



GENERAL OFFICES • 2501 HUDSON ROAD • ST. PAUL, MINNESOTA 55119 • TEL. 733-1110

Nuclear Products

24 October 1967

2449

U.S. Atomic Energy Commission  
Washington, D.C. 20545

Attn: James C. Malaro  
Isotopes Branch  
Division of Material Licensing

Subject: Cs-137 gamma source, 3M Model 4D6M

Dear Mr. Malaro:

The purpose of this correspondence is to place on file information relative to our Cs-137 gamma source, Model 4D6M. This source is to be fabricated for the Ohmart Corporation and included in one of their gauging systems. The Ohmart drawings which apply to this source are numbers A-11761 and B11760. Ohmart will be contacting you concerning the licensing of this source shortly.

This source would be fabricated using Cs-137 in the form of 3M Brand Radiating Microspheres and is designed for an activity loading of up to 1 curie of Cs-137. I have attached herewith a copy of our drawing B1921-738 which shows the construction of this source. We have previously provided to you a great deal of information concerning the properties of 3M Brand Radiating Microspheres and therefore I refer you to previous correspondence for any information you might need concerning this product.

Fabrication of this source is identical to that for any Cs-137 volume of this source of this type. I specifically refer you to the materials submitted in registration of our Model 4F6S for details and information, which you might require. The Cs-137 microspheres are loaded into the inner capsule using a calibrated scoop. The inner plug is then pressed into place and silver brazed. The outer capsule is then formed by insertion of the inner capsule and plugging followed by welding to make the final seal. Labeling of this source would be as shown on the drawing and previously submitted to you for Model 4F5S.

SEALED SOURCE FILE

DUPLICATED  
FOR DIV. OF COMPLIANCE

9805290387 960126  
PDR RC \*  
SSD PDR

NO MANUFACTURING COMPANY

U.S.A.E.C.

-2-

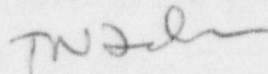
24 October 1967

Since this source is essentially identical to the Model 4F6S or Model 4F6D both of which have been registered no additional destructive testing was carried out on this source design. I refer you to the registration information on these other sources for information on the type of environments which a source of this kind will stand. The following Quality Control procedures were followed during the fabrication of these sources.

1. After assembly of the inner capsule and sealing the source is subjected to a standard smear test and bubble type leak test. Less than 0.0005 microcuries of Cs-137 can be removed by the smear test and the leak test must be negative.
2. After the assembly of the outer capsule and welding the same tests are made on the finished source. In this case however, the limit of the smear test is 0.0001 microcuries of Cs-137.
3. Immediately prior to shipment the source is smear tested as noted above with the same limits being applied.

I trust that the information contained herein is sufficient to permit registration of this source. If you have any questions please do not hesitate to contact me personally at any time.

Very truly yours,



T. N. Lahr  
Manager-Pilot Plant  
3M Nuclear Products

Enclosure

TNL/jl

SEALED SOURCE FILE



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Nuclear Products

September 21, 1964

United States Atomic  
Energy Commission  
Washington, D. C. 20545

Attention: Mr. Cecil R. Buchanan  
Assistant Chief  
Isotopes Branch  
Division of Materials Licensing

Subject: Cs-137 Gamma Source, 3M Model 4F6S

Dear Mr. Buchanan:

Reference your letter of 14 September 1964.

The minimum wall thicknesses for each of the two source capsules are as follows:

Side (circular) walls - 0.060"

End wall - 0.025"

If further information is needed please do not hesitate to contact me.

Very truly yours,

Robert J. Kunz  
Supervisor  
Administrative Services  
TCAAP-588

RJK/ar



MINNESOTA MINING

FACTURING COMPANY

9609040081 lp.

50PP 02



ML:LB:WEN

SEP 14 1964

Minnesota Mining and  
Manufacturing Company  
2501 Hudson Road  
St. Paul 19, Minnesota

Attention: Mr. Robert J. Kusz

Gentlemen:

This responds to your letter dated August 14, 1964, containing information pertinent to your Model 4F68 sealed source. We note your comment that the dimensions given in your drawing No. A-1921-78 may vary. We request that you specify the minimum thickness of each wall of the two source capsules.

Sincerely yours,

Cecil E. Buchanan  
Assistant Chief  
Isotopes Branch  
Division of Materials  
Licensing

bcc: Sealed Source Files

SEALED SOURCE FILES

ML:LB  
WENhaddican:bjb

ML:LB  
CRB Buchanan

9/9/64

9/ /64

9604090122 ip



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Nuclear Products

August 14, 1964

United States Atomic Energy  
Commission  
Washington, D. C. 20545

Attention: Mr. William O. Miller  
Isotopes Branch  
Division of Materials Licensing

Subject: Cs-137 Gamma Source, 3M Model 4F6S

Dear Bill:

The purpose of this correspondence is to place on file information pertinent to our High Integrity Cs-137 Gamma Source, Model 4F6S.

This source is designed to be used in applications where a high integrity gamma source is needed, particularly where extreme environmental conditions are involved.

Sources would be fabricated using Cs-137. Activity loadings may vary from about 10 mc to 5 curies.

The Cs-137 used in these sources is in the form of 3M Brand Radiating Microspheres. The Cs-137 is absorbed into the Microspheres, which are initially strong, porous ceramic particles, and a heat treatment chemically and physically fixes the activity in place. The still free flowing particles are then subjected to an acid wash to remove any surface activity. The particle sizes of the Microspheres are in the 30 to 200 micron range. The Microspheres retain their particulate nature up to at least 1500°C. The Microspheres have been subjected to a dose of 1000 megarads with no visible change nor any lessening of the ability of the carrier to retain isotopes. The specific activity of the Microspheres is determined by either solution of a weighed quantity of the spheres in hydrofluoric acid followed by a beta counting, and/or direct assay of a weighed quantity of the spheres.

**SEALED SOURCE FILES**

MINNESOTA MINING AND MANUFACTURING COMPANY

7609090127 4 pp.



William O. Miller  
U.S. Atomic Energy  
Commission

August 14, 1964

The Cs-137 Microspheres are loaded into the inner capsule using a calibrated scoop. The inner plug is then silver brazed in place. The inner capsule is then placed in the outer capsule and the outer plug heliarc welded in place.

Enclosed please find 3M drawing A-1921-78 which presents the physical dimensions and the materials of construction of the source. The physical dimensions are for a typical source and may vary from about  $\frac{1}{2}$  the size presented to about twice the size, in both diameter and length. Also the inner capsule may be inverted, depending upon the end use.

Depending upon the end use of the source either the following information would be engraved on the exterior of the outer capsule, or a permanent type label containing the information presented below plus the radiation symbol would be affixed to the exterior of the outer capsule.

Caution Radioactive Material  
X mc Cs-137  
Serial XXX  
Model 4F6S  
Date  
3M Company

The following tests have been performed on 1 curie prototype models of this source. After each test the source was wipe tested and leak tested. The wipe tests were counted in a detection instrument capable of detecting less than  $0.0001 \mu\text{c}$  of Cs-137. All wipes showed less than  $0.0001 \mu\text{c}$  of removable Cs-137. The leak tests were performed by immersing the source for a minimum of 10 seconds in water at  $200^{\circ}\text{F}$  and observing any bubbles generated. All leak tests were negative.

1. Heat Test - Heating at  $1000^{\circ}\text{C}$  for 30 minutes.
2. Quench Test -  $1000^{\circ}\text{C}$  to cold water.
3. Molten Lead Test - Immersion in molten lead at  $437^{\circ}\text{F}$   $500^{\circ}\text{C}$  for 30 minutes.
4. Impact Test - Dropping a weight generating 2 foot pounds on sides of source at two points  $180^{\circ}$  apart, and on each end, the test being performed 20 times at each point.

The following quality control procedures are followed during the fabrication of these sources:

SEALED SOURCE FILES

William O. Miller  
U.S. Atomic Energy  
Commission

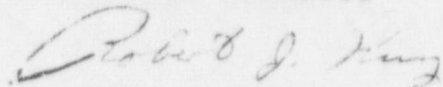
August 14, 1964

1. After the inner plug has been silver brazed in place the inner capsule is cleaned up until wipe tests show less than 0.0005  $\mu\text{c}$  of removable Cs-137.
2. After outer plug has been welded in place the source is wipe tested. If the wipe yields greater than 0.0001  $\mu\text{c}$  of Cs-137 the source is cleaned up until this wipe test limit has been reached.
3. Source is then stored for 7 days and wipe tested again. If the wipe yields greater than 0.0001  $\mu\text{c}$  of Cs-137 the source is rejected.
4. Before shipment the source is again wipe tested, and this wipe also must show less than 0.0001  $\mu\text{c}$  of removable Cs-137.

I trust that the information contained herein is sufficient to permit your registration of this source. If there are any questions please do not hesitate to contact me.

Very truly yours,

MINNESOTA MINING AND  
MANUFACTURING COMPANY  
Nuclear Products



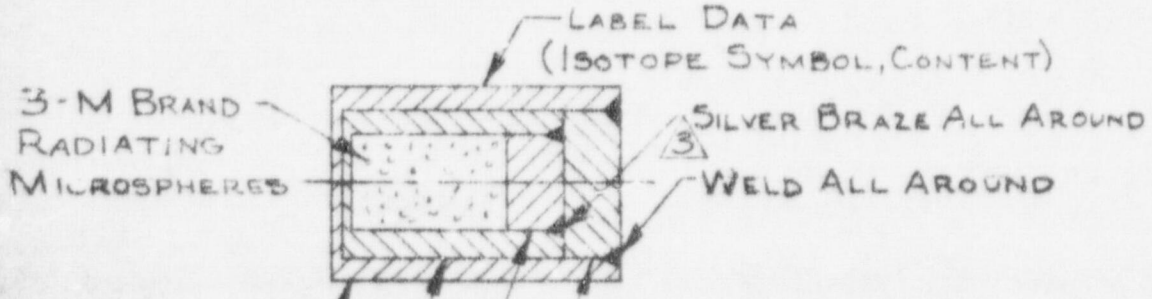
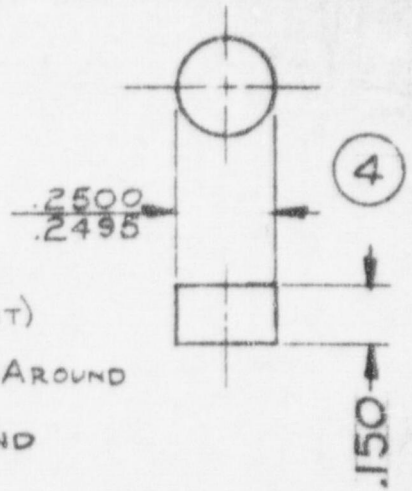
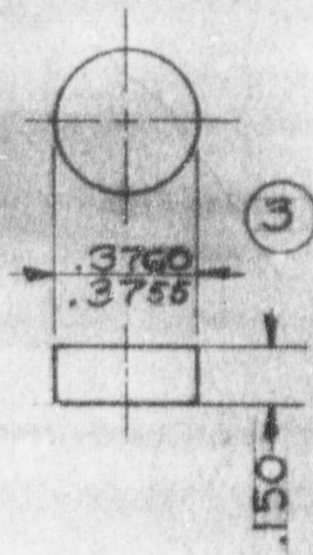
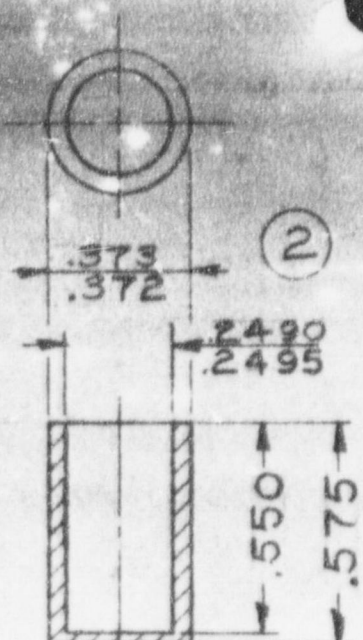
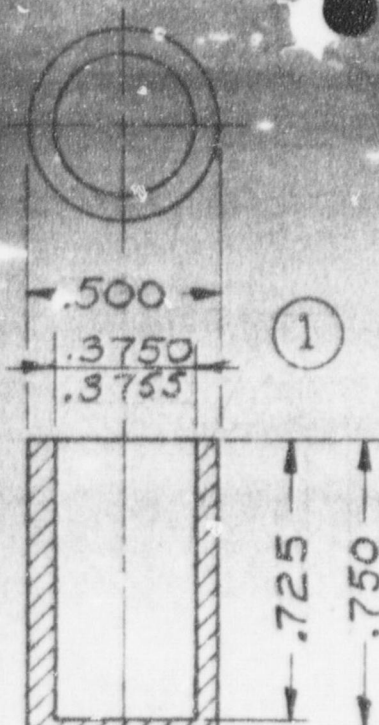
Robert J. Kunz  
Supervisor  
Administrative Services  
TCAAP-588

RJK/tmw  
Encl:



SEALED SOURCE FILES





ASS'Y.

NOTE:  
 1- SAFE OPERATING TEMP.  
 1200° F. (MAX).  
 2- MILLICURIE CONTENT  
 0-5000 Cs-137.

### SEALED SOURCE FILES

MAT'L.  
 STAINLESS STEEL OR  
 MONEL

31

USED ON

EXCEPT AS NOTED. FINISH G 3

EXCEPT AS NOTED. TOLERANCES  
 FRAC. DIM. ± WELD-CSTG DIM. ±  
 DEC. DIM. ± .003 ANGULAR DIM. ±

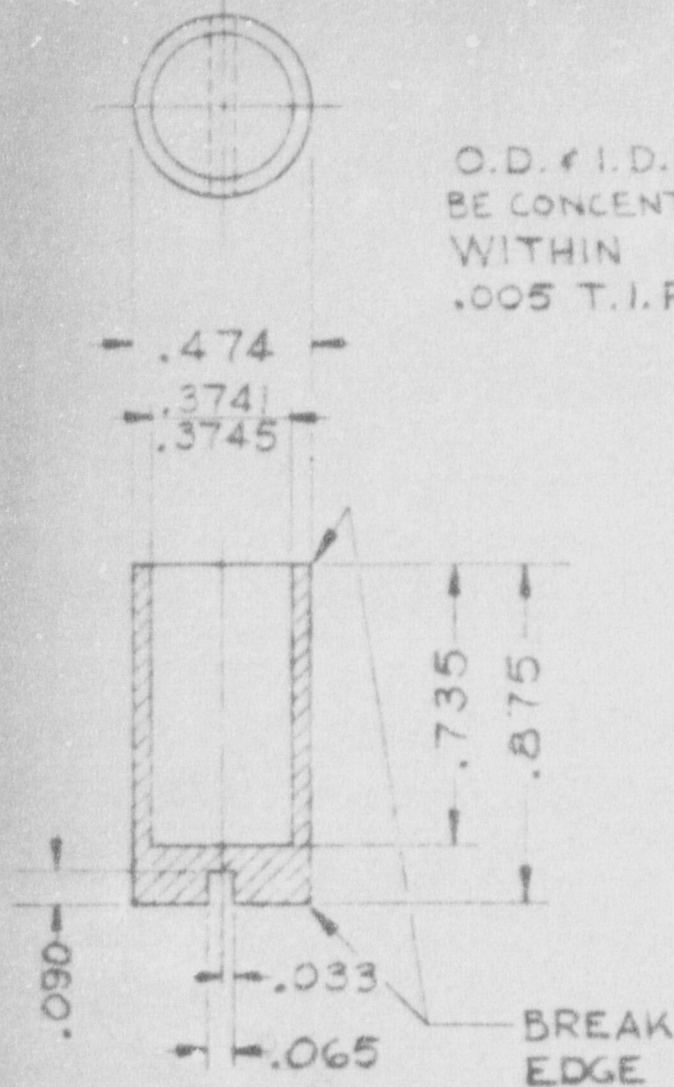
DR. J.D. SWENSON SCALE 2"=1"

CH. APP.

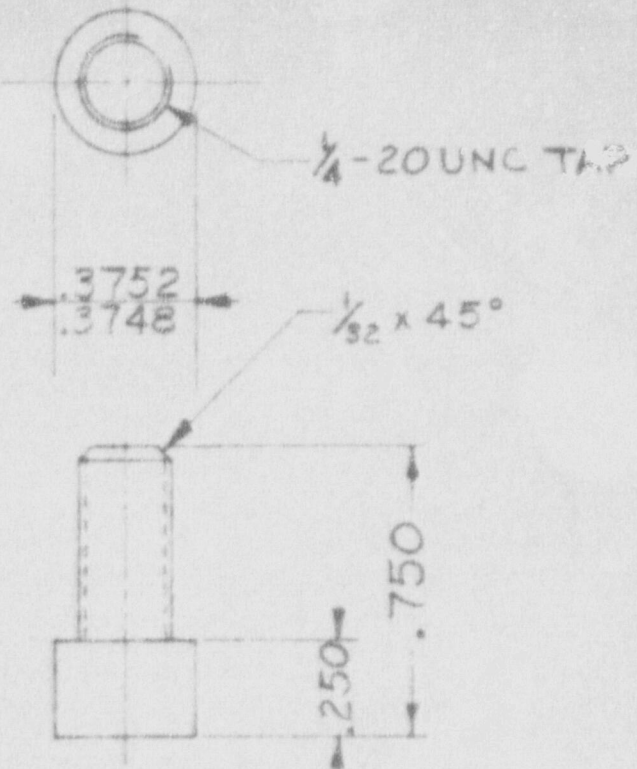
MINNESOTA MINING & MANUFACTURING CO.  
 ST. PAUL, MINNESOTA

2	AUG. 14, 1964	JDS	
	WAS WELDED		
	DELETE NOTE		
	WAS OHMART POINT SOURCE		
1	SEPT. 19, 63		
ISSUE	ISSUE DATE AND CHANGE RECORD	REV.	CH.
DIVISION STAFF LAB ENGR. PROJ.			
TITLE			
MODEL 4F65			
VOLUME SOURCE			
A	1921	78	





O.D. & I.D. TO  
BE CONCENTRIC  
WITHIN  
.005 T.I.R.



O.D. & THREADED STEM  
TO BE CONCENTRIC  
WITHIN .005 T.I.R.

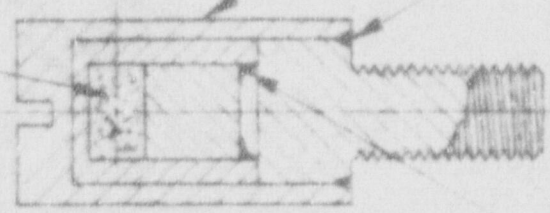
3M BRAND  
RADIATING  
MICROSPHERES  
CONTAINING  
ISOTOPE

ACTIVITY  
5  
8

ENGRAVED LABEL DATA

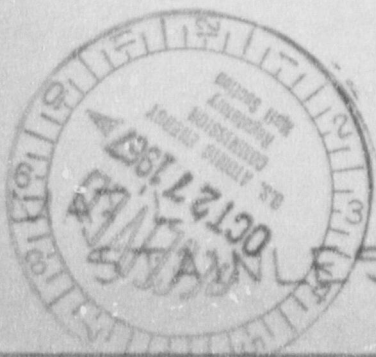
WELD ALL AROUND

NOTE:  
CAPSULE O.D.  
CONCENTRIC  
STEM TO WITHIN

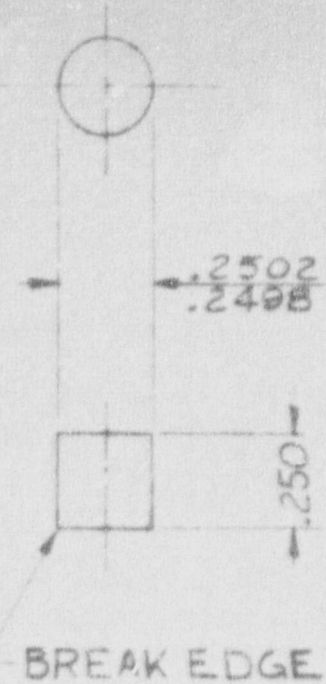
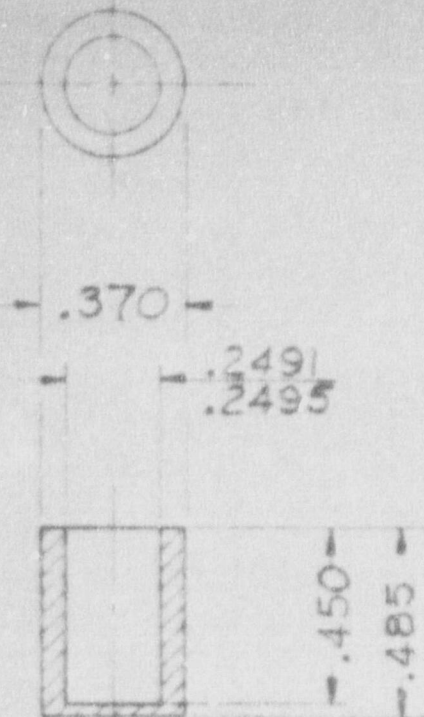


ASSEMBLY

SILVER BRAZE  
ALL AROUND



STAINLESS STEEL TYPE 304



**ANSTEC  
APERTURE  
CARD**

Also Available on  
Aperture Card

9805290387-01

TO BE  
WITH THREADED  
HIN .018" T.I.R.

USED ON

OCT. 24, 1967

TOLERANCES EXCEPT AS NOTED		MAXIMUM SURFACE ROUGHNESS EXCEPT AS NOTED		ISSUE	ISSUE DATE AND CHANGE RECORD	REV.	CH
MACHINED DIMENSIONS		63		DIVISION NUCLEAR PRODS PROJ.			
.80 ± .02   .000 ± .005		SCALE 2"=1"		TITLE			
ANGULAR DIM. ±		DR. J.D. SWENSON		Cs-137 SOURCE			
WELDMENT		CH. U.W. JOHNSON		WITH 1/4-20 UNC STUD END			
DINL		APP. TND		3M MODEL No. 4D6M			
MINNESOTA MINING & MANUFACTURING CO.		B		1921-738			
ST. PAUL, MINNESOTA							