

LANL MLU 20 October TRUPACT Loading Survey Document

Date: 10/25/2021

To: Kelly Wohlwend, LANL MLU Team Lead

From: Amber Allardice, SNL RP Project Lead (TA-5)

Subject: 20 October TRUPACT Loading Survey

The following SNL document contains requested radiological survey information, as part of the documentation for the MLU shipment performed by the LANL MLU team on October 20th. The survey was performed in TA-5, on October 20th, 2021. This survey was for radiological coverage for the disassembly of two TRUPACTs, the assembly and loading of their payloads, and the reassembly of the TRUPACTs.

- LANL MLU TRUPACT Packaging Survey (Trailer #329): I-20211019-4

All information contained was completed, reviewed, and approved by SNL RP personnel, and is intended for receipt and use by the LANL MLU Team at their discretion.



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Radiological Survey Report

Survey I-20211019-4

General Information

Title: LANL MLU TRUPACT Packaging Survey (Trailer #329)
Survey Date/Time: 10/20/2021 06:00
Location: 6593 /Outside
TWD or RTWD #: SPRF-RTWD-027, Rev.0
Purpose: Job Cov/Characterization
Requestor Org: 01381
Status: Approved by: Allardice, Amber, 10/25/2021
Ready for Review by: Bowman, Brian, 10/25/2021

Lead Surveyor: Bowman, Brian
Work Order/Task #: N/A

Additional Surveyors

Surveyor
Kegeler, Stephen
Martinez, Daniel
Molina, Vanessa
Rollins, Andrew
Tafoya, David

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12248	D	N/A	N/A	D	2/10/2022	N/A	N/A
2	3030	278104	C	43-10-1	105184	C	2/10/2022	0.21	0.31
3	3030	276345	C	43-10-1	113586	C	12/10/2021	0.21	0.31
4	RADEYE PX	10367	D	NRD	2214	D	1/10/2022	N/A	N/A

Instruments Used - Notes

#	Notes
1	BKGD = <0.1 mR/hr
2	BKGD CPM (a/B) = 0/35
3	BKGD CPM (a/B) = 0/48
4	BKGD = <0.1 mrem/hr

Radiological Survey Report

Comments:

****SURVEY UNLOCKED TO MAKE ADMINISTRATIVE CORRECTION/CLARIFICATION FOR DATE SURVEY PERFORMED****

Survey for characterization/job coverage for the loading of TRUPACT containers on trailer #329.

Trailer #329 loaded with TRUPACT #171, #184, & #193.

TRUPACT #171 contained payload assembly #SA007 using ratchet straps #2360, 2945, and 3510.

TRUPACT #184 contained payload assembly #SA008 using ratchet straps #3475, 2615, and 3432.

TRUPACT #193 will remain empty and was not opened during packaging/loading evolution.

Area where loading of TRUPACTs performed was posted as a Radioactive Material Area (RMA) and a Controlled Area (ContA).

After loading was complete, RMA and ContA were collapsed to the trailer.

Radiological conditions observed did not exceed area postings.

Radionuclides of Concern:

Fission Products: Zr, Nb, Mo, Tc, Ru, Rh, Te

Transuranics: Isotopes of Pu

Contamination Limits:

Removable: 20dpm/100cm² (alpha); 200dpm/100cm² (beta/gamma).

Dose rates performed on-contact (OC) and at 1 meter from payload (gamma and neutron).

All dose rates were consistent with background levels.

Swipes taken were counted on a Ludlum 30-30 counter.

All swipes were less than removable contamination limits.

30-30 MDA sheets are attached.

Swipes 1-10 counted using 30-30 S/N: 278104/105184

Swipes 11-26 counted using 30-30 S/N: 276345/113586

OCV- Outer Containment Vessel

ICV- Inner Containment Vessel

Attachments:

1.) *TRUPACT Container and Payload Diagram*

2.) *30-30 MDA Sheet (S/N: 278104/105184)*

3.) *30-30 MDA Sheet (S/N: 276345/113586)*

4.) *Original Survey*

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	TRUPACT #171- OCV Lid	
2	TRUPACT #171- OCV Lid	
3	TRUPACT #171- OCV Lid	
4	TRUPACT #171- ICV Lid	
5	TRUPACT #171- ICV Lid	
6	TRUPACT #171- Containment	
7	TRUPACT #171- Containment	
8	TRUPACT #171- Containment	
9	TRUPACT #171- Containment	
10	TRUPACT #171- Containment	Survey performed on the interior, bottom of the containment.
11	TRUPACT #184- OCV Lid	
12	TRUPACT #184- OCV Lid	
13	TRUPACT #184- OCV Lid	
14	TRUPACT #184- ICV Lid	
15	TRUPACT #184- ICV Lid	
16	TRUPACT #184- Containment	
17	TRUPACT #184- Containment	
18	TRUPACT #184- Containment	
19	TRUPACT #184- Containment	
20	TRUPACT #184- Containment	Survey performed on the interior, bottom of the containment.
21	Ratchet Strap #2360	
22	Ratchet Strap #2945	
23	Ratchet Strap #3510	
24	Ratchet Strap #3475	
25	Ratchet Strap #2615	
26	Ratchet Strap #3432	
27	Payload for Container #184	Dose rate survey only.
28	Payload for Container #171	Dose rate survey only.

Radiological Survey Report

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Radionuclide: Pu-239

Eff. for Removable: Inst:2 Eff: 0.31

Default Bkg Value: 0

Eff. for Total: Inst:N/A Eff: N/A

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	0	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
2	1	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
3	2	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
4	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
5	0	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
6	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
7	2	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
8	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
9	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
10	2	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
11	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
12	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
13	0	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
14	3	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
15	2	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
16	2	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
17	1	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
18	0	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
19	1	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
20	2	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
21	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
22	3	cpm/100 cm2	0	cpm/100 cm2	R	9.7	dpm/100 cm2
23	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
24	4	cpm/100 cm2	0	cpm/100 cm2	R	12.9	dpm/100 cm2
25	3	cpm/100 cm2	0	cpm/100 cm2	R	9.7	dpm/100 cm2
26	3	cpm/100 cm2	0	cpm/100 cm2	R	9.7	dpm/100 cm2

Radiological Survey Report

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:2 Eff: 0.21

Eff. for Total: Inst:N/A Eff: N/A

Radionuclide: Cs-137

Default Bkg Value: 35

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	44	cpm/100 cm2	35	cpm/100 cm2	R	42.9	dpm/100 cm2
2	48	cpm/100 cm2	35	cpm/100 cm2	R	61.9	dpm/100 cm2
3	34	cpm/100 cm2	35	cpm/100 cm2	R	ND	dpm/100 cm2
4	34	cpm/100 cm2	35	cpm/100 cm2	R	ND	dpm/100 cm2
5	43	cpm/100 cm2	35	cpm/100 cm2	R	38.1	dpm/100 cm2
6	37	cpm/100 cm2	35	cpm/100 cm2	R	9.5	dpm/100 cm2
7	43	cpm/100 cm2	35	cpm/100 cm2	R	38.1	dpm/100 cm2
8	43	cpm/100 cm2	35	cpm/100 cm2	R	38.1	dpm/100 cm2
9	48	cpm/100 cm2	35	cpm/100 cm2	R	61.9	dpm/100 cm2
10	41	cpm/100 cm2	35	cpm/100 cm2	R	28.6	dpm/100 cm2
11	45	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
12	30	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
13	38	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
14	42	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
15	43	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
16	43	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
17	28	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
18	49	cpm/100 cm2	48	cpm/100 cm2	R	4.8	dpm/100 cm2
19	41	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
20	35	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
21	40	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
22	40	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
23	38	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
24	40	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
25	39	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
26	32	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Gamma	<0.1	mR/hr	OC	
4	Gamma	<0.1	mR/hr	OC	
6	Gamma	<0.1	mR/hr	OC	
11	Gamma	<0.1	mR/hr	OC	
14	Gamma	<0.1	mR/hr	OC	
16	Gamma	<0.1	mR/hr	OC	
27	Gamma	<0.1	mR/hr	OC/1 m	Dose rates consistent at all distances measured.
28	Gamma	<0.1	mR/hr	OC/1 m	Dose rates consistent at all distances measured.

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

#	Radiation Type	Reading	Units	Distance From Source	Comment
27	Neutron	<0.1	mrem/hr	OC/1 m	Dose rates consistent at all distances measured.
28	Neutron	<0.1	mrem/hr	OC/1 m	Dose rates consistent at all distances measured.

Radiological Survey Report

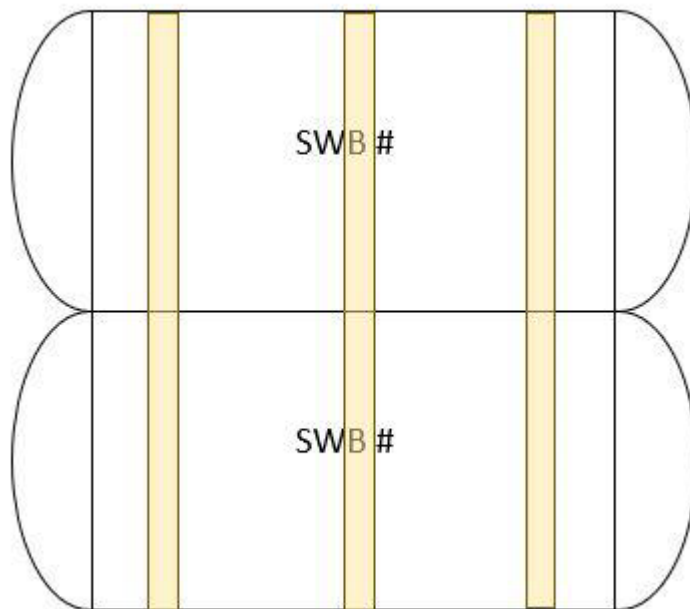
Attachments

Order	Filename	Description	Pages
1	TRUPACT Container and Payload Diagram.pdf	TRUPACT Container and Payload Diagram	1
2	30-30 MDA Sheet LANL MLU Packaging 20OCT21 2	30-30 S/N: 278104/105184 MDA Sheet	1
3	30-30 MDA Sheet LANL MLU Packaging 20OCT21 2	30-30 S/N: 276345/113586 MDA Sheet	1
4	LANL MLU TRUPACT Packaging Survey (Trailer #32	Original Survey	10

TRUPACT Container



Payload



Note: Swipes taken on interior surfaces of the OCV, ICV, and the containment. Payload consisted of two SWBs stacked on top of each. Ratchet straps were used to secure the SWBs together prior to loading into the TRUPACT containments.

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: 278104

Calibration Expires: 2/10/22

Location: Bldg. 6593

Probe Type: 43-10-1

Probe #: 105184

CALCULATION BY: David Tafaya

DATE: 10/20/21

Expected Sample Radionuclide (α): Pu-239 α Detector Efficiency for expected radionuclide (cpd):

0.31 (Pu-239)

Expected Sample Radionuclide (β): Cs-137 β Detector Efficiency for expected radionuclide (cpd):

0.21 (Cs-137)

Background Count Time (min): 1

If background and sample count times are the same, use MDA calculation method 4.6.1.

Sample Count Time (min): 1

If background and sample count times are different then use MDA calculation method 4.6.2.

Daily check background count rate shall be used for MDA determination.

 α

0

cpm

 β

35

cpm

Method 4.4.2:

Use when background and sample count times are the same.

$$MDA = \frac{2.71 + 4.65\sqrt{(R_b * t_b)}}{t_b * E}$$

Method 4.4.3:

Use when background and sample count times are different.

$$MDA = \frac{2.71 + 3.29\sqrt{(R_b * t_s)\left(1 + \frac{t_s}{t_b}\right)}}{t_s * E}$$

Where:

MDA = Minimum Detectable Activity level in dpm

 R_b = Background count rate in counts per minute t_s = Sample count time in minutes t_b = Background count time in minutesE = Detector efficiency (α or β) in counts per disintegration (cpd)

Instrument MDA Calculation Results	Acceptable	MDA Acceptance Limits [†] (from Table 6-1, RPPM)	
α MDA: 9	Y ☒ N ☐ N/A ☐	Nuclide	dpm
β MDA: 144	Y ☒ N ☐ N/A ☐		
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129		20	
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133		200	
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.		1000	
U-natural, U-235, U-238 and associated decay products		1000 (alpha)	
[†] Assumes swipe area is 100 cm ²			
List Applicable Survey Number(s): I-20211019-4			
REVIEWED BY: [Signature]		DATE: 10/20/2021	
Radiation Protection Line Support Project Leader (or Designee)			

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: 276345 Calibration Expires: 12/10/21 Location: Bldg. 6593Probe Type: 43-10-1 Probe #: 113586CALCULATION BY: David Tafaya DATE: 10/20/21Expected Sample Radionuclide (α): Pu-239 α Detector Efficiency for expected radionuclide (cpd): 0.31 (Pu-239)Expected Sample Radionuclide (β): Cs-137 β Detector Efficiency for expected radionuclide (cpd): 0.21 (Cs-137)Background Count Time (min): 1 If background and sample count times are the same, use MDA calculation method 4.6.1.Sample Count Time (min): 1 If background and sample count times are different then use MDA calculation method 4.6.2.

Daily check background count rate shall be used for MDA determination.

 α 0 cpm β 48 cpm**Method 4.4.2:**

Use when background and sample count times are the same.

$$MDA = \frac{2.71 + 4.65 \sqrt{(R_b * t_b)}}{t_b * E}$$

Method 4.4.3:

Use when background and sample count times are different.

$$MDA = \frac{2.71 + 3.29 \sqrt{(R_b * t_s) \left(1 + \frac{t_s}{t_b}\right)}}{t_s * E}$$

Where:

MDA = Minimum Detectable Activity level in dpm

 R_b = Background count rate in counts per minute t_s = Sample count time in minutes t_b = Background count time in minutesE = Detector efficiency (α or β) in counts per disintegration (cpd)

Instrument MDA Calculation Results	Acceptable	MDA Acceptance Limits [†] (from Table 6-1, RPPM)	
		Nuclide	dpm
α MDA: <u>9</u>	Y ☒ N ☐ N/A ☐		
β MDA: <u>167</u>	Y ☒ N ☐ N/A ☐		
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129		20	
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133		200	
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.		1000	
U-natural, U-235, U-238 and associated decay products		1000 (alpha)	
[†] Assumes swipe area is 100 cm ²			
List Applicable Survey Number(s):		<u>I-20211019-4</u>	
REVIEWED BY: <u>[Signature]</u>		DATE: <u>10/20/2021</u>	
Radiation Protection Line Support Project Leader (or Designee)			

Radiological Survey Report

Survey I-20211019-4

General Information

Title: LANL MLU TRUPACT Packaging Survey (Trailer #329)
Survey Date/Time: 10/19/2021 10:08
Location: 6593 /Outside
TWD or RTWD #: SPRF-RTWD-027, Rev.0
Purpose: Job Cov/Characterization
Requestor Org: 01381
Status: In Process
Ready for Review by: Bowman, Brian

Lead Surveyor: Bowman, Brian
Work Order/Task #: N/A

Additional Surveyors

Surveyor
Kegeler, Stephen
Martinez, Daniel
Molina, Vanessa
Rollins, Andrew
Tafoya, David

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12248	D	N/A	N/A	D	2/10/2022	N/A	N/A
2	3030	278104	C	43-10-1	105184	C	2/10/2022	0.21	0.31
3	3030	276345	C	43-10-1	113586	C	12/10/2021	0.21	0.31
4	RADEYE PX	10367	D	NRD	2214	D	1/10/2022	N/A	N/A

Instruments Used - Notes

#	Notes
1	BKGD = <0.1 mR/hr
2	BKGD CPM (a/B) = 0/35
3	BKGD CPM (a/B) = 0/48
4	BKGD = <0.1 mrem/hr

Radiological Survey Report

Comments:

Survey for characterization/job coverage for the loading of TRUPACT containers on trailer #329.

Trailer #329 loaded with TRUPACT #171, #184, & #193.

TRUPACT #171 contained payload assembly #SA007 using ratchet straps #2360, 2945, and 3510.

TRUPACT #184 contained payload assembly #SA008 using ratchet straps #3475, 2615, and 3432.

TRUPACT #193 will remain empty and was not opened during packaging/loading evolution.

Area where loading of TRUPACTs performed was posted as a Radioactive Material Area (RMA) and a Controlled Area (ContA).

After loading was complete, RMA and ContA were collapsed to the trailer.

Radiological conditions observed did not exceed area postings.

Radionuclides of Concern:

Fission Products: Zr, Nb, Mo, Tc, Ru, Rh, Te

Transuranics: Isotopes of Pu

Contamination Limits:

Removable: 20dpm/100cm² (alpha); 200dpm/100cm² (beta/gamma).

Dose rates performed on-contact (OC) and at 1 meter from payload (gamma and neutron).

All dose rates were consistent with background levels.

Swipes taken were counted on a Ludlum 30-30 counter.

All swipes were less than removable contamination limits.

30-30 MDA sheets are attached.

Swipes 1-10 counted using 30-30 S/N: 278104/105184

Swipes 11-26 counted using 30-30 S/N: 276345/113586

OCV- Outer Containment Vessel

ICV- Inner Containment Vessel

Attachments:

1.) TRUPACT Container and Payload Diagram

2.) 30-30 MDA Sheet (S/N: 278104/105184)

3) 30-30 MDA Sheet (S/N: 276345/113586)

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	TRUPACT #171- OCV Lid	
2	TRUPACT #171- OCV Lid	
3	TRUPACT #171- OCV Lid	
4	TRUPACT #171- ICV Lid	
5	TRUPACT #171- ICV Lid	
6	TRUPACT #171- Containment	
7	TRUPACT #171- Containment	
8	TRUPACT #171- Containment	
9	TRUPACT #171- Containment	
10	TRUPACT #171- Containment	Survey performed on the interior, bottom of the containment.
11	TRUPACT #184- OCV Lid	
12	TRUPACT #184- OCV Lid	
13	TRUPACT #184- OCV Lid	
14	TRUPACT #184- ICV Lid	
15	TRUPACT #184- ICV Lid	
16	TRUPACT #184- Containment	
17	TRUPACT #184- Containment	
18	TRUPACT #184- Containment	
19	TRUPACT #184- Containment	
20	TRUPACT #184- Containment	Survey performed on the interior, bottom of the containment.
21	Ratchet Strap #2360	
22	Ratchet Strap #2945	
23	Ratchet Strap #3510	
24	Ratchet Strap #3475	
25	Ratchet Strap #2615	
26	Ratchet Strap #3432	
27	Payload for Container #184	Dose rate survey only.
28	Payload for Container #171	Dose rate survey only.

Radiological Survey Report

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Radionuclide: Pu-239

Eff. for Removable: Inst:2 Eff: 0.31

Default Bkg Value: 0

Eff. for Total: Inst:N/A Eff: N/A

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	0	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
2	1	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
3	2	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
4	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
5	0	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
6	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
7	2	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
8	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
9	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
10	2	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
11	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
12	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
13	0	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
14	3	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
15	2	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
16	2	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
17	1	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
18	0	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
19	1	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
20	2	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
21	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
22	3	cpm/100 cm2	0	cpm/100 cm2	R	9.7	dpm/100 cm2
23	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
24	4	cpm/100 cm2	0	cpm/100 cm2	R	12.9	dpm/100 cm2
25	3	cpm/100 cm2	0	cpm/100 cm2	R	9.7	dpm/100 cm2
26	3	cpm/100 cm2	0	cpm/100 cm2	R	9.7	dpm/100 cm2

Radiological Survey Report

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:2 Eff: 0.21

Eff. for Total: Inst:N/A Eff: N/A

Radionuclide: Cs-137

Default Bkg Value: 35

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	44	cpm/100 cm2	35	cpm/100 cm2	R	42.9	dpm/100 cm2
2	48	cpm/100 cm2	35	cpm/100 cm2	R	61.9	dpm/100 cm2
3	34	cpm/100 cm2	35	cpm/100 cm2	R	ND	dpm/100 cm2
4	34	cpm/100 cm2	35	cpm/100 cm2	R	ND	dpm/100 cm2
5	43	cpm/100 cm2	35	cpm/100 cm2	R	38.1	dpm/100 cm2
6	37	cpm/100 cm2	35	cpm/100 cm2	R	9.5	dpm/100 cm2
7	43	cpm/100 cm2	35	cpm/100 cm2	R	38.1	dpm/100 cm2
8	43	cpm/100 cm2	35	cpm/100 cm2	R	38.1	dpm/100 cm2
9	48	cpm/100 cm2	35	cpm/100 cm2	R	61.9	dpm/100 cm2
10	41	cpm/100 cm2	35	cpm/100 cm2	R	28.6	dpm/100 cm2
11	45	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
12	30	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
13	38	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
14	42	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
15	43	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
16	43	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
17	28	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
18	49	cpm/100 cm2	48	cpm/100 cm2	R	4.8	dpm/100 cm2
19	41	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
20	35	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
21	40	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
22	40	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
23	38	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
24	40	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
25	39	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
26	32	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Gamma	<0.1	mR/hr	OC	
4	Gamma	<0.1	mR/hr	OC	
6	Gamma	<0.1	mR/hr	OC	
11	Gamma	<0.1	mR/hr	OC	
14	Gamma	<0.1	mR/hr	OC	
16	Gamma	<0.1	mR/hr	OC	
27	Gamma	<0.1	mR/hr	OC/1 m	Dose rates consistent at all distances measured.
28	Gamma	<0.1	mR/hr	OC/1 m	Dose rates consistent at all distances measured.

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

#	Radiation Type	Reading	Units	Distance From Source	Comment
27	Neutron	<0.1	mrem/hr	OC/1 m	Dose rates consistent at all distances measured.
28	Neutron	<0.1	mrem/hr	OC/1 m	Dose rates consistent at all distances measured.

Radiological Survey Report

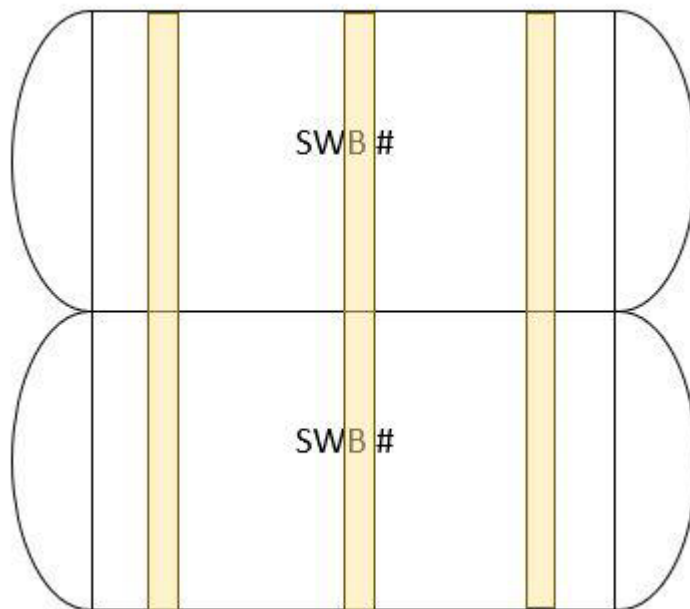
Attachments

Order	Filename	Description	Pages
1	TRUPACT Container and Payload Diagram.pdf	TRUPACT Container and Payload Diagram	1
2	30-30 MDA Sheet LANL MLU Packaging 20OCT21 2	30-30 S/N: 278104/105184 MDA Sheet	1
3	30-30 MDA Sheet LANL MLU Packaging 20OCT21 2	30-30 S/N: 276345/113586 MDA Sheet	1

TRUPACT Container



Payload



Note: Swipes taken on interior surfaces of the OCV, ICV, and the containment. Payload consisted of two SWBs stacked on top of each. Ratchet straps were used to secure the SWBs together prior to loading into the TRUPACT containments.

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: 278104

Calibration Expires: 2/10/22

Location: Bldg. 6593

Probe Type: 43-10-1

Probe #: 105184

CALCULATION BY: David Tafaya

DATE: 10/20/21

Expected Sample Radionuclide (α): Pu-239 α Detector Efficiency for expected radionuclide (cpd):

0.31 (Pu-239)

Expected Sample Radionuclide (β): Cs-137 β Detector Efficiency for expected radionuclide (cpd):

0.21 (Cs-137)

Background Count Time (min): 1

If background and sample count times are the same, use MDA calculation method 4.6.1.

Sample Count Time (min): 1

If background and sample count times are different then use MDA calculation method 4.6.2.

Daily check background count rate shall be used for MDA determination.

 α

0

cpm

 β

35

cpm

Method 4.4.2:

Use when background and sample count times are the same.

$$MDA = \frac{2.71 + 4.65\sqrt{(R_b * t_b)}}{t_b * E}$$

Method 4.4.3:

Use when background and sample count times are different.

$$MDA = \frac{2.71 + 3.29\sqrt{(R_b * t_s) \left(1 + \frac{t_s}{t_b}\right)}}{t_s * E}$$

Where:

MDA = Minimum Detectable Activity level in dpm

 R_b = Background count rate in counts per minute t_s = Sample count time in minutes t_b = Background count time in minutesE = Detector efficiency (α or β) in counts per disintegration (cpd)

Instrument MDA Calculation Results	Acceptable	MDA Acceptance Limits [†] (from Table 6-1, RPPM)	
		Nuclide	dpm
α MDA: 9	Y ☒ N ☐ N/A ☐	Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20
β MDA: 144	Y ☒ N ☐ N/A ☐	Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200
		Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.	1000
		U-natural, U-235, U-238 and associated decay products	1000 (alpha)
[†] Assumes swipe area is 100 cm ²			
List Applicable Survey Number(s):		I-20211019-4	
REVIEWED BY: [Signature]		DATE: 10/20/2021	
Radiation Protection Line Support Project Leader (or Designee)			

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: 276345 Calibration Expires: 12/10/21 Location: Bldg. 6593Probe Type: 43-10-1 Probe #: 113586CALCULATION BY: David Tafaya DATE: 10/20/21Expected Sample Radionuclide (α): Pu-239 α Detector Efficiency for expected radionuclide (cpd): 0.31 (Pu-239)Expected Sample Radionuclide (β): Cs-137 β Detector Efficiency for expected radionuclide (cpd): 0.21 (Cs-137)Background Count Time (min): 1 If background and sample count times are the same, use MDA calculation method 4.6.1.Sample Count Time (min): 1 If background and sample count times are different then use MDA calculation method 4.6.2.

Daily check background count rate shall be used for MDA determination.

 α 0 cpm β 48 cpm**Method 4.4.2:**

Use when background and sample count times are the same.

$$MDA = \frac{2.71 + 4.65 \sqrt{(R_b * t_b)}}{t_b * E}$$

Method 4.4.3:

Use when background and sample count times are different.

$$MDA = \frac{2.71 + 3.29 \sqrt{(R_b * t_s) \left(1 + \frac{t_s}{t_b}\right)}}{t_s * E}$$

Where:

MDA = Minimum Detectable Activity level in dpm

 R_b = Background count rate in counts per minute t_s = Sample count time in minutes t_b = Background count time in minutesE = Detector efficiency (α or β) in counts per disintegration (cpd)

Instrument MDA Calculation Results	Acceptable	MDA Acceptance Limits [†] (from Table 6-1, RPPM)	
		Nuclide	dpm
α MDA: <u>9</u>	Y ☒ N ☐ N/A ☐		
β MDA: <u>167</u>	Y ☒ N ☐ N/A ☐		
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129		20	
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133		200	
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.		1000	
U-natural, U-235, U-238 and associated decay products		1000 (alpha)	
[†] Assumes swipe area is 100 cm ²			
List Applicable Survey Number(s):		<u>I-20211019-4</u>	
REVIEWED BY: <u>[Signature]</u>		DATE: <u>10/20/2021</u>	
Radiation Protection Line Support Project Leader (or Designee)			