Amersham Corporation

40,North Avenue Burlington, Massachusetts 01803 Telephone (617) 272-2000

13 August 1990

Mr. Charles MacDonald, Chief Transportation Branch Division of Safeguards and Transportation NMSS U.S. Nuclear Regulatory Commission OWFN 4E4 Washington, D.C. 20555

RE: Docket Number 71-9006

Dear Mr. MacDonald:

As agreed in our meeting on 18 July 1990, Amersham will include instructions for conducting a physical verification that a shipping container is empty prior to shipment.

We are currently designing a gauge to be used to conduct this test. If the current design passes all of our in-house tests, we will be able to distribute the gauge by 31 December 1990. If we need to implement another design, distribution would not take place until early 1991. Under the present design, the gauge will consist of a flexible teflon rod which is marked to indicate proper source tube length, which is specific to each device. A separate gauge will be designed for each different device. If there is an obstruction in the tube (cropped source), the gauge will not be able to bot on out in the tube and will indicate a warning signal (i.e. red color). This gauge will be attached to the device and be sent out with each shipment of the device, so that customers will have immediate access to the appropriate gauge.

The customer will be required to conduct a physical probe of an empty source tube prior to shipment. The instructions for the shipping packages are being revised to reflect the use of this gauge, where applicable.

I've enclosed revised instructions for the shipment of an empty 500 SU source changer that has been modified with the lock mechanism. These instructions include a procedure that the shipper must follow to assure that the container is empty.

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I trust this completes the information needed for your review for renewal of Type B Certificate of Compliance No. 9006. If you require any additional information, please contact me.

Sincerely,

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Catalian m. Ronghan

Cathleen M. Roughan Radiation Safety Officer

CMR/bt

Enclosures

Model AI 500 SU SOURCE CHANGER WITH LOCK MECHANISM

OPERATION MANUAL

NOTICE

This device is used as a radiographic source changer and Type B(U) transport package for the Amersham Corporation radioactive sources listed in this manual. The user should become thoroughly familiar with the instruction manual before attempting operation of the equipment.

In order to use this equipment to perform source changes within the United States, the user must be specifically licensed to do so. Application for a license should be filed on Form NRC-313 with the appropriate U.S. Nuclear Regulatory Commission Region Office or with the appropriate agreement state office.

Prior to initial use of the source changer as a Type B transport package, the user in the United States must register his name, license number and package identification number with:

> Director Officer of Nuclear Material Safety and Safeguards U.S. Nuclear Regulatory Commission Washington, DC 20555

The user must have in his possession a copy of USNRC Certificate of Compliance Number 9006 issued for this package.

Prior to the first export shipment of this source changer from the United States, the user must also register with:

Office of Hazardous Materials Regulation Materials Transportation Bureau U.S. Department of Transportation Washington, DC 20590

The user must have in his possession a copy of International Atomic Energy Agency Certificate of Competent Authority Number USA/9006/B(U) issued for this source changer.

Users of this equipment outside the United States must comply with the regulatory, licensing and transportation rules and regulations as they apply in their respective countries.

General

The AI Model 500 SU source changer is used primarily for the transfer of encapsulated radicactive sources into radiographic exposure devices. The source changer is designed to contain the radioactive sources during transport and to permit the field exchange of source.

The source changer is five inches (127 mm) wide, six inches (152 mm) high and eleven inches (279 mm) long. The total weight of the source changer is 60 pounds (27 kg). The source changer contains 39 pounds (18 kg) of depleted uranium as shielding.

The source changer is approved as a Type B(U) transport package under USNRC Certificate of Compliance Number 9006 and IAEA Certificate of Competent Authority Number USA/9006/B(U). The capacity of the source changer is 120 curies of iridium-192 as one of the source assemblies listed in table 1.

NOTE: This container is not authorized for sources which are not attached to pigtails or that are not listed in Table 1.

Shipment Data

An envelope accompanies each shipment and contains a source certificate with decay data and leak test certification, a source identification plate for attachment to the user's radiographic exposure device, return shipping labels, tamper proof seals and an instruction manual.

Radiation Safety Considerations

Pursuant to USNRC and agreement state regulations, all personnel present during radiographic and source changing operations are required to wear a direct reading pocket dosimeter and either a film badge or a thermoluminescent dosimeter (TLD). The pocket dosimeter must be recharged at the start of each shift. The operator should frequently check the pocket dosimeter reading throughout the shift. Dosimeter readings must be recorded at the end of each shift. Records of the initial and final readings of the pocket dosimeter must be kept for inspection by the USNRC.

In the event that a person's pocket dosimeter is found to be off scale, that person must stop all work with radiation immediately. His film badge (or TLD) must be sent in immediately for processing, and he must not reenter a restricted area until it has been determined that he received less than the maximum allowed occupational exponent as defined in 10 CFR Part 20.101.

Personnel performing source changing operations should also have a calibrated and operable radiation survey meter capable of measuring form 2mR/hr to at least 1000 mR/hr to determine radiation levels when performing these operations. Areas in which source changing is performed must be identified. If a permanent radiographic installation is used, it must have the appropriate personnel access control devices as defined in 10 CFR 20.203. Otherwise, certain areas must be established as follows:

> Access to the Restricted Area must be controlled. A Restricted Area is defined in 10 CFR 20.105 as the area where an individual could receive an exposure in excess of two milliroentgens in any one hour, or 100 milliroentgens in seven consecutive days or 500 milliroentgens in one year. The Restricted Area should also be posted with signs reading "Caution (or Danger) - Radiation Area." Signs reading "Caution (or Danger) - High Radiation Area" should be posted around the perimeter where an individual could receive an exposure in excess of 100 milliroentgens in any one hour.

The radiographer or radiographer's assistant must guard against unauthorized entrance into these areas at all times. No personnel should be allowed into the restricted area without a direct reading pocket dosimeter and either a film badge or TLD.

Receipt of Radioactive Material

The consignee of a package of radioactive material must make arrangements to receive the package when it is delivered. If the package is to be picked up at the carrier's terminal, 10 CFR Part 20.205 requires that this be done expeditiously upon notification of its arrival.

Upon receipt, survey the source changer with a survey meter as soon as possible, preferably at the time of pickup and no more than three hours later if it was received during normal working hours, or no more than 18 hours later if it was received after normal working hours. Radiation levels should not exceed 200 milliroentgens per hour at the surface of the source changer nor 10 milliroentgens per hour at a distance of three feet from the surface. Actual radiation levels should be recorded on the receiving report. If the radiation levels exceed these limits, the container should be secured in a Restricted Area, and the appropriate personnel notified.

All components should be inspected for physical damage.

The radioisotope, activity model number and serial number of the source and the package model number and serial number should be recorded.

Operation

 Locate the source changer and the radiographic exposure device in a restricted area. Arrange them so that they can be connected by the source guide tube extension which accompanies the source changer. Locate the control unit to the radiographic exposure device as far away as possible from the exposure device and preferably behind radiation shielding. Unlock the source changer and open the cover. Remove the envelope containing the documentation and remove the source guide tube extension.

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- 4. Connect the drive cable to the source assembly in the exposure device and connect the control unit to the exposure device in accordance with the manufacturer's instructions and the company's operating and emergency procedures.
- 5. Connect the guide tube extension to the radiographic exposure device and to the fitting of the source changer over the empty tube, unlock the key-operated lock and raise the lock slide of the source changer to the OPEN position.
- 6. Assure no unauthorized personnel are in the estricted area. At the exposure device controls, creak the source assembly rapidly from the exposure device to the source changer. Observe the survey meter during this operation. The radiation intensity should greatly increase as the source is first exposed, decrease slightly as the source moves through the guide tube and reduce to background when the source enters the source changer.
- 7. Approach the exposure device with a survey meter; survey the exposure device on all sides, survey the guide tube and survey the source changer on all sides to assure the source has been properly transferred and stored. The radiation level should be less than 200 mR/hr and at the surface of the source changer and less than 10 mR/hr at one meter from the surface of the source changer.
- 8. Move the lock slide on the source changer to the LOCK position (down). Engage the key operated lock. While maintaining positive forward force on the drive cable and source assembly, disconnect the source guide tube extension from the source changer and expose the drive cable to source assembly connection. I connect the drive cable from the source assembly. Install the appropriate holddown cap over the source assembly.
- 9. Remove the holddown cap from the other source assembly. Connect the drive cable to the source assembly. Connect the guide tube extension to the source changer fitting. Unlock the key operated lock and raise the lock slide to the OPEN position.

NOTE: Assure that the source exchange tube is securely

Revision 4 August 1990 connected to the source changer. If the source exchange tube is not properly connected the source can not be removed from the source changer.

- 10. Assure no unauthorized personnel are in the restricted area. At the exposure device controls, crank the source assembly rapidly from the source changer to the exposure device. Observe the survey meter during this operation. The radiation intensity should greatly increase as the source is first exposed, increase slightly as the source moves through the guide tube and decrease to background as the source assembly enters the exposure device.
- 11. Approach the exposure device with the survey meter, survey the exposure device on all sides, survey the length of the guide tuba, and survey the source changer on all sides to assure the source has been properly transferred to its storage position in the exposure device. Radiation levels should be less than 200 mR/hr at the surface and less than 10 mR/hr at one meter from the surface of the exposure device and the source changer.
- 12. Lock the exposure device. Move the lock slide of the source changer to the LOCK position. Remove the guide tube extension from the source changer and exposure device and install it in the front compartment of the source changer.
- 13. Affix the identification plate of the new source to the exposure device. Place the identification plate for the old source in the source changer, secured to the appropriate holdown cap.
- 14. Assure that the proper holddown cap is installed over the source in the source changer (see Table 1). Seal wire the caps in place. Insert seal wire through the holddown cap and the drilled bolt on the lock mechanism. Insert holdown cap over empty tube also. Assure that the key operated locks are engaged, and remove keys.
- 15. Close the source changer cover and insert closure bolt and padlock and secure. Insert seal wire through closure bolt.

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Shipment of Radioactive Source

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- Assure that the source assembly is secured in the proper storage position and the source changer is locked. Assure that the source changer cover is sealwired with a tamperproof seal.
- If the source changer is to be packed in a crate or other outer packaging, the outer packaging must be strong enough to withstand the normal conditions of transport. These requirements are outlined in 10 CFR 71.71. The source changer should be put in the outer package with sufficient blocking to prevent shifting during transportation.
- Assure the removable contamination levels on the outside of the package do not exceed 0.001 microcuries prior to shipment.
 - Survey the package with a survey meter at the surface and at a distance of one meter from the surface to determine the proper radioactive shipping labels to be applied to the package as required by 49 CFR Part 172.403. The radiation exposure limits for each shipping label are given in figure 1. If radiation levels above 200 mR/hr at the surface or 10 mR/hr at one meter from the surface are measured, the package must not be shipped.

Properly complete two shipping labels indicating the radioisotope, activity and the Transit Index. The Transport Index is use the Transit of a flow II and Yellow III labels and is defined as the maximum radiation level in milliroentgens per hour measured at a distance of one meter from the surface of the package. Put these two labels on opposite sides of the package after making sure any previous labels have been removed. The package should be marked with the proper shipping name (Radioactive Material, Special Form, n.o.s.) and the identification number (UN 2974). If the source changer is packaged inside an outer container, mark the outside package "INSIDE PACKAGE

COMPLJES WITH PRESCRIBED SPECIFICATIONS -TYPE B(U) USA/9006/B(U)."

Complete the appropriate shipping papers - Examples are shown in Figure 2 and 3. These shipping papers must include:

a. Proper Shipping name (Radioactive Material, Special Form, n,o.s.) and Identification Number (UN2974). The letters RQ must be placed next to the proper shipping name if shipping more than 10 Ci of Ir-192.

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Name of Radionuclide (Iridium-192).

- c. Activity of the Source (in Curies).
 d. Category of Label Applied (i.e. Radioactive Yellow II).
- e. Transport Index.

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- f. Package Identification Number (i.e. USA/9006/B(U) Type B).
- g. Shipper's Certification.

"This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transport according to the applicable regulations of the Department of Transportation."

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For air shipments, the following shipper's certification may be used:

"I hereby certify that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled and are in proper condition for carriage by air according to applicable national governmental regulations."

 For air shipments for, from or through the United States, a "CARGO AIRCRAFT ONLY" label and the shipping papers must state:

> "THIS SHIPMENT IS WITHIN THE LIMITATIONS PRESCRIBED FOR CARGO ONLY AIRCRAFT."

Due to the depleted uranium used as shielding in the source changer, a notice must also be enclosed in or on the package included with the packing list, or otherwise forwarded with the package. This notice must include the name of the consignor or consignee and the following statement:

"This package conforms to the conditions and limitations specified in 49 CFR 173.424 for excepted radioactive material, articles manufactured from depleted uranium, UN 2909." Shipment of an Empty Package

- For shipment of an empty source changer, first assure the changer does not contain an unauthorized source or cropped source by performing a physical verification using the following procedure.
- NOTE: Use only the gauge provided with the source changer. Do not use any other tool or a gauge for another device. If you do not have the proper gauge to perform the test, contact Amersham Corporation before conducting the test.
 - a. Insert the proper gauge in the empty tube(s) of the source changer. Read the gauge at the top of the outlet fitting.
 - b. The gauge should bottom out in the empty source tube and indicate a safe condition (green signal). Verify that each empty tube indicates a safe condition and proceed to step 2.
 - c. If the gauge indicates an unsafe condition (red signal) there may be an obstruction in the tube. Remove the gauge slowly while observing the survey meter. If the radiation levels increase as the gauge is being removed keep the gauge within the device, secure the device and contact Amersham for further instructions. If the radiation levels remain normal as the gauge is being removed, completely remove gauge and contact Amersham Corporation for shipping instructions.
- 2. When you have assured the container is empty, insert the shipping plugs securely over the empty tubes. Close the cover of the source changer, insert the closure bolt and padlock. Seal wire through the closure bolt.
- Assure that the levels of removable radioactive contamination on the outside surface of the outer package do not exceed 0.001 microcurie per 100 square centimeters.
- Survey the container and prepare the package depending upon the radiation levels obtained, as given below.
 - a. If the radiation level is below 0.5 mR/hr at the surface and there is no measurable radiation level at one meter from the container, no label is required. Mark the outside of the package with the proper shipping name (Radioactive Material, articles manufactured from depleted uranium UN 2909). Mark the outside of the

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package:

"Exempt from specification packaging, shipping paper and certification, marking and labeling and exempt from the requirements of Part 175 per 49 CFR 173.421-1 and 49 CFR 173.424."

Additionally, a notice must be enclosed in or on the package included with the packing list or otherwise forwarded with the package. This notice must include the name of the consignor or consignee and the statement:

"This package conforms to the conditions and limitations specified in 49 CFR 173.424 for excepted radioactive materials, articles manufactured from depleted uranium, UN 2909."

b. If the radiation level exceeds 0.5 mrem/hr, or if there is a measurable radiation level at one meter from the surface, use the criteria of table 1 to determine the proper shipping labels to be applied to the package. Mark the outside of the outer shipping package with the proper shipping name and identification number (Radioactive Material, LSA, n.o.s., UN 2912).

If the container is packaged inside a crate or other outer packaging, mark the outer package with the statement "INSIDE PACKAGE COMPLIES WITH PRESCRIBED SPECIFICA-TIONS", USA/9006/B(U), Type B.

Properly complete the shipping papers, indicating:

- i. Proper shipping name and identification number (i.e. Radioactive Material, LSA, n.o.s. UN 2912
- ii. Name of the adionuclide (i.e. depleted uranium-238)
- iii. Physical and chemical form (i.e. Solid Metal)
 - iv. Activity of the uranium 5 millicuries
 - v. Category of label applied (i.e. Radioactive Yellow II)
- vi. Transport Index
- vii. USNRC identification number or DOT specification number (i.e. USA/9006/B(U))
- viii. For export shipments, the IAEA identification number (i.e. USA/9006/B(U))
 - ix. Shipper's Certification:

"This is to certify that the above named materials

are properly classified, described, packaged, marked and labeled, and are in proper condition for transport according to the applicable regulations of the Department of Transportation."

NOTE:

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 For air shipments, the following Shipper's Certification may be used:

"I hereby certify that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in proper condition for carriage by air according to applicable national governmental regulations.

- 2) For air shipments, the package must be labeled with a "CARGO AIRCRAFT ONLY" label, and the shipping papers must state: "THIS SHIPMENT IS WITHIN THE LIMITATIONS PRESCRIBED FOR CARGO-ONLY AIRCRAFT".
- Return the container to Amersham Corporation according to proper procedures for transporting radioactive material as established in Title 49 Code of Federal Regulations part 172-178
- NOTE: The U.S. Department of Transportation, in 49 CFR 173.22 (c) requires each shipper of Type B quantities of radioactive material to provide prior notification to the consignee of the dates of shipment and expected arrival.

Table 1

Source Assemblies Used In Conjunction With The Model AI 500 SU Source Changer With Lock Mechanism

Amersham Source Assembly Designs	Holddown Cap Designs		
848	T		
A-1-A	N		
A-2-A	G		
RG-13	N		
RG SA-13	G		
89911	N		
89912	G		
877	N		
879	G		

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Pro	at Surface	at One Meter
Radioactive White I	0.5 mR/hr	None
Radioactive Yellow 11	50 mR/hr	1.0 mR/hr
Radioactive Yellow III	200 mR/t.r	10 mK/l.r

Maximus Radiation Level

SHIPPER ORDER NO ORD	SHIP DATE
ORD	
CONSIGNEE	
Amersham Corporation Hollyfield Drive Baton Rouge, LA 70898	
DVALUE	
O:	O3 ED VALUE CONSIGNEE Amersham Corporation Hollyfield Drive Baton Rouge, LA 70898

SHIPPERS CERTIFICATION ATTACHED FOR THE FOLLOWING PACKING LIST(S):

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							COLLECT	
Route			Car initials an	d Number				
Packages	Kind of Package, Descript	tion of Articles Special	Marks and Exceptions	(Sub to Cor.)	Or Rete Class	Ck Col	WEIGHT-RATE CHARGE	
	Model 500 SU se	ource changer					PICK-UP	
	radioactive mate	rial, specia	l form				CHARGE	
	NOS. UN2974						DELIVERY CHARGE	
		R	2				ADVANCE	
	Iridium-192 84	curies					CHARGE	
	USA/ PODE (P(III)						TRANS	
	9006/B(U)		the second s				EXCESS	
	Type B(U)Packag	e					CHARGE	
				+			SUBTCTAL	
••••••							CONSIGNORS	
	Radioactive Yell	low II labele						
		THE PERSON AND CAR					COD FEE	
	transport index	0.8						
							TOTAL	
	+						COMMENTS	
				++				
	RELEASED VALUE N	NOT TO EXCEED	DADC PER POUND					
	Dackaged marked an	t the above nam	ned materials are proj	perly classifie	d. descr	ibed.		
_	to the applicable requ	lations of the D	e in proper condition for	or transportati	on acco	rding		
the shipment where the rate	i moves between two ports by a carrier is dependent on value shippers are requ	by water the law requires the	net the bill of leging shall state whethe	tation.		101E-		
OURIER SIG	NATURE	TO be not exceeding \$	per	the property the agree	o or declared	to suit		
		noore no	SIGN CONSIG	NEE SIGNATURE				
ATE	TIME		DATE RECEIVED IN GOOD	ORDER EXCEPT A	SNOTED		1	
		PM				AM	1-01	

Amersham Corporation 40 North Avenue Burlington, MA 01803 U.S.A.		Air Waybill No Page of Pages Shipper's Reference Number				
Consignee Amersham Internatio White Lion Road ENGLAND	nal					
Two completed and signed copies of t be handed to the operator	this Declare	tion must				1
TRANSPORT DETAILS						
This shipment is within the similations prescribed for (delete non-appaceble) PASSENGER CARGO ANDZARGO AIRCRAFT AIRCRAFT ONLY	Airport o Logan,	f Departure Boston	•	Dangerous Goods Regula applicable law, subject to la must not, in any circums signed by a consolidator, agent	respects with tions may be in gal penalties. T tances, be con a forwarder or i	the applicable breach of the his Declaration npleted and/or an IATA cargo
Airport of Destination:	stle. III	ĸ		Shipment type (delete non ap	ADIOACTIVE	
NATURE AND QUANTITY OF DAM	NGEROUS	GOODS				
Dangerous Goods id		******	•••••••	[**** ·····		· · · · · · · · · · · · · · · · · · ·
Proper Shipping Name	Class Or Dry alor	UN 202 N 208	Sube- diary Fush	Quantity and type of packing	Packing that	Authorization
Radioactive Material RQ Special Form N.O.S.	7	UN2974		1R-192 102.1 curi 3778 GB	olid ts Yellow q 11 T.I.	Special Form Certificate USA/03355 Type B(U) Package Certificate
				Type B(U) Package(s)	Dimensions	058/9006/1
Additional Handling Information hereby declare that the contents o described above by proper shipping and labelled, and are in all respects according to the applicable interne	this consi name and in the pro	ignment are d are classif per conditio	fully al	nd accurately Name/Title sked, marked Radiologica Insport by air Place and	e of Signatory Technician Date	
ions		7-22		Burlingtor Signature (see warming)	1. MA U.S.A.	