

Rapiscan[®] systems

An OSI Systems Company

February 11, 2011

Marilyn Diaz
Project Manager, Chemical Engineer
Fuel Manufacturing Branch
Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
M.S. EBB2-C40M
11555 Rockville Pike
Rockville, MD 20852

RE: Request for an Exemption from the Requirement for a Criticality Monitoring System

Dear Ms. Diaz:

Rapiscan Laboratories (Rapiscan) requests, under the process described in 10CFR70.17, an exemption from the requirements of 10CFR70.24 (a) which requires a criticality monitoring system when a licensee possesses greater than a specified amount of SNM. We are seeking a possession limit higher than this specified amount of SNM; however, we feel that the form and use of the material is such that a criticality monitoring system is not required.

As stated in Rapiscan's NRC license application, the SNM we seek to possess (shown in Tables 1 and 2) are to be used as Test Objects for systems that are capable of detecting SNM hidden in cargo under research projects funded by the Domestic Nuclear Detection Office (DNDO), Department of Homeland Security. The SNM is not in a soluble or readily dispersible form.

Table 1. Test objects made from special nuclear material of low strategic significance.

Test Object		Quantity	Total Mass (g)	Description
A	Plutonium	1	██████	A ██████████ Pu disk encapsulated in a tantalum/stainless steel housing that is ██████████. There will be ██████████ Pu. This item was designed and fabricated by PNNL.
B	Highly Enriched Uranium ██████	2	██████	██████████ HEU disk encapsulated in a titanium case that is ██████████. There will be no more than ██████████ of contained U-235 (██████ enrichment). This item was fabricated by Y12.

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Table 2. Test objects made from low enriched (<20% U-235) uranium.

Test Object		Quantity	Total Mass (kg)	Description
C	Uranium Metal	4	[REDACTED]	DTRA-designed [REDACTED] nickel-plated (3-5 mils) uranium plate. There is [REDACTED] per plate of U-235 [REDACTED] enrichment) for a total of [REDACTED]. These items were fabricated by Y-12.
D	Uranium Oxide (UO2)	7	[REDACTED]	[REDACTED] grams of UO2 will be compressed to a density of 9 g/cc and encapsulated in a stainless steel canister [REDACTED]. There will be [REDACTED] of contained U235 [REDACTED] % enrichment) for a total of [REDACTED]. This item will be fabricated by Y-12.
E	Uranium Oxide (U3O8)	10	[REDACTED]	[REDACTED] grams of U3O8 will be compressed to a density of [REDACTED] and encapsulated in a stainless steel canister [REDACTED] and [REDACTED]. There will be [REDACTED] of contained U235 [REDACTED] enrichment) for a total of [REDACTED]. This item will be fabricated by Y-12.
F	Uranium Oxide (U3O8)	1	[REDACTED]	This is the Rapiscan source that is currently on our CA Radioactive Materials License. It was manufactured by Argonne & Brunswick National Labs. It contains [REDACTED] of U-235 [REDACTED] enrichment)

Worst Case Analysis

Sensor Concepts and Applications, Inc. (SCA) is a DNDO contractor that is seeking to possess all of the SNM Test Objects being fabricated for DNDO. A copy of their request for an exemption is attached.

The main differences between the inventory contained in SCA's calculation and our inventory are the following:

1. SCA is seeking to possess three of Test Object B, while Rapiscan is seeking to possess only two of Test Object B.
2. Rapiscan currently possesses Test Object F which is not part of SCA's calculation.

These differences mean that Rapiscan is seeking to possess an additional 69 g of U235.

DNDO has suggested that we use SCA's worst case scenario calculations as an upper bound estimate of K_{eff} to support our request for an exemption from the requirements for a criticality alarm system.

SCA's worst case scenario consisted of the following:

- All of the SNM that SCA is seeking to possess melted and formed a sphere
- The sphere of SNM did not contain any oxygen from the UO_2 or U_3O_8 materials
- The sphere of SNM did not contain any cladding materials
- The sphere of SNM was placed into a 1.5 meter sphere of water.

SCA used MCNP to calculate that the K_{eff} is 0.80245 +/- 0.00086 under these worst case assumptions.

SCA's conclusion was that a criticality accident is not a credible scenario since the physical form of the material can not be altered and the worst case K_{eff} was below 0.9 at the 95% confidence level. The additional 69 g of U235 is not expected to materially change this conclusion.

Based on these results, Rapiscan Laboratories requests an exemption from the requirement for a criticality alarm system.

If you have any questions please call me at 310.349.2494 or email me at Mabdu@rapiscansystems.com.

Sincerely,



Mershad Shahabidin
Radiation Safety Officer