

**TYPE A QUANTITIES FOR SELECTED RADIONUCLIDES**  
(49 CFR 173.435)

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

INSTRUMENTS & ARTICLES			
NATURE OF CONTENTS	INSTRUMENT LIMIT*	Package Limit	Limited Quantity
<b>SOLIDS</b>			
Special Form	10 <sup>-2</sup> A1	A1	10 <sup>-3</sup> A1
Normal Form*	10 <sup>-2</sup> A2	A2	10 <sup>-3</sup> A2
<b>LIQUIDS</b>			
<sup>3</sup> 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 <sup>-3</sup> A2	10 <sup>-1</sup> A2	10 <sup>-4</sup> A2
<b>GASES</b>			
** <sup>3</sup> H	20 Ci	200 Ci	20 Ci
Special Form	10 <sup>-3</sup> A1	10 <sup>-2</sup> A1	10 <sup>-3</sup> A1
Other Form	10 <sup>-3</sup> A2	10 <sup>-2</sup> A2	10 <sup>-3</sup> A2
<b>NOTES</b>			
* 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 cm<sup>2</sup>)  
(49 CFR 173.443)

	μCi/cm <sup>2</sup>	DPM/cm <sup>2</sup>
Beta-Gamma emitters, nuclides with half-life less than 10 days, U-Natural, Th-Natural, <sup>235</sup> U, <sup>238</sup> U, <sup>232</sup> Th, <sup>228</sup> Th, and <sup>230</sup> Th in ores or physical concentrates.	10 <sup>-5</sup>	22.0
All other Alpha emitters	10 <sup>-6</sup>	2.2

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

Date: 13 May 14

Shipper: DLA Distributions

Destination: Andersen AFB, GU

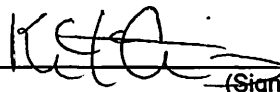
Item Description	Radionuclide	Activity Each	Number of Items	Total Activity
Optical bore (inside cardboard box)	Ni-63	10 mCi	1	10 mCi

Instrument: Mfgr Fluke Model 451P S/N J287007 Cal date 24 Jul 13 Alpha Probe S/N F041042

Radiation Package Survey Results (gamma): Background: 4 µR/h Surface 24 µR/h 1 meter 8 µR/h

Radiation Package Swipe Results (Alpha): Area Swiped (cm<sup>2</sup>) 300 Background: 0 Result 0 µR/h

Person completing checklist SSgt Kristian Atkinson

  
(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/cm<sup>2</sup> (alpha) or 22 dpm/cm<sup>2</sup> (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 UN2916; 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: 1000 Ci Actual package activity: 0.03 µCi  
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: