WORCESTER
POLYTECHNIC
INSTITUTE

Worcester
Massachusetts 01609
(617) 753-1411

February 23, 1979

Mr. Robert O. McClintock, Chief
Materials Radiological Protection Section
United States Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, Pennsylvania 19406

Dear Mr. McClintock:

Enclosed is our report concerning the decontamination of the Van de Graaff area in the Olin Hall of Physics, Worcester Polytechnic Institute. We will gladly provide any other information we have that you might wish.

The tritium target has been removed from the accelerator and stored safely (?) with other spent targets. We have no immediate plans to use a tritium target. Before we resume operation, a set of guidelines will have to be approved by the Radiation, Health and Safeguards Committee to prevent a reoccurrence of this problem. I also expect some regular monitoring of the decontaminated area, at least until we are sure all measurable traces are gone.

Sincerely,

Raymond Goloskie

Raymond Goloskie, Chairman
Radiation, Health and
Safeguards Committee and
Associate Professor of Physics

RG/j

Enclosure

7903290228

Department of Physics
Worcester Polytechnic Institute Worcester, MA 01609

Decontamination of the Worcester Polytechnic Institute Van de Graaff Area

A swipe survey of the Van de Graaff accelerator room in Olin Hall 032, and the radioactive storage area, Olin Hall 007, was performed on November 11, 1978. The swipes were counted in a Nuclear Chicago Windowless Flow Counter, operated in the region of limited proportionality at 1 mV sensitivity, on December 1, 1978. The results were considerably above background and indicated a contamination at the mCi level. The laboratory area was sealed off. Basically, all the rooms off Olin Hall 004, and 004 itself, were placed off limits by locking the door to Olin 004 and chaining it shut. The only other door to this area was an emergency exit and this could only be opened from the inside. The door to Olin 004 was posted.

On this same day, December 1, 1978, a few of these swipes were counted in a liquid scintillation detection system, located in the Life Sciences Department at Worcester Polytechnic Institute. There the contamination was identified as tritium.

Also, on this day Mr. McClintock of the Nuclear Regulatory Commission was informed of the situation. He sent Mr. John Glenn of the Region I office to consult with us (Mr. Caola and myself) about our decontamination procedures. This meeting took place on December 5, 1978. Mr. Glenn suggested sampling for gaseous contamination in addition to our proposed procedures.

An emergency meeting of the Radiation, Health and Safeguards Committee was held on December 4, 1978, during which time possible causes and decontamination techniques were discussed. Mr. Caola then formulated a written decontamination procedure which is attached. Also at this meeting, and following a suggestion from Mc. McClintock, arrangements were made for a bioassay of Dr. Goloskie, the only person to have spent a considerable amount of time in the area recently. This test was performed on December 5, 1978 at the University of Massachusetts Medical School and no activity was found.

On December 4, 1978, several other preliminary steps were taken. Mr. Parker of the Massachusetts NIAT was informed. A smear survey in the hall outside Olin 004 was taken and no activity was found. The ventilation fans to the area were shut off, and some supplies necessary for the decontamination were ordered from Interex Corporation, Natick, MA. Finally, an air pump was sent to Alden Research Laboratory for calibration.

The ratio of the counting rates in the scintillation spectrometer to that in the flow counter varied considerably; that is, 5.5, 0.28, 15, .90, 6.0. On the basis of these, I have assumed that the detector efficiency

of the flow counter averages better than 20% and this figure was used in subsequent calculations. The swipe surveys were about 100 cm^2 and a counting rate of one count per minute above background corresponds to a contamination of 25 picocurie per M^2.

Using this approximation the contamination in a given area can be estimated by finding the average count rate above background and multiplying this by 25 to get the contamination density in picocuries per square meter. Multiplying by the horizontal area one obtains a reasonable estimate of the total contamination of a given area. Using this method the contamination in Olin 007 is estimated at 1.5 mCi and the contamination in the vault, Olin 032, is estimated at 12 mCi. These surveys were not very extensive, particulary in Olin 007; however, I feel that these estimates are representative of the correct amounts. The horizontal surfaces only are used in the calculation because almost all the contamination was found on these surfaces. The only significant exceptions occurred on those surfaces that were handled often.

On December 6, prior to performing any decontamination, the air in Olin 004 was sampled for particulate matter and gaseous contamination. One hundred sixty liters were drawn through a filter and another equal amount was bubbled through a small amount of water. Using the liquid scintillation system no evidence was found for airborn activity of the gaseous or particulate type.

The clean-up commenced on December 7. The lobby to Olin 004 was surveyed, indicating a contamination of about 75 microcuries. Over 95% of this was in one spot on a workbench with traces elsewhere. This area was cleaned using radiac wash and large tissues (Kaydry) as described in the appended sheets. The protective clothing included coveralls, respirators, rubber gloves, disposable boots and rubber overshoes. The boot and glove openings were taped shut. After cleaning, the area was resurveyed. These final swipes were generally of larger area than 100 cm^2. A particular area was considered cleaned if the swipe was less than two standard deviations above background (unless there were a pattern of such slightly large counts). On completion the room certainly averaged less than 2 cpm above background, corresponding to a contamination level of less than 50 picocurie per square meter. This criterion was used in general in the decontamination procedure. Wipe surveys were made on the exposed surfaces of the personnel on leaving contaminated areas.

Olin 003 was surveyed next and found to have a trace of contamination in one corner which was easily cleaned. Prior to proceeding further, the tritium target was removed from the accelerator and each target was placed in a separate ziploc storage bag and these were placed in a glass dessicator.

Olin 004 itself was surveyed fairly extensively. This survey indicated a total contamination of about 3 millicurie which was most prevalent in the area near the Van de Graaff console, but with significant amounts in the more heavily used areas. This area was cleaned once to remove the loose dust before the final cleaning and checking. This procedure reduced the problem of cross contamination which was encountered when the clean-up of this room began.

Olin 006 and 007 were cleaned simultaneously with 004. Olin 006 was not surveyed prior to cleaning but was not expected to be heavily contaminated and cleaned easily. Olin 007, the radioactive storage area, was difficult to clean requiring several days in spite of its small size. The clean-up of these three areas was finished on January 15, 1979. During this operation, Olin 005 was surveyed. It was found to be clean except for a couple of pieces of nuclear equipment that were removed.

The clean-up of the vault, Olin 032, then began. The filters in the attic were checked and found to be radioactively clean. An exhaust fan to the vault was turned on and the loose dust was cleaned up. After this preliminary cleaning, the ventilating and heating fans were turned on for that end of the building. The clean-up of the vault was finished on February 14. At this point, all the floor and wall surfaces have been cleaned and checked. There are still numerous pieces of portable equipment to be checked, but these are collected together and appropriately labeled. Also a few cabinets and drawers are unchecked, but these have been labeled and sealed shut.

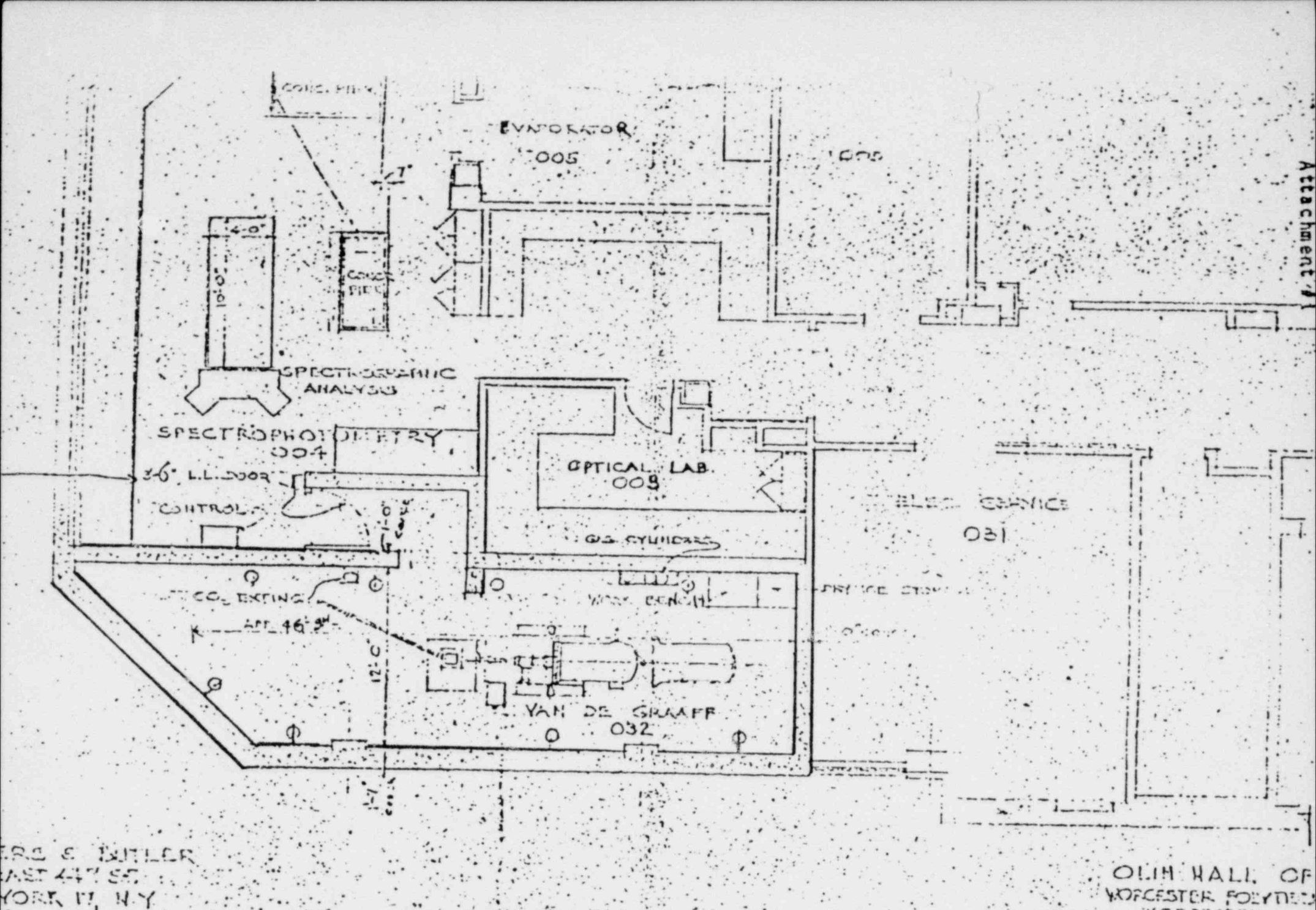
We plan to dispose of the waste commercially through Interex Corporation in Natick, MA. At present we have over twenty trash bags full. Also, we have performed about 4,000 wipe tests in our surveys to date.

We believe that the contamination was caused by poor procedures in handling the tritium targets. It does not appear to have come from the tritium evolving from the target and passing through the pumping system. The pump oil for all three mechanical pumps showed no sign of contamination. I do not expect to find any in the mercury diffusion pump either. The total contamination is only a few percent of the total activity of one of the targets. At least one attempt was made to clean the surface of one of the targets, which might account for the contamination in the Van de Graaff vault, and this somehow became attached to the dust and spread. The contamination in the storage area is more puzzling, and I have no believeable explanation for its cause.

Raymond Goloskie
Associate Professor of Physics

RG/j

February 21, 1979

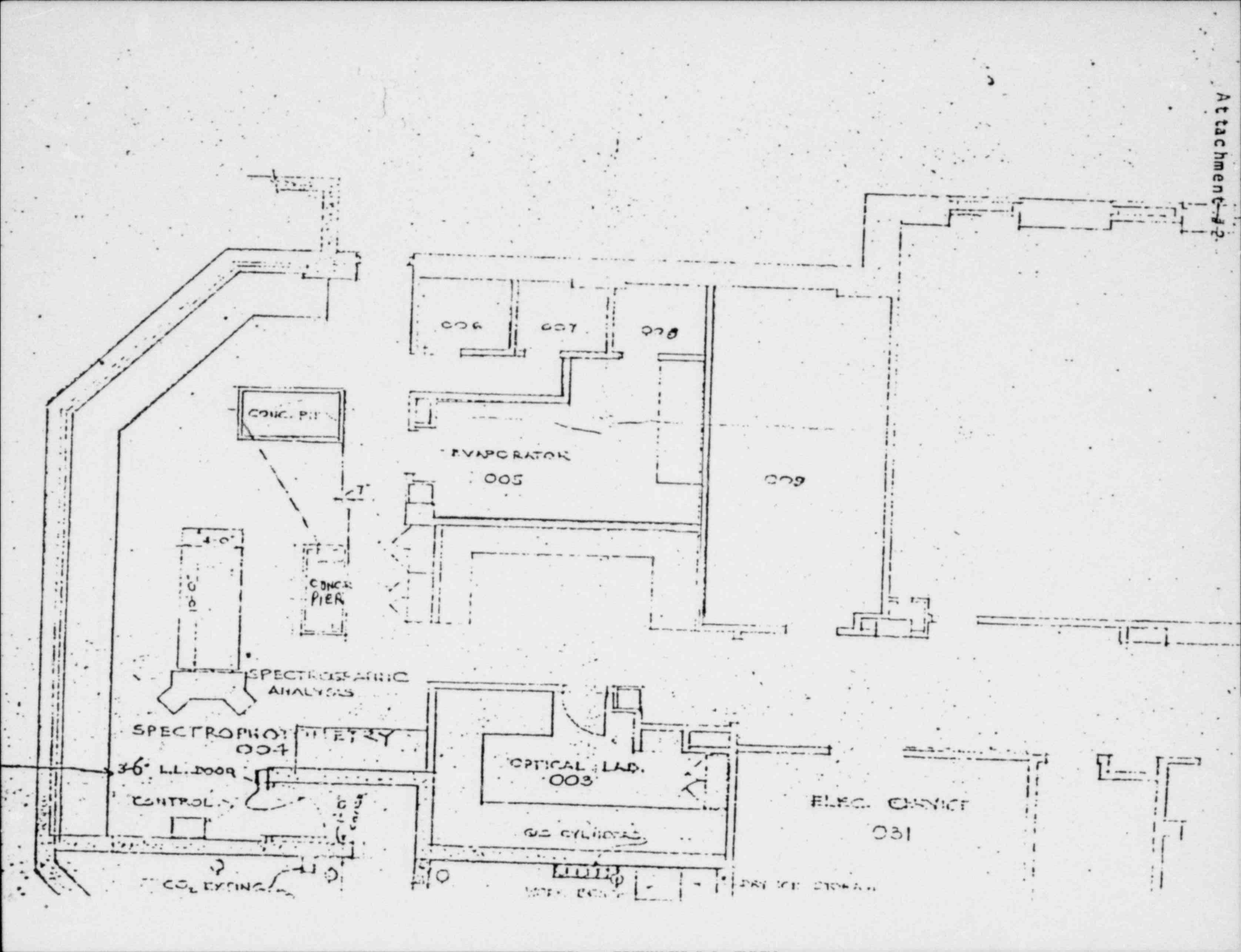


PROPOSED VAN DE GRAAFF ROOM

SCALE 1/8" = 1'-0"

GROUND FLOOR

OLIN HALL OF
WORCESTER POLYTECH
WORCESTER,


Attachment 2
CONC. PIT
EVAPORATOR
005
009
CONC. PIER
SPECTROGRAPHIC
ANALYSIS
SPECTROPHOTOMETRY
004
36" L.L. DOOR
CONTROL
OPTICAL LAB.
003
ELEC. SHOP
031
CO2 CYLINDERS
CO2 EVAPS.
DRY ICE STORAGE

Worcester Polytechnic Institute

PROCEDURE FOR DECONTAMINATING A CONTROLLED SURFACE CONTAMINATION AREA

1) The extent of surface contamination is to be determined by smear testing around a suspected area (about 100 cm^2) and immediately analyzing the smears until contamination is found. Establish a boundary around the area in which the surface contamination is confined.

2) Once the extent of surface contamination has been determined and a boundary has been set up, establish a counting station close by, but not in the immediate vicinity of the surface contamination. This precaution is necessary to prevent the contamination of the counting station.

3) Establish a step-off area in which personnel may remove their anticontamination clothing. This area will have absorbent, plastic-backed material taped to the floor outside the boundary with a waste bag inside the boundary. Provisions will be made to survey personnel as they exit the controlled surface contamination area.

4) All personnel will wear protective anticontamination clothing upon entry into the contaminated area. This clothing will consist of things such as gloves, boots, overshoes, coveralls, hoods, and respirators. The clothing requirements will be determined by the Radiological Safety Officer, based on the presence and concentrations

of air and/or surface particulate contamination. This clothing will be removed before stepping outside the boundary in such a manner as not to contaminate personnel.

5) Obtain an air particulate sample in the area and analyze the air filter for radioactive air particulate. Determine if the results conform to 10CFR20, Appendix B, for a specific isotope, if one is detected.

6) Clean-up may begin at this point. It will be performed by using soft, absorbent material, dampened with a suitable liquid, which will suspend the isotope that has been detected. Care shall be taken to wipe the surface to be decontaminated once with one side of the absorbent material, then folding it to use the other side rather than smearing the contamination around in a circle and spreading it about.

7) Decontaminate a small area from ceiling to floor in a systematic manner to prevent cross contamination of areas already decontaminated.

8) When an area is believed to be decontaminated, conduct a thorough smear survey of that area. If the results show that surface contamination is still present, repeat the clean-up procedure.

9) Once the area's decontamination has been confirmed, the boundary and step-off area may be moved into the edge of the next area to be decontaminated. This process will be repeated until the surface contamination is thoroughly removed from the total area and normal

access can be restored.

10) All waste that is either contaminated or potentially contaminated will be disposed of in plastic bags that will be taped shut and tagged appropriately to indicate their contents. These bags will then be disposed of in accordance with the Code of Federal Regulations.

ACC

NRC-7
(7-78)
10 CFR 110

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY GAO
B-180225(R0362)

APPLICATION FOR LICENSE TO EXPORT NUCLEAR MATERIAL AND EQUIPMENT *(See Instructions on Reverse)*

1. APPLICANT'S USE →	a. DATE OF APPLICATION	b. APPLICANT'S REFERENCE	2. NRC USE →	a. LICENSE NO.	b. DOCKET NO.
	March 19, 1979	ICS-8387		XSOO1023	11000539

3. APPLICANT'S NAME AND ADDRESS	RIS	4. SUPPLIER'S NAME AND ADDRESS *(Complete if applicant is not supplier of material)*	RIS
a. NAME: Westinghouse Electric Corporation			
b. STREET ADDRESS: P. O. Box 355		a. NAME: Monsanto Corporation	
c. CITY: Pittsburgh; STATE: PA; ZIP CODE: 15230		b. STREET ADDRESS: 1515 Nicholas Road	
d. TELEPHONE NUMBER *(Area Code – Number – Extension)*: (412)-373-4571		c. CITY: Dayton; STATE: OH; ZIP CODE: 45418	

5. FIRST SHIPMENT SCHEDULED	6. FINAL SHIPMENT SCHEDULED	7. APPLICANT'S CONTRACTUAL DELIVERY DATE	8. PROPOSED LICENSE EXPIRATION DATE	9. U.S. DEPARTMENT OF ENERGY CONTRACT NO. *(If Known)*
Feb. 1983	Feb. 1983	Feb. 1983	Feb. 1985	Unknown

10. ULTIMATE CONSIGNEE	RIS	11. ULTIMATE END USE *(Include plant or facility name)*
a. NAME: Iberduero, S.A.		The primary sources will be used for plant start-up operation at the Sayago nuclear power generating plant.
b. STREET ADDRESS: Apartado 119, Gardoqui 8		
c. CITY – STATE – COUNTRY: Bilbao 8, Spain		11a. EST. DATE OF FIRST USE

12. INTERMEDIATE CONSIGNEE	RIS	13. INTERMEDIATE END USE
a. NAME: None		None
b. STREET ADDRESS		
c. CITY – STATE – COUNTRY		13a. EST. DATE OF FIRST USE

14. INTERMEDIATE CONSIGNEE	RIS	15. INTERMEDIATE END USE
a. NAME: None		None
b. STREET ADDRESS		
c. CITY – STATE – COUNTRY		15a. EST. DATE OF FIRST USE

16. NRC USE	17. DESCRIPTION *(Include chemical and physical form of nuclear material; give dollar value of nuclear equipment and components)*	18. MAX. ELEMENT WEIGHT	19. MAX. WT. %	20. MAX ISOTOPE WT.	21. UNIT
	The primary source material (Californium 252) is in a Palladium-Californium$_2$ Oxygen$_3$ cermet sealed source. Californium 252 has a half life of 2.65 years. Each source has a nominal strength of 4×10^8 neutron/second. The nominal activity is 0.1 curies/source.				

RECEIVED U.S. NRC

22. COUNTRY OF ORIGIN – SOURCE MATERIAL	23. COUNTRY OF ORIGIN – SNM WHERE ENRICHED OR PRODUCED	24. COUNTRIES WHICH ATTACH SAFEGUARDS *(If Known)*
N/A	Unknown	

MAR 21 PM 5 19

25. ADDITIONAL INFORMATION *(Use separate sheet if necessary)*
The two sources will be shipped in a steel, lead lined container. Each source will contain a maximum of 226 micrograms of Californium 252.

26. The applicant certifies that this application is prepared in conformity with Title 10, Code of Federal Regulations, and that all information in this application is correct to the best of his/her knowledge.

27. AUTHORIZED OFFICIAL	a. SIGNATURE	b. TITLE
	C. G. Dahlstrom	Senior Engineer

790329 0226