

**ANDERSEN AFB RADIATION SAFETY OFFICER
SHIPMENT QUALITY ASSURANCE CHECKLIST**

Date: 20 Aug 13 Shipper: Manufacturer in Hawaii Destination: Andersen AFB, GU

Item Description	Radionuclide	Activity Each	Number of Items	Total Activity
5 Gallon Bucket/Barrel	CO - 60	36.9 MBq	1	36.9 MBq

Instrument: Mfgr 451P Model _____ S/N J287007 Cal date 16 Jul 12 Alpha Probe S/N F041042

Radiation Package Survey Results (gamma): Background: 10 uR/h Surface 3.5 mR/h 1 meter 110 uR/r

Radiation Package Swipe Results (Alpha): Area Swiped (cm2) 100 Background: 0 Result 9 uR/h

Person completing checklist SSgt Jeremy Boldt



(Signature)

EXCEPTED PACKAGE SHIPMENT

YES NO

- 1. Strong tight package (package that will not leak material during conditions normally incident to transportation).
- 2. Radiation level at any point on the external surface of package less than or equal to 0.5 mRem/hr.
- 3. Removable surface contamination less than 2.2 dpm/cm² (alpha) or 22 dpm/cm² (beta/gamma).
- 4. Outside of the inner package or outside of package itself bears the marking "Radioactive".
- 5. Package contains less than 15 grams of U-235 (check yes if U-235 not present).
- 6. Notice enclosed in or on the package includes consignor or consignee and one of the following, as appropriate:

- a. This package conforms to the conditions and limitations specified in 49CFR 173.421 for radioactive material, excepted package - limited quantity of material, UN2910;
- b. This package conforms to the conditions and limitations specified in 49CFR 173.422 for radioactive material, excepted package - instruments or articles UN2915; or
- c. This package conforms to the conditions and limitations specified in 49CFR 173.424 for radioactive material, excepted package - articles manufactured from depleted uranium, UN2910.

7. Activity less than 173.423. Shipment as:

a. Limited quantity: Permissible package limit: _____ Actual package activity: _____

b. Instrument or article: Permissible package limit: 7 Ci Actual package activity: 0.00099729 uCi
Permissible maximum article activity: _____ Actual maximum article activity: _____

8. For instruments and articles, the radiation level at 10 cm from any point on the external surface of any unpackaged instrument or article does not exceed 10 mRem/hr.

IMPORTANT: If you checked "no" to any item above, contact Andersen AFB Radiation Safety Officer for further instructions.

COMMENTS:

TYPE A QUANTITIES FOR SELECTED RADIONUCLIDES
(49 CFR 173.435)

ISOTOPE	A1(Ci)	A2(Ci)
²⁴¹ Am	54.1	0.00541
¹³³ Ba	40	10
¹⁴ C	1000	60
²⁵² Cf	2	0.009
⁵⁷ Co	90	90
⁶⁰ Co	7	7
¹³⁷ Cs	30	10
⁵⁵ Fe	1000	1000
³ H	1000	1000
(compressed, uncompressed, luminous paint, absorbed on solid carrier in water)		
³ H (other forms)	20	20
¹²³ I	50	50
¹²⁵ I	1000	50
¹²⁹ I	1000	2
¹³¹ I	40	10
¹⁹² Ir	20	10
^{85m} Kr (uncompressed)	100	100
^{85m} Kr (compressed)	3	3
⁸⁵ Kr (uncompressed)	1000	1000
⁸⁵ Kr (compressed)	5	5
⁶³ Ni	1000	100
³² P	30	30
²¹⁰ Po	200	0.2
²³⁹ Pu	2	0.002
²⁴⁰ Pu	2	0.002
²²⁶ Ra	10	0.05
¹⁸⁷ Re	Unlimited	Unlimited
⁹⁰ Sr	10	0.04
^{99m} Tc	100	100
⁹⁹ Tc	1000	25
²³² Th	Unlimited	Unlimited
Th (Nat)	Unlimited	Unlimited
²³⁸ U	Unlimited	Unlimited
U (depleted)	Unlimited	Unlimited
U (Nat)	Unlimited	Unlimited

OTHER DEFINITIONS

TRANSPORTATION INDEX (TI) - unit-less number, rounded up to nearest first decimal place; maximum mR/hr at one meter from package.

TYPE A PACKAGE - does not require competent authority approval; limited to A1 or A2 values (White I, Yellow II or Yellow III)

TYPE B PACKAGE - requires approval; NOT limited to A1 or A2 values (White I, Yellow II or Yellow III)

ACTIVITY LIMITS-LIMITED QUANTITY, INSTRUMENTS & ARTICLES
(49 CFR 173.425)

NATURE OF CONTENTS	INSTRUMENTS & ARTICLES		Limited Quantity
	INSTRUMENT LIMIT*	Package Limit	
SOLIDS			
Special Form	10 ⁻² A1	A1	10 ⁻³ A1
Normal Form*	10 ⁻² A2	A2	10 ⁻³ A2
LIQUIDS			
³ H Water			
<0.1 Ci/liter			1000 Ci
0.1 - 1.0 Ci/liter			100 Ci
>1.0 Ci/liter			1.0 Ci
Other liquids	10 ⁻³ A2	10 ⁻¹ A2	10 ⁻⁴ A2
GASES			
** ³ H	20 Ci	200 Ci	20 Ci
Special Form	10 ⁻³ A1	10 ⁻² A1	10 ⁻³ A1
Other Form	10 ⁻³ A2	10 ⁻² A2	10 ⁻³ A2
NOTES			
* For mixture of Radionuclides, see 49 CFR 173.433(d)			
** These values also apply to Tritium in activated luminous paint and Tritium absorbed on solid carriers.			

RADIATION LEVEL LIMITS
(49 CFR 172.403 & 173.441)

LABEL CATEGORY	TRANSPORTATION INDEX (TI)	RADIATION LIMITS
White	N/A	≤ 0.5
mR/hr		
Yellow II	≤ 1.0	≤ 50
mR/hr		
Yellow III	≤ 10	≤ 200
mR/hr		

PACKAGE RADIATION LEVEL LIMITS
(49 CFR 173.421(b), 173.422)

LIMITED QUANTITY = ≤ 0.5 mR/hr on any surface
INSTRUMENTS & ARTICLES = ≤ 0.5 mR/hr on any surface. (≤ 10 mR/hr at 4 inches from external surface of instrument)

REMOVABLE EXTERNAL PACKAGE CONTAMINATION LIMITS
(averaged over 300 cm²)
(49 CFR 173.443)

	$\mu\text{Ci}/\text{cm}^2$	DPM/cm ²
Beta-Gamma emitters, nuclides with half-life less than 10 days, U-Natural, Th-Natural, ²³⁵ U, ²³⁸ U, ²³² Th, ²²⁸ Th, and ²³⁰ Th in ores or physical concentrates.	10 ⁻⁵	22.0
All other Alpha emitters	10 ⁻⁶	2.2