

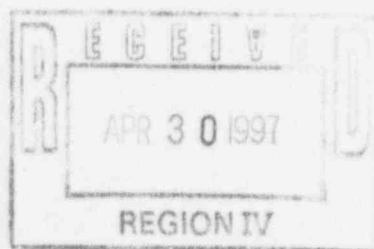


Tucker

TECHNOLOGIES, INC.

12607 E. 60th Street.
Tulsa, Oklahoma 74146-6910
(918) 252-5416 • Fax (918) 212-4496

IE-07



April 29, 1997

30-19278

U. S. Nuclear Regulatory Commission
Region IV
ATTN: Administrative Office
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011-8064

Please find Tucker Technologies, Inc. (license number 35-19815-01) written report required by the Nuclear Regulatory Commission stated in 10.1 CFR Part 39.35 (2).

This report is submitted for reason related to a radioactive source resulting in reading above 0.005 microcuries determined by its six-month wipe test. The source discussed is a 2 curie Cesium-137 well logging source. Source serial number is 1634GW, NRC model number CDC.CY4, Amersham product code CDC.2742 and Amersham's capsule type X2074. This source was purchased from Amersham in August 1992. This report will describe equipment and locations involved test results and the corrective actions taken.

I think you will agree that Tucker Technology, Inc. has handled this situation in a safe and respectful manner. Listed below are events in chronological order.

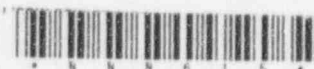
3/11/97 Wipe Tested R.A Source Serial #1634GW, 2ci Cs 137 (standard 6 month wipe test).

4/9/97 Charley Gallager from Monitoring Services in Houston Texas called to inform me that the wipe test preformed on the 11th March 1997 for R. A. Source Serial # 1634GW resulted reading of 5.7×10^{-3} microcuries (attachment 1). The legal wipe results are 5.0×10^{-3} microcuries. We discussed the situation and he informed me that sometimes sources have a high wipe reading due to small bubbles breaking loose created at the weld during manufacturing. Usually a second wipe will confirm this by resulting in a lower reading. He also informed me if the second wipe test resulted in lower reading it could be used for the official 6-month wipe test.

4/9/97 Wiped Tested R.A. Source Serial # 1634GW to confirm the above theory and sent wipe test envelope Federal Express to Monitoring Services in Houston, requesting results as soon as possible. While waiting for results the source was not used or removed from its holding pit and the source handling stick and last tool the source was placed in were contained. I have complete confidence in Monitoring Services capabilities. However, I wanted to confirm that Monitoring Services had not made some type of mistake, for example mixing up wipe test packets, contamination of wipe at Monitoring Services facility, or any other possible human error. This source had never indicated any evidence of problems in the previous five years of wipe testing (attachment 2). Since the source had not been transported or used down hole since the last wipe test it seemed unusual that it could have been damaged causing a leak. The pervious wipe was preformed on the 9th September 1996 and the results were 4.53×10^{-7}

IE 2/1

9705120054 970429
PDR ADOCK 03019278
C PDR



microcuries. The only usage of this source since the wipe performed on the 9TH September 1996 was 2/18/97 when it was used to calibrate lithology density pad (LDP-BA-010) at our facility in Tulsa. It was also used in LDP-BA-010 on 2/21/97 to collect data from our natural occurring blocks we have at our facility. It was never used down hole in our test well or any other wells during that time period.

4/14/97 Called Charles Gallagher at Monitoring Services in Houston requesting the results of the second wipe test. His reply was the second wipe was okay and the reading was 2.01×10^{-4} microcuries, which is well below legal limits. However, I still had concerns why the first wipe test performed on 3/11/97 was high. I called Dave Jones with Gamma Tron, explained the situation, and expressed concern about the results of the 3/11/97-wipe test. I asked him if he could check the source to help determine if it was as bubble breaking loose from the weld created during manufacturing or what could have caused the high wipe test results. He said he could check the source but he suggested that since Amersham manufactured the source I contact them for assistance.

4/14/97 I called Amersham and talked to Lisa Lee in customer support. Informed her that we had a problem with a source manufactured by Amersham, (a 2 ci CS 137, NRC model # CDC.CY4, Amersham Product Code CDC.2742 and Amersham Capsule Type x2074, serial # 1634GW) which was received in August 1992 already placed in our designed bull-plug. I asked her if Amersham could check the source to help determine the high wipe test on 3/11/97 and the low wipe test on 4/9/97. She said she would talk to her advisor and get back with me.

4/14/97 Jim Horn with Amersham called back and we discussed the results of the wipe test. He told me that it could have been a bubble breaking loose and that it would not leak any more. We also discussed having the source wipe tested once a week for several months while it was being contained and if a high reading resulted again appropriate action would take place. Jim said he would talk to his advisor Paul Mellor and get back with me.

4/14/97 Jim Horn from Amersham called again and said Paul Mellor wanted us to send the source back to Amersham in Arlington Heights, Illinois and they would check the source for leaks. Amersham Reference # SCR 1092.

4/15/97 The source was shipped back to Amersham with all documentation on Roadway Trucking. The source pig key was sent separately by certified mail to the attention of Jim Horn.

4/24/97 Called Jim Horn with Amersham to check for results of source 1634GW. He said the source was leaking and would be disposed of by Amersham. He also said a complete written report would be forwarded to me when completed.

4/24/97 Talked to Linda Howell with the NRC. Discussed the process of filling out a leaking source report 10.1 CFR Part 39.35. which is to be filed with the NRC Region IV Administrative Office.

4/25/97 Wipe tested pit in which R.A. Source 1634GW was stored, wipe tested the source stick which was used to handle source, and wipe tested the last tool which the source was placed in LDP-BA-010 on 2/21/97.

4/25/97 Called Charley Gallagher with Monitoring Services for the official final results for source 1634GW wipe dated 9th April 1997. I had received verbal and fax results on the 14th of April 1997 (attachment 3), but I wanted the official final results for my written report to the NRC. He was not in and I was informed that he would not be in until Monday April 28, 1997. Asked if there was any one else that could assist me and was informed there was not.

4/25/97 Called Amersham and talked to Jim Horn and Paul Mellor on a conference call. Paul Mellor informed me that two-wipe test were performed on the source bull-plug and the highest reading was 1 nCi. He also informed me that a wipe test was performed on the transportation pig that the source was shipped in, and it had no measurable contamination levels. He did say that the source was removed from the bull-plug and the source capsule was wipe tested at the weld and the results showed 65 nCi of contamination was removed. They also mentioned that since contamination levels were so low it indicated that the primary source was not leaking and was only the secondary container that was leaking. Paul informed me that he would try to have his written report faxed to me today, but if not he would for sure have it completed and to me the first thing Monday morning.

4/25/97 Jim Horn with Amersham called and wanted me to fax drawings of our source holder (bull-plug) to him. I faxed Jim 3 drawings, (1) drawing #1201 which was specifications on Amersham's capsule CDC.CY4, (2) drawing #10169 which was source holder, assembly cap, shield and sub., (3) drawing where to fuse (weld) cap. All drawings are (attachment 4).

4/25/97 Called Linda Howell with the NRC updating her with the information I had received from Amersham about the wipe test results which indicated that the source holder had contained most of the contamination. Informed her that I had faxed drawing of our source holder to Amersham, had wipe tested the pit which 1634GW, and had been stored in, wipe tested the source handling stick that was used to handle source 1634GW and had wipe tested the last tool that the source had been placed in. Informed her that even though I had wiped the above items I would not have the results back from Monitoring Services before I send my written response to the NRC on Monday 4/28/97. She said that would be okay and I could append the information at a later date. Linda asked me if Amersham had already disposed of the source or if they still had it. I told her to the best of my knowledge they had already taken the proper steps for disposal, and did not know if they had already shipped for disposal. I told Linda that I felt we had completed all of necessary procedures and asked her if there was anything more we could do. She agreed we had met the entire requirement. She did suggest that we keep all of this information in our decommission file. Her suggestion was noted and will be completed.

4/25/97 Received the written examination report from Amersham's Paul Mellor (attachment 5). I reviewed his report and noted that he had left out the information concerning the wipe test results performed on the transportation pig.

4/25/97 Called Paul Mellor of Amersham back to request that he include the results of the wipe test performed on the transportation pig. Also, I asked him if the 2 o-rings that are placed inside the source holder were present when they disassembled the source. His reply was no they were not. This was not mentioned in his report. I will call him back on Monday 4/28/97 requesting this be included. I feel this is important.

because the o-rings are installed to prevent the very movement that he is mentioning in the discussion and recommendation section of his report. Paul did mention that he did not like to install o-rings inside sources because of the possibility of the radiolysis that can form acids with certain o-ring materials. I informed Paul that Amersham loaded the source in our bull-plug (source holder) and if the o-rings were missing, Amersham left them out. As indicated in attachment 4 drawing #10169 in the Notes section. Paul also mentioned that he thought this source was a 1 in-a-million incident.

4/28/97 Called Paul Mellor with Amersham. He was not available, I talked to Lisa Lee asking her to leave a message with Paul concerning the o-rings. Also asked Lisa to have Paul call me back as soon as he could.

4/28/97 Called Charley Gallagher with Monitoring Services, he had not arrived at work yet this morning. I left a message for him to call me as soon as he arrived.

4/28/97 Called Charley Gallagher with Monitoring Services, informing him of the 3 wipe tests that I Federal Expressed to him on 4/25/97. He said he had received the package and he would try to perform the survey today and fax me the result. Also I informed him that I had not received the final official result of the wipe test taken on the 4/9/97. He informed me that he had sent them out. I checked with our accounts received and found the results. Included as (attachment 6).

4/28/97 Called Paul Mellor with Amersham requesting that he mention in his report the o-rings were missing when Amersham disassembled the source. This matter was noted in this report on 4/25/97. Also I asked Paul to fax me his updated report so I could include it with my report to the NRC.

4/28/97 Received from Monitoring Services a fax with the preliminary results of the three wipe test taken on 4/25/97. Wipe (1) was of the pit which 1634GW was stored in, the result was 0.3×10^{-04} uci/100 sq. cm. Wipe (2) was of LDT-BA-010 the last tool, source 1634GW was placed in, the result was 0.2×10^{-04} uci/100 sq. cm. Wipe (3) was of the source handling stick use to handle source 1634GW, the result was 0.5×10^{-05} uci/100 sq. cm. This is included in (attachment 7). In conversation with Paul Mellor I informed him of the results and said this was not a problem. Charley Gallagher of Monitoring Services agreed that the wipe indicated no contamination. For gamma and beta the allowable limits for unrestricted use you are allowed 1000 DPM. As you can see we are well under these limits with readings of 58, 36 and 11 DPM.

4/29/97 Received from Paul Mellor of Amersham by fax his updated examination report for source serial number 1634GW. This is included in (attachment 8).

As Paul Mellor of Amersham indicated in his report, the source had not catastrophically failed. I believe the problem was caught and corrected before this could take place due to quick action taken part by Tucker Technologies, Inc. and Amersham.

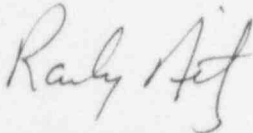
Tucker Technologies, Inc. is currently investigating replacing the 2 o-rings, which are used to prevent source movement inside the source holder indicated on drawing #10169, with some type of spring washer or waffle spring or gap spring. When the best type of spring is located this modification will be implemented. This will eliminate the possibility of the acid species that could occur between the o-ring and the radiation

indicated by Paul Mellor of Amersham. However, this has no impact on the source-leaking problem.

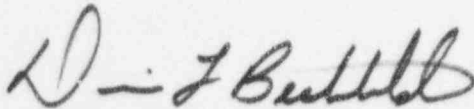
Tucker Technologies, Inc. will notify all of their service districts (none are presently in United States) of the situation that has occurred. Informing them of the modification of the o-rings being replaced with the spring and the fusing of the source holder a complete 360 degrees instead of present four tacks at 90 degrees.

Should you have questions or information concerning this report please contact me at the above address or phone number.

Sincerely;

A handwritten signature in cursive script, appearing to read "Randy Nitz".

Randy Nitz RSO

A handwritten signature in cursive script, appearing to read "Dennis Bechhold".

Dennis Bechhold
Controller

Attachment
1



Monitoring Services

P.O. BOX 580648 • HOUSTON, TEXAS 77256-0648 • AREA CODE 713/641-0391 • FAX 713/641-6153

SEALED SOURCE LEAK TEST CERTIFICATE

TUCKER TECHNOLOGIES INC.
12607 EAST 60TH ST. SOUTH
TULSA, OK 74146
ATTN OF: R. NITZ

C FILE 1793

S FILE 17103

N FILE 1409

INVOICE NO. _____ DATE _____

RADIONUCLIDE CS-137

ACTIVITY 2 CI SERIAL NO 1634 GW

WIPE DATE 031187 WIPED BY _____

EFF. .995

GROSS CPM 12606 BKG CPM 19 NET CPM 12587

NET CPM _____ = MICROCURIE

EFFX2.22X10⁶ DPM/ μ CI

THE ABOVE SOURCE WIPE TEST HAS BEEN ASSAYED IN ACCORDANCE WITH OUR RADIOACTIVE MATERIAL LICENSE AND THE APPROPRIATE REGULATORY REQUIREMENTS. THE REGULATIONS DEFINE A LEAKING SOURCE AS ONE FROM WHICH AN APPROPRIATE WIPE TEST HAS REMOVED 0.005 MICROCURIE OR MORE OF ACTIVITY.

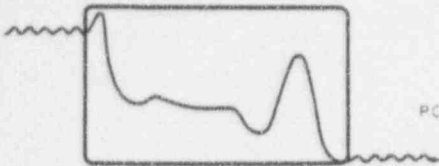
THE REMOVABLE ACTIVITY WAS 5.70E-03 MICROCURIE

ASSAY NO. 040597 12 DATE 04-05-19.97

ASSAYED BY Paul Tully

*Revised 4/14/97 by results
OK checked by phone
going to check about 4/14/97
Source Resealed*

**Attachment
2**



Monitoring Services

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SEALED SOURCE LEAK TEST CERTIFICATE

TUCKER TECHNOLOGIES INC.
12607 EAST 60TH ST. SOUTH
TULSA, OK 74146
ATTN OF: R. NITZ

C FILE 1793

S FILE 17103

N FILE 1409

INVOICE NO. _____ DATE _____

RADIONUCLIDE CS-137

ACTIVITY 2 CI SERIAL NO 1634 GW

WIPE DATE 031197 WIPED BY _____

EFF. .995

GROSS CPM 12606 BKG CPM 19 NET CPM 12587

NET CPM _____ = MICROCURIE

EFFX2.22X10⁶ DPM/μ CI

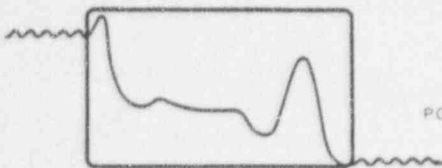
THE ABOVE SOURCE WIPE TEST HAS BEEN ASSAYED IN ACCORDANCE WITH OUR RADIOACTIVE MATERIAL LICENSE AND THE APPROPRIATE REGULATORY REQUIREMENTS. THE REGULATIONS DEFINE A LEAKING SOURCE AS ONE FROM WHICH AN APPROPRIATE WIPE TEST HAS REMOVED 0.005 MICROCURIE OR MORE OF ACTIVITY.

THE REMOVABLE ACTIVITY WAS 5.70E-03 MICROCURIE

ASSAY NO 040597 12 DATE 04-05-19.97

ASSAYED BY Charles T. Hilly

*Revised 4/1/97 by Results
OK checked by phone
going to check about heavy
source removal*



Monitoring Services

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SEALED SOURCE LEAK TEST CERTIFICATE

TUCKER TECHNOLOGIES INC.
12607 EAST 60TH ST. SOUTH
TULSA, OK 74146
ATTN OF: R. NITZ

C FILE 1793

S FILE 17103

N FILE 1409

INVOICE NO. _____ DATE _____

RADIONUCLIDE CS-137

ACTIVITY 2 CI SERIAL NO 1634 GW

WIPE DATE 090996 WIPED BY _____

EFF. .995

GROSS CPM 22 BKG CPM 21 NET CPM 1

NET CPM _____ = MICROCURIE

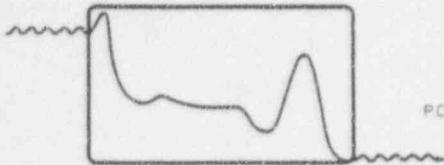
EFFX2.22X10⁶ DPM/μ CI

THE ABOVE SOURCE WIPE TEST HAS BEEN ASSAYED IN ACCORDANCE WITH OUR RADIOACTIVE MATERIAL LICENSE AND THE APPROPRIATE REGULATORY REQUIREMENTS. THE REGULATIONS DEFINE A LEAKING SOURCE AS ONE FROM WHICH AN APPROPRIATE WIPE TEST HAS REMOVED 0.005 MICROCURIE OR MORE OF ACTIVITY

THE REMOVABLE ACTIVITY WAS 4.53E-07 MICROCURIE

ASSAY NO. 091496 110 DATE 09-14-1996

ASSAYED BY *Clark T. Hilly*



Monitoring Services

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SEALED SOURCE LEAK TEST CERTIFICATE

TUCKER TECHNOLOGIES INC.
12607 EAST 60TH ST. SOUTH
TULSA, OK 74146
ATTN OF: P. NITZ

C FILE 1793

S FILE 17103

N FILE 1409

INVOICE NO. _____ DATE _____

RADIONUCLIDE CS-137

ACTIVITY 2 CI SERIAL NO. 1634 GW

WIPE DATE 031296 WIPED BY _____

EFF. .995

GROSS CPM 33 BKG. CPM 19 NET CPM 14

NET CPM _____ = MICROCURIE

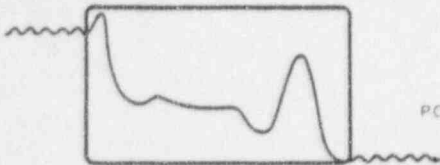
EFFX2.22X10⁶ DPM/ μ CI

THE ABOVE SOURCE WIPE TEST HAS BEEN ASSAYED IN ACCORDANCE WITH OUR RADIOACTIVE MATERIAL LICENSE AND THE APPROPRIATE REGULATORY REQUIREMENTS. THE REGULATIONS DEFINE A LEAKING SOURCE AS ONE FROM WHICH AN APPROPRIATE WIPE TEST HAS REMOVED 0.005 MICROCURIE OR MORE OF ACTIVITY.

THE REMOVABLE ACTIVITY WAS 6.34E-06 MICROCURIE

ASSAY NO. 032396 14 DATE 03-23-19.96

ASSAYED BY *Charles T. Wilgus*



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SEALED SOURCE LEAK TEST CERTIFICATE

TUCKER TECHNOLOGIES INC.
12607 EAST 60TH ST. SOUTH
TULSA, OK 74146
ATTN OF: R. NITZ

C FILE 1793

S FILE 17103

N FILE 1409

INVOICE NO. _____ DATE _____

RADIONUCLIDE CS-137

ACTIVITY 2 CI SERIAL NO. 1634 GW

WIPE DATE 090595 WIPED BY _____

EFF .995

GROSS CPM 20 BKG. CPM 18 NET CPM 2

NET CPM _____ = MICROCURIE

EFFX2.22X10⁶ DPM/ μ CI

THE ABOVE SOURCE WIPE TEST HAS BEEN ASSAYED IN ACCORDANCE WITH OUR RADIOACTIVE MATERIAL LICENSE AND THE APPROPRIATE REGULATORY REQUIREMENTS. THE REGULATIONS DEFINE A LEAKING SOURCE AS ONE FROM WHICH AN APPROPRIATE WIPE TEST HAS REMOVED 0.005 MICROCURIE OR MORE OF ACTIVITY.

THE REMOVABLE ACTIVITY WAS 9.05E-07 MICROCURIE

ASSAY NO. 090995 20 DATE 09-09-19.95

ASSAYED BY Charles T. Hilly



Monitoring Services

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SEALED SOURCE LEAK TEST CERTIFICATE

DIGITAL LOGGING INC.
12607 EAST 60TH ST. SOUTH
TULSA, OK 74146
ATTN OF: D. GYRE

C FILE 1793

S FILE 17103

N FILE 1409

INVOICE NO. _____ DATE _____

RADIONUCLIDE CS-137

ACTIVITY 2 CI SERIAL NO. 1634 GW

WIPE DATE 111794 WIPED BY _____

EFF .995

GROSS CPM 32 BKG CPM 16 NET CPM 16

NET CPM _____ = MICROCURIE

EFFX2.22X10⁶ DPM/ μ CI

THE ABOVE SOURCE WIPE TEST HAS BEEN ASSAYED IN ACCORDANCE WITH OUR RADIOACTIVE MATERIAL LICENSE AND THE APPROPRIATE REGULATORY REQUIREMENTS. THE REGULATIONS DEFINE A LEAKING SOURCE AS ONE FROM WHICH AN APPROPRIATE WIPE TEST HAS REMOVED 0.005 MICROCURIE OR MORE OF ACTIVITY.

THE REMOVABLE ACTIVITY WAS 7.24E-06 MICROCURIE

ASSAY NO. 112494 97 DATE 11-24-19.94

ASSAYED BY Charles T. Gylfe

RECEIVED
NOV 30 1994



Monitoring Services

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SEALED SOURCE LEAK TEST CERTIFICATE

DIGITAL LOGGING INC.
12607 EAST 60TH ST. SOUTH
TULSA, OK 74146
ATTN OF: D. AYRE

C FILE 1793

S FILE 17103

N FILE 1409

INVOICE NO. _____ DATE _____

RADIONUCLIDE CS-137

ACTIVITY 2 CI SERIAL NO. 1634 GW

WIPE DATE 050694 WIPED BY _____

EFF. .995

GROSS CPM 36 BKG. CPM 19 NET CPM 17

NET CPM _____ = MICROCURIE
EFFX2.22X10⁶ DPM/μ CI

THE ABOVE SOURCE WIPE TEST HAS BEEN ASSAYED IN ACCORDANCE WITH OUR RADIOACTIVE MATERIAL LICENSE AND THE APPROPRIATE REGULATORY REQUIREMENTS. THE REGULATIONS DEFINE A LEAKING SOURCE AS ONE FROM WHICH AN APPROPRIATE WIPE TEST HAS REMOVED 0.005 MICROCURIE OR MORE OF ACTIVITY.

THE REMOVABLE ACTIVITY WAS 7.70E-06 MICROCURIE

ASSAY NO. 051494 23 DATE 05-14-1994

ASSAYED BY Paul T. Hylton



Monitoring Services

P.O. BOX 580648 • HOUSTON, TEXAS 77258-0648 • AREA CODE 713/641-0391 • FAX 713/641-6153

SEALED SOURCE LEAK TEST CERTIFICATE

DIGITAL LOGGING INC.
12607 EAST 60TH ST. SOUTH
TULSA, OK 74146
ATTN OF: ROGER TALOR

C FILE 1793

S FILE 17103

N FILE 1409

INVOICE NO. _____ DATE _____

RADIONUCLIDE CS-137

ACTIVITY 2 CI SERIAL NO 1634 GW

WIPE DATE 100893 WIPED BY _____

EFF .995

GROSS CPM 26 BKG CPM 19 NET CPM 7

NET CPM _____ = MICROCURIE
EFFX2.22X10⁶ DPM/ μ CI

THE ABOVE SOURCE WIPE TEST HAS BEEN ASSAYED IN ACCORDANCE WITH OUR RADIOACTIVE MATERIAL LICENSE AND THE APPROPRIATE REGULATORY REQUIREMENTS. THE REGULATIONS DEFINE A LEAKING SOURCE AS ONE FROM WHICH AN APPROPRIATE WIPE TEST HAS REMOVED 0.005 MICROCURIE OR MORE OF ACTIVITY.

THE REMOVABLE ACTIVITY WAS 3.17E-06 MICROCURIE

ASSAY NO. 100993 22 DATE 10-09-19.93

ASSAYED BY CTG

CUSTOMER REPORT



Monitoring Services

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SEALED SOURCE LEAK TEST CERTIFICATE

DIGITAL LOGGING INC.
12607 EAST 80TH ST. SOUTH
TULSA, OK 74146
ATTN OF: ROGER TALOR

C FILE 1793

S FILE 1710

N FILE 1409

INVOICE NO. _____ DATE _____

RADIONUCLIDE CS 137

ACTIVITY 2 CI SERIAL NO 1634 GW

WIPE DATE 040573 WIPED BY _____

EFF 1995

GROSS CPM 30 BKG CPM 18 NET CPM 12

NET CPM _____ = MICROCURIE
EFFX2.22X10⁶ DPM/μ CI

THE ABOVE SOURCE WIPE TEST HAS BEEN ASSAYED IN ACCORDANCE WITH OUR RADIOACTIVE MATERIAL LICENSE AND THE APPROPRIATE REGULATORY REQUIREMENTS. THE REGULATIONS DEFINE A LEAKING SOURCE AS ONE FROM WHICH AN APPROPRIATE WIPE TEST HAS REMOVED 0.005 MICROCURIE OR MORE OF ACTIVITY.

THE REMOVABLE ACTIVITY WAS 5.43E-06 MICROCURIE

ASSAY NO. 041073 14 DATE 04-10-1995

ASSAYED BY ETG

Radioactive source test report

SHEET 1 OF 1

product code CDC2742		description CAESIUM-137 OIL WELL LOGGING SOURCE		customer order no 419727 1 customer AMERSHAM CORPORATION C/O CIZZON CORP CUSTOMS BROKER 9650 W FOSTER AVENUE CHICAGO ILLINOIS 60656 AEC L USA		BSI/ISO classification C66646	
AI item no KB9604 2		nominal activity				special form certificate no GB/278/S	
source model no						recommended working life	
CDC.CY4 serial no batch no		2Ci measurement 1	74GBq	measurement 2	test D	15 YEARS test A	test A
1634GW	CURIES 2.21	date 18/08/92		date	18/08/92	19/10/92	18/08/92
notes							
<p>AKR - AIR-KERMA RATE IN MICROGRAYS PER SEC AT ONE METRE TO CONVERT AKR TO EQUIVALENT ACTIVITY IN CURIES MULTIPLY BY 1.25 THE ABOVE SOURCES PASSED A PRESSURE TEST OF 4 x 15 MINUTE PERIODS AT 25,000 PSI ON THE ABOVE SOURCES CONTAIN NOT MORE THAN 1% CS-134 DATE OF DESPATCH 6 NOV 92</p>							
signature		position		date		06/11/92	

*this classification complies with BS5288:1976, which is in agreement with ISO2919
(see overleaf for definition and description of tests)

Amersham International plc

Amersham Laboratories
White Lion Road
Buckinghamshire England HP7 9LL

Telephone (0494) 544000
Fax (0494) 543243
Cables Activity Amersham
Telex 83141 ACTIVA G

Amersham

PROCEDURES FOR RECEIVING RADIOACTIVE MATERIAL (SEALED SOURCES)

The following procedures will be used when receiving Sealed Sources:

1. Visual inspection: Check that source vault is locked and no apparent damage is visible.
2. Survey the package - it should have no more than 200 milliroentgens per hour at Package Surface or 10 milliroentgens per hour at 3 ft. If reading is in excess of this, notify the RSO, the shipping company and the N.R.C. Regional office.
3. Check for a current leak test. If there is no leak test, the source must be leak tested before use.
4. Check material to be sure it is on the License and check serial numbers; be sure material is what was ordered.
5. Take a wipe test of the interior of the transportation vault and check for contamination. If contamination exists, notify the Company R.S.O. immediately.

Take the following readings:

Package Surface 3 MR/Hr.

3 ft. from Surface .5 MR/Hr.

Wipe of Package Interior .02 MR/Hr.

Survey Meter Identification

Model Number Ludlum 3

Cal. Date 8-21-92

Manufacture Ludlum

Serial No. 63052

Signature [Signature]

Attachment
3

MONITORING SERVICES
PO BOX 580648
HOUSTON, TEXAS 77258-0648
(713) 641-0391
fax (713) 641-6153

fax

to: RANDY NITZ

fax #: 918-252-4496

from: CHARLES T. GALLAGHER

date: April 15, 1997

subject: PRELIMINARY RESULTS

pages: 2

NOTES: SEE ATTACHED

CONTINUING SERVICES

P. O. BOX 500000

HOUSTON, TEXAS 77258-0000

LEAK TEST REPORT

1. BY
TUCKER TECHNOLOGIES INC.
11007 FINE SOUTH ST SOUTH
HOUSTON TX 77040
ATTN: K. NITZ
LOCATION 1409

ATTN:
LOCATION

ASSAILED BY CTG

WIPE BY

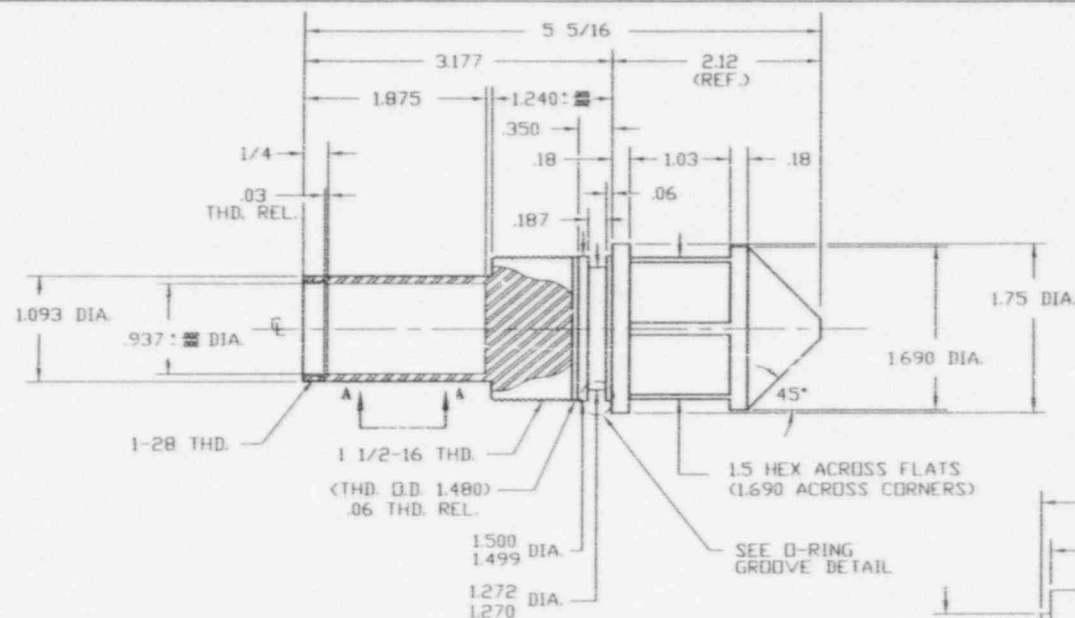
LEAK TEST RESULTS 04-12-97

DBG CPM= 21

ASST	FILE CODE	PROJECT NUMBER	SERIAL	DATE OF WIPE	ISOTOPE	GROSS CPM	NET CPM	EFF CPM	DBM	MICROCURIES
041297Ed	17103		1234 GW	04-09-97	CS-137	405	444	0.995	446	2.01E-04

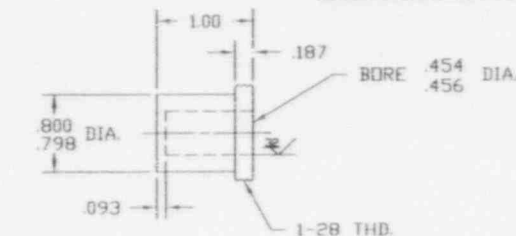
**Attachment
4**

REVISIONS				
REV	DESCRIPTION	DR	DATE	APPD
D	SEE ECN NO. 901	J.J.	2-12-91	R.T.
E	SEE ECN NO. 947 & REDRAWN TO AUTOCAD	S.L.	11-07-91	R.T.
F	SEE ECN NO. 2268	S.L.	04-27-93	



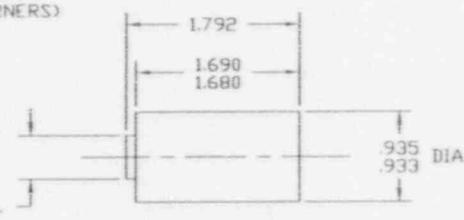
-4 DETAIL SOURCE SUB

MATERIAL: 17-4 PH SST. (91006-002B)



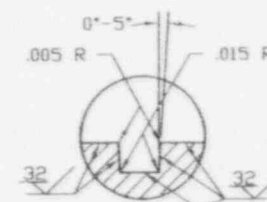
-2 DETAIL CAP

MATERIAL: 17-4 PH SST. (91006-0016)

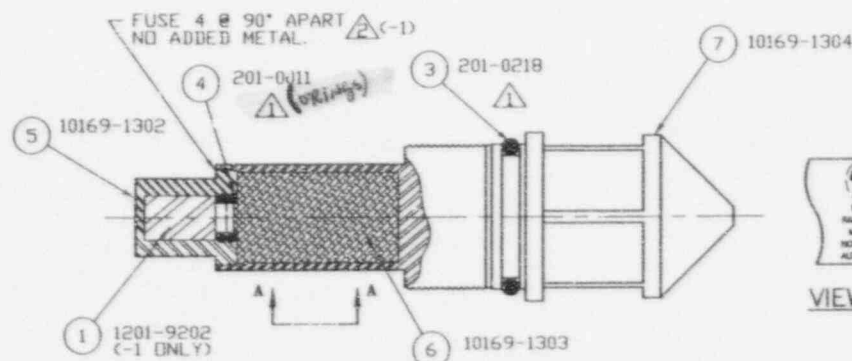


-3 DETAIL TUNGSTEN SHIELD

MATERIAL: TUNGSTEN (91161-0016)



O-RING GROOVE DETAIL
(NO SCALE)



-4301 SOURCE HOLDER ASSEMBLY

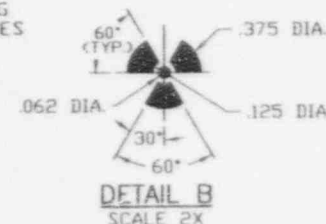
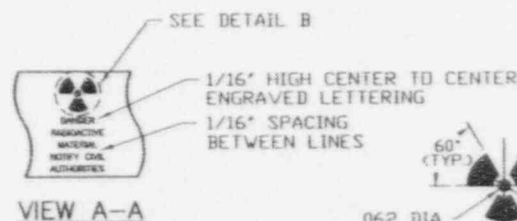
(WITH 2C CESIUM SOURCE)
(70045-4001: 1 REQ'D.)

-4302 SOURCE HOLDER ASSEMBLY

(LESS 2C CESIUM SOURCE)

NOTE:

- ALL O-RINGS MUST BE INSTALLED BEFORE INSERTING SOURCE.
- FUSING OPERATION TO BE PERFORMED BY SOURCE INSTALLER.



DETAIL B
SCALE 2X

PART NO.	DESCRIPTION
10169-4301	AS SHOWN (BCD ASSY & SOURCE)
10169-4302	AS SHOWN (BCD ASSY)
10169-1302	AS SHOWN -2 (CAP)
10169-1303	AS SHOWN -3 (TUNGSTEN SHIELD)
10169-1304	AS SHOWN -4 (SOURCE SUB)
10169-1305	SEE SHEET NO. 2
10169-4306	SEE SHEET NO. 2
10169-1307	SEE SHEET NO. 2
10169-4308	SEE SHEET NO. 2

UNLESS OTHERWISE SPECIFIED DO NOT SCALE THIS DRAWING REMOVE ALL BURRS AND SHARP EDGES ALL DIMENSIONS TO BE MET AFTER PLATING AND HEAT TREATING TOLERANCES ARE: DIMENSION XXX = 1.000 FRACTIONAL = 1/64 ANGULAR = 1/2°		THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY AND CONFIDENTIAL TO Tucker Technologies, Inc. AND MAY NOT BE REPRODUCED OR OTHERWISE USED WITHOUT WRITTEN PERMISSION FROM Tucker Technologies, Inc.			
DRAWN SDN-LE		DATE 11-07-91		TITLE SOURCE HOLDER, ASSEMBLY CAP, SHIELD AND SUB 2C CESIUM	
CHECKED		DESIGNED		SCALE 1:1	
ENGINEER		RELEASED		SHEET NO. 10169	
HEAT TREAT				REV F	
SEE SEPARATE PARTS LIST				SHEET 1 OF 2	

4

3

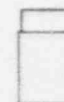
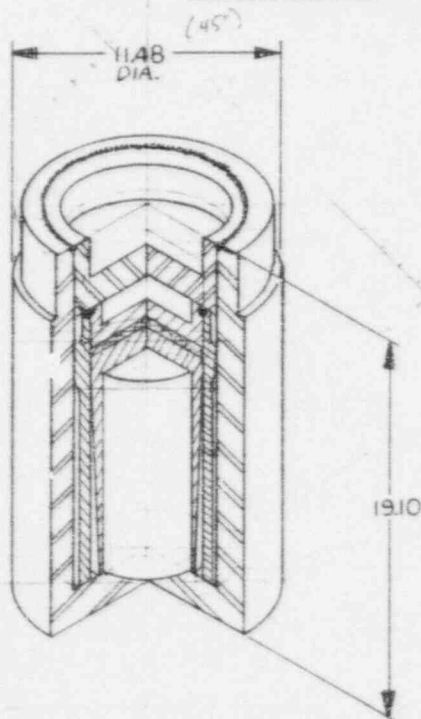
2

1

REVISIONS

SYM	DESCRIPTION	DR	DATE	APPD
A	REDRAWN PER ECL 897	D.H.	12-18-90	RT

ALL DIMENSIONS
METRIC MM



ACTUAL SIZE

CESIUM-137 GAMMA SOURCES

THIS DOCUMENT CONTAINS
INFORMATION PROPRIETARY &
CONFIDENTIAL TO
Tucker Technologies, Inc.
AND MAY NOT BE REPRODUCED
OR OTHERWISE USED
WITHOUT WRITTEN PERMISSION FROM
Tucker Technologies, Inc.


MFR. P/L:

CAPSULE TYPE: X2074
AMERSHAM PRODUCT CODE: CDC. 2742
NRC MODEL #: CDC. CY4

PART NO.	DESCRIPTION
1201-9202	AS SHOWN

MANUFACTURER:

AMERSHAM CORP
2636 SO. CLEARBROOK DR.
ARLINGTON HEIGHT, IL 60005

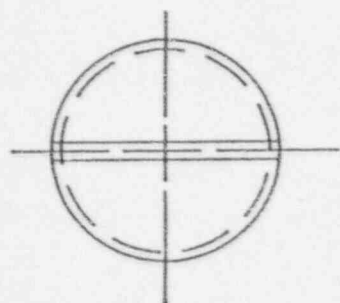
			UNLESS OTHERWISE SPECIFIED		CONTRACT NO.		 Tucker Technologies, Inc. Tulsa, Oklahoma, U.S.A.	
			DO NOT SCALE THIS DRAWING		CUSTOMER		TITLE	
			REMOVE ALL BURRS AND SHARP EDGES		DRAWN BY		SPEC. SOURCE 2C1	
			ALL DIMENSIONS TO BE MET AFTER PLATING		DATE		CS 137	
			TOLERANCES ARE:		D. HORN		12-18-90	
			DECIMAL XX: ± .01 XXX: ±		CHECKED BY		SIZE	
			FRACTIONAL: ± ANGULAR: ±		DESIGNED BY		DRAWING NO.	
			MATERIAL		RELEASED BY		1201	
							REV.	
							A	
1069-4301 -2 1							SCALE 4:1	
NEXT ASSY -NO QTY							SHEET / OF /	
APPLICATION								

4

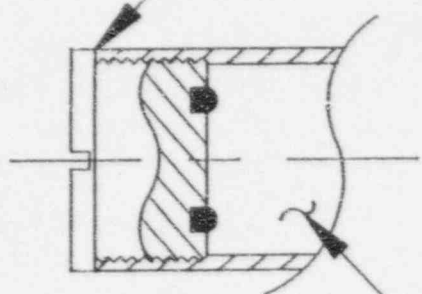
3

2

1



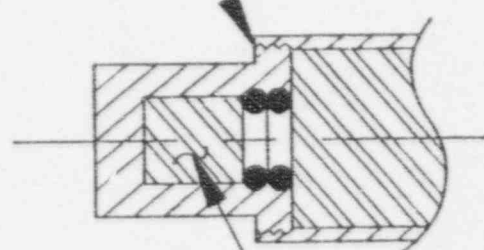
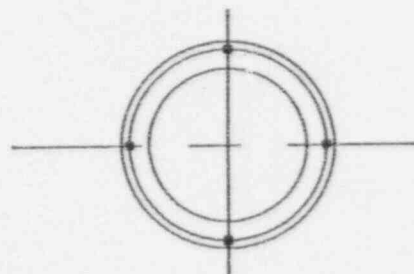
FUSE @ 90° APART
NO ADDED METAL.



20 CI AMBE

SOURCE HOLDER ASSEMBLY

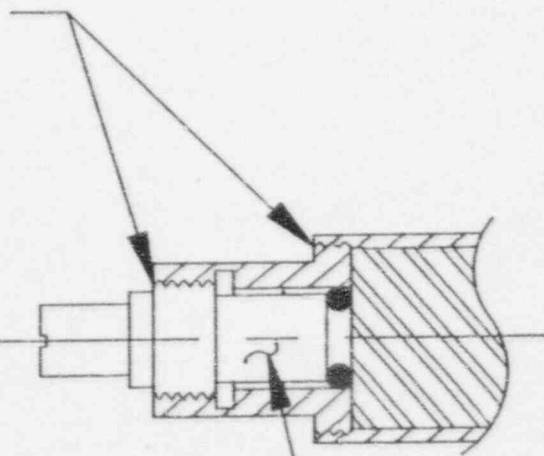
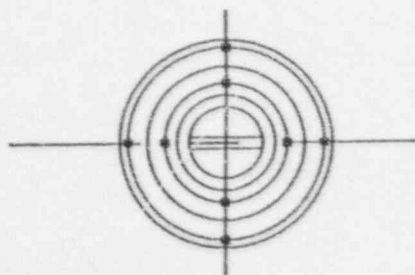
FUSE @ 90° APART
NO ADDED METAL.



2 CI CESIUM

SOURCE HOLDER ASSEMBLY

FUSE @ 90° APART
NO ADDED METAL.



2 CI CESIUM

SOURCE HOLDER ASSEMBLY



Tucker
TECHNOLOGIES, INC.

Tulsa, Oklahoma U.S.A.

**Attachment
5**



fax

Sources

Amersham Corporation
2636 S. Clearbrook Drive
Arlington Heights
Illinois 60005-4692

tel 847 593-6300
fax 847 593-8091

Amersham
QSA

to	copy
Randy Nitz	
address/location	
Tucker Technology	
fax number	
918 252 4496	
from	
Paul Mellor Commercial Operations Manager	
	number of pages to follow
April 24 97	
if this message is not fully or legibly received please telephone 847 593 6300 X369	

Here is the report I propose issuing

Let me know if you would like to
change anything

Regards
Paul Mellor

Examination of a 2Ci Cesium-137 Oil Well Logging Source for Tucker Technology, Oklahoma

Introduction

On April 14, Randy Nitz of Tucker Technology informed Amersham that 5.7nCi of removable contamination had been detected on a routine wipe test (March 11, 1997) of source 1634GW, Amersham product code CDC2742, model number CDC.CY4. A subsequent wipe test on April 11 showed 3.0nCi of removable contamination. Although this subsequent wipe test was below the 5nCi action level, Amersham agreed to examine the source. The source was originally supplied in August, 1992.

Evaluation

The source was received at Amersham in the standard shipping container for this type of source when loaded into a bull plug; see attached drawing. Initially, the core at the back of the bull plug was wiped. Contamination levels were measured at less than background. Subsequent wipes of the source area, the barrel and the thread, removed a maximum of 1nCi. The source holder was then unscrewed and the source weld was wiped and 65nCi of Cs-137 was removed. The source in the holder was examined under a CCTV system and, although there was evidence of damage and debris, no cracks or holes were observed. To prevent spread of contamination, the source was cast into a two part epoxy block.

Visual appearance of the bull plug is that of a well used item, but not badly damaged. The "O" ring was in reasonable condition. The face of the tungsten backshield was coated in a fine brown powder. The appearance of this powder was of finely ground rust. A vigorous wipe of this brown powder covered area removed 13nCi. The projection of the backshield showed evidence of having been in close contact with the weld of the source and may have been vibrating against it.

Conclusion

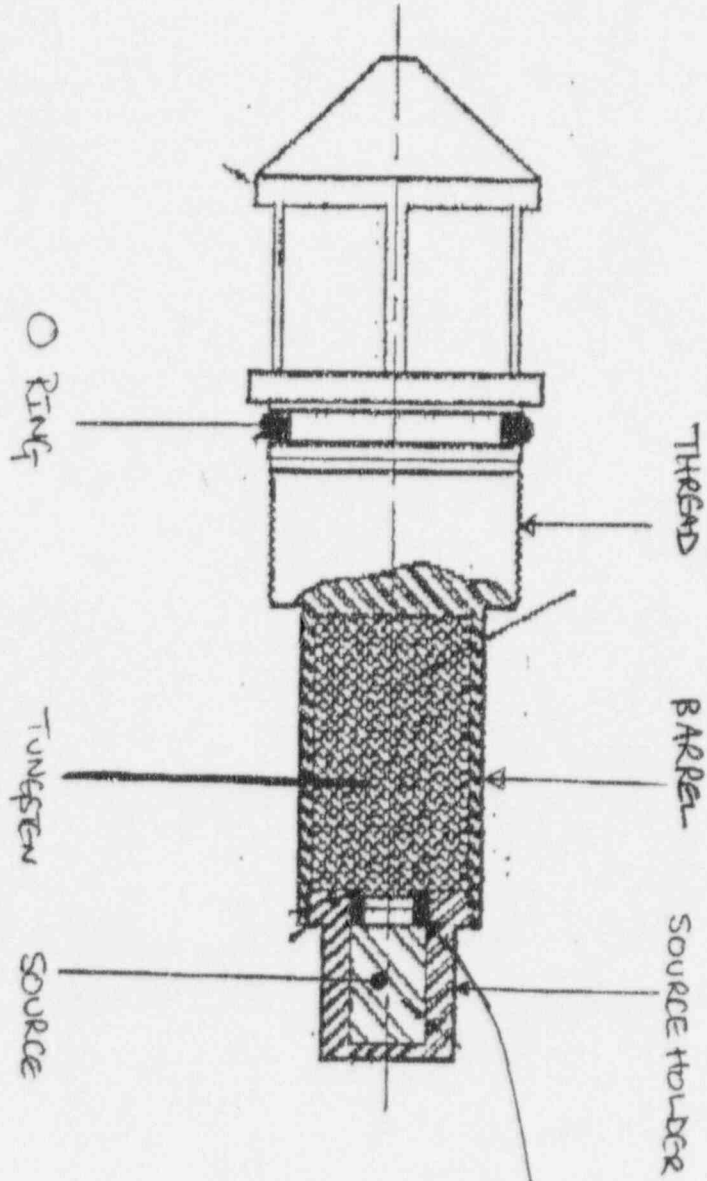
1. Radioactive material has migrated from the sealed source to the outside of the bull plug.
2. The levels of activity removed suggest that the source has not catastrophically failed. This conclusion is supported by visual examination of the weld.
3. If the weld has failed, then the contamination is associated with contamination on the outside of the inner capsule; see data sheet for CDC.CY4 sources.

Discussion

This source was loaded into a bull plug that is screwed together. Normally, this type of bull plug is spot welded to prevent the bull plug unscrewing. It is possible that in use, the bull plug became partially unscrewed, allowing the source to move when experiencing vibration down hole. This could have resulted in wear to weld, resulting in the release of contamination.

Recommendation

It is recommended that bull plugs of this type be assembled with spring washers to prevent the movement of the source and subsequently be welded with a full circumferential weld.



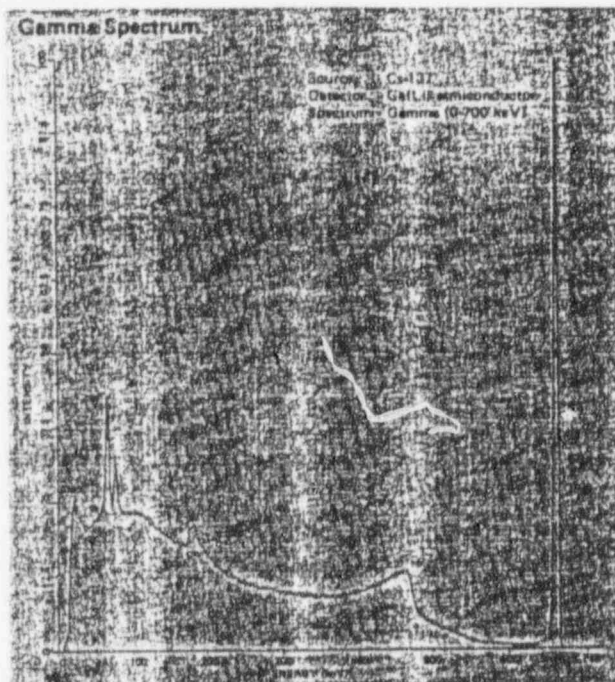
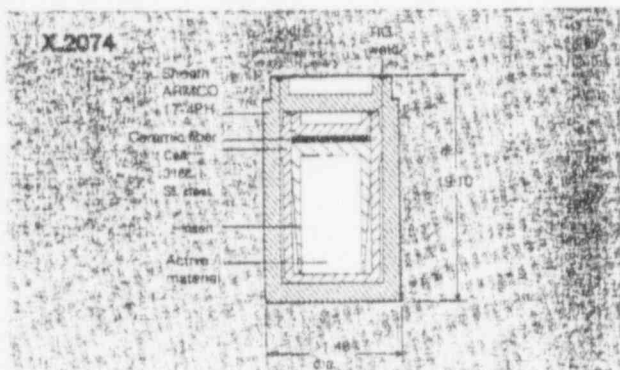
(2 O-rings 201-d011
R.N.H. 2/26/97)

2 Ci Cesium-137 Gamma Well-Logging Source Model Number CDC.CY4

Description

The CDC.CY4 2 Ci Cesium-137 gamma source is specifically designed to meet oil and mineral logging criteria. This source design is double encapsulated in an Armco 17-4PH stainless steel outer capsule and an AISI 316L inner capsule. The Cs-137 is contained in Amersham's unique ceramic matrix to ensure the integrity of the source. The Cs-137 ceramic is manufactured by firing a special Cs-137 compound, finely homogenized SiO_2 and strengthening agents in special casts. A uniform solid ceramic matrix is formed, incorporating the Cesium-137 radionuclide. This matrix is insoluble in almost every ordinary solvent, and immobilized for the most rugged type of abuse during use. Amersham has designed this source to be the safest possible encapsulation. This source is registered under model number CDC.CY4 by the NRC, and additionally meets the more stringent requirements of the Texas Regulations for Control of Radiation, Part 36.108(a)(3) and the Louisiana Administration Code 33:XV.2017.A.3.

Amersham sources are supplied with certified output measurements. This ensures that the sources supplied consistently meet the specifications required for formation density measurements—a considerable advantage over sources supplied by nominal content alone.



Amersham Features

- **Safety**
All sources are of double encapsulated construction containing the activity in an insoluble and non-dispersible ceramic form. All sources are individually pressure tested to 25,000 psi.
- **Regulatory Approval**
The CDC.CY4 has been registered for well-logging applications by the US Nuclear Regulatory Commission (NRC). Additionally they meet the more stringent requirements of the Texas Regulations for Control of Radiation, Part 36.108(a)(3) and the Louisiana Administration Code 33:XV.2017.A.3.
- **High Integrity Capsules**
Only the highest quality stainless steel is used to produce the highest integrity capsules available. All components are built to satisfy criteria for oil well-logging as contained in ANSI N 542-1977. All incoming steels are quarantined in Amersham bonded warehouses until accepted by Amersham quality control.
- **Stable Output**
Source to source output will not vary by greater than $\pm 12\%$ and are usually within $\pm 5\%$. Tighter tolerances can be maintained on request. Source design ensures that activity will not move, so output varies with time, only by decay.
- **Loading Facilities**
Source loading into customer designed bull-plugs or nose caps available upon request.
- **Measurement Assurance**
Amersham participates in intercomparison programs with NIST and other national laboratories to assure output measurement accuracy.

Amersham

Product Specification

Isotope: Cesium-137 maximum loading up to 2.3 Ci
 Licensing: Registered as NRC model number CDC.CY4.
 Half Life: 30 years
 Recommended working life: 15 years
 ANSI/ISO classification: C66534
 Certification: Documentation that each source has passed
 Quality Assurance and Measurement Tests is provided.
 Insert Composition: CsCl, SiO₂ and various salts which
 are mixed by a special process and fired into a ceramic
 becomes chemically bonded to the inner source capsule.
 Closure Method: Tungsten Inert Gas Welding
 Capsule Material: Armco 17-4pH stainless steel outer
 capsule/AISI type 316L inner capsule
 Pressure Rating: 25,000 psi, (30,000 psi available on request).
 Source Identification: Each source bears engraved data
 for identification and traceability. Additional labelling as
 required in the Texas Regulations for Control of Radiation,
 Part 36.108(a)(3) and the Louisiana Administration Code
 33:XV.2017.A.3, can be added if needed.
 Chemical Purity: >99.95%. CsCl Chemical separation
 employed to remove Ba-137 decay product to maximize
 the specific activity and output.
 Isotopic Purity: Cs-137 36 atom % (typically)

Quality Assurance

Wipe test. To meet ANSI N.542-1977 Appendix A2.1.1.

The source is wiped with a swab or tissue, moistened with
 ethanol or water; the activity removed is measured. Limit:
 0.005µCi.

Bubble test. To meet ANSI N.542-1977 Appendix A2.2.2.

The source is immersed in a suitable liquid (ethanediol) and
 the pressure in the vessel reduced to 100mm of mercury.
 No bubbles must be observed.

Output Measurement: Intercomparison with secondary
 National Laboratory standards.

Pressure Test: Each source capsule is subjected to
 a pressure test regime involving pressurizing the capsule
 to 25,000psi and holding for 15 minutes. The pressure is
 released and the process repeated three times. Pass/fail
 criteria involve weight gain of the capsule and ability to
 satisfy a mechanical integrity inspection.

Nuclear Data: Cesium-137

half-life	type of decay	particle energies and transition probabilities		electromagnetic transitions	
		energy MeV	transition probability	photon energy MeV	photons emitted per disintegration
(30y)		0.512	94.6%		
		1.174	5.4%		
via ^{137m} Ba (2.6m):					
internal conversion electrons Ba K X-rays ~8%				0.662	85.1%
		0.624	7.8%	(0.032-0.038)	
		0.656	1.37%		
		0.661	0.37%		

Shipping

The US DOT regulations in 49CFR 173.435 and the inter-
 national transport regulations in IAEA Safety Series No. 6,
 1973 Revised Edition (as amended) allow ≤10 Ci of non-
 special form Cs-137 and ≤30 Ci of Cs-137 in special form
 to be shipped in a Type A package.

Amersham supplies USA DOT 7A Type A packaging for
 shipment of 2 Ci Cs-137 sources. Custom designs and
 Type B packaging available upon request.

How to order

Orders may be placed by mail, fax or telephone. Each order
 should include the following information:

1. Purchase order number and/or contract number and
 quotation number if applicable.
2. Ship to address.
3. Invoice address description.
4. Catalog number and product design.
5. Quantity required.
6. Special product requirements, if any.
7. Delivery date required.
8. Special instruction.
9. In the United States a USNRC or Agreement State license
 number is required. A similar requirement exists in Canada
 for AECB licenses. A copy of the appropriate license is
 required to be on file at Amersham before shipment.

In the USA and Canada persons or organizations processing,
 using, selling, or transporting radioactive materials must be
 licensed by a national authority or state government agency.
 Users of radioisotopes should familiarize themselves with all
 applicable regulations.

In the United States, a person who wishes to use radioactive
 sources must possess an appropriate USNRC or Agreement
 State license.

In Canada all users must possess an AECB license.

Caution

Product contains radioactive materials. Contents are dan-
 gerous. Remote handling required. Do not hammer, drill into,
 saw into or otherwise breach the integrity of the capsule. If
 in doubt, refer to your institutions standard procedures for
 radioactive materials or contact local authorities.

Amersham Corporation

2636 South Clearbrook Drive, Arlington Heights, IL 60005
 (800) 323-6695 • (708) 593-6300

Amersham Canada Limited 1166 South Service Road West, Oakville, Ontario L6L 5T7
 (416) 847-1166 / (800) 387-7160 (Ont/Que) • (800) 387-7146 (rest of Canada)

Amersham

**Attachment
6**



Monitoring Services

P.O. BOX 580648 • HOUSTON, TEXAS 77256-0648 • AREA CODE 713/641-0391 • FAX 713/641-6153

SEALED SOURCE LEAK TEST CERTIFICATE

TUCKER TECHNOLOGIES INC.
12607 EAST 60TH ST. SOUTH
TULSA, OK 74146
ATTN OF: R. NITZ

C FILE 1793

S FILE 17103

N FILE 1409

INVOICE NO. _____ DATE _____

RADIONUCLIDE CS-137

ACTIVITY 2 CI SERIAL NO 1634 GW

WIPE DATE 040997 WIPED BY _____

EFF. 995

GROSS CPM 465 BKG. CPM 21 NET CPM 444

NET CPM _____ = MICROCURIE

EFFX2.22X10⁶ DPM/ μ CI

THE ABOVE SOURCE WIPE TEST HAS BEEN ASSAYED IN ACCORDANCE WITH OUR RADIOACTIVE MATERIAL LICENSE AND THE APPROPRIATE REGULATORY REQUIREMENTS. THE REGULATIONS DEFINE A LEAKING SOURCE AS ONE FROM WHICH AN APPROPRIATE WIPE TEST HAS REMOVED 0.005 MICROCURIE OR MORE OF ACTIVITY.

THE REMOVABLE ACTIVITY WAS 2.01E-04 MICROCURIE

ASSAY NO. 041297 54 DATE 04-12-19.97

ASSAYED BY Charles H. Hays

Attachment
7

MONITORING SERVICES
PO BOX 580648
HOUSTON, TEXAS 77258-0648
(713) 641-0391
fax (713) 641-6153

fax

to: RANDY NIETZ

fax #: 918-252-4496

from: CHARLES T. GALLAGHER

date: April 28, 1997

subject: PRELIMINARY RESULTS

pages: 2

NOTES: SEE ATTACHED

WIPE SURVEY REPORT

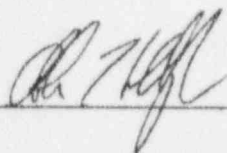
04-28-1997

COUNTER LSC
DATE COLLECTED 04-25-97
DATE COUNTED 04-28-97
CALIBRATION STANDARD CS-137
EFFICIENCY .95

TUCKER TECHNOLOGIES
ATTN: RANDY NIETZ
12607 E. 60TH ST. SOUTH
TULSA OK 74146

WIPE #	CPM	BG	NET CPM	EFF	DPM	uCi/100 sq cm	LOCATION
1	87	32	55	0.95	58	0.3E-04	PIT WHICH 1634GW HELD
2	66	32	34	0.95	36	0.2E-04	LDT-BA-010 LAST TOOL
3	42	32	10	0.95	11	0.5E-05	SOURCE STICK

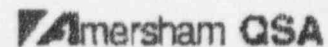
SIGNATURE



DATE

4-28-97

**Attachment
8**



Page 1 of 5

FAX TO: Randy Nitz - Tucker Wireline

FAX NO.: (918) 252-4496

FROM: Paul Mellor

DATE: April 29, 1997

SUBJECT: Report

Amersham Corporation
2636 South Clearbrook Drive
Arlington Heights, IL 60005

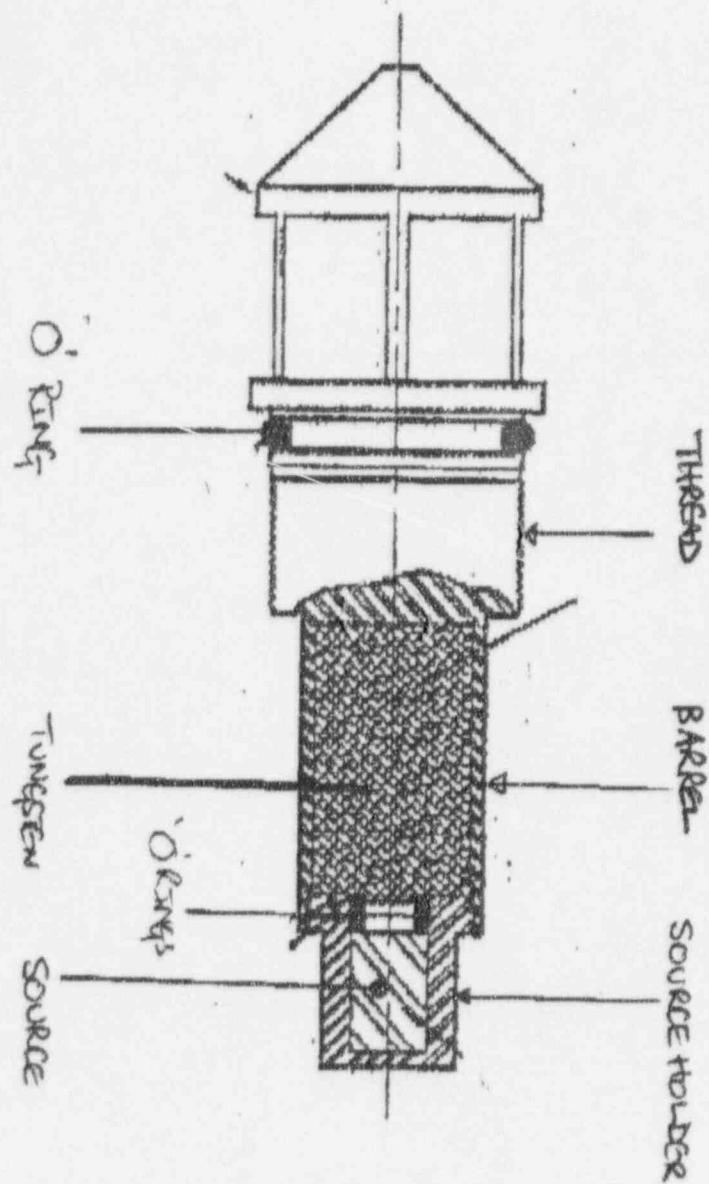
tel (847) 593-6300
fax (847) 593-8091
AI Tie-Line ext. 541

Attached is appended report.

Regards,

A handwritten signature in cursive script that reads 'Paul Mellor'.

Paul Mellor
Commercial Operations Manager

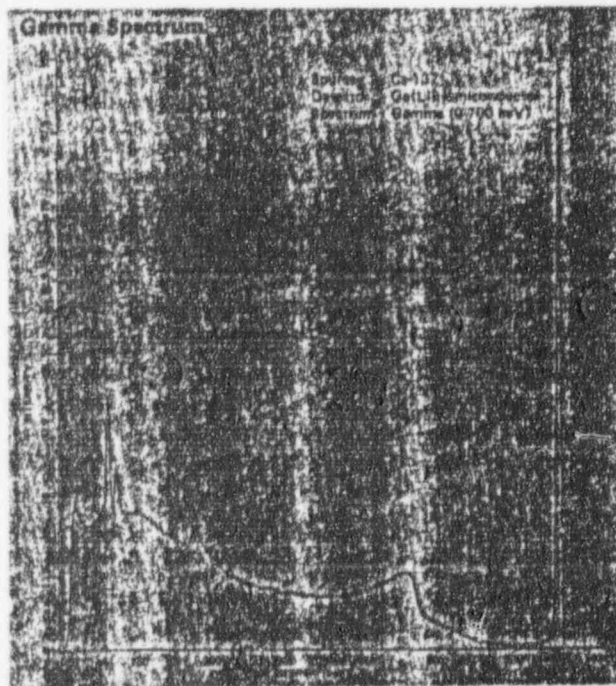


2 Ci Cesium-137 Gamma Well-Logging Source Model Number CDC.CY4

Description

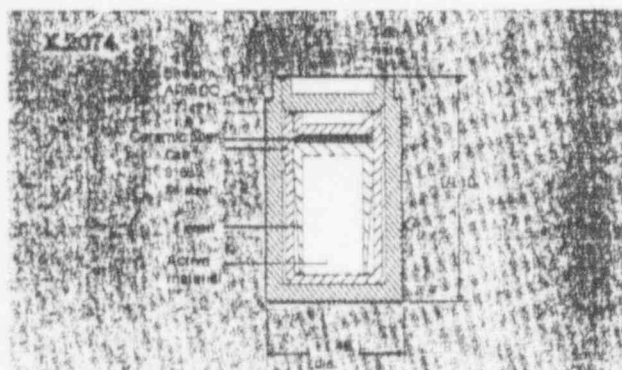
The CDC.CY4 2 Ci Cesium-137 gamma source is specifically designed to meet oil and mineral logging criteria. This source design is double encapsulated in an Armco 17-4pH stainless steel outer capsule and an AISI 316L inner capsule. The Cs-137 is contained in Amersham's unique ceramic matrix to ensure the integrity of the source. The Cs-137 ceramic is manufactured by firing a special Cs-137 compound, finely homogenized SiO_2 and strengthening agents in special casts. A uniform solid ceramic matrix is formed, incorporating the Cesium-137 radionuclide. This matrix is insoluble in almost every ordinary solvent, and immobilized for the most rugged type of abuse during use. Amersham has designed this source to be the safest possible encapsulation. This source is registered under model number CDC.CY4 by the NRC, and additionally meets the more stringent requirements of the Texas Regulations for Control of Radiation, Part 36.108(a)(3) and the Louisiana Administration Code 33.XV.2017.A.3.

Amersham sources are supplied with certified output measurements. This ensures that the sources supplied consistently meet the specifications required for formation density measurements—a considerable advantage over sources supplied by nominal content alone.



Amersham Features

- **Safety**
All sources are of double encapsulated construction containing the activity in an insoluble and non-dispersible ceramic form. All sources are individually pressure tested to 25,000 psi.
- **Regulatory Approval**
The CDC.CY4 has been registered for well-logging applications by the US Nuclear Regulatory Commission (NRC). Additionally they meet the more stringent requirements of the Texas Regulations for Control of Radiation, Part 36.108(a)(3) and the Louisiana Administration Code 33.XV.2017.A.3.
- **High Integrity Capsules**
Only the highest quality stainless steel is used to produce the highest integrity capsules available. All components are built to satisfy criteria for oil well-logging as contained in ANSI N.542-1977. All incoming steels are quarantined in Amersham bonded warehouses until accepted by Amersham quality control.
- **Stable Output**
Source to source output will not vary by greater than $\pm 12\%$ and are usually within $\pm 5\%$. Tighter tolerances can be maintained on request. Source design ensures that activity will not move, so output varies with time, only by decay.
- **Loading Facilities**
Source loading into customer designed bull-plugs or nose caps available upon request.
- **Measurement Assurance**
Amersham participates in intercomparison programs with NIST and other national laboratories to assure output measurement accuracy.



Product Specification

Isotope: Cesium-137 maximum loading up to 2.3 Ci
 Licensing: Registered as NRC model number CDC.CY4.
 Half Life: 30 years
 Recommended working life: 15 years
 ANSI/ISO classification: C66534
 Certification: Documentation that each source has passed
 Quality Assurance and Measurement Tests is provided.
 Insert Composition: CaCl_2 , SiO_2 and various salts which
 are mixed by a special process and fired into a ceramic
 becomes chemically bonded to the inner source capsule.
 Closure Method: Tungsten Inert Gas Welding
 Capsule Material: Armco 17-4PH stainless steel outer
 capsule/AlSi type 316L inner capsule
 Pressure Rating: 25,000 psi, (30,000 psi available on request).
 Source Identification: Each source bears engraved data
 for identification and traceability. Additional labelling as
 required in the Texas Regulations for Control of Radiation,
 Part 36.108(a)(3) and the Louisiana Administration Code
 33:XV.2017.A.3. can be added if needed.
 Chemical Purity: >99.95% CaCl_2 Chemical separation
 employed to remove Ba-137 decay product to maximize
 the specific activity and output.
 Isotopic Purity: Cs-137 36 atom % (typically)

Quality Assurance

Wipe test. To meet ANSI N.542-1977 Appendix A2.1.1.
 The source is wiped with a swab or tissue, moistened with
 ethanol or water; the activity removed is measured. Limit:
 0.005 μCi .

Bubble test. To meet ANSI N.542-1977 Appendix A2.2.2.
 The source is immersed in a suitable liquid (ethanediol) and
 the pressure in the vessel reduced to 100mm of mercury.
 No bubbles must be observed.

Output Measurement: Intercomparison with secondary
 National Laboratory standards.

Pressure Test: Each source capsule is subjected to
 a pressure test regime involving pressurizing the capsule
 to 25,000psi and holding for 15 minutes. The pressure is
 released and the process repeated three times. Pass/fail
 criteria involve weight gain of the capsule and ability to
 satisfy a mechanical integrity inspection.

Nuclear Data: Cesium-137

half-life	type of decay	particle energies and transition probabilities		electromagnetic transitions	
		energy MeV	transition probability	photon energy MeV	photons emitted per disintegration
(30y)	B -	0.512	94.6%		
		1.174	5.4%		
via ^{137}mBa (2.5m):					
Internal conversion electrons Ba K X-rays ~6%				0.862	85.1%
862.	0.624	7.8%	(0.032-0.038)		
882	0.656	1.37%			
862.	0.661	0.37%			

Shipping

The US DOT regulations in 49CFR 173.435 and the inter-
 national transport regulations in IAEA Safety Series No. 8,
 1973 Revised Edition (as amended) allow ≤ 10 Ci of non-
 special form Cs-137 and ≤ 30 Ci of Cs-137 in special form
 to be shipped in a Type A package.

Amersham supplies USA DOT 7A Type A packaging for
 shipment of 2 Ci Cs-137 sources. Custom designs and
 Type B packaging available upon request.

How to order

Orders may be placed by mail, fax or telephone. Each order
 should include the following information:

1. Purchase order number and/or contract number and
 quotation number if applicable
2. Ship to address.
3. Invoice address description.
4. Catalog number and product design.
5. Quantity required.
6. Special product requirements, if any.
7. Delivery date required.
8. Special instruction.
8. In the United States a USNRC or Agreement State license
 number is required. A similar requirement exists in Canada
 for AECB licenses. A copy of the appropriate license is
 required to be on file at Amersham before shipment.

In the USA and Canada persons or organizations processing,
 using, selling, or transporting radioactive materials must be
 licensed by a national authority or state government agency.
 Users of radioisotopes should familiarize themselves with all
 applicable regulations.

In the United States, a person who wishes to use radioactive
 sources must possess an appropriate USNRC or Agreement
 State license.

In Canada all users must possess an AECB license.

Caution

Product contains radioactive materials. Contents are dan-
 gerous. Remote handling required. Do not hammer, drill into,
 saw into or otherwise breach the integrity of the capsule. If
 in doubt, refer to your institutions standard procedures for
 radioactive materials or contact local authorities.

Amersham Corporation

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 (800) 323-8695 • (708) 593-8300

Amersham Canada Limited 1166 South Service Road West, Oakville, Ontario L6L 5T7
 (416) 847-1166 / (800) 387-7160 (Ont/Que) • (800) 387-7146 (rest of Canada)

Amersham

Examination of a 2Ci Cesium-137 Oil Well Logging Source for Tucker Technology, Oklahoma

Introduction

On April 14, Randy Nitz of Tucker Technology informed Amersham that 5.7nCi of removable contamination had been detected on a routine wipe test (March 11, 1997 of source 1634GW, Amersham product code CDC2742, model number CDC.CY4). A subsequent wipe test on April 11 showed 3.0nCi of removable contamination. Although this subsequent wipe test was below the 5nCi action level, Amersham agreed to examine the source. The source was originally supplied in August, 1992.

Evaluation

The source was received at Amersham in the standard shipping container for this type of source when loaded into a bull plug; see attached drawing. Initially, the core at the back of the bull plug was wiped. Contamination levels were measured at less than background. Subsequent wipes of the source area, the barrel and the thread, removed a maximum of 1nCi. The source holder was then unscrewed and the source weld was wiped and 65nCi of Cs-137 was removed. The source in the holder was examined under a CCTV system and, although there was evidence of damage and debris, no cracks or holes were observed. To prevent spread of contamination, the source was cast into a two part epoxy block.

Visual appearance of the bull plug is that of a well used item, but not badly damaged. The "O" ring was in reasonable condition. The face of the tungsten backshield was coated in a fine brown powder. The appearance of this powder was of finely ground rust. A vigorous wipe of this brown powder covered area removed 13nCi. The projection of the backshield showed evidence of having been in close contact with the weld of the source and may have been vibrating against it. The design of these bull plugs requires two rings between the source and bull plug. Those "O" rings were not present.

Shipping Container

A wipe of the inside of the shipping container showed that it was free of contamination.

Conclusion

1. Radioactive material has immigrated from the sealed source to the outside of the bull plug.
2. The levels of activity removed suggest that the source has not catastrophically failed. This conclusion is supported by visual examination of the weld.
3. If the weld has failed, then the contamination is associated with contamination on the outside of the inner capsule; see data sheet for CDC.CY4 sources.

Discussion

This source was loaded into a bull plug that is screwed together. Normally, this type of bull plug is spot welded to prevent the bull plug unscrewing. It is possible that in use, the bull plug became partially unscrewed, allowing the source to move when experiencing vibration down hole. This could have resulted in wear to weld, resulting in the release of contamination.

Recommendation

It is recommended that bull plugs of this type be assembled with spring washers to prevent the movement of the source and subsequently be welded with a full circumferential weld.

Paul Mellor
April 29, 1997

