Checkbox – Iridium-192 (Model A424-9)
41. Checkbox – Cobalt-60 (Model A424-14)
42. Checkbox – Selenium-75 (Model A424-25W)
43. Checkbox – Cesium-137 (Model 77302)
44. Checkbox – Other isotope and/or model number
45. Checkbox – Name of isotope and model number

EXPOSURE AND BARRIER POSTING INFORMATION

46. Checkbox – “Caution Radiation Area” sign posted (2 minimum)
47. Checkbox – “Caution/Danger High Radiation Area” sign posted (1 minimum)
48. Checkbox – Rope/ribbon was used to make a physical barrier (Whenever practical)
49. Checkbox – Cones/signs were used with or in lieu of rope/ribbon (Following Acuren’s protocol)
50. Checkbox – Radiation reducing collimator was used (Whenever practical)
51. Number of half-value layers the utilized collimator provided
52. Total number of signs posted
53. Exposure time per exposure stated in minutes:seconds (i.e.: 1:15 = 1 min 15 sec)
54. Number of exposures at the time stated in (Box 53)
55. Maximum total minutes of exposure per hour (1 – 60)
56. Maximum permissible dose rate (MPDR) – 2 mR in any hour distance
 - $60 \div (\text{Box 55}) \times 2 = \text{Maximum permissible dose rate (MPDR)}$
57. Calculated distance to 2 mR/hr restricted boundary
 - $$\sqrt{\left(\frac{C}{2} \times \frac{xH}{M} \right)}$$
58. Calculated distance to 100 mR/hr High Radiation Area
 - $$\sqrt{\left(\frac{C}{1} \times \frac{xH}{1} \right)}$$
59. Distance to established boundaries
60. Physical survey readings at established boundaries
61. Checkbox – Exposures made below ground/grade level
62. Depth below ground/grade level
63. Checkbox – Exposures made above ground/grade level
64. Height above ground/grade level
65. Sketch of controlled exposure area (Use as much detail as possible!!!)
66. Physical survey reading of exposure device when removed from storage
 - When removed from permanent storage facility (Vault)
 - If temporary vehicle storage was utilized, prior to transportation
67. Physical survey reading of exposure device after last exposure, prior to transportation
68. Physical survey reading of exposure device, after transportation, prior to storage.
69. Signature and date – Attesting to the statements above, at the conclusion of that shift/job.