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

NO.: NR-460-S-910-S DATE: January 26, 1996

SEALED SOURCE TYPE: Gauge Source

MODEL: 3F1R

MANUFACTURER/DISTRIBUTOR: 3M Health Physics Services
3M Center, Building 224-2E-06
St. Paul, MN 55144-1000

ISOTOPE: MAXIMUM ACTIVITY:

Strontium-90 25.00 millicuries (0.925 GBq)

LEAK TEST FREQUENCY: 6 Months

PRINCIPAL USE: (E) Beta Gauges

CUSTOM SOURCE: _____ YES ___X___ NO

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

SEALED SOURCE TYPE: Gauge Source

DESCRIPTION:

The 3F1R is a singly-encapsulated point source. Strontium-90 (Sr-90) is absorbed into small ceramic particles using a heat treatment to create 3M Brand Radiating Microspheres. The microspheres are loaded into a 0.250 in. (0.635 cm) long, 0.160 in. (0.406 cm) nominal outer diameter, 0.060 in. (0.152 cm) nominal inner diameter capsule with a 0.002 in. (0.005 cm) thick stainless steel window, gold brazed across one end. After loading the microspheres, a 0.060 in. (0.152 cm) nominal diameter, 0.180 in. (0.457 cm) long inner plug is inserted and welded in place, sealing the microspheres inside.

The entire inner assembly is inserted, window end first, into a chamber designed to hold it in an outer capsule. The outer capsule is 1.207 in. (3.066 cm) long with a diameter of 0.485 in. (1.232 cm). A nominally 0.500 in. (1.270 cm) deep, 0.250 in. (0.635 cm) diameter hole is drilled into one end. A 0.094 in. (0.239 cm) diameter hole is drilled through the source centered 0.188 in. (0.478 cm) from that end. A chamber, whose axis is perpendicular to the 0.094 in. (0.239 cm) diameter hole's axis, is drilled near the opposite end. The chamber is 0.324 in. (0.823 cm) long with a nominal diameter of 0.162 in. (0.412 cm) and is centered 0.128 in. (0.325 cm) from the end. A coaxial 0.060 in. (0.152 cm) diameter shaft is drilled the rest of the way through the capsule, creating a 0.051 in. (0.130 cm) wide ring around the shaft where it meets the chamber. The inner assembly is inserted into the chamber so that the window is pressed against this ring. That way, the shaft acts as a window or collimator for the radiation beam. Finally, a 0.162 in. (0.412 cm) nominal diameter, 0.060 in. (0.152 cm) thick outer plug is inserted behind the inner assembly and welded in place, sealing the inner assembly inside.

Both capsules and both plugs are made from type 304 stainless steel.

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

SEALED SOURCE TYPE: Gauge Source

DIAGRAM:

See Attachment 1

LABELING:

The following information was engraved on the side of the outer capsule:

XXX mc Sr-90
Serial No._____

CONDITIONS OF NORMAL USE:

The Model 3F1R source was designed for use in a gauging instrument manufactured by Ball Brothers Research Corporation.

PROTOTYPE TESTING:

A sample Model 3F1R was tested in 1982 in accordance with the specifications of ANSI N452-1977 and achieved a classification of 77C53343.

EXTERNAL RADIATION LEVELS:

The manufacturer did not provide external radiation level data for this source model. As referenced in the 1992 Revised Edition of the Health Physics and Radiological Health Handbook, Rules of Thumb, for a point source of beta radiation (neglecting self- and air-absorption) of a given source strength in curies, the dose rate at 0.394 in. (1.0 cm) is approximately equal to 200.0 R/hr per mCi (54.0 Gy/hr per MBq). The variation with energy is small over a wide range. Based upon this, beta dose rates were calculated for a 25 mCi (0.925 GBq) Pm-147 sealed source to be approximately 5,000 R/hr (50 Gy/hr) at 0.394 in. (1.0 cm). This calculation is based upon the neglect of self- and air-absorption. Also, the absorption due to the shielding material was not taken into consideration. With the inclusion of the stainless steel shielding and air-absorption, it is expected that

SEALED SOURCE TYPE: Gauge Source

EXTERNAL RADIATION LEVELS: (continued)

external radiation levels at 11.81 in. and 39.37 in. (30.00 cm and 100.0 cm) would be negligible. Likewise, the dose rate at 0.394 in. (1.000 cm) would be expected to be significantly reduced from the calculated value above.

QUALITY ASSURANCE AND CONTROL:

The following quality control procedures were followed during production of this source:

1. The inner capsule was bubble leak tested after welding the inner plug in place. If any bubbles were observed from the capsule while immersed, it failed the bubble leak test.

2. The inner capsule was smear tested after welding the inner plug in place and before inserting it into the outer capsule. The maximum allowable limit for this smear test was 0.0005 μCi (18.50 Bq) of removable Sr-90 contamination.

3. The completed source was smear tested after fabrication and again immediately prior to shipment. The maximum allowable limit for these smear tests was also 0.0005 μCi (18.50 Bq) of removable Sr-90 contamination.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- This source may be used only by persons specifically licensed by the NRC or an Agreement State.

- Handling, storage, use, transfer, and disposal: to be determined by the licensing authority.

- This source shall be leak tested at intervals not to exceed 6 months using techniques capable of detecting 0.005 μCi (185.0 Bq) of removable contamination.

- This registration sheet and the information contained within the references shall not be changed without the written consent of the NRC.

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

SEALED SOURCE TYPE: Gauge Source

SAFETY ANALYSIS SUMMARY:

The Model 3F1R source is not a current product manufactured or distributed by 3M Health Physics Services. However, 3M Health Physics Services will continue to receive 3F1R sources for disposal.

Based on our review of the Model 3F1R source, and the information and test data cited below, we continue to conclude that this source is acceptable for specific licensing purposes.

Furthermore, we continue to conclude that the Model 3F1R 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.

REFERENCES:

The following supporting documents for the Model 3F1R source are hereby incorporated by reference and are made a part of this registry document:

- 3M Health Physics Services' letters dated August 6, 1991, and June 13, 1968, with enclosures thereto
- ANSI Tests - Reclassification Radioactive Sources, Static Control Systems/3M - Test Report dated August 31, 1982

ISSUING AGENCY:

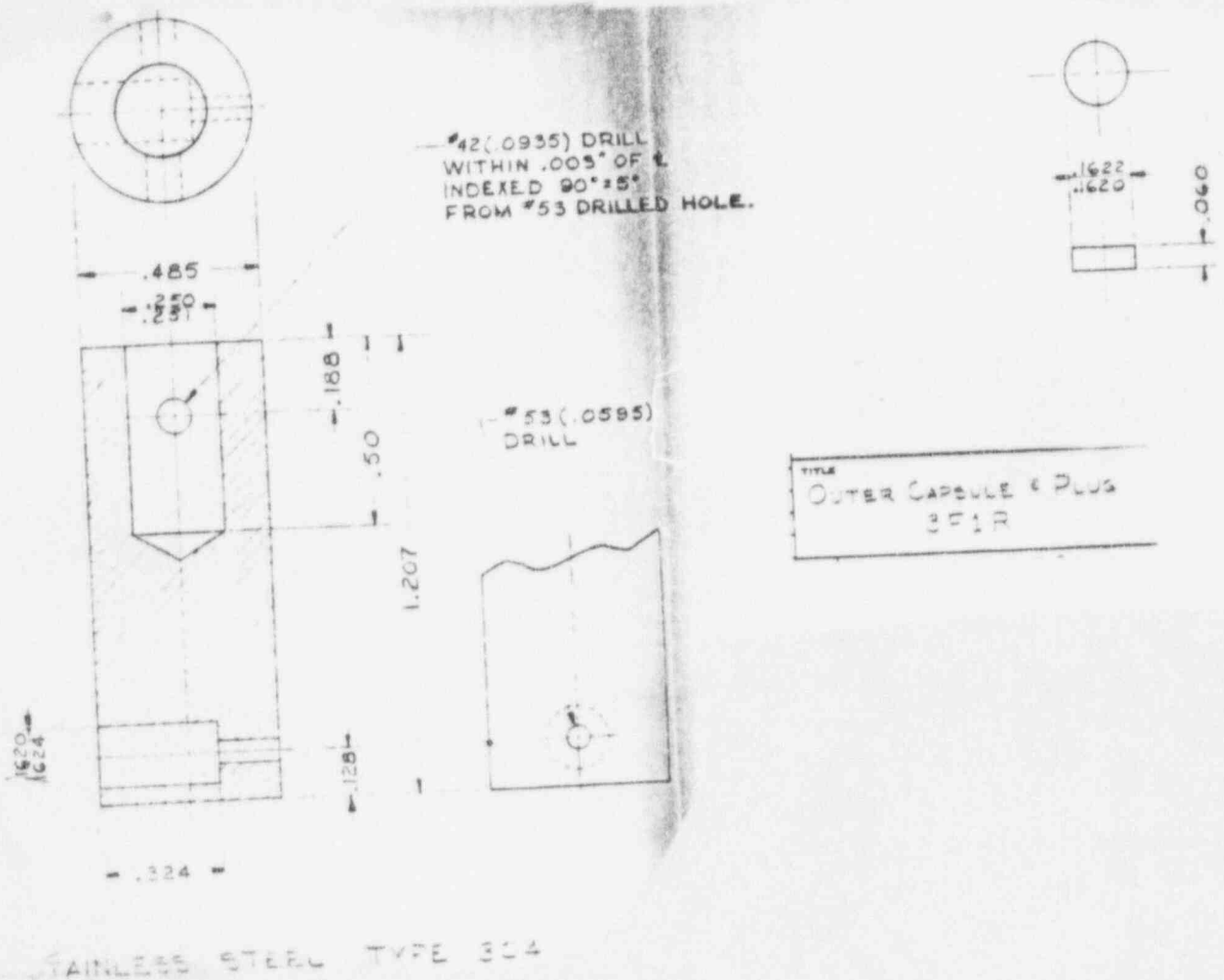
U.S. Nuclear Regulatory Commission

Date: January 26, 1996 Reviewer: Douglas A. Broaddus

Date: January 26, 1996 Concurrence: Steven L. Baggett

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

NO.: NR-460-S-910-S DATE: January 26, 1996 ATTACHMENT 1



STAINLESS STEEL TYPE 304

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 12, 1996

NOTE TO: MINNESOTA MINING AND MANUFACTURING (3M) INACTIVE FILES

FROM: DOUGLAS A. BROADDUS

SUBJECT: INACTIVATION OF REGISTRATIONS BASED ON AUGUST 6, 1991, LETTER.

A number of the background files for the registration certificates requested (by 3M letter dated August 6, 1991) to be made inactive contain limited information on the products. A search of 3M registration, archive, and license files, and information in NUDOCS was performed to obtain additional information. Also, 3M was contacted to obtain any additional information that may have been in their files. 3M provided limited additional information concerning these products and indicated that the information provided represented all additional information in their files. Additional information obtained from these sources has been added to the applicable registration files.

At the present time, the information contained in the background registration files represents all available information for these products. In addition, a number of these products were originally reviewed and approved by the Atomic Energy Commission (AEC). The reviews performed for these products to make the certificates inactive were based on the information available, the previous reviews and approvals, and the historical use of the products (i.e., reports of failures or design problems, or the lack thereof). In several instances, insufficient information was available to perform an adequate safety review. In these instances, the certificates have been reissued based solely on the original AEC review and approval, and no additional safety review was performed.

February 29, 1996

Robert G. Wissink
3M Health Physics Services
3M Center Bldg. 224-2E-06
St. Paul, MN 55144-1000

Dear Mr. Wissink:

This letter is in response to your request dated August 6, 1991, and subsequent letters, requesting to transfer to inactive status all registration sheets issued to 3M as listed in the first column of Enclosure 1. We have transferred the requested certificates to inactive status. The certificate numbers have been changed as listed in Enclosure 1. Copies of the inactive certificates are enclosed for your records.

Please read over the registration certificates and notify us immediately if there are any errors or inconsistencies.

If you have any questions, please contact me at (301) 415-5847 or Mr. Steven Baggett at (301) 415-7273.

Sincerely,

/S/

Douglas A. Broaddus, Mechanical Engineer
Sealed Source Safety Section
Source Containment and
Devices Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Enclosures: As stated

Distribution:
SSSS R/F NE01 SSD-91-71
Registration certificate files listed in Enclosure 1

DOCUMENT NAME: C:\WPDOCS\SSDS\INACTIVE\NRC\460INACT.CMP
To receive a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFFICE	SCDB	C								
NAME	DABroaddus									
DATE	02/27/96									

OFFICIAL RECORD COPY

9603200005 MPP.

ENCLOSURE 1

REGISTRATIONS TRANSFERRED TO INACTIVE STATUS

Old Certificate No.	New Certificate No.	Model Number(s)
NR-459-S-101-S	NR-8008-S-801-S	4F6Y
NR-459-S-102-S	NR-8008-S-802-S	3F1G
NR-460-S-101-S	NR-0460-S-875-S	4F6D
NR-460-S-102-S	COMBINED WITH NR-0460-S-874-S	4F6H, 4F6B
NR-460-S-103-S	NR-0460-S-876-S	4F6G
NR-460-S-104-S	COMBINED WITH NR-0460-S-865-S	6D6A
NR-460-S-105-S	NR-0460-S-877-S	6B6F
NR-460-S-106-S	NR-0460-S-878-S	4F6P
NR-460-S-107-S	NR-0460-S-879-S	1C2A, 1C2B
NR-460-S-108-S	NR-0460-S-880-S	4F3B
NR-460-S-109-S	NR-0460-S-881-S	4F3C
NR-460-S-110-S	NR-0460-S-882-S	3M1C
NR-460-S-111-S	NR-0460-S-883-S	3M1B
NR-460-S-112-S	NR-0460-S-884-S	3E4G
NR-460-S-113-S	NR-0460-S-885-S	4D3A
NR-460-S-114-S	NR-0460-S-886-S	4D3B
NR-460-S-115-S	NR-0460-S-887-S	4D6D
NR-460-S-116-S	NR-0460-S-888-S	4D6F
NR-460-S-117-S	NR-0460-S-889-S	5F1D
NR-460-S-118-S	COMBINED INTO NR-0460-S-890-S	5F1E
NR-460-S-119-S		5F1F
NR-460-S-120-S	NR-0460-S-891-S	5F1G
NR-460-S-121-S	NR-0460-S-892-S	3L2B
NR-460-S-122-S	NR-0460-S-893-S	3L2A
NR-460-S-123-S	NR-0460-S-894-S	3M1F
NR-460-S-124-S	NR-0460-S-895-S	3L2C

ENCLOSURE 1

REGISTRATIONS TRANSFERRED TO INACTIVE STATUS

Old Certificate No.	New Certificate No.	Model Number(s)
NR-460-S-125-S	NR-0460-S-896-S	1E2J
NR-460-S-126-S	NR-0460-S-897-S	3F1G
NR-460-S-127-S	NONE - NO INFORMATION AVAILABLE	4F1E
NR-460-S-128-S	NR-0460-S-899-S	5F1H
NR-460-S-129-S	NR-0460-S-900-S	3E4O
NR-460-S-130-S	COMBINED INTO NR-0460-S-901-S	5F1N
NR-460-S-131-S		5F1N (MODIFIED)
NR-460-S-132-S	NR-0460-S-902-S	7B8L
NR-460-S-133-S	COMBINED INTO NR-0460-S-903-S	6H6A
NR-460-S-134-S		6H6B
NR-460-S-135-S	NR-0460-S-904-S	4D6M
NR-460-S-136-S	NR-0460-S-905-S	3L2E
NR-460-S-137-S	NR-0460-S-906-S	6500, 6520 (FORM. 6D6C)
NR-460-S-138-S	NR-0460-S-907-S	3L2D
NR-460-S-139-S	NR-0460-S-908-S	3Q1D
NR-460-S-140-S	NR-0460-S-909-S	3E4L, 3E4S
NR-460-S-141-S	NR-0460-S-910-S	3F1R
NR-460-S-142-S	NR-0460-S-911-S	902, 902F, 903
NR-460-S-143-S	COMBINED WITH NR-0460-S-871-S	4P6E
NR-460-S-144-S	COMBINED WITH NR-0460-S-872-S	4P6M
NR-460-S-145-S	NR-0460-S-912-S	3M1L
NR-460-S-146-S	NR-0460-S-913-S	3G9A
NR-460-S-147-S	NR-0460-S-914-S	3B4G
NR-460-S-148-S	COMBINED WITH NR-0460-S-871-S	4F3F
NR-460-S-149-S	NR-0460-S-915-S	4F3G

ENCLOSURE 1

REGISTRATIONS TRANSFERRED TO INACTIVE STATUS

Old Certificate No.	New Certificate No.	Model Number(s)
NR-460-S-150-S	NR-0460-S-916-S	6D1A
NR-460-S-151-S	COMBINED WITH NR-0460-S-869-S	6530, 6540 (FORM. 6B6G)
NR-460-S-152-S	NR-0460-S-917-S	6H6D
NR-460-S-153-S	NOT REQUIRED	ALBUMIN MICROSPHERES
NR-460-S-154-S	NR-0460-S-919-S	6H6E, 8C9T
NR-460-S-155-S	COMBINED INTO NR-0460-S-920-S	4D6L
NR-460-S-156-S		4D6P
NR-460-S-158-S	NR-0460-S-921-S	3F1I, 3F1J, 3F1L
NR-460-S-159-S	NR-0460-S-922-S	3F1V
NR-460-S-160-S	COMBINED WITH NR-0460-S-873-S	4P6T
NR-460-S-161-S	COMBINED INTO NR-0460-S-920-S	4F3D
NR-460-S-162-S	NR-0460-S-923-S	4F3H
NR-460-S-163-S	COMBINED INTO NR-0460-S-920-S	4F6S
NR-460-S-164-S	COMBINED WITH NR-0460-S-900-S	3E40
NR-460-S-165-S	NR-0460-S-924-S	6701
NR-460-S-166-S	NR-0460-S-925-S	6702
NR-460-S-167-S	NR-0460-S-926-S	6711
NR-460-S-168-G	NR-0460-S-927-G	702, 703, 704
NR-460-S-169-S	NR-0460-S-928-S	6510, 6550, 6570 (FORMERLY 6B6G)
NR-460-S-170-S	NR-0460-S-929-S	4P6V
NR-460-S-171-S	NR-0460-S-930-S	4F6ST

February 29, 1996

Robert G. Wissink
3M Health Physics Services
3M Center Bldg. 224-2E-06
St. Paul, MN 55144-1000

Dear Mr. Wissink:

This letter is in response to your request dated August 6, 1991, and subsequent letters, requesting to transfer to inactive status all registration sheets issued to 3M as listed in the first column of Enclosure 1. We have transferred the requested certificates to inactive status. The certificate numbers have been changed as listed in Enclosure 1. Copies of the inactive certificates are enclosed for your records.

Please read over the registration certificates and notify us immediately if there are any errors or inconsistencies.

If you have any questions, please contact me at (301) 415-5847 or Mr. Steven Baggett at (301) 415-7273.

Sincerely,

/S/

Douglas A. Broaddus, Mechanical Engineer
Sealed Source Safety Section
Source Containment and
Devices Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Enclosures: As stated

Distribution:
SSSS R/F NE01 SSD-91-71
Registration certificate files listed in Enclosure 1

DOCUMENT NAME: C:\WPDOCS\SSDS\INACTIVE\NRC\460INACT.CMP
To receive a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFFICE	SCDB	C							
NAME	DABroaddus								
DATE	02/27/96								

OFFICIAL RECORD COPY