NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
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2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. THIS CERTIFICATE IS ISSUED ON THE BASIS OF A SAFETY ANALYSIS REPORT OF THE PACKAGE DESIGN OR APPLICATION

a. ISSUED TO *(Name and Address)*

Alpha-Omega Services, Inc.
9156 Rose Street
P.O. Box 789
Bellflower, CA 90706

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

AOS application, Revision H, dated December 30, 2012, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model Nos.: AOS-025A, AOS-050A, AOS-100A, AOS-100B, and AOS-100A-S

(2) Description

A cylindrical stainless steel packaging, designed to transport Type B quantities of encapsulated solid materials or solid metals meeting Normal or Special Form criteria. The packaging is available in three model sizes – AOS-025, AOS-050, and AOS-100. Tungsten alloy is used as shielding material in model numbers with the suffix A, while carbon steel is the shielding material for model numbers with the suffix B. The Model No. AOS-100A-S has a double-ended opening configuration to be either loaded or unloaded from either end of the package. All models use a double O-ring arrangement seal in the lid joint.

The packaging includes an outer shell, a cavity, a shielding cylinder and shielding plugs, a bottom plate, a lid and lid plug. The outer shell and the cavity cylinder interlock to encase the shielding cylinder, made of either tungsten or carbon steel. A weldment attaches the upper portion of the cavity to its lower portion encasing the shielding. At the cavity's closed end, the shielding plug is encased between the cavity bottom wall and the packaging bottom plate. The shielding plug encased on the lid plug is of the same size and material (tungsten or carbon steel) as the one encased at the bottom of the packaging. The lid consists of a flat disk, with recessed areas concentric with the bolt holes on the top surface, to protect the bolts from impact loads. The packaging may use either elastomeric or metallic lid seals: the Model Nos. AOS-025A and AOS-050A elastomeric seal has two O-rings and one flat metal

5.(a)(2) Description (Continued)

retainer ring, while the Model No. AOS-100 has two O-rings and two SS300 series flat retainer rings. The metallic seal for all models is a double "C" cross section seal.

Additional packaging components include lid bolts and port plugs with their threaded pipe plugs, O-ring seals, port plug covers, and a pair of trunnions with their attachment bolts. The impact limiters consist of a thin-walled stainless steel cylindrical shell, filled with polyurethane foam, with a dish head at one end and a flat disk at the other end. At the dish-head end, another recess is provided to reduce the area available for impact during a head-on drop event. Twelve (12) squared ribs are attached to the inner wall of the cylindrical recess section of the flat disk end. Eight (8) of these ribs extend beyond the flat disk plate and are used as turnbuckle attachment points. The turnbuckles join the impact limiters and partially enclose the packaging. For the Model No. AOS-025 package, the turnbuckles are replaced with "J" hooks. The package is transported in the upright position, using a shipping cage and a pallet. The maximum weights of the package, including contents, impact limiters, all associated hardware, packing and shoring material, shall not exceed the values listed below:

Model	Width in a transport configuration (in.)	Height in a transport configuration (in.)	Packaging OD (in.)	Packaging Height (in.)	Cavity OD (in.)	Cavity Height (in.)	Maximum Package Weight (lbs.)
AOS-025A	18	21.38	7	9	1.62	5	220
AOS-050A	35.75	36.63	14	18	3.25	10	1,500
AOS-100A	60.96	71.65	28	36	6.50	20	12,500
AOS-100B	60.96	71.65	28	36	6.50	20	11,000
AOS-100A-S	60.96	71.65	28	36	6.50	20	12,500

(3) Drawings

The packaging is constructed and assembled in accordance with the following drawings:

Model	Assembly	Rev.	Impact Limiter	Rev.	Packaging	Rev.	Liner/Axial Shielding Plates	Rev.
AOS-025A	166D8142	H	105E9722	G	166D8143	G	183C8485	F
AOS-050A	105E9718	H	166D8138	G	166D8137	G	-	-
AOS-100A	105E9711	H	105E9713	G	105E9712 G001	H	183C8491	G
AOS-100B	105E9711	H	105E9713	G	105E9712 G002	H	183C8491	G
AOS-100A-S	105E9711	H	105E9713	G	105E9719	H	183C8491	G

5.(b) Contents

(1) Type and form of material

Activation product radioactive materials as Normal or Special Form. Special Form materials shall have a current certificate. Normal Form materials shall be enclosed in an inner container. The inner container is considered to be a "shoring device."

Any material with a melting point less than 900°F shall be in Special Form.

(2) Maximum quantity of material per package

(i) Maximum decay heat: 10 watts for Model No. AOS-025A; 100 watts for Model No. AOS-050A; 400 watts for Model Nos. AOS-100A, AOS-100A-S, and AOS-100B.

(ii) Maximum weight of contents: 10 lbs for Model No. AOS-025A; 60 lbs. for Model No. AOS-050A; 500 lbs. for Model Nos. AOS-100A, AOS-100A-S, and AOS-100B. Maximum weight includes any shoring devices and any additional shielding plates.

(iii) Fissile materials and irradiated fissile materials containing fission products are prohibited. Free-standing liquid is not authorized.

Table 1- Activity Limits (TBq)

Isotope	AOS-025	AOS-050	AOS-100A AOS-100A-S	AOS-100B
Co-60	4.55E-03	7.84E-02	123	0.362
Co-60 (1)	-	-	810	4.14
Cs-137	0.392	11.1	2950	19.5
Hf-181	-	81.4	3370	138
Ir-192	2.68	47.7	2410	85.8
Zr/Nb-95	-	1.06	913	2.36
Ho-166	0.44	6.55	-	-
Yb-169	147	1470	-	-
Shipping Configuration	Use of Liner required	No additional shielding required	(1) Axial shielding plates required	(1) Axial shielding plates required

6. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package must be prepared for shipment and operated in accordance with the Operating Procedures of Chapter No. 7 of the application, and

   (b) Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter No. 8 of the application.

7. For transport by air, quantities are limited to the lesser of Table 1 of this certificate or 3,000 A_2.

8. For contents meeting Normal Form requirements, the package must be leak-tested to 10^{-7} std cm^3/sec prior to the first use of the package, and prior to each subsequent use.

9. When contents are loaded under water, or if water is introduced in the cavity of the package, the package must be vacuum dried prior to shipment and the cavity of the package filled with helium for such shipments.

10. The sealing surfaces of the package must be inspected. The metallic seal shall be replaced prior to each shipment. The elastomeric seal can be used only for shipment of Special Form material.

11. Appropriate shoring devices, to secure and immobilize inner containers, must be comprised of materials compatible with the radioactive contents and the cask cavity material. All shoring materials within the cavity must have a melting point greater than 900°F.

12. Torque values for the lid bolts and the connectors of the impact limiters must be as follows:

Model	Lid Bolt (ft-lb), lubricated	Impact limiter connector (ft-lb), lubricated
AOS-025A	35	10
AOS-050A	62.5	3
AOS-100A	500	70
AOS-100B	500	70
AOS-100A-S	500	70

13. The weight of the foam in each impact limiter must be measured and its average density calculated based on the known volume of foam fill.

14. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.

15. Revision No. 1 of this certificate may be used until May 31, 2014.

16. Expiration date: February 28, 2017.

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REFERENCES

Radioactive Material Transport Packaging System Safety Analysis Report for Model AOS-025, AOS-050, and AOS-100 Transport Packages, Rev. H, dated December 30, 2012.

Supplements dated: April 4 and May 14, 2013.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

/RA/ K. Banovac for

Michele Sampson, Acting Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Date: May 29, 2013