

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket: 030-16055

License: 34-19089-01

Report: 030-16055/97002(DNMS)

Licensee: Advanced Medical Systems, Inc.

Location: 1020 London Road  
Cleveland, OH

Dates of Inspection: March 31 through April 1, 1997, with sample  
analyses performed at the Region III laboratory  
through April 30, 1997.

Inspectors: Michael Weber, Health Physicist

Approved: John R. Madera, Chief  
Nuclear Materials Inspection Branch 1

Attachments: List of Persons contacted, Inspection Procedures  
Used, and List of Acronyms Used

## EXECUTIVE SUMMARY

Advanced Medical Systems, Inc. (AMS)  
Cleveland, OH  
NRC Inspection Report No. 030-16055/97002(DNMS)

During the weekend of March 15-16, 1997, a water pump in a manhole connected to the AMS facility's foundation drainage system failed, and consequently ground water entered the facility's contaminated basement and became contaminated with cobalt-60. Subsequently, water pumped from the drainage system showed the presence of cobalt-60 contamination. Since AMS is isolated from the regional sewerage system, the contaminated water did not enter the sewer.

Two tankfuls of water (approx. 6000 gallons) pumped from AMS' manhole after the pump failure showed cobalt-60 concentrations above the release criteria, and are therefore being stored for further processing. According to AMS' measurements, all of the water pumped from the manhole since March 26, 1997 has met the release criteria.

The inspection revealed that the most likely source of the contamination was cobalt-60 carried out of the basement with the groundwater which had seeped in through cracks in the walls.

AMS has taken appropriate actions to prevent recurrence of similar incidents. Also, in the near future, AMS will begin water and core soil sampling around the foundation drainage system to confirm there is no residual contamination. NRC will monitor this sampling.

No violations of NRC requirements were identified during this inspection.

## Details

### 1. Program Overview

Prior to May 31, 1991, AMS was authorized to manufacture NRC approved sealed sources for use in teletherapy machines. Currently, AMS is only authorized for handling sealed sources and for routine health physics activities (including decommissioning activities).

According to AMS, the current inventory at the London Road facility consists of a 1200 curie sealed calibration source, and approximately 960 curies of waste.

The license issued to AMS was originally issued on November 2, 1979, and was renewed on December 13, 1989, with an expiration date of December 31, 1994. In November 1994, AMS submitted a timely renewal application, and the existing license continues to be effective pending completion of the NRC review of the renewal application. The license was most recently amended on April 4, 1997.

### 2. Pump Failure Incident

During the weekend of March 15-16, 1997, a water pump in a manhole at AMS' Cleveland, Ohio facility failed. The pump is connected to the facility's foundation drainage system, and is used to pump ground water from the drainage system and manhole to water storage tanks located inside the facility. After the failure of the pump, approximately 1000 gallons of ground water entered the facility's basement through cracks in the walls. The basement is contaminated with cobalt-60.

On March 17-18, 1997, AMS workers, wearing proper protective clothing, vacuumed up the water and transferred it via hose to a storage tank located in a secured, restricted area inside the facility. The workers measured the cobalt-60 concentration in a sample from the storage tank and obtained a result of 1.3 microcuries per liter. This water is being stored for eventual processing (cleaning) and disposal.

In order to prevent recurrence of the pump failure, the workers replaced the defective pump with a duplex pump, obtained pagers, and began checking the pump on a daily basis, including weekends. On April 22-23, 1997, AMS contractors installed an explosion proof water level switch in the manhole. The switch is connected to AMS' security system.

Shortly after the pump failure incident, AMS workers began testing foundation drainage water pumped from AMS' manhole. Prior to April 4, 1997, per court order, AMS could not discharge foundation drainage water if the cobalt-60 concentration exceeded 100 picocuries per liter (pCi/l). Per NRC regulations, AMS could not discharge the water if it contained insoluble cobalt-60. Since April 4, 1997, per NRC License Condition, AMS may not discharge the water if the concentration of cobalt-60 is greater than 100 pCi/l, or if it contains detectable insoluble cobalt-60 (minimum detectable activity no greater than 15 pCi/l).



A sample from Tank 222, containing the first tankful of water pumped from the manhole, showed a cobalt-60 concentration of  $332 \pm 38$  pCi/l. Water from this tank was then passed through a roughing filter of pore size 1.0 micrometer and transferred to Tank 622. A sample from Tank 622 showed a cobalt-60 concentration of  $341 \pm 25$  pCi/l. The next tankful of water pumped from the manhole, Tank 173, showed a cobalt-60 concentration of  $247 \pm 32$  pCi/l. Since these concentration levels exceed the release criteria of 100 pCi/l, the water from these tanks is being stored for eventual processing and disposal. This contaminated water did not enter the sewer because the AMS facility is isolated from the regional sewerage system. Subsequent tankfuls of water pumped from the manhole have met the release criteria. (See Appendix A for complete results of AMS' analyses.)

Regarding the source of the cobalt-60 detected in the foundation drainage system, the inspection revealed that the most likely source was cobalt-60 carried out of the basement with the groundwater which had seeped in through cracks in the walls. This is based on the following information: (1) the AMS workers had no control over the water levels inside and outside of the basement during the incident; therefore it appears likely that a pressure differential which would have prevented contaminated basement water from seeping out of the basement was not established throughout the incident,<sup>1</sup> and (2) since AMS began pumping foundation drainage water from its manhole in 1995, cobalt-60 concentrations at the levels of hundreds of pCi/l have not been observed, except immediately after the pump failure incident.

On March 31, 1997, representatives from AMS, NRC Headquarters, and Region III participated in a telephone conference to discuss the pump failure event. During the conference, AMS representatives indicated that they had contacted a hydrogeologist who indicated that his initial opinion was that cobalt-60 was carried from the basement back to the drainage system. In addition, AMS representatives indicated that AMS contractors will soon use a drill rig to obtain water and soil samples at various points along the foundation drainage system. NRC will closely monitor this testing.

No violations of NRC requirements were identified.

### 3. NRC's Confirmatory Measurements

The inspector obtained the following water samples at AMS: (1) 1.0 liter from Tank 295 (basement water), (2) 1.0 liter from Tank 622, (3) 0.5 liter from Tank 173, (4) 1.0 liter from Tank 877, (5) 0.5 liter from Tank 880, (6) 1.0 liter from the manhole, (7) 0.5 liter from the 4" line connecting the foundation drainage system to the manhole. The samples were analyzed in the Region III laboratory, using a gamma spectroscopy system. The results are in good agreement with AMS'

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<sup>1</sup> During the 1995 basement water clean up project, AMS workers kept the water level outside of the basement higher than the water level inside the basement in order to prevent contaminated basement water from seeping out of the basement.

measurements, with one exception. For Tank 622, NRC detected  $19 \pm 3$  pCi/l on the filter, whereas AMS' results (for a different filter) showed no detectable cobalt-60.<sup>2</sup> However, as mentioned earlier, this tank is being stored for eventual processing and disposal since its cobalt-60 concentration in water exceeds the release criterion. (See Appendix B for complete results of NRC's analyses.)

No violations of NRC requirements were identified.

#### 4. Conclusion

The pump failure incident resulted in the contamination of AMS' foundation drainage system. Based on the analyses of manhole water samples, it appears that the cobalt-60 concentrations in the manhole are decreasing with time. Two tankfuls of water (approx. 6000 gallons) pumped from AMS' manhole after the pump failure showed cobalt-60 concentrations above the release criteria, and are therefore being stored for further processing. According to AMS' measurements, all of the water pumped from the manhole since March 26, 1997 has met the release criteria. AMS has taken appropriate actions to prevent recurrence of similar incidents. Also, in the near future, AMS will begin water and core soil sampling around the foundation drainage system to confirm there is no residual contamination. NRC will monitor this sampling.

No violations of NRC requirements were observed during the inspection.

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<sup>2</sup> The MDA for AMS' in-house analysis was 8.5 pCi/l; the MDA for AMS' contact laboratory's analysis was 3.2 pCi/l.

Appendix A

AMS WATER AND FILTER SAMPLES FROM MANHOLE AMS' ANALYSES			
Date	Sample	Co-60 Concentration	Co-60 MDA
March 24, 1997	Tank 222	332 ± 38 pCi/l	53 pCi/l
March 24, 1997	Tank 622	341 ± 25 pCi/l	36 pCi/l
March 24, 1997	Tank 622 filter	< MDA	3.2 pCi/l
March 24, 1997	Tank 622 filter	< MDA	8.5 pCi/l
March 25, 1997	Tank 173	247 ± 32 pCi/l	48 pCi/l
March 25, 1997	Tank 173 filter	< MDA	8.5 pCi/l
March 26, 1997	Tank 877	72 ± 28 pCi/l	48 pCi/l
March 26, 1997	Tank 877 filter	< MDA	8.6 pCi/l
March 31, 1997	4" line	< MDA	36 pCi/l
April 1, 1997	4" line	< MDA	36 pCi/l
April 2, 1997	4" line	< MDA	36 pCi/l
April 2, 1997	Tank 880	51 ± 20 pCi/l	35 pCi/l
April 2, 1997	Tank 880 filter	< MDA	8.6 pCi/l
April 9, 1997	Tank 222	41 ± 20 pCi/l	36 pCi/l
April 9, 1997	Tank 222 filter	< MDA	8.5 pCi/l
April 10, 1997	Tank 955	< MDA	6.2 pCi/l
April 10, 1997	Tank 955 filter	< MDA	5.7 pCi/l
April 15, 1997	Tank 329	46 ± 19 pCi/l	35 pCi/l
April 15, 1997	Tank 329 filter	< MDA	8.6 pCi/l
April 16, 1997	Tank 302	< MDA	35 pCi/l
April 16, 1997	Tank 302 filter	< MDA	8.6 pCi/l
April 16, 1997	4" line	42 ± 19 pCi/l	35 pCi/l



Appendix B

AMS WATER AND FILTER SAMPLES - APRIL 1, 1997 NRC'S CONFIRMATORY ANALYSES		
WATER COLLECTED FROM BASEMENT		
Sample	Co-60 Concentration	Co-60 MDA
Tank 295	1.26 ± 0.05 µCi/l	0.003 µCi/l
Tank 295	1.21 ± 0.05 µCi/l	0.003 µCi/l
WATER COLLECTED FROM MANHOLE		
Sample	Co-60 Concentration	Co-60 MDA
Tank 622	398 ± 42 pCi/l	35 pCi/l
Tank 622	474 ± 48 pCi/l	41 pCi/l
Tank 622 filter	19 ± 3 pCi/l	3.5 pCi/l
Tank 173	250 ± 34 pCi/l	44 pCi/l
Tank 173 filter	< MDA	9.4 pCi/l
Tank 877	89 ± 13 pCi/l	22 pCi/l
Tank 877 filter	< MDA	10 pCi/l
Tank 880	48 ± 21 pCi/l	44 pCi/l
Tank 880 filter	< MDA	13 pCi/l
Manhole	< MDA	54 pCi/l
Manhole	< MDA	41 pCi/l
Manhole filter	< MDA	6.7 pCi/l
4" Line	25 ± 9 pCi/l	19 pCi/l
4" Line filter	< MDA	11 pCi/l

## ATTACHMENT

### LIST OF PERSONS CONTACTED

Edward Svigel - Chair, Radiation Safety Committee  
Stephen Haddock - Radiation Safety Officer  
Christopher Reed - Assistant Radiation Safety Officer  
Carol Berger, C.H.P. - Consultant to AMS  
Dwight Miller - Attorney for AMS

### INSPECTION PROCEDURES USED

IP 87103      Inspection of Incidents at Nuclear Materials Facilities

### LIST OF ACRONYMS USED

AMS	Advanced Medical Systems, Inc.
DNMS	Division of Nuclear Materials Safety
IP	Inspection Procedure
MDA	Minimum Detectable Activity
NRC	U.S. Nuclear Regulatory Commission
pCi/l	Picocurie per liter