

**sensor**  
**SERVICES, Inc.** \_\_\_\_\_ Radiological & Maintenance Services for Industrial Nuclear Gauging Systems \_\_\_\_\_  
2757 Camden Pointe Drive, Sherrills Ford, NC 28673 (828) 478-2980 FAX (828) 478-2844

July 22, 2002

Mr. Bryan Parker  
U.S. Nuclear Regulatory Commission, Region II  
61 Forsyth Street, S.W., Suite 23T85  
Atlanta, GA 30303-8931

**SUBJECT:** Am-241 sealed source leakage.

Dear Bryan,

In the past two weeks, SSI has become aware of a sealed Am-241 source that, most likely, is leaking minute amounts of Am-241. The leak test conducted by SSI did not prove to be as high as .005 uCi., with the highest results of four cultures being .001 uCi. The other three were some what smaller. The four cultures were taken on the surface of the active side of the source capsule where SSI has leak test tested the same source, the same way, for the past ten years with absolutely negative results.

The source is located at:

Marino Ware (formerly Pro Steel and then American Strip Steel)  
Coopertown Road  
Delanco, NJ 08075  
Mr. Tom Vail Plant manager (856) 461-8300

Serial #	Quantity	D.O.M.	Vendor	Source Vendor	Source Model
3158LV	1,000 mCi (Am-241)	4-20-86	Gamma Inst. (GR/100)	Amersham	AMC.19

The environment at Marion Ware is not bad or unusual. There is no unusual vibration, the C-Frame does not suffer from abuse due to sheet breaks or cobbles. There are no corrosive elements in the air or area. SSI has worked with and leak tested hundreds of similar devices using the same type AMC.19 capsule, also with negative results. not to mention at times cleaning the source capsule of grease, oil metal fragments, etc.. Never any problems.

The order of events are as follows:

- **Wednesday July 10, 2002:** Field Engineer Rod Lake arrived on site to perform the customer's scheduled semi-annual Radiological Inspection on two GammaRay Am-241 isotopes. This was the last of four customer visits for this trip. Upon leak testing the first source, Rod became suspicious of higher than normal results and took another culture which also proved to be suspicious. The initial results did not appear high enough to alert the customer at this time. SSI's leak test procedure for this device is explained later in this report.
- **Thursday July 11, 2002:** After returning from his inspection trip, Rod analyzed the two cultures at the Titusville office with the first culture coming out at .00097 uCi and the second at .00074 uCi.. Rod called me on my cell phone (I was en-route to Atlanta) about 4<sup>PM</sup> and informed me of the results. Rod and I conferred telephonically later that nigh when I reach a motel and we double checked our procedures and results.

***Satisfaction Through Quality Service***

- **Friday July 12, 2002:** I called Mr. John Vail, plant manager and explained our findings and the situation. Based on our results, although not a true "Positive Leak Test", I explained that the device should be shut down and not used until further notice. Mr. John Vail complied with this request. I also promised to get back with Mr. Vail next Monday with a game plan for dealing with the situation after I had conferred with the source manufacturer.
- **Monday July 15, 2002:** Conferred with AEA Technology on the suspect source which I believe to be Amersham model AMC.19. Called Mr. Vail after lunch and explained SSI policy to revisit and recheck any suspect leak test as soon as possible using more accurate equipment than the standard field survey meter. I proposed that I make a special visit to the plant Wednesday morning to recheck the device. I also made arrangements to have SSI's portable Ludlum 2000 Scaler on site the same day.
- **Wednesday July 17, 2002:** Arrived on site at 10:45 <sup>AM</sup> and performed the following procedure:
  - A. Cleared the area and placed plastic sheets at work area and around device C-Frame.
  - B. Took wipe samples with moistened sponge, around external areas of C-Frame, local machinery and the external area of the source housing assembly. Both survey meter, with End Count Probe, and Scaler results were negative.
  - C. Removed housing cover plate and turned upside down on sheet of plastic. Wipe tested inside of cover, again results were negative with both detection devices.
  - D. Wipe tested the entire inside of housing, except the inside of the source holder. Results again negative. The inside of the housing was very clean. This is normal for a Gamma Ray 100 device as, assuming the cover gasket is intact, the housing is hermetically sealed.
  - E. Pushed aside the shutter bar and inspected the surface of the source capsule with an inspection mirror. This was done at about a 12 inch distance. I observed the surface of the capsule which seemed to be intact with no dents or fissures. I did however, notice two small discolorations about the size the printed letter o and some discoloration at the rim of the capsule that appeared to me to be like rust. Having done this procedure many times, with this and other similar devices using the AMC.19 source, you normally would expect to see a shiny stainless steel cover at the bottom of the brass columniation cone. I have in the past, had to clean oil, grease, metal fragments and sometime damaged screws from the surface of similar devices using the AMC.19 source. The capsule always returned to being shiny and never have I had a positive leak test with those devices.
  - F. Wipe tested the surface of the source capsule, results were .00038 uCi. Tried a second culture with the intent to remove the discoloration, this result was .00041 uCi. The discoloration remained. (Please note, this discoloration may not be a factor at all with this problem. Also please note that I have trouble with some colors, namely dark brown and dark red)
  - G. Informed Mr. Vail of the results and recommended the device be removed from service and placed in steel salvage drum. Mr. Vail agreed with this plan.
  - H. Reinstalled housing cover, removed housing from the C-Frame and placed in heavy plastic bag. Placed the housing in a 10 gallon steel salvage drum with gasketed lid. Also placed any possibly contaminated tools, plastic or latex gloves inside another bag and then placed it in the same 10 gallon drum. Put "Caution Radioactive Materials" labels on the drum and stored unit in a locked enclosure.
  - I. Rechecked work area and C-Frame with wipe test and survey meter for possible contamination, found none.
- **Thursday July 19, 2002:** Made initial call to NRC Region I and left message for a call back.

The GammaRay 100 source housing is very easy to access. The source assembly is a circular 9" diameter aluminum housing about 4.5" thick. The covers have gaskets and the insides are normally very clean. Source is located about 1" at the bottom of the brass source holder (thick walled brass pipe) and is easily wiped and checked. Four Allen screws and a cannon plug hold the housing on the C-Frame.

**SSI's Leak Test Procedure for Gamma Ray 100:**

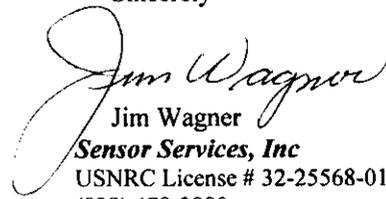
- Use a 3/4" cut cube of clean sponge moistened with distilled water. One side marked black with permanent marker.
- Check side of sponge opposite of black markings with Survey Meter End Count probe for one minute recording the back ground reading.
- Remove the Gamma Ray cover and activate the shutter to the open position. With an inspection mirror, check surface of source capsule which is at the bottom of a thick wall brass tube (about 1" deep).
- Using forceps, gently wipe sponge, side opposite black marking, on surface of source capsule and check with End Count Probe for 1 minute. If results are 10 counts or higher above background, recheck again.
- Place sponge in 9 dram pill bottle and label it with date, customer and source serial number.

I have included a copy of the spec. sheet for the AMC.19 pus a diagram of the GR/100 source housing.

The test results do not reach the level of .005 uCi, but it is SSI contention this source is leaking and should be taken out of service and disposed of. It is my understanding that Amersham model AMC.19 has had very good track record with little or no failures in the field. It would be interest to know what caused this problem.

The customer in this situation has been very cooperative and understanding. If you have any questions of if SSI can be of further service, please don't hesitate to call.

Sincerely

  
Jim Wagner  
**Sensor Services, Inc**  
USNRC License # 32-25568-01  
(828) 478-2980

cc: Mr. John Vail - Marino Ware  
Mr. Rod Lake - SSI  
Rusty Barrett - AEA Technology

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES  
 SAFETY EVALUATION OF A DEVICE  
 (AMENDED IN ENTIRETY)

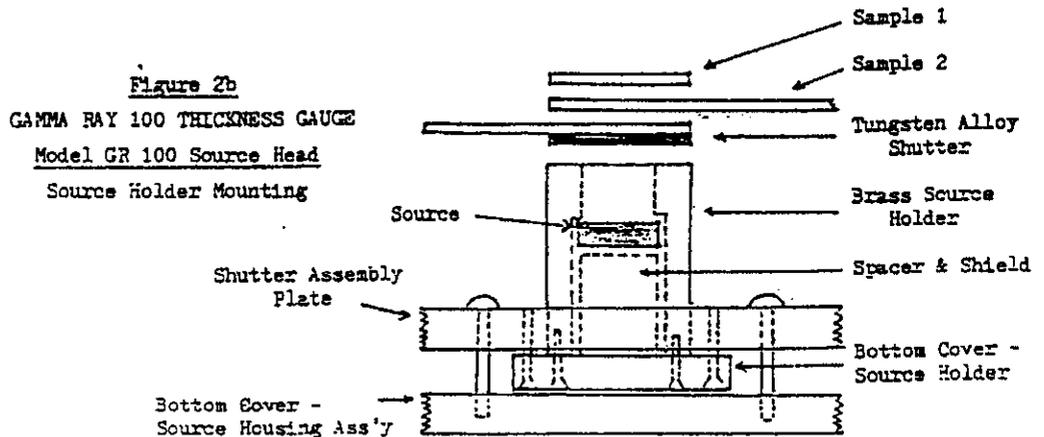
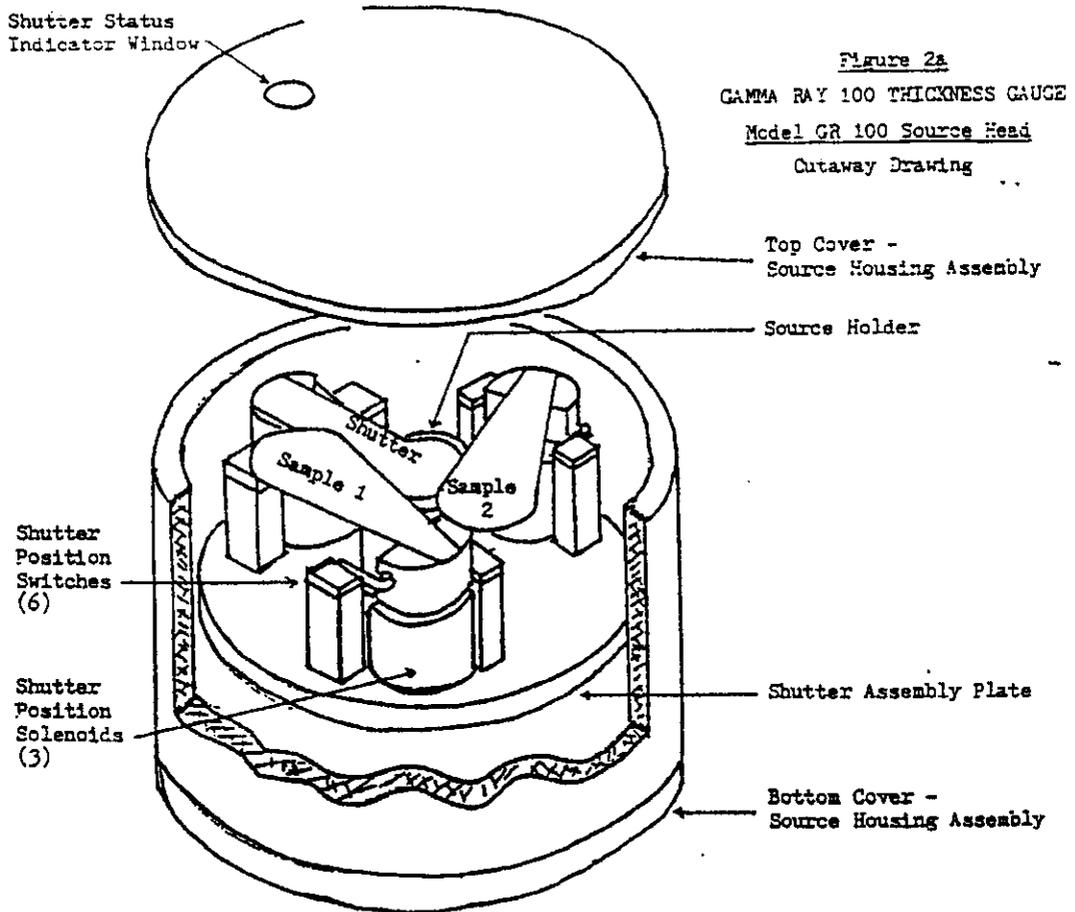
NO: IL-353-D-101-G

DATE: August 26, 1997

ATTACHMENT 2

DEVICE TYPE: Gamma Gauge

EXPLODED DIAGRAMS OF INTERNAL ARRANGEMENT FOR GR100



# Americium-241

## $\gamma$ and Primary X-ray Sources

### Disc Sources

Nominal activity* Capsule		Code	Typical photon output in photons/sec per steradian* 59.5keV
MBq	mCi		
3.7	100	X.91	$53.0 \times 10^6$
11.1	300	X.92	$150.0 \times 10^6$
18.5	500	X.97	$280.0 \times 10^6$
37	1000	X.93	$500.0 \times 10^6$
111	3000	X.94	$1.2 \times 10^9$

\*Tolerance  $\pm 10\%$

Recommended working life: 15 years

### Quality Control

Wipe test A

Bubble test D

Immersion test L

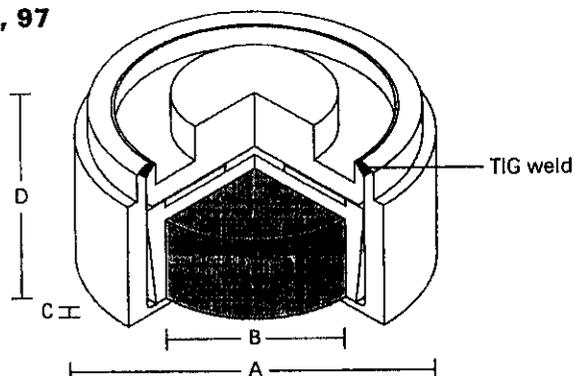
60keV  $\gamma$ -ray emission is measured in narrow beam geometry using a thin NaI detector.

Spectral purity is checked using Si (Li), Ge (Li) and NaI detectors.

### Neutron emission

All Americium-241 sources emit  $\sim 10^4$  n/sec per Ci (0.3n/sec per MBq) due to ( $\alpha$ , n) reactions with the low atomic number elements (for example, Si, Al, O) in the active material.

### X.91-95, 97



### Capsule dimensions and Safety performance testing

Capsule	Overall diam. 'A' mm	Active diam. 'B' mm	Window thickness 'C' mm	Overall thickness 'D' mm	Safety performance testing		
					ANSI/ISO classification	IAEA special form	Model number
X.91	10.8	7.5	0.2-0.25	6.0	C64444	GB/38/S-85	AMC.16
X.92	15.0	12.0	0.2-0.25	6.0	C64444	GB/39/S-85	AMC.17
X.93	30.0	25.0	0.2-0.25	6.0	C64444	GB/40/S-85	AMC.19
X.94	36.0	31.0	0.25-0.3	8.0	E64444	GB/107/S-85	AMC.30
X.95	45.0	40.0	0.25-0.3	8.0	E64444	GB/121/S-85	AMC.50
X.97	22.0	18.0	0.2 0.25	6.0	C64444	GB/41/S-85	AMC.18