

APPROVALS

OPL-660 AND OP-660 SAR

Revision 1

12 Jun 98

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Revision Instructions

Remove Pages	Insert Pages	Reason For Change
i, Rev 0	i, Rev 1	Updated index to reflect page changes.
1-3 through 1-26, Rev 0	1-3 through 1-11, Rev 1	<p>Section 1.2.1.2- Updated drawing number for 660 series descriptive drawings. Clarified maximum weight of uranium shield without lead.</p> <p>Section 1.2.1.2 - Table 1-2 Deleted drawing references.</p> <p>Section 1.3- Updated appendix listing.</p> <p>Appendix- Removed old descriptive drawings for entire 660 series and replaced with consolidated 660 drawings, R66060 - Rev A. Added detail on R66050 - Rev C for the box to eliminate dimensions controlled by Mil SPEC. Removed MIL-S-23389B from appendix, will retain on file at AEA Technology and will provide clean copy to NRC for informational purposes.</p>
5-3, Rev 0	5-3, Rev 1	Clarified unit used for radiation profile was an off the shelf unit and was not a test unit.
7-1, Rev 0	7-1, Rev 1	Require the use of two seal wires for shipment to provide indication of unauthorized tampering.

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Table 1-2 identifies the distinguishing features of each Model 660 Series projector and drawing numbers.

Table 1-2 Model 660 Series Projectors

Model	Description	Maximum Activity
660	Narrow body pre-automatic lock	120 Ci
660	Wide body pre-automatic lock	120 Ci
660E	Any version of the 660 with the addition of an electrical hookup as previously approved	120 Ci
660A	Wide body retrofitted with automatic locking mechanism	120 Ci
660AE	Any version of the 660A with the addition of an electrical hookup as previously approved	120 Ci
660B	Wide body manufactured with automatic locking	140 Ci
660BE	Any version of the 660B with the addition of an electrical hookup as previously approved	140 Ci

The radioactive material is sealed in a source capsule which conforms to the requirements for special form radioactive material. This source capsule is installed in a source holder assembly that can be loaded and secured in the proper shielded position in the projector.

The source holder assembly is housed in an S-shaped titanium or zircalloy source tube. The source tube has an inside diameter of 0.38 in. (9.7mm) and a minimum wall thickness of 0.04 inches (1mm). The source tube is surrounded by depleted-uranium metal as shielding material. The depleted uranium shielding is cast in place around the source tube. The maximum weight of the depleted-uranium shield without lead is 37 pounds (16.8 Kg).

The depleted-uranium shield on some packages may have supplemental lead (as shown in drawings R66060, Rev. A). The addition of this shielding does not impair the package's ability to meet the Type B(U) requirements as demonstrated in the test reports in Section 2.10.

The depleted-uranium shield is encased in a steel housing consisting of a shell and two end-plates. The shell is fabricated from 0.06-inch (1.5-mm) stainless or carbon steel. The end-plates are fabricated from 0.12-inch (3-mm) steel and are bolted together by means of four carbon steel tapped rods that extend through the shell and by carbon steel, flat-head screws. The void space in the housing is filled with a rigid polyurethane foam. The outer packaging is designed to avoid the collection and retention of water. The package has a smooth finish to provide for easy decontamination.

Attached to the rear end-plate is the control connector and lock assembly. This assembly incorporates either:

1. An automatic locking feature that locks the source assembly in the exposure device when the source is returned to the stored position for the Models 660A, 660B, 660AE and 660BE.

or

2. A selector ring assembly that by manual operation secures the source assembly in the shielded position for the Model 660 and the Model 660E.

In addition, the source cannot be exposed unless a secure connection of the source assembly to the drive cable has been made. The control unit cannot be disconnected unless the source assembly is completely in the stored position in the shield.

Attached to the front end-plate of the exposure device is the storage plug connector. This connector provides a means of securing the source storage plug to the exposure device by threading into a connector. The storage plug and the connector are drilled for the attachment of a seal wire which can be used as a means of installing a tamper indicator seal. The storage plug prevents dirt from entering the exposure device whenever the device is not in use.

The radioactive material is sealed inside a special form capsule. This capsule acts as the containment vessel for the radioactive material.

The outside of the Model 660 Series projector contains all the markings required on the nameplates by 10 CFR 20, 10 CFR 40 and 10 CFR 34. The nameplates are capable of maintaining legibility after withstanding a 1475° F (800° C) fire test per 10 CFR 71.

1.2.2 Operational Features

The OPL-660 and OP-660 containers secure the Model 660 Series projector in the center of the package. The package has a lid that secures with latches.

Before the Model 660 Series projector can be used, the container latches must be released, the container lid removed and the projector lifted out of the container.

The source assembly of the projector is secured in the proper shielded storage position by the locking assembly. For the Models 660A, 660B, 660AE and 660BE, the source assembly is locked in position by the automatic locking slide and a key lock that prevents rotation of a selector ring which must be in the operate position in order for the locking slide to be unlocked. For the Models 660 and 660E the source assembly is locked in position by placing the selector ring into the lock position and depressing the key lock which prevents rotation of the selector ring.

All Model 660 Series projector devices have a protective cap installed into the lock to prevent damage to the exposed end of the source assembly (the connector) when the control unit is not connected to the exposure device. A storage plug on the front end-plate is used to provide another means of securing the source assembly in the proper storage position.

1.2.3 Contents of Packaging

The OPL-660 and OP-660 packages are designed for the transport of special form Iridium-192 sources in quantities up to a maximum 140 curies. The Models 660, 660E, 660A and 660AE projectors are designed for 120 curies and the Model 660B and 660BE projectors are designed for 140 curies.

The maximum activity is defined as output curies as required in ANSI N432 and 10 CFR 34.20.

This source meets special form requirements under 10 CFR 71, US Department of Transportation regulations, and IAEA Safety Series No. 6, 1985 (as amended 1990).

1.3 Appendix

R66050, Rev. C, (Sheets 1 & 2), Model OPL-660 and Model OP-660
Descriptive Drawings
Pages 1-7 through 1-8

R66060, Rev.A, (Sheets 1-3), Model 660 Series Projector Descriptive
Drawing
Pages 1-9 through 1-11

FIGURE WITHHELD UNDER 10 CFR 2.390

REVISED PER DDCO# 18	SENTINEL™			DESCRIPTIVE
APPROVED/DATE <i>S. [Signature] 15 Dec 98</i>	Amersham Corporation			DRAWING
	40 NORTH AVE, BURLINGTON, MA 01803			
UNLESS OTHERWISE SPECIFIED; 1. DIMENSIONS ARE IN INCHES. 2. TOLERANCES: SEE NOTE 1.3.	TITLE MODEL OPL-660 & OP-660 SHIPPING CONTAINER			
	SIZE A	DWG. NO. R 66050	REV C	
		SCALE NONE	SHEET 1 OF 2	

FIGURE WITHHELD UNDER 10 CFR 2.390

UNLESS OTHERWISE SPECIFIED; 1. DIMENSIONS ARE IN INCHES. 2. TOLERANCES: .XX ± 0.02 FRACTIONS ± 1/4	TITLE MODEL OPL-660 & OP-660 SHIPPING CONTAINER		
	SIZE A	DWG. NO. R 66050	REV C
	SCALE NONE	SHEET 2 OF 2	

FIGURE WITHHELD UNDER 10 CFR 2.390

REVISED PER DDCO# 18	SENTINEL TM Amersham Corporation 40 NORTH AVE, BURLINGTON, MA 01803	DESCRIPTIVE DRAWING
APPROVED/DATE <i>S. G. [unclear] 15 June 98</i>		
UNLESS OTHERWISE SPECIFIED; 1. DIMENSIONS ARE IN INCHES.	TITLE MODEL 660 SERIES PROJECTOR	
2. TOLERANCES: X ± 0.1 XX ± 0.06 FRACTIONS ± 1/8	SIZE DWG. NO. R 66060	REV
	A SCALE NONE	SHEET 1 OF 3 A

FIGURE WITHHELD UNDER 10 CFR 2.390

UNLESS OTHERWISE SPECIFIED; 1. DIMENSIONS ARE IN INCHES. 2. TOLERANCES: X ± 0.1 .XX ± 0.06 FRACTIONS ± 1/8	TITLE MODEL 660 SERIES PROJECTOR		
	SIZE	DWG. NO. R 66060	REV
	A	SCALE NONE	SHEET 2 OF 3 A

FIGURE WITHHELD UNDER 10 CFR 2.390

UNLESS OTHERWISE SPECIFIED; 1. DIMENSIONS ARE IN INCHES. 2. TOLERANCES: .XXX ± 0.005 FRACTIONS ± 1/8	TITLE MODEL 660 SERIES PROJECTOR		
	SIZE	DWG. NO. R 66060	REV A
	A	SCALE NONE	SHEET 3 OF 3

5.5 Appendix

Table 5-1 summarizes the results of radiation profiles of an off-the-shelf Model 660 Series projector (Serial Number 4537) with 107 Curies of IR-192 (Serial Number 8534).

Table 5-1 Projector Profile with 107 Ci of IR-192

Location	At Surface	At 1 Meter
Top	89 mR/hr	0.7 mR/hr
Right	86 mR/hr	0.5 mR/hr
Front	74 mR/hr	0.9 mR/hr
Left	127 mR/hr	1.0 mR/hr
Rear	99 mR/hr	1.0 mR/hr
Bottom	65 mR/hr	0.4 mR/hr

Table 5-2 extrapolates the results reported in Table 5-1 to reflect the maximum capacity of 140 Curies of IR-192.

Table 5-2 Projector Profile Extrapolated to Maximum Capacity

Location	Surface	One Meter
Top	117 mR/hr	0.9 mR/hr
Right	113 mR/hr	0.7 mR/hr
Front	97 mR/hr	1.2 mR/hr
Left	166 mR/hr	1.3 mR/hr
Rear	130 mR/hr	1.3 mR/hr
Bottom	85 mR/hr	0.5 mR/hr

Section 7 Operating Procedure

7.1 Procedure for Loading the Package

To load an OPL-660 or OP-660 package:

1. Ensure that the source is locked into place in its storage position within the 660 series projector. To check this, the dust cover cap and shipping plug must be installed, the plunger lock must be in the down position, and the key removed.
2. Visually inspect the OPL-660 or OP-660 container to verify the following:
 - a. The inserts are properly installed and secured within the box.
 - b. The sides, top and bottom of the foam/wood inserts have no significant damage, and there are no missing pieces.

Replace any missing or significantly damaged pieces.
 - c. The steel liner is installed and that there are no cracks or holes.
 - d. The box and lid are in good physical condition with no excessive rust, cracked welds, major dents or holes. **DO NOT** use the container if it is not in good physical condition.
 - e. The latches are not broken and can be properly installed and secured.
 - f. The gasket has no signs of cracking. Replace the gasket if it is cracked or ripped.
 - g. The container handles are in good condition.
3. Place the projector into the container and install lid.
4. Secure latches of lid by engaging the latch over the lip on the lid and pulling latch down against box. Apply a tamper indicator seal through each of the latches or some other seal to indicate removal of the lid.
5. Assure all the conditions of the Certificate of Compliance are met and the package has all the required markings.