

LA-UR-24-23223

Approved for public release; distribution is unlimited.

Title: RCT Continuing Training - Radioactive Sealed Sources

Author(s): O'Sullivan, Patrick Timothy

Intended for: Web

Issued: 2024-04-09

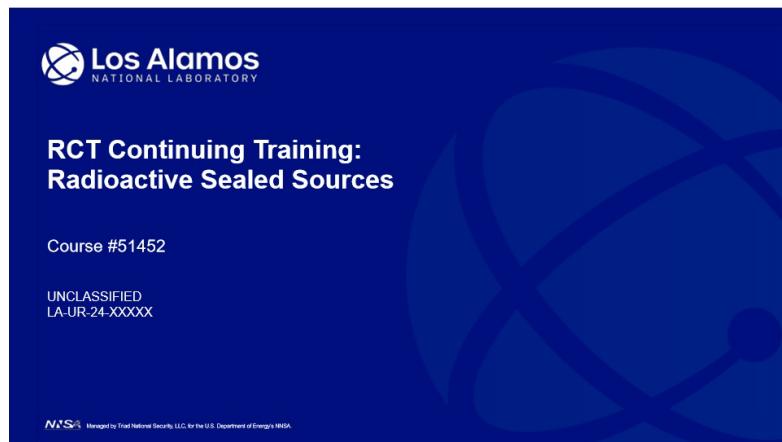


Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by Triad National Security, LLC for the National Nuclear Security Administration of U.S. Department of Energy under contract 89233218CNA00001. By approving this article, the publisher recognizes that the U.S. Government retains nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.

RCT Continuing Training: Radioactive Sealed Sources

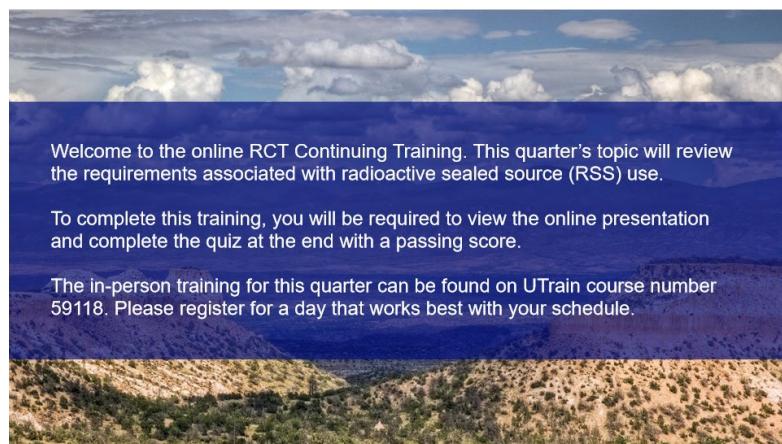
1. RCT Continuing Training Radioactive Sealed Sources

1.1 RCT Continuing Training: Radioactive Sealed Sources



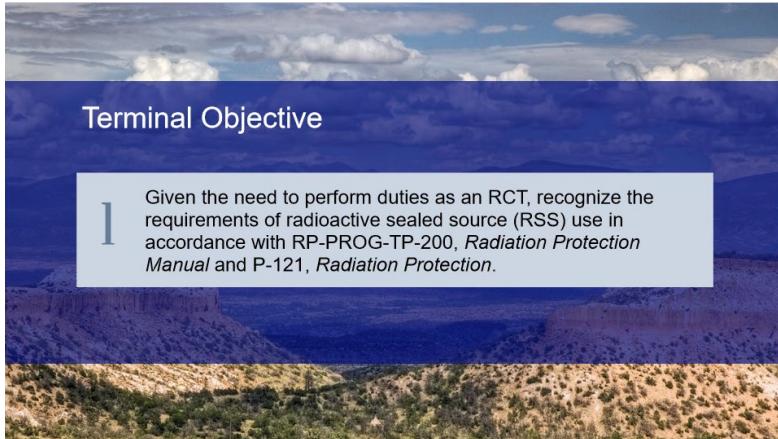
Notes:

1.2 Introduction



Notes:

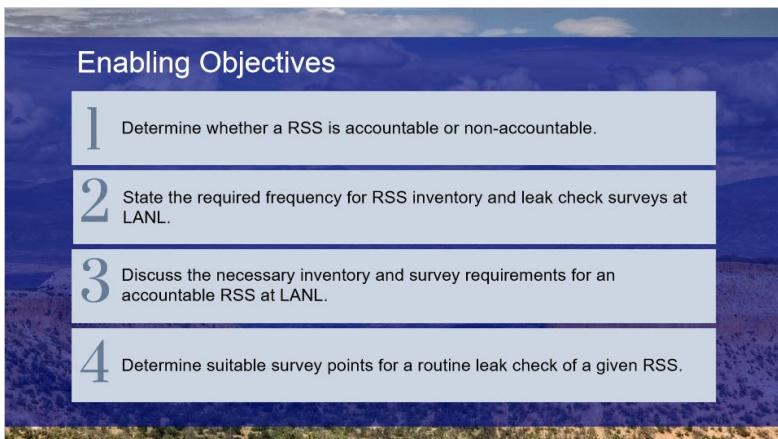
1.3 Terminal Objective



Terminal Objective

1 Given the need to perform duties as an RCT, recognize the requirements of radioactive sealed source (RSS) use in accordance with RP-PROG-TP-200, *Radiation Protection Manual* and P-121, *Radiation Protection*.

1.4 Enabling Objectives

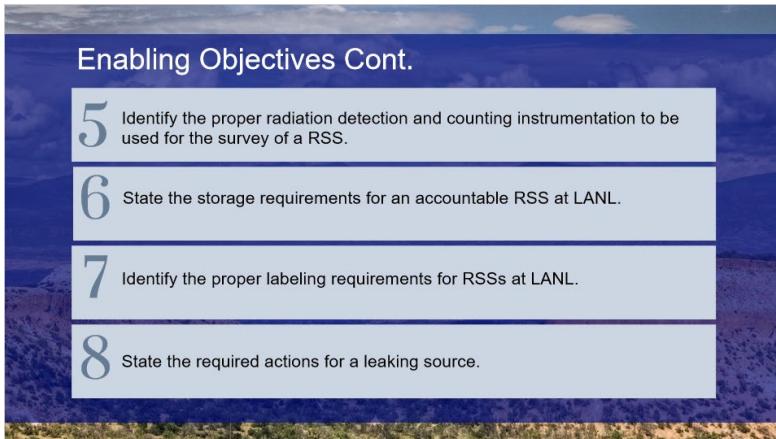


Enabling Objectives

- 1** Determine whether a RSS is accountable or non-accountable.
- 2** State the required frequency for RSS inventory and leak check surveys at LANL.
- 3** Discuss the necessary inventory and survey requirements for an accountable RSS at LANL.
- 4** Determine suitable survey points for a routine leak check of a given RSS.

Notes:

1.5 Enabling Objectives Cont.



Enabling Objectives Cont.

- 5** Identify the proper radiation detection and counting instrumentation to be used for the survey of a RSS.
- 6** State the storage requirements for an accountable RSS at LANL.
- 7** Identify the proper labeling requirements for RSSs at LANL.
- 8** State the required actions for a leaking source.

1.6 Why RSS Control is Important



Why RSS Control Matters

Radioactive Sealed Sources can be found all over LANL property for a variety of uses. RCTs use them for instrument checks and customers use them for a variety of work.

As an RCT, you are responsible for proper handling of RSSs to include labeling, storage, inventory, and survey requirements which prevents unauthorized access and potential spreads of contamination.



1.7 Event Summary

Leaking Tritium Source at Lawrence Livermore (LL-2007-LLNL-07)

- In 2006, a LLNL facility requested one Cs-137 sealed source. They received two sources, one of which was unlabeled, and subsequently found to be degraded and leaking tritium.
- The source was found to be leaking after an investigation into elevated results during monthly routine monitoring surveys.
- Low levels of contamination were inadvertently spread to two facilities, a government vehicle, personal clothing, a personal vehicle, and a private residence. Bioassay results were normal.



1.8 Contributing Factors

Contributing Factors

- Two sources were sent when only one was requested
- The extra source:
 - was not labeled, inventoried or stored properly
 - was incorrectly packaged and transported
- The extra source emitted a radiation that was not detectable by the instruments used to detect the expected isotopes.
- When multiple abnormalities arose, workers assumed proper precautions were taken and no concerns were raised.

 Los Alamos

1.9 Lessons Learned

Lessons Learned

- Everyone is personally responsible for ensuring safe operations.
- Staff raise safety concerns because trust permeates the organization.
- A questioning attitude is cultivated.




1.10 SCoR and ConOps Principles

Applicable SCoR and ConOps Principles




1.11 What makes a RSS Accountable?

A large, cylindrical metal canister with a handle and a locking mechanism, likely a radioactive waste container. It is sitting on a yellow surface with a radiation warning symbol in the background.

Notes:

Untitled Layer 1 (Slide Layer)

1.12 Inventory Requirements

RSS Inventory Requirements

- Accountable sources must be inventoried at an interval not to exceed 6 months.
- An inventory must:
 - Establish physical location of each accountable RSS
 - Verify the presence and adequacy of associated postings/labels
 - Establish the adequacy of storage locations, containers, and locking devices



Click here to view the specific requirements in P121 before proceeding

Los Alamos

Untitled Layer 1 (Slide Layer)

RSS Inventory Requirements

- Accountable sources must be inventoried at an interval not to exceed 6 months.
- An inventory must:
 - Establish physical location of each accountable RSS
 - Verify the presence and adequacy of associated postings/labels
 - Establish the adequacy of storage locations, containers, and locking devices

Click the procedure to close

6 months.

Specific requirements in P121 before proceeding

Los Alamos

1.13 Knowledge Chek #1

(Multiple Choice, 10 points, unlimited attempts permitted)

What is P121 Appendix 16A used for?

- It defines the minimum activity required for a source to be accountable.
- It determines source labeling requirements.
- It defines source storage requirements.
- It defines what surveys are required during a leak test.

Correct	Choice
X	It defines the minimum activity required for a source to be accountable.
	It determines source labeling requirements.
	It defines source storage requirements.
	It defines what surveys are required during a leak test.

Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

You did not select the correct response.

Correct (Slide Layer)

What is P121 Appendix 16A used for?

It defines the minimum activity required for a source to be accountable.

It determine

It defines so

It defines wh



Correct

That's right! You selected the correct response.

[Continue](#)

Incorrect (Slide Layer)

What is P121 Appendix 16A used for?

It defines the minimum activity required for a source to be accountable.

It determine

It defines so

It defines wh



Incorrect

You did not select the correct response.

[Continue](#)

Try Again (Slide Layer)

What is P121 Appendix 16A used for?

It defines the minimum activity required for a source to be accountable.

It determine

It defines so

It defines wh



Incorrect

That is incorrect. Please try again.

[Try Again](#)

1.14 Survey Requirements

Required RSS Surveys

RP-PROG-TP-200, Section 1623.1 General Leak Test Requirements

Accountable RSSs must be leak tested:

- Upon receipt
- Prior to packaging for transport or shipping onsite or off-site
- When damage is suspected
- At least every six (6) months

[Click here to view the specific requirements in RP-PROG-TP-200 before proceeding](#)



Untitled Layer 1 (Slide Layer)

1623 Leak Testing Accountable RSSs

1623.1 General Leak Test Requirements

[1] Leak tests are only required for accountable RSSs.

[2] Accountable RSSs must be leak tested:

- Upon receipt (initial and following transfer)
- Prior to transfer
- When damage is suspected
- At least every six (6) months

[3] Accountable RSSs are NOT subject to periodic leak testing if:

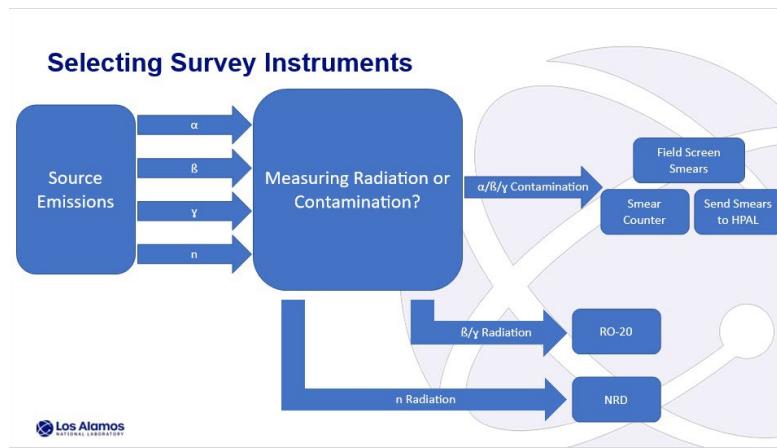
- The RSS consists solely of gaseous radioactive material (e.g., Kr-85) or helium
- The RSS has been removed from service (long term storage)
- The RSS is located in an area that is unsafe for human entry or otherwise inaccessible (e.g., oxygen deficient, WMA, glove box, etc.)

[4] Leak tests shall be performed by a Radiation Control Technician (RCT).

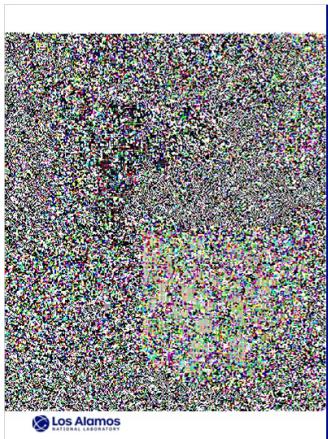
[5] Sources found to be leaking must be removed from service and controlled in accordance with contamination control practices.

Click the procedure to close

1.15 Survey Instrument Selection



1.16 Survey Locations

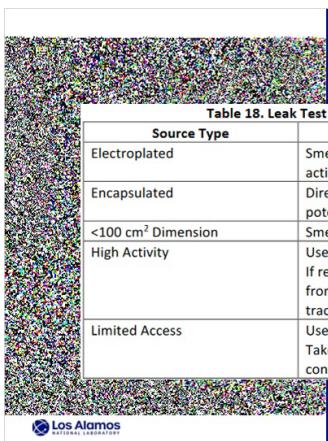


Survey Locations

- Determine the type of source to be leak tested
- Refer to RP-PROG-TP-200, section 1623.2, table 18
- Some sources may require indirect smears

[Click here to view Table 18 before proceeding](#)

Untitled Layer 1 (Slide Layer)



Survey Locations

Click the table to close

Source Type	Guidance
Electroplated	Smear the inside of the storage container to avoid removing activity from the active area.
Encapsulated	Directly smear the source focusing on weld seams or other potential points of leakage.
<100 cm ² Dimension	Smear the entire surface on one smear.
High Activity	Use remote-handling tools to obtain a direct smear, if possible. If remote handling is not possible, take indirect smears (e.g., from the inside of the storage container or along movement tracks, etc.)
Limited Access	Use remote-handling tools to obtain a direct smear, if possible. Take indirect smears (e.g., from the inside of the storage container, along movement tracks, nearby equipment, etc.)

1.17 RSS Leak Test Demonstration Video

Pu-239 Leak Test Demonstration



1.18 Knowledge Check #2

(Multiple Choice, 10 points, unlimited attempts permitted)

Which is a special consideration for performing smear surveys on accountable sources?

- Some sources may require indirect smears.
- Depending on how the source is contained, no survey may be required.
- Some sources must be direct surveyed only.
- Leak testing sources more than once every six months is not recommended.

Correct	Choice
X	Some sources may require indirect smears.
	Depending on how the source is contained, no survey may be required.
	Some sources must be direct surveyed only.
	Leak testing sources more than once every six months is not recommended.

Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

You did not select the correct response.

Correct (Slide Layer)

Which is a special consideration for performing smear surveys on accountable sources?

- Some sources
- Depending on the source
- Some sources
- Leak testing



Correct

That's right! You selected the correct response.

[Continue](#)

Incorrect (Slide Layer)

Which is a special consideration for performing smear surveys on accountable sources?

- Some sources
- Depending on the source
- Some sources
- Leak testing



Incorrect

You did not select the correct response.

[Continue](#)

Try Again (Slide Layer)

Which is a special consideration for performing smear surveys on accountable sources?

- Some sources
- Depending on the source
- Some sources
- Leak testing



Incorrect

That is incorrect. Please try again.

[Try Again](#)

1.19 Storage Requirements

Storage Requirements

- Accountable RSS storage areas must be an approved location
- Accountable RSS storage areas must be secured to prevent unauthorized access
- RCTs must perform and document radiological surveys of RSS storage areas
- RCTs must maintain radiological posting for RSS storage areas

[Click here to view the specific requirements listed in P121 before proceeding](#)





Untitled Layer 1 (Slide Layer)

Storage Requirements

- Accountable RSS storage areas must be an approved location
- Accountable RSS storage areas must be secured to prevent unauthorized access
- RCTs must perform and document radiological surveys of RSS storage areas
- RCTs must maintain radiological posting for RSS storage areas

[Click here to view the specific requirements listed in P121 before proceeding](#)





1.20 Storage Requirements Cont.

Storage Requirements Cont.

- Accountable sources can be placed in "long term storage" when not in use, but they must be kept separate from active sources in an approved storage location.
- Accountable sources in long term storage require a tag with the following information:
 - Out of service date
 - Source control number
 - Location (TA, building, room)
 - RSS custodian
 - "Six month RSS inventory required"
 - "Leak test required prior to use"

[Click here to view an overview of RSS requirements in P121 before proceeding](#)





Untitled Layer 1 (Slide Layer)



Table 16-2. RSS Requirements by Type				Click the table to close
RSS Type	Database Registration	Inventory	Periodic Leak	Form except
Non-accountable	Not required	Not required	Not required	Form except
Accountable, active	Required	Required	Required	Form except
Accountable, in long-term storage	Required	Required	Not required	Form except
Accountable, pending disposal ¹	Required	Required	Not required	Form except
Accountable, inaccessible or in areas unsafe for human entry	Required	Not required	Not required	Form except

¹ An RSS must be in an appropriate waste container or packaged and ready for shipping to be considered pending disposal.

1.21 Labeling Requirements



RSS Labeling Requirements																																																																																																									
<ul style="list-style-type: none">Radioactive Sealed Sources are labeled in accordance with P121 Chapter 17.Labeling exceptions are found in P121, table 17-2.Sources with an activity one tenth of Appendix 16A values, and less than 0.1 Curie are exempt from labeling requirements. However, it is always a good practice to label any radioactive material.																																																																																																									
<table border="1"><caption>Appendix 16A Values for Establishing Radioactive Sealed Source (RSS) Accountability and Radioactive Material Posting and Labeling Requirements</caption><thead><tr><th>Radionuclide</th><th>Activity (uCi)</th><th>Radionuclide</th><th>Activity (uCi)</th><th>Radionuclide</th><th>Activity (uCi)</th></tr></thead><tbody><tr><td>⁹⁰Sr</td><td>150,000,000</td><td>⁹⁰Y</td><td>480,000</td><td>¹¹³In</td><td>330</td></tr><tr><td>⁹Be</td><td>3,100</td><td>⁸⁹Sr</td><td>35,000 (includes activity from PSr only - not ⁹⁰Y)</td><td>¹¹³Sn</td><td>810,000</td></tr><tr><td>¹⁰B</td><td>140,000</td><td>⁹⁰Y</td><td>33</td><td>¹¹³Sn</td><td>13,000</td></tr><tr><td>⁴⁰K</td><td>4,600,000</td><td>⁹¹Ra</td><td>33</td><td>¹¹³Sr</td><td>160</td></tr><tr><td>¹³⁷Cs</td><td>19</td><td>⁹²Y</td><td>30,000</td><td>¹¹³Sr</td><td>21</td></tr><tr><td>¹⁹⁷Au</td><td>15</td><td>⁹²Zr</td><td>110</td><td>¹¹³Sb</td><td>67</td></tr><tr><td>¹⁹⁷Rb</td><td>40,000</td><td>⁹²Zr</td><td>93,000</td><td>¹¹³Te</td><td>180</td></tr><tr><td>¹⁹⁷Rb</td><td>2,400,000</td><td>⁹³Zr</td><td>190</td><td>¹¹³Te</td><td>200</td></tr><tr><td>¹⁹⁷Rb</td><td>2,000,000</td><td>⁹⁴Nb</td><td>69</td><td>¹¹³Te</td><td>440</td></tr><tr><td>⁹⁰Rb</td><td>270</td><td>⁹⁵Nb</td><td>360</td><td>¹¹³Te</td><td>600</td></tr><tr><td>¹⁹⁷Rb</td><td>1,200,000</td><td>⁹⁶Nb</td><td>19</td><td>¹¹³Te</td><td>2,500</td></tr><tr><td>¹⁹⁷Rb</td><td>1,100,000</td><td>⁹⁷Nb</td><td>440</td><td>¹¹³Te</td><td>350</td></tr><tr><td>¹⁹⁷Rb</td><td>62</td><td>⁹⁸Nb</td><td>23</td><td>¹¹³Te</td><td>180</td></tr><tr><td>¹⁹⁷Rb</td><td>150</td><td>⁹⁹Nb</td><td>340</td><td>¹¹³Ca</td><td>50</td></tr><tr><td>¹⁹⁷Rb</td><td>100,000,000</td><td>¹⁰⁰Nb</td><td>77</td><td>¹¹³Ca</td><td>1,300,000</td></tr><tr><td>¹⁹⁷Rb</td><td>75,000,000</td><td>¹⁰¹Nb</td><td>130</td><td>¹¹³Ca</td><td>60</td></tr></tbody></table>				Radionuclide	Activity (uCi)	Radionuclide	Activity (uCi)	Radionuclide	Activity (uCi)	⁹⁰ Sr	150,000,000	⁹⁰ Y	480,000	¹¹³ In	330	⁹ Be	3,100	⁸⁹ Sr	35,000 (includes activity from PSr only - not ⁹⁰ Y)	¹¹³ Sn	810,000	¹⁰ B	140,000	⁹⁰ Y	33	¹¹³ Sn	13,000	⁴⁰ K	4,600,000	⁹¹ Ra	33	¹¹³ Sr	160	¹³⁷ Cs	19	⁹² Y	30,000	¹¹³ Sr	21	¹⁹⁷ Au	15	⁹² Zr	110	¹¹³ Sb	67	¹⁹⁷ Rb	40,000	⁹² Zr	93,000	¹¹³ Te	180	¹⁹⁷ Rb	2,400,000	⁹³ Zr	190	¹¹³ Te	200	¹⁹⁷ Rb	2,000,000	⁹⁴ Nb	69	¹¹³ Te	440	⁹⁰ Rb	270	⁹⁵ Nb	360	¹¹³ Te	600	¹⁹⁷ Rb	1,200,000	⁹⁶ Nb	19	¹¹³ Te	2,500	¹⁹⁷ Rb	1,100,000	⁹⁷ Nb	440	¹¹³ Te	350	¹⁹⁷ Rb	62	⁹⁸ Nb	23	¹¹³ Te	180	¹⁹⁷ Rb	150	⁹⁹ Nb	340	¹¹³ Ca	50	¹⁹⁷ Rb	100,000,000	¹⁰⁰ Nb	77	¹¹³ Ca	1,300,000	¹⁹⁷ Rb	75,000,000	¹⁰¹ Nb	130	¹¹³ Ca	60
Radionuclide	Activity (uCi)	Radionuclide	Activity (uCi)	Radionuclide	Activity (uCi)																																																																																																				
⁹⁰ Sr	150,000,000	⁹⁰ Y	480,000	¹¹³ In	330																																																																																																				
⁹ Be	3,100	⁸⁹ Sr	35,000 (includes activity from PSr only - not ⁹⁰ Y)	¹¹³ Sn	810,000																																																																																																				
¹⁰ B	140,000	⁹⁰ Y	33	¹¹³ Sn	13,000																																																																																																				
⁴⁰ K	4,600,000	⁹¹ Ra	33	¹¹³ Sr	160																																																																																																				
¹³⁷ Cs	19	⁹² Y	30,000	¹¹³ Sr	21																																																																																																				
¹⁹⁷ Au	15	⁹² Zr	110	¹¹³ Sb	67																																																																																																				
¹⁹⁷ Rb	40,000	⁹² Zr	93,000	¹¹³ Te	180																																																																																																				
¹⁹⁷ Rb	2,400,000	⁹³ Zr	190	¹¹³ Te	200																																																																																																				
¹⁹⁷ Rb	2,000,000	⁹⁴ Nb	69	¹¹³ Te	440																																																																																																				
⁹⁰ Rb	270	⁹⁵ Nb	360	¹¹³ Te	600																																																																																																				
¹⁹⁷ Rb	1,200,000	⁹⁶ Nb	19	¹¹³ Te	2,500																																																																																																				
¹⁹⁷ Rb	1,100,000	⁹⁷ Nb	440	¹¹³ Te	350																																																																																																				
¹⁹⁷ Rb	62	⁹⁸ Nb	23	¹¹³ Te	180																																																																																																				
¹⁹⁷ Rb	150	⁹⁹ Nb	340	¹¹³ Ca	50																																																																																																				
¹⁹⁷ Rb	100,000,000	¹⁰⁰ Nb	77	¹¹³ Ca	1,300,000																																																																																																				
¹⁹⁷ Rb	75,000,000	¹⁰¹ Nb	130	¹¹³ Ca	60																																																																																																				
																																																																																																									

1.22 Labeling Criteria



Labeling Criteria	
<ul style="list-style-type: none">When required, radioactive material labels MUST include:<ul style="list-style-type: none">“Caution” or “Danger”“Radioactive Material”TrefoilRadionuclide presentEstimated quantity of activityDate when activity was estimated	

Click here to view the labeling requirements listed in P121 before proceeding

Untitled Layer 1 (Slide Layer)

1544 Accounting for labeled material

1. When labels are required, labels must be durable, legible, and provide the information to allow individual handling, using, or working in the vicinity of the labeled material to control exposures (see 835.605). Information must include as a minimum:

- Radionuclide present or some representative description (e.g., "mixed activation products," "mixed fission products," "actinides," "spallation products");
- Estimated quantity of radioactivity, contamination level, or dose rate (contamination and dose rate information must be provided by Deployed RP); and
- Date when the quantity was estimated or measured.

2. Labels must indicate the quantity of material, the date of measurement, and the Deployed RP responsible for the measurement.

3. Labels must indicate the quantity of material, the date of measurement, and the Deployed RP responsible for the measurement.

4. Labels must indicate the quantity of material, the date of measurement, and the Deployed RP responsible for the measurement.

5. Labels must indicate the quantity of material, the date of measurement, and the Deployed RP responsible for the measurement.

6. Labels must indicate the quantity of material, the date of measurement, and the Deployed RP responsible for the measurement.

7. When labels are required, labels must be durable, legible, and provide the information to allow individual handling, using, or working in the vicinity of the labeled material to control exposures (see 835.605). Information must include as a minimum:

- Radionuclide present or some representative description (e.g., "mixed activation products," "mixed fission products," "actinides," "spallation products");
- Estimated quantity of radioactivity, contamination level, or dose rate (contamination and dose rate information must be provided by Deployed RP); and
- Date when the quantity was estimated or measured.

Click the procedure to close

labels

ted in P121

1.23 Knowledge Check #3

(Multiple Choice, 10 points, unlimited attempts permitted)

An accountable RSS placed in long term storage must be leak tested...

- Prior to use
- Every 6 months
- Annually
- Quarterly

Correct	Choice
X	Prior to use
	Every 6 months
	Annually
	Quarterly

Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

You did not select the correct response.

Correct (Slide Layer)

An accountable RSS placed in long term storage must be leak tested...

Prior to use
 Every 6 months
 Annually
 Quarterly


Correct

That's right! You selected the correct response.

[Continue](#)

Incorrect (Slide Layer)

An accountable RSS placed in long term storage must be leak tested...

Prior to use
 Every 6 months
 Annually
 Quarterly


Incorrect

You did not select the correct response.

[Continue](#)

Try Again (Slide Layer)

An accountable RSS placed in long term storage must be leak tested...

Prior to use

Every 6 months

Annually

Quarterly



Incorrect

That is incorrect. Please try again.

[Try Again](#)

1.24 Good Work Practices

Good Work Practices

- Regularly inspect sources for signs of degradation
- Maintain an inventory/check out sheet
- Lock up all source storage areas
- Only remove sources when in use and return them when finished
- Perform an assay of check sources to ensure accuracy



1.25 Leaking Cesium Source Event

Leaking Cesium Source Event

- In 2020, a LANL source was suspected to be leaking after personnel noticed a puncture in the center of a Cs-137 source.
- Proper actions were taken and surveys verified loose surface contamination levels to be above the limits of P121 Table 14-2.
- The source was controlled and follow up actions were taken to ensure no spread of contamination to other items/areas.



1.26 Response to Leaking Sources

Responding to a Leaking Source

- The required actions for discovery of a leaking source are located in RP-PROG-TP-200, Section 1623.2.
- [8] If contamination is detected, THEN:
 - Inform the RSS custodian, HPFC, and SCO
 - Determine the extent of contamination spread by performing additional surveys
 - Contain the source and apply an HPRMS tag to the container

[Click here to see an overview of the RSS leak test procedure in RP-PROG-TP-200 before proceeding](#)



Untitled Layer 1 (Slide Layer)

1623.2 Performing Leak Tests

WARNING
Gloves must be worn when handling radioactive sources.

[1] Verify the manufacturer information and SCO accountable source tag are legible and intact.

- If the accountable source tag is NOT legible, THEN notify the SCO.
- If the manufacturer information is NOT legible, THEN permanently mark the RSSMS generated source control number.

[2] Inspect the sealed source for damage.

- A visual inspection is NOT required for sources that must be remotely handled.
- Inspection mirrors should be used to inspect high activity sources.

[3] If damage is observed, THEN inform the RSS custodian, HPFC, and the SCO.

[4] REFER TO Table 18 for leak test guidance AND perform a smear survey.

Table 18. Leak Test Smear Survey Requirements

Source Type	Source	Procedure
Electropolished	Smear the inside of the storage container to avoid removing activity from the active area.	
Encapsulated	Directly smear the source or the source on weld seams or other potential points of leakage.	
<100 cm ² dimension	Smear the source on one smear.	
High Activity	Use remote-handling tools to obtain a direct smear, if possible. If remote handling is not possible, take indirect smears (e.g., from the outside of the storage container or along movement tracks, etc.)	
Limited Access	Use remote-handling tools to obtain a direct smear, if possible. Take indirect smears (e.g., from the inside of the storage container, along movement tracks, safety equipment, etc.)	

[5] Monitor gloved hands for contamination.

[6] Perform a field screen of the smear(s).

[7] If contamination is detected, THEN GO TO step [8].

[8] If contamination is detected, THEN:

- Inform the RSS custodian, HPFC, and SCO.
- Determine the extent of contamination spread by performing additional surveys.
- Contain the source and apply an HPRMS tag to the container

[9] Complete survey package AND provide a copy to the RSS custodian.

[10] The RSS custodian shall enter the leak test results into RSSMS.

N: and SCO

Contain the source and apply an HPRMS tag to the container

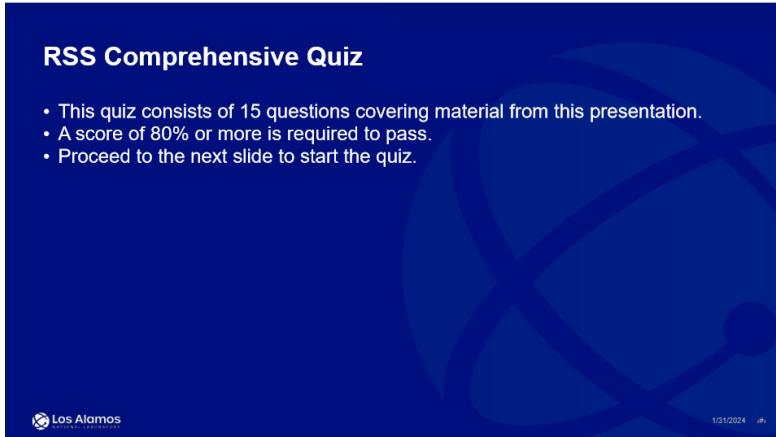
[Click the procedure to close](#)

[Click here to see an overview of the RSS leak test procedure in RP-PROG-TP-200 before proceeding](#)



2. Quiz

2.1 Quiz Introduction



RSS Comprehensive Quiz

- This quiz consists of 15 questions covering material from this presentation.
- A score of 80% or more is required to pass.
- Proceed to the next slide to start the quiz.

1/31/2024 6s

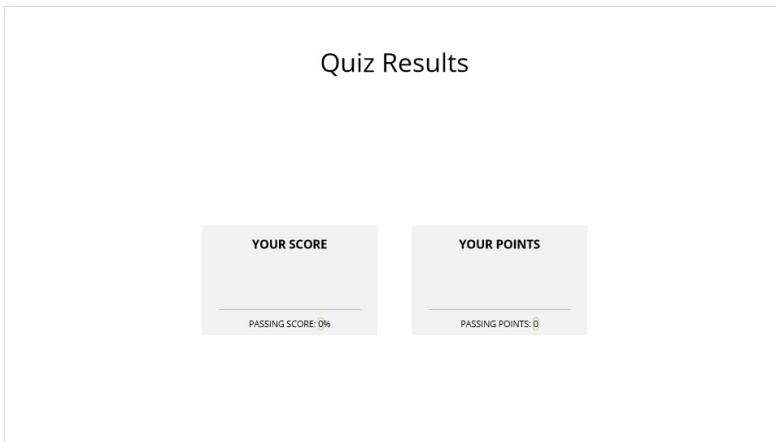
Notes:

2.2 Draw from RSS Quiz Bank

Draw all questions randomly from RSS Quiz Bank

2.3 Quiz Results

(Results Slide, 0 points, 1 attempt permitted)



Quiz Results

YOUR SCORE	YOUR POINTS
PASSING SCORE: 0%	PASSING POINTS: 0

Results for

2.2 Draw from RSS Quiz Bank

Result slide properties

Passing 80%

Score

Success (Slide Layer)

Quiz Results



Nice job, you passed!

YOUR SCORE	0%
PASSING SCORE:	0%
YOUR POINTS	0
PASSING POINTS:	0

[Review Quiz](#) [Continue](#)

Failure (Slide Layer)

Quiz Results

X

Sorry, you didn't pass.

YOUR SCORE  0%	YOUR POINTS  0
PASSING SCORE: 0%	PASSING POINTS: 0

[Retry Quiz](#)

2.4 End of Course

End of Course

Congratulations! You have successfully completed the online portion of this quarters Continuing Training. Be sure to also sign up for the required in-person training under course number 59118 in UTrain.



Questions? Contact rp-training@lanl.gov

[EXIT COURSE](#)

1. RSS Quiz Bank

Q1.1 An accountable source only needs to be inventoried annually.

(True/False, 10 points, 1 attempt permitted)

An accountable source only needs to be inventoried annually.

- True
- False

Correct	Choice
	True
X	False

Q1.2 Which criteria makes a source accountable?

(Multiple Choice, 10 points, 1 attempt permitted)

Which criteria makes a source accountable?

- The half-life and the activity
- The half-life and the size
- The activity and the chemical make up
- The size and chemical make up

Correct	Choice
X	The half-life and the activity

The half-life and the size
The activity and the chemical make up
The size and chemical make up

Q1.3 What dictates the activity at which a source may become accountable?

(Multiple Choice, 10 points, 1 attempt permitted)

What dictates the activity at which a source may become accountable?

P121 Appendix 16A
 P121 Table 14-2
 P121 Table 17-2
 P121 Appendix 14B

Correct	Choice
X	P121 Appendix 16A
	P121 Table 14-2
	P121 Table 17-2
	P121 Appendix 14B

Q1.4 In order for a source to be considered accountable, it must have a half life greater than or equal to:

(Multiple Choice, 10 points, 1 attempt permitted)

In order for a source to be considered accountable, it must have a half life greater than or equal to:

- 30 days
- 30 weeks
- 13 days
- 13 weeks

Correct	Choice
X	30 days
	30 weeks
	13 days
	13 weeks

Q1.5 An RSS inventory must include which of the following?

(Multiple Choice, 10 points, 1 attempt permitted)

An RSS inventory must include which of the following?

- Verification of the presence and adequacy of postings and labels
- A list of who has used the sources in the last 6 months
- Verifying the walls are painted yellow and magenta
- A distance measurement of the source to the nearest office

Correct	Choice
X	Verification of the presence and adequacy of postings and labels
	A list of who has used the sources in the last 6 months
	Verifying the walls are painted yellow and magenta
	A distance measurement of the source to the nearest office

Q1.6 An accountable source must be leak checked at all of these times

EXCEPT

(Multiple Choice, 10 points, 1 attempt permitted)

An accountable source must be leak checked at all of these times EXCEPT

- When damage to the source is suspected
- Prior to use for the day
- Upon receipt
- Every 6 months

Correct	Choice
	When damage to the source is suspected
X	Prior to use for the day
	Upon receipt
	Every 6 months

Q1.7 What procedure contains the required survey locations for accountable sources?

(Multiple Choice, 10 points, 1 attempt permitted)

What procedure contains the required survey locations for accountable sources?

- RP-PROG-TP-200, Radiation Protection Manual
- P121, Radiation Protection
- RP-PROG-TP-203, Packaging and Transport Requirements for RP Activities
- RP-PROG-TP-201, Radiological Emergency Response

Correct	Choice
X	RP-PROG-TP-200, Radiation Protection Manual
	P121, Radiation Protection
	RP-PROG-TP-203, Packaging and Transport Requirements for RP Activities
	RP-PROG-TP-201, Radiological Emergency Response

Q1.8 All accountable sources must be smeared directly to check for leakage.

(True/False, 10 points, 1 attempt permitted)

All accountable sources must be smeared directly to check for leakage.

- True
- False

Correct	Choice
	True
X	False

Q1.9 Which of the following is a requirement of an accountable RSS storage area?

(Multiple Choice, 10 points, 1 attempt permitted)

Which of the following is a requirement of an accountable RSS storage area?

- They must be secured with a lock or device that prevents unauthorized access.
- They must have the walls painted yellow and magenta.
- They must have video surveillance to monitor personnel that enter the storage area.
- They must be inside of a HRA.

Correct	Choice
X	They must be secured with a lock or device that prevents unauthorized access.
	They must have the walls painted yellow and magenta.
	They must have video surveillance to monitor personnel that enter the storage area.
	They must be inside of a HRA.

Q1.10 An accountable RSS placed into long term storage does not require a leak test every six months.

(True/False, 10 points, 1 attempt permitted)

An accountable RSS placed into long term storage does not require a leak test every six months.

True
 False

Correct	Choice
X	True
	False

Q1.11 An RSS label must include:

(Multiple Choice, 10 points, 1 attempt permitted)

An RSS label must include:

- The estimated activity of the source.
- The signature of who made the label.
- The 1 meter dose rate readings.
- The removable contamination survey results.

Correct	Choice
X	The estimated activity of the source.
	The signature of who made the label.
	The 1 meter dose rate readings.
	The removable contamination survey results.

Q1.12 An RSS label must include:

(Multiple Choice, 10 points, 1 attempt permitted)

An RSS label must include:

- The radionuclide used in the source
- What radiation the source emits
- The 30 cm and on contact dose rates
- The most recent leak test survey results

Correct	Choice
X	The radionuclide used in the source
	What radiation the source emits
	The 30 cm and on contact dose rates
	The most recent leak test survey results

Q1.13 If a source is found to be leaking, which of the following is an appropriate action?

(Multiple Choice, 10 points, 1 attempt permitted)

If a source is found to be leaking, which of the following is an appropriate action?

- Determine the extent of contamination spread by performing additional surveys.
- Evacuate the immediate area where the leaking source was discovered.
- Throw the source into the trash.
- Attempt to decontaminate the source.

Correct	Choice
X	Determine the extent of contamination spread by performing additional surveys.
	Evacuate the immediate area where the leaking source was discovered.
	Throw the source into the trash.
	Attempt to decontaminate the source.

Q1.14 What should ultimately be done with a leaking source?

(Multiple Choice, 10 points, 1 attempt permitted)

What should ultimately be done with a leaking source?

- The source should be placed in a container labeled with an HPRMS tag.
- The source should be thrown into the trash for disposal.
- The source should be decontaminated and sent to HPAL for a new assay.
- The source should remain in use.

Correct	Choice
X	The source should be placed in a container labeled with an HPRMS tag.
	The source should be thrown into the trash for disposal.
	The source should be decontaminated and sent to HPAL for a new assay.
	The source should remain in use.

Q1.15 If a source is found to be leaking, what three entities should be notified?

(Multiple Choice, 10 points, 1 attempt permitted)

If a source is found to be leaking, what three entities should be notified?

- Your RSS Custodian, HPFC, and SCO
- Your RSS Custodian, Division Lead, and SCO
- Your HPFC, EOSC, and Operations Center
- Your Operations Center, EOSC, and RSS Custodian

Correct	Choice
X	Your RSS Custodian, HPFC, and SCO
	Your RSS Custodian, Division Lead, and SCO
	Your HPFC, EOSC, and Operations Center
	Your Operations Center, EOSC, and RSS Custodian

RCT Continuing Training – Radioactive Sealed Sources Transcript

Slide #1.1 RCT Continuing Training – Radioactive Sealed Sources

No narration

Slide #1.2 Introduction

“Welcome to RCT Continuing Training. This quarter’s topic will review the requirements associated with radioactive sealed source, or RSS, use. To complete this training, you will be required to view this entire presentation and complete the quiz at the end with a passing score. The in-person training for this quarter can be found on UTrain course number 59118. Please register for a day that works best with your schedule.”

Slide #1.3 Terminal Objective

“The terminal objective for this course is: Given the need to perform duties as an RCT, recognize the requirements of radioactive sealed source, RSS, use in accordance with RP-PROG-TP-200, Radiation Protection Manual and P121, Radiation Protection.”

Slide #1.4 Enabling Objectives

“To accomplish our terminal objective, we will be focusing on the following enabling objectives:

1. Determine whether a RSS is accountable or non-accountable.
2. State the required frequency for RSS inventory and leak check surveys at LANL.
3. Discuss the necessary inventory and survey requirements for an accountable RSS at LANL.
4. Determine suitable survey points for a routine leak check of a given RSS.”

Slide #1.5 Enabling Objectives Cont.

5. Identify the proper radiation detection and counting instrumentation to be used for the survey of a RSS.
6. State the storage requirements for an accountable RSS at LANL.
7. Identify the proper labeling requirements for RSSs at LANL.
8. State the required actions for a leaking source.”

Slide #1.6 Why RSS Control Matters

“Radioactive Sealed sources can be found all over LANL property for a variety of uses. RCTs use them for instrument checks and customers use them for a variety of work. As an RCT, you are responsible for proper handling of RSSs to include labeling, storage, inventory, and survey requirements which prevents unauthorized access and potential spreads of contamination.”

Slide #1.7 Event Summary

“To further illustrate the gravity of why RSS control matters, we can explore an event involving sources at the Lawrence Livermore National Laboratory. One of their facilities had requested a single cesium 137 source in 2006. The facility was instead given two sources, one of which was a tritium source that was leaking and was only discovered to be leaking from elevated survey results during monthly routine surveys. Due to the long delay in detection of the leak, tritium contamination was found to have been spread to two facilities, a government vehicle, personal clothing, a personal vehicle, and a private residence.”

Slide #1.8 Contributing Factors

“Now let’s look at the applicable contributing factors. Obviously the first thing that should have been a red flag for these workers is that they received two sources instead of one. But in addition to getting a second source, that second source was not controlled properly to include labeling, inventory, storage, packaging, and transport requirements. This bonus source also emitted a radiation that the RCTs did not expect to encounter and consequently the instruments they used were unable to detect the leak that was occurring during receipt. When signs arose that indicated an unknown source of contamination was spreading, workers assumed precautions were taken and raised no concerns.”

Slide #1.9 Lessons Learned

“The lessons we can learn from this event coincide very well with some of the lab’s SCoR principles. Everyone is personally responsible for ensuring safe operations and staff raise concerns because trust permeates the organization. When something abnormal occurs during your work, no one should hesitate to notify others. If indications for a spread of contamination are present, take the action necessary to find the cause of the contamination, or at least verify that it is being investigated with supervision. A questioning attitude also applies here. If a worker receives two sources when only expecting one or even simpler, there are additional items in a received shipment than what was requested or on an inventory sheet, a call to the shipping facility is necessary for clarification.”

Slide #1.10 Scor and CONOPS Principles

“Now let’s review what safe conduct of research and conduct of operations principles apply to RSS controls. In terms of ConOps, our operating routines are affected because we work with various types of RSSs daily. RSSs require robust controls to prevent their loss and ensure they don’t spread contamination to uncontrolled areas. We also need to be in compliance with DOE and LANL procedures. We covered the three SCoR principles of personal responsibility, raising concerns, and a questioning attitude in the previous slide, but two additional principles are relevant as well. Proper compliance with RSS requirements helps us identify hazards and understanding RSS use necessitates a knowledge of what can go wrong when these sources are in service.”

Slide #1.11 What makes an RSS accountable?

“While all RSSs should be handled with care, an accountable RSS is a higher hazard to personnel and requires specific controls. P121 defines an accountable RSS as any source that has both a half-life greater than or equal to 30 days and also has an activity greater than or equal to the corresponding value found on appendix 16A of P121. The most common accountable RSS used by RCTs is the Americium Beryllium, or AmBe sources used for NRD instrument checks.”

Slide #1.12 Inventory Requirements

“If a source is accountable, it must be inventoried at least every 6 months. This inventory must establish the location of the accountable source, that required postings and labels are present, and that the storage location, containers, and locking devices can adequately prevent unintentional personnel access.”

Slide #1.13 Knowledge Check #1

No narration

Slide #1.14 Survey Requirements

“Survey frequencies to leak test accountable RSSs are required upon receipt, prior to packaging for transport, when any damage is suspected, and at least once every six months. Performing RSS leak checks while performing the 6 month inventory can help maximize efficiency of meeting both inventory and survey requirements.”

Slide #1.15 Survey Instrument Selection

“When performing RSS leak checks, it is important to know what the isotope emits. This will dictate what instruments are used for surveys. For contamination, smears will be used to detect any removable contamination. Field screen the smears with a portable survey instrument. Be sure to use an instrument that will detect the anticipated contamination type or cover all types of contamination by utilizing a dual scintillation detector like a 380 AB probe or 43-93 probe. We want to know of a leak as early as possible, so we can respond as early as possible. Then either count the smears using a smear counter, such as a 3030E or prepare the smears to be sent to HPAL. For beta and gamma radiation surveys, use the RO-20 in open and closed window respectively, and for neutron radiation, use a neutron radiation detector or NRD.”

Slide #1.16 Survey Locations

“Not all sources are built the same, and therefore require different survey methods. You will need to determine what type of source you will be dealing with and refer to table 18 in RP-PROG-TP-200 section 1623.2 to find the survey locations. Please note that some sources, like the electroplated sources listed in table 18, require indirect smears as to avoid damage from repeated smear surveys on the source surface.”

Slide #1.17 RSS Leak Test Demonstration

“Alright so we are going to do a survey on the source and make sure we don’t have anything leaking. We are going to open up the container. Take a smear where the source was at. Make sure you do a direct survey of the smear. Get a second smear. Smear the edge of the source. Direct survey of the smear. Flip the source over. Make sure you don’t see anything missing on the source itself, no cracks, no material missing. Go ahead and take the third smear, direct survey the smear. Make sure you put the source ID on there when you send smears to HPAL. Place the source back in its container.”

Slide #1.18 Knowledge Check #2

No narration

Slide #1.19 Storage Requirements

“If a source is accountable, the storage location must be approved by your supervision and must be secured in a way that prevents unauthorized access. RCTs are responsible for surveying these storage areas with proper documentation and must maintain the radiological posting of these areas as with all controlled areas.”

Slide #1.20 Storage Requirements Cont.

“If an accountable source will not be used for a long period of time, then it may be placed in long term storage. This storage area must be a separate location to the one used for active accountable sources in use. Additionally, each accountable source in a long-term storage area must be tagged with information that includes:

- The out of service date
- The source control number
- Its location
- Who the RSS custodian is
- The phrase ‘six-month RSS inventory required’
- And the statement ‘leak test required prior to use’ as accountable sources in long term storage are exempt from six-month leak test requirements.”

Slide #1.21 Labeling Requirements

“Just like all radioactive material, an RSS must be labeled in accordance with P121 chapter 17. However exemptions do apply to certain sources which can be found in table 17-2. Basically, if a source contains less than 1/10 of the activity listed in Appendix 16A and is less than 0.1 Curies in total activity, they need not be labeled. However, it is always a good work practice to label any radioactive material and it’s always nice to have identification for our check sources.”

Slide #1.22 Labeling Criteria

“A properly labeled source must include the following information:

- The word caution or danger
- The words radioactive material
- A trefoil
- The radionuclide used in the source
- An estimated quantity of activity
- And the date that activity was estimated”

Slide #1.23 Knowledge Check #3

No narration

Slide #1.24 Good Work Practices

“As we alluded in the labeling requirements. Exempt sources may be treated differently from accountable sources or even ones that don’t meet the criteria for exemption in table 17-2, but we want to treat them with the same level of caution to develop good work habits. These sources can leak just like any other source and inadvertent exposure can cause the spread of contamination onto clothes or skin. So, consider taking these additional steps when working with all sources:

- Regularly inspect sources for signs of degradation. A common issue with even depleted uranium, or DU, slugs used as response check sources is small pieces of the DU chipping off. So just a quick visual inspection prior to use can go a long way in preventing a potential spread of contamination. Another potential sign of a leaking source is unusually low readings during a performance test of an instrument.
- An informal inventory and checkout sheet kept at the source storage location can assist in keeping track of sources day-to-day and can remove the guess work of where a source has gone, especially with sources that see use by multiple technicians.
- Lock up all source storage areas so non-RP personnel cannot inadvertently access them.
- Only remove the sources when in use and return them to their proper location when finished. One of the most annoying things that can occur during routine maintenance is when a source is needed for CAM or PCM tests and a technician has left it in another storage location.
- And finally, as a quality-of-life improvement for instrument checks, be sure to perform regular assays of your sources needed for accurate tests like initial setups and performance tests.”

Slide #1.25 Leaking Cesium Source

“To contrast the Lawrence Livermore event lets review an event that occurred here at LANL that was addressed the right way. In 2020, a puncture was observed in the center of a cesium 137 source and was suspected of leaking. Surveys verified that a leak had indeed occurred, and proper response actions were taken by controlling the source to ensure no additional spread of contamination was possible.”

Slide #1.26 Response to Leaking Sources

"So, what exactly are the proper actions to take if a source is found to be leaking? Section 1623.2 of TP-200 states that the RSS custodian, HPFC, and Source Control Office, or SCO, be informed. The RCT need to verify that contamination has not been spread by performing additional surveys. The source itself must be contained in a sealed container, like a bag, and labeled with an HPRMS tag to prevent further spread of contamination."

Slide #2.1 Quiz Introduction

No narration

Slide #2.2 Draw from RSS Quiz Bank

No narration

Slide #2.3 Quiz Results

No narration

Slide #2.4 End of Course

"Congratulations! You have successfully completed the online portion of this quarters Continuing Training. Be sure to also sign up for the required in-person training under course number 59118 in UTrain. As always, if you have any questions or comments, please contact rptraining@lanl.gov. Press the exit course button to exit this presentation."