

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

No.: NR-8008-S-802-S DATE: June 3, 2004 PAGE 2 OF 6
(Previously NR-460-S-897-S and NR-459-S-102-S)

SOURCE TYPE: Sealed Source

DESCRIPTION:

The 3F1G is a thin window, beta-emitting, doubly-encapsulated source. Strontium-90 (Sr-90) was absorbed into small ceramic particles. The isotope was permanently fixed to the particles using a heat treatment to create 3M Brand Radiating Microspheres. The microspheres were loaded into an inner capsule 0.290 in. (0.737 cm) high, with an outer diameter of 0.556 in. (1.412 cm) and an inner diameter of 0.450 in. (1.143 cm). The tube was made from type 304 stainless steel, to which a 0.002 in. (0.005 cm) thick, type 304 stainless steel window had been laser welded. The window was welded both inside and outside the capsule so that the assembly can withstand 100.0 psi (689.5 kPa) of pressure. Aluminum powder was loaded into the capsule behind the microspheres. An inner plug 0.451 in. (1.146 cm) in diameter and 0.200 in. (0.508 cm) thick, made from type 304 stainless steel, was inserted behind the aluminum and microspheres, pressing them both against the window. The inner plug was TIG welded in place, sealing the microspheres inside.

The entire inner assembly was placed into an outer capsule 0.400 in. (1.016 cm) high, with an outer diameter of 0.700 in. (1.778 cm) and an inner diameter of 0.562 in. (1.428 cm), which was made from type 304 stainless steel. A 0.002 in. (0.005 cm) thick, type 304 stainless steel window had been laser welded to the outer capsule. The window was welded inside and outside the capsule so that the assembly can withstand 100.0 psi (689.5 kPa) of pressure. The outside of the capsule was threaded to allow the source to be screwed into a device. An outer welding plug was inserted into the outer capsule and was TIG welded in place. The outer plug is a 0.563 in. (1.430 cm) diameter, 0.100 in. (0.254 cm) thick disk, made from type 304 stainless steel. A 0.310 in. (0.787 cm) outer diameter, 0.120 in. (0.305 cm) long area with a recessed 5/32 in. (0.397 cm) hex head protrudes from the disk.

DIAGRAM:

See Attachment 1.

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SOURCE TYPE: Sealed Source

LABELING:

The serial number was engraved on the side of the extension of the outer plug. Space limitations precluded any further labeling.

CONDITIONS OF NORMAL USE:

This source was designed to be used in calibration devices used by the U.S. military in case of large radiation releases, such as a nuclear attack.

PROTOTYPE TESTING:

A prototype of the 3F1G source was tested according to ANSI guidelines, and achieved an ANSI Classification of 77C45343 (ANSI N542-1977). In addition, 3M drawing No. 12-1921-0474-8 indicates that the 3F1G source was also built to meet or exceed Special Form criteria under 10 CFR 49.

EXTERNAL RADIATION LEVELS:

3M reported dose rates were calculated for a 1.000 Ci (37.00 GBq) source using dose rates obtained using a 45.00 mCi (1.665 GBq) source. The calculated dose rates for the one curie source are as follows:

<u>Distance</u> <u>in (cm)</u>	<u>Max. Radiation Level</u>	
	<u>mr/hr</u>	<u>(FSv/hr)</u>
Contact	19,040	(190,400)
11.81 (30)	317.3	(3,173)

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QUALITY ASSURANCE AND CONTROL:

The Quality Control Group operated from policies described in the Static Control Systems Division Manual (New Brighton Plant). The quality system was based on Mil-Q-9858-A guidelines on file with the Source Containment and Devices Branch of the NRC.

The following quality control procedures were followed during production of the 3F1G source:

1. The inner capsule was leak (bubble) tested after welding the inner plug in place.
2. The inner capsule was smear tested after welding the inner plug in place.
3. The complete source was leak (bubble) tested immediately after fabrication.
4. The complete source was smear tested immediately after fabrication.
5. The complete assembly was smear tested immediately prior to shipment.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- C This source may be used only by persons specifically licensed by the NRC or an Agreement State.
- C Handling, storage, use, transfer, and disposal: to be determined by the licensing authority.
- C This source shall not be subjected to environmental or other conditions of use which exceed ANSI Classification 77C43343 (ANSI N542-1977).

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SOURCE TYPE: Sealed Source

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE (Cont'd):

- C This source shall be leak tested at intervals not to exceed 6 months using techniques capable of detecting 0.005 microcurie (185.0 Bq) of removable contamination.
- C This registration sheet and the information contained within the references shall not be changed without the written consent of the NRC.
- This product will no longer be commercially distributed but may still be approved for licensing purposes.
 - REVIEWER'S NOTE: Model 3F1G, was originally registered under certificate no. NR-459-S-102-S. This model was inactivated under certificate no. NR-460-S-897-S, on February 29, 1996. Both of these registration certificates are combined into this certificate, no. NR-8008-S-802-S, which supercedes all previous registration certificates for Model 3F1G.

SAFETY ANALYSIS SUMMARY:

The Model 3F1G source is not a current product manufactured or distributed by 3M Health Physics Services. However, 3M Health Physics Services will continue to receive Model 3F1G sources for disposal.

Based on our review of Model 3F1G source, and the information and test data cited below, we continue to conclude that this sealed source is acceptable for specific licensing purposes.

Furthermore, we continue to conclude that the Model 3F1G source would be expected to maintain its containment integrity for normal conditions of use and accidental conditions which might occur during uses specified in this certificate.

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NO: NR-8008-S-802-S DATE: June 3, 2004 ATTACHMENT 1
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