

71-9027



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15 August 2006

Mr. Stewart Brown, Senior Project Manager
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
One White Flint
Rockville, MD 20852

Docket No.: 71-9027
TAC Nos. L23922, L23895 and L23896

Subject: Additional Supportive Information for the Model 741-OP Type B Container

Dear Mr. Brown:

In response to our conversations on 14 & 15 August 2006, we provide the following information and response:

- Section 8.2.3 is modified to incorporate the lock assembly component test as requested by your staff.
- Pages 1-1, 2-1, 2-5, 2-10 and Drawing R741-OP are revised to reflect maximum package weight as 510 lbs instead of 515 and 625 lbs previously referenced on these documents.


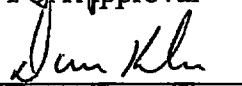
The revised pages of Revision 7 to the Model 741-OP SAR are submitted as they are the only pages that changes from Revision 6 of the SAR. Changes to the text of Revision 7 of the SAR addressing items discussed in this letter are indicated by vertical lines in the right hand margin. Should you have any additional questions or wish to discuss this submission, please contact me.

Nmss01

Sincerely,



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 RA/QA Approval	<u>16 Aug 06</u> Date
 Engineering Approval	<u>15 Aug 06</u> Date

Enclosures:

- A List of Affected Pages
- B Revised Pages 1-1, 2-1, 2-5, 2-10 and 8-3 of SAR Revision 7
- C Drawing R741-OP Rev E

Section 1 - GENERAL INFORMATION

1.1 Introduction

The Model 741-OP is designed as a transport package and storage container for Type B quantities of special form radioactive material. It conforms to the Type B(U)-96 criteria for packaging in accordance 10 CFR 71, 49 CFR 173, and IAEA Regulations for the Safe Transport of Radioactive Material 1996 Edition (Revised) No. TS-R-1 (ST-1, Revised).

1.2 Package Description

(Reference:

- 10 CFR 71.33
- IAEA TS-R-1, paragraph 220 & 807)

The transport package consists of an outer steel container with wood and foam inserts inside which is housed a Model 741 Series Projector (Figure 1.2.A). The Model 741-OP package may contain the following projector models; 741, 741A, 741B, 741E, 741AE, and 741BE. These models are structurally identical. All materials of construction and methods of fabrication are essentially the same. The models with the designation AE, BE and E have wires and connectors attached to the end plates for automatic source actuation when the device is in operation. All models except the 741 and 741E use a Posilok™ lock assembly. Prior to 1980, the Models 741, 741A and 741AE and 741E were manufactured with zircalloy source tubes, all other models have titanium source tubes. Throughout this evaluation, all models are considered interchangeable.

The exterior steel container is lined with polyurethane foam and wood which protects the Projector during transport. It is also fitted with wood inserts which locate and hold the projector in position within the container. The projector fits in the center of the inserts but is not mechanically fixed to the outer box. The container lid is closed by two padlock latches which are recessed into the front face of the box. The container is fitted with box section feet at each end, extending the full depth of the box enabling access underneath for mechanical lifting.

The package is constructed in accordance with descriptive drawings in Appendix A. Overall external dimensions for the 741-OP package is approximately 32" (813 mm) wide by 18 ½" (470 mm) high by 19" (483 mm) deep. The package weighs a maximum of 510 lbs (231 kgs) and is used for the transport of 1.22 TBq (33 Ci) of Co-60 as a special form source.

Section 2 - STRUCTURAL EVALUATION

This section identifies and describes the principal structural engineering design of the packaging, components, and systems important to safety and compliance with the performance requirements of 10 CFR Part 71.

2.1 Description of Structural Design

(Reference:

- 10 CFR 71.33(a)
- IAEA TS-R-1, paragraph 220 & 807(b))

2.1.1 Discussion

The Model 741-OP transport packages are described in Section 1.2, "Package Description."

2.1.2 Design Criteria

The Model 741-OP transport packages are designed to comply with the requirements for Type B(U) packaging as prescribed by 10 CFR 71 and IAEA TS-R-1. All design criteria are evaluated by a straightforward application of the appropriate section of 10 CFR 71 or IAEA TS-R-1.

2.1.3 Weight and Centers of Gravity

The transport package weighs up to 510 lbs (231 kg). The maximum weight of the Model 741 projector is 360 lbs (162 kg). The maximum weight of the projector shield is 225 lbs (101 kg). The shield may also include the addition of up to 17 lbs (7.7 kgs) of lead as supplemental shielding to the exterior surface of the shield. This lead if applied will not exceed ½ inch thick in any location on the depleted uranium shield. The center of gravity (C of G) is nominally assumed as the geometric center of the shield.

2.1.4 Identification of Codes and Standards for Package Design

2.1.4.1 Package Design

See Section 2.1.2 relating to design criteria of the package. No specific codes or standards were directly incorporated in the design effort of the finished assembly for the 741-OP transport packages. However the design was based on the Type A and Type B(U) container requirements of 49 CFR, 10 CFR 71 and IAEA regulations in effect at the time of the package design.

Safety Analysis Report for the Model 741-OP Transport Package

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Reference: “Design of Welded Structures”, James F. Lincoln Arc Welding Foundation, Library of Congress, Catalog # 66-23123.

Where:

t = steel thickness of the base = 0.06 inches
d = depth of the package = 15 inches
b = length of the package = 32 inches)

From this equation the bending moment of inertia is 250 in⁴. From this the maximum stress on the package is calculated by:

$$\sigma = PLc/4I$$

Where:

P = The weight of the transport package 510 lbs (231 kg)
L = The length of the base between forks 9 inches (229 mm)
c = Half the thickness of the box section 7.5 inches (191 mm)
I = The moment of inertia 250 in⁴ (10,406 cm⁴)

From this relationship, the stress generated in the base is calculated to be 34 psi. With a Safety Factor of 3 applied, the maximum stress in the base is 105 psi. This is less than 1% of the ultimate yield strength of the steel base, 42,000 psi. Further, as was demonstrated in TP 72 Report (see Section 2.12.3), TP72(A) was subjected for 24 hrs to a compressive load which was six times the maximum package weight. The test unit inside the overpack was a Model 680 projector which is larger than the 741 projector with less wood protection surrounding the projector inside the overpack. The 680 was measured before and after testing in two locations: (1) the overall package height at the end of the overpack, and (2) the package centerline distance measured from the package the bottom to the ground. After testing there was no buckling or deformation of the package in these areas. By comparison since the 741 projector (and overall package) is lighter and has additional internal wood support than the tested unit, it can be further assessed that the package strength in the 741-OP configuration is sufficient to withstand the stress requirements of this section.

2.4.2 Tie-Down Devices

(Reference:

- *USNRC, 10 CFR 71.45(b) (1) (2) (3)*
- *IAEA TS-R-1, paragraph 606 and 636)*

The Model 741-OP packages have no tie down attachments. The package can be blocked and braced according to standard transportation practices.

The removal of 0.5 lbs (approximately 22% by weight) of polyurethane foam per box side to accommodate insertion of access ports has essentially no effect on the package's ability to survive the 1.2 m drop. This is demonstrated by the package ability to survive, with minimal damage, the 9 m drop which imparts more than 700% of the unit energy into the foam as would the 1.2 m drop. The removal of 22% of the polyurethane foam increases the unit energy input to the remaining foam less than 140%.

Test unit TP72(A) weighed a total of 598 lbs. The maximum requested package weight for the Model 741-OP is 510 lbs. In the normal condition drop test, the test unit sustained no damage to the inner 680 device and received less physical damage to the overpack than was produced by the hypothetical accident testing (See Section 2.7).

Therefore the test information obtained for TP72(A) under Test Plan Report 72 is considered conservative and remains valid to demonstrate that the Model 741-OP transport package maintains its structural integrity under the Normal Conditions of Transport, 1.2 m drop test.

2.6.8 Corner Drop

(Reference:

- *USNRC, 10 CFR 71.71(c)(8)*
- *IAEA TS-R-1, paragraph 722(b)*

This test is not applicable, as the transport package does not transport fissile material, nor is the exterior of the transport package made from either fiberboard or wood.

2.6.9 Compression

(Reference:

- *USNRC, 10 CFR 71.71(c)(9)*
- *IAEA TS-R-1, paragraph 723)*

As described in Test Plan 82 Report (Section 2.12.7), compliance of the Model 741-OP is based on testing performed on the Model 680-OP under Test Plan 72 Report (Section 2.12.3). The following describes the testing of the Model 680-OP test units.

Test Plan Report 72 demonstrated that the test unit maintained its structural integrity and shielding effectiveness under the Normal Conditions of Transport compression test. The actual test specimen for the compression test weighed 598 lbs. The test specimen was subjected to a compressive load of 3,149 lbs (1,431 kg) for a period of 24 hours, which exceeds six times the package weight of 510 lb. This is greater than 2 lb/in² (13 kPa) multiplied by the vertically projected surface area of the package.

Following the test, no damage to the unit was observed. There was a 5/16" reduction in overall height but this was due to settling of the lid and occurred immediately after the load was applied.

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8.2 Maintenance Program

8.2.1 Structural and Pressure Tests

Not applicable. Material certification is obtained for Safety Class A components used in the transport package prior to their initial use. Based on the construction of the design, no additional structural testing during the life of the package is necessary if the container shows no signs of defect when prepared for shipment in accordance with the requirements of Section 7 of the SAR.

The 741-OP packaging system is not designed to require increased or decrease operating pressures to maintain containment during transport, therefore pressure tests of package components prior to individual shipment is not required.

8.2.2 Leakage Tests

As described in Section 8.1.4, "Leakage Tests," the radioactive source assembly is leak-tested at manufacture. In addition, the sources are leak tested in accordance with that Section at least once every six months thereafter if being transported to ensure that removable contamination is less than 185 Bq (0.005 μ Ci).

8.2.3 Component and Material Tests

The transport package is inspected for tightness of fasteners, proper seal wires, and general condition prior to each use as described in Section 7 of this SAR. Further the lock assembly of the device is tested to assure that the security of the radioactive source will be maintained. Failure of this test prevents use of the device until the lock assembly is corrected and re-tested.

8.2.4 Thermal Tests

Not applicable. The source content of the Model 741-OP packages has minimal effect on the package surface temperature and therefore no additional testing is necessary to evaluate thermal properties of the packaging prior to shipment.


8.2.5 Miscellaneous Tests

Inspections and tests designed for secondary users of this transport package under the general license provisions of 10 CFR 71.17(b) are provided in Section 7.

8.3 Appendix

Not applicable.

Security-Related Information Figure Withheld Under 10 CFR 2.390

		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">APPROVALS</th> <th style="width: 50%;">DATE</th> </tr> </thead> <tbody> <tr> <td><i>D. Price</i></td> <td>15 Aug '06</td> </tr> <tr> <td><i>A. Pichler</i></td> <td>15 Aug '06</td> </tr> </tbody> </table>		APPROVALS	DATE	<i>D. Price</i>	15 Aug '06	<i>A. Pichler</i>	15 Aug '06	 <p style="text-align: center;">QSA GLOBAL 40 NORTH AVE, BURLINGTON, MA 01803</p>		DESCRIPTIVE DRAWING	
APPROVALS	DATE												
<i>D. Price</i>	15 Aug '06												
<i>A. Pichler</i>	15 Aug '06												
		UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES TOLERANCES: FRACTIONS ± 1/8 XX ± 0.12 XXX ± 0.08 XXXX ± 0.020		TITLE MODEL 741-OP									
				SIZE A	DWG. NO. R741-OP		REV E						
				SCALE: NONE		SHEET 1 OF 7							
ERF #	1473												

Security-Related Information Figure
Withheld Under 10 CFR 2.390

UNLESS OTHERWISE SPECIFIED: ALL DIM.S ARE INCHES, TOL ± 1/8			
SIZE	DWG. NO.	R741-OP	REV
A	SCALE:	NONE	E
		SHEET 2	OF 7

FIGURE WITHHELD UNDER 10 CFR 2.390

UNLESS OTHERWISE SPECIFIED: ALL DIMS ARE INCHES, TOL $\pm 1/8$			
SIZE	DWG. NO.	R741-OP	REV
A	SCALE:	NONE	E
		SHEET 3	OF 7

FIGURE WITHHELD UNDER 10 CFR 2.390

UNLESS OTHERWISE SPECIFIED: ALL DIM.S ARE INCHES, TOL \pm 1/8			
SIZE	DWG. NO.	R741-0P	REV
A	SCALE: NONE	SHEET 4 OF 7	E

Security-Related Information Figure
Withheld Under 10 CFR 2.390

UNLESS OTHERWISE SPECIFIED: ALL DIM.S ARE INCHES, TOL \pm 1/8			
SIZE	DWG. NO.	R741-OP	REV
A	SCALE: NONE	SHEET 5 OF 7	E

FIGURE WITHHELD UNDER 10 CFR 2.390

UNLESS OTHERWISE SPECIFIED: ALL DIM.S ARE INCHES, TOL $\pm 1/8$			
SIZE	DWG. NO.	R741-OP	REV
A	SCALE: NONE	SHEET 6 OF 7	E

FIGURE WITHHELD UNDER 10 CFR 2.390

UNLESS OTHERWISE SPECIFIED: ALL DIM.S ARE INCHES, TOL \pm 1/4			
SIZE	DWG. NO.	R741-OP	REV
A	SCALE: NONE	SHEET 7 OF 7	E