REPORT ON THE RECEIPT OF 8049 CURIES OF SEALED SOURCES OF ^{60}Co AT WASHINGTON STATE UNIVERSITY ON SEPTEMBER 29, 1988

by
B. Srinivasan
(Report Completed Nov. 4, 1988)

A/3

TABLE OF CONTENTS

INTRODUCTION

A ^{60}Co gamma irradiation facility is situated at the Nuclear Radiation enter (NRC) and is mainly used for research in biological sciences. In 1969, the ^{60}Co content of the irradiator was at a maximum of 17,500 Curies. In the 20 years period, the source had decayed to 1200 Curies with concomitant reduction in the gamma dose rate. Since the researchers require higher dose rate than what was available from the 1200 Curie source, it became necessary to add fresh ^{60}Co to the existing facility.

Mr. Marshall Scott of the NRC was able to obtain a donation of 27 individual sealed sources of ^{60}Co from Northrop Corporation and J.L. Shepherd and Associates with a combined source strength of 8049 Curies. One single source among the 27 contained 5000 Curies of ^{60}Co. It was planned to use this largest source to augment the ^{60}Co content of the irradiator. Other 26 sources would be kept in storage for future use.

The irradiator is at the south east end bottom of the nuclear reactor pool. The nuclear reactor is operated under a license agreement with the Nuclear Regulatory commission. However, the sources in the gamma irradiator are listed under the WSU radioactive materials license from the State of Washington. Thus the donated sources would be governed by the regulations of the State license, but physically situated in the nuclear reactor pool. Both the Radiation Safety Office (RSO) and the Nuclear Radiation Center are held jointly responsible for the operation of the gamma irradiator and for any improvement on the irradiator.

Since July 1988, Mr. Scott had been in correspondence with Dr. Gary Serio of Northrup Corporation to arrange for the shipment of the donated sources from the General Electric Company in Pleasanton, California to WSU. Copies of letters exchanged between Mr. Scott and the donors were given to the RSO earlier by Mr. Scott.

Mr. Marshall Scott had prepared a written plan for the receipt of the sources at WSU and submitted it to the Radiation Safety Office on September 14, 1988.

On September 19, 1988, I returned to Pullman to assume the position as Director of the Radiation Safety Office. On September 22 and 23, I was informed for the first time about the imminent shipment of the ^{60}Co sources from California which was to arrive early the following week. Mr. Scott described to me the details about the shipment and the

planned procedures for unloading and storing the sources under water in the nuclear reactor pool. Furthermore, he showed me the special long tools which he was fabricating to lift the innermost container of the sources, under water. A summary of the information which were gathered by me from conversations with Mr. Scott is given below.

1. The 27 individual sealed sources would be leak tested at the hot cell facilities of the General Electric Company in Pleasanton, California.

2. After successful leak tests, they would be placed inside a lead cask. About 6000 lbs of lead, would be used to provide adequate shielding from the gamma rays.

3. The lead cask would then be placed in a lead lined steel container (outer pack).

4. The container classified as a type B package would be transported as an exclusive shipment on an open bed truck, with proper placards.

5. The truck upon arrival here will be backed into the pool room. Mr. Scott had made a request to the shippers that the package be placed at the rear end of the truck (over the wheels for stability), so that the overhead cranes at the NRC pool room could be used to lift the lead cask and lower into the nuclear reactor pool.

6. After completing the essential surveys for the acceptance of the package, the lead cask would be lifted and placed under water as described in item 5 above.

7. Long tools would be used to remove the sources from the lead cask.

8. The sources would then be laterally moved towards the center of the pool and placed on the floor (under water) closer to the south wall.

9. The empty lead cask would then be lifted out of the pool, cleaned, dried, swipe tested, placed inside the steel container and returned to California.

10. Nuclear reactor pool water, would be analyzed, before and after emplacement of the new sources to demonstrate that the sources were not leaking.

RADIATION SAFETY CONSIDERATIONS

On September 26, 1988, I informed (by telephone) Mr. Robert Verellen of the Department of Social and Health Services (DSHS) in Olympia, about the imminent shipment. I sent a letter to him the following day, with a copy forwarded to Dr. Tom Okita, Chairman of the Radiation Safety Committee.

Calculations made by me showed that the water in the reactor pool, the concrete walls of the pool and the unexcavated earth surrounding the wall would provide adequate shielding, from the gamma rays of 8049 Curies of ^{60}Co, in all occupied areas of the building. Even in the cave room, in the basement of the building, which is shielded by water and concrete only, the shielding was found to be adequate; note that the cave room, is used only sporadically--not more than a few hours per month. Actual radiation measurements completed after emplacement of the sources verified the above conclusions to be correct.

I asked that the work crew for the unloading operations to be made up of a minimum number of experienced personnel. All members of the work crew would wear audible - direct reading digital dosimeters in addition to the regular film badges and finger rings.

The members of the crew were Mr. Scott, Mr. Jerry Neideger, Mr. Brian Bunce (all three form NRC), and Mr. Donald Elting and me (both from RSO). The NRC personnel would be in charge of the unloading operations and the RSO personnel would be in charge of radiation survey. Note that Mr. Neideger and Mr. Bunce are part of the reactor operations staff and Mr. Scott is a NRC staff member.

ARRIVAL OF SOURCES

On September 29, 1988, the truck with the ^{60}Co sources arrived at 1:40 p.m. at the NRC parking lot (east end). The shipping container was found placed at the middle of the truck bed instead of at the expected position at the rear. Apparently the shipment, weighing a total of 10400 lbs, could be transported safely in that position and not at the rear. Mr. Scott had not been informed about this change.

In order to unload the sources with the facilities available here, it was decided to lift the inner lead cask and place it towards the rear of the truck, back the truck into the pool room and unload the sources using the procedures given above. Note that the inner lead cask weighed 7000 lbs and therefore it could be safely transported in that position - total distance driven with the lead cask in that position was less than 200 yards. The WesMar construction Company in Pullman was asked to provide a movable crane, to lift the lead cask and place it towards the rear of the truck; no suitable crane was available at the WSU Physical Plant to meet our need.

RADIATION SURVEY OF THE SHIPMENT

The shipping papers were found to be in order. Along with the shipping papers, the results of the swipe tests of the individual sources carried out at the General Electric Company were also received. The swipe tests showed less than 0.005 microCuries of transferable activity from each of the sources and therefore all sources are acceptable for further use.

Mr. Elting and I carried out the required surveys before accepting the shipment. The maximum gamma radiation dose was less than 7mR/hr at all accessible external surfaces of the package, except at the bottom center. There the dose was 40mR/hr but this point was not easily accessible; the long cable connecting the meter to the GM probe was pushed through an annular space between the truck bed and the container to obtain the measurement at the bottom surface of the container. The dose at the edge of the truck bed, about 2 feet away from the container, was 0.4mR/hr. The driver's seat and all points 3 meters away from the package registered less than 0.05 mR/hr (not distinguishable from the background values). Note that the work crew and all other personnel remained at distances greater than 3 meters away from the package, throughout the unloading operations except for short periods of approach (5 to 10 minutes) by the work crew for conducting surveys, attaching the straps, clevises and crane hooks etc. The dose rate at a point between the middle of the container and beneath the truck bed was 4 mR/hr (about 3 feet away from the container).

The swipe surveys of the external surfaces of the steel container and the truck bed showed a maximum removable activity of about 70dpm per 100cm^2 area.

The shipment was acceptable as received since it satisfied the regulatory requirements. (The dose rate at any point on the external surface of the package did not exceed 200mR/hr and did not exceed 10mR/hr at 1 meter distance. Also, the removable radioactivity was less than 22,000dpm/100cm^2. Individual sources were certified to pass the leak test).

OBJECTIONS BY THE RADIATION SAFETY OFFICE STAFF

Mr. Fred Miller of the RSO objected to the unloading of the shipment. He said that there was a likelihood of accidental exposure even to those persons who were present inside the building but not participating directly in the unloading operations. He requested that all personnel in the building be informed about the unloading work.

I called a meeting of all personnel at the building, at about 3 p.m. In that meeting, the details about the shipment and the procedures to be followed in the unloading operation were discussed. The following conclusions were reached at that meeting and were implemented.

1. All personnel not involved in the unloading operation were given the option either to leave the building or to remain in the conference room inside the building. Note that the conference room is at the west end of the building, about 60 feet from the ^{60}Co work area.

2. A road barrier would be set up to limit access to the work area, during the removal of the lead cask from inside the outer pack. (Mr. Neideger's suggestion).

3. Film badges would be issued to both the driver Mr. Frank Kendall and the crane operator Mr. Bud Garrelts (Mr. Wilson's suggestion).

4. Mr. Scott informed all those present at the meeting about a recent telephone conversation he had with Mr. Todd Tillinghast of the General Electric Company. The call was made by Mr. Scott to apprise Mr. Tillinghast about our plans to lift the lead cask and place it at the rear of the truck

as the first part of our unloading operation. In that telephone call, Mr. Tillinghast told Mr. Scott to expect about 2R/hr radiation dose streaming through a centering recess at the bottom center; the thickness of lead shield at that recess is about a few inches less than the rest of the cask.

The maximum radiation exposure to personnel could occur if personnel intercepted the streaming radiation from the bottom as could occur in an accidental placement of the cask on its side. This was considered unlikely. However, care was exercised throughout the unloading operations to allow personnel to approach the cask only when it was placed on the ground; in this manner, only scattered radiation of lower intensity would cause exposure to workers. While the cask was lifted, personnel were about 15 to 20 feet away. A radiation monitor was used continuously to assess personnel exposure of persons nearest to the cask, and found to be negligible.

Mr. Bill Wilson of the NRC suggested (during the actual operations) that the lead cask be placed on absorbent papers in order to minimize any possibility of contamination. This was done.

I decided that we should unload the sources even though we were surprised by two aspects of shipment which came to our attention only after the package reached Pullman: a) the package positioned at the middle of the truck bed and b) the streaming dose of 2R/hr at the bottom center (due to less thick lead shielding in that place). The work crew was confident that the sources could be unloaded without exceeding the maximum permissible levels of exposure to personnel. The alternative to refuse to accept the shipment was not considered by me.

REMOVAL OF THE INNER LEAD CASK

Mr. Scott loosened the bolts on the top lid of the steal container and the lid was removed using the portable crane. Then the inner lead cask was lifted out of the steel container and was placed on absorbent paper on the ground beside the truck.

The maximum radiation dose on all accessible surfaces of the lead cask was less than 70mR/hr. No attempt was made

to measure the streaming radiation dose at the bottom center, which was believed to be 2R/hr. The maximum rating of our instruments was 2R/hr and the higher range of 0 to 2R/hr was attainable only through the internal GM detector. Any attempt to measure the 2R/hr field would unnecessarily increase the radiation dose to personnel.

The removable activity from the accessible surfaces of the lead cask was less than 45dpm/100cm^2.

After completing the radiation survey, the lead cask was placed on absorbent papers at the rear of the truck. The combined operations of removing the top lid, lifting the lead cask out of the steel container, radiation surveys of the lead cask and placing the lead cask at the rear of the truck took about 30 minutes. On the average, the work crew might have been exposed to a radiation dose of about 7mRem (≈70mR/hr x 0.1 hr). The driver and the crane operator would have received a smaller dose than given above, because of larger distance of separation.

REMOVAL OF THE SOURCES

The truck with the lead cask positioned at the rear was backed into the pool room, through the open east bay door, within about 10 minutes; all work crew personnel were at least 10 feet away from the lead cask.

The lead cask was then lifted using the overhead crane in the pool room and the truck was moved forward. The lead cask was then kept on absorbent papers on the floor. The radiation dose was again found to be a maximum of 70mR/hr at all accessible surfaces of the cask, when it was placed on the floor of the reactor hall.

Mr. Scott loosened the bolts on the lid of the cask; the lid was left in place. Then the cask was slowly lowered to the bottom of the nuclear reactor pool and was placed at the east end bottom of the pool The lid of the inner cask was lifted out of the pool and was placed on the south east end of the pool room.

The sources inside the receptacle of the lead cask were removed, under water, using long tools. They were placed near the center of the south wall of the pool. Note that 26 (pencil) sources were kept in one container and an annular

source was kept separately (on the projection of the middle partition wall). Radiation dose measurements on the surface of the pool at a point directly above the sources did not show any increase above ambient levels in the past (about 0.05mR/hr). Note that the reactor was not operating at this time.

The empty lead cask was lifted out of the pool, again using the overhead crane. Continuous dose rate measurements at the water surface above the cask, while it was lifted out of the pool, showed that the cask was empty. The empty cask was placed on absorbent papers on the east wall of the pool. Water inside the receptacle of the cask was drained. The body of the cask and the lid were wiped clean and dried. Swipe samples of the cask showed a maximum removable activity of about 850dpm/100cm^2. The dose rate of the cask was at the ambient level (of the pool room) of about 0.05mr/hr.

The empty lead cask was then placed at the rear of the truck. The repacking operations were the reverse of the unpacking operations. The truck with the empty lead cask packed inside the steel container was released for the return journey to California. All the procedures given in this section were completed within about 90 minutes.

In all these operations, the work crew might have received about 7mRem of radiation dose (70mR/hr x 0.1 hr) mainly at the time of loosening the bolts and attaching the crane hooks to the cask. The driver and the crane operator were stationed far away from the work area.

RADIATION DOSE EQUIVALENT ESTIMATES

All seven digital dosimeters used by the work crew, the driver and the crane operator were found to read less than 1mRem of radiation dose equivalent for whole body exposure. However, the body extremities might have received a higher dose. I estimate from time of exposure x exposure rate that the radiation dose equivalent received by any part of the body is less than 15 millirem for any member of the work crew; the driver and the crane operator did not work near the lead cask and therefore would have received less than 15 mRem of exposure. Note that the maximum permissible exposure is 1250 mRem for a calendar quarter. Thus, the additional exposures received in this work were well within

the regulatory limits. In view of the above observations, I did not make a special request for immediate processing of the film badges.

BUILDING RADIATION SURVEY AND POOL WATER ANALYSES

After emplacement of the sources in the nuclear reactor pool, various areas of the building were surveyed with portable instrument the same evening (September 29) by me. The radiation levels on the 1st and 2nd floor of the building (offices and hall ways) were found to be less than 0.05mR/hr-typically 0.01mR/hr-and showed no great variations from place to place. The cave room was monitored later and the radiation levels showed no increases relative to the past, i.e. before emplacement of the new sources. Pool water showed little or no changes in the ^{60}Co concentrations compared to past observations.

From the above observations, I conclude that the addition of the new sealed sources of ^{60}Co into reactor pool did not cause significant increases in the radiation level in all occupied areas of the building. The unloading operations did not result in leakage of the sources.

EPILOGUE

It appears that one or more persons at the Radiation Safety Office made a request to Dr. Walfred Peterson, the WSU Ombudsman, to undertake a complete investigation of the events relating to the shipment, since they believed that the ^{60}Co project was not planned and executed well. The complaint was made on or about October 7, a week after completion of the work. Dr. Peterson had contacted Dr. David Barbee, Director of the Nuclear Radiation Center, who in turn requested Mr. Arden Scroggs of DSHS, on October 11, for an investigation. Note that Mr. Scroggs was at WSU during the period October 10-12, conducting the annual inspection of the Radiation Safety Program. Mr. Scroggs had discussions with the Radiation Safety Office staff and me and his findings were reported at a meeting on October 12. Personnel present at the meeting were Dr. Robert Smith (Vice

Provost for Research), Radiation Safety Committee members (except Dr. M.J. Smerdon), Dr. David Barbee, Mr. Donald Elting, Mr. Fred Miller and me. The major points of Mr. Scroggs' report are given below.

1. Planning for the receipt of ^{60}Co shipment was haphazard.

2. Members of the Radiation Safety Committee, the staff at both NRC and RSO should have been briefed before the arrival of the sources. The occupants of the building were not adequately informed.

3. Lines of authority were not distinctly defined; the RSO is in charge of the sources going into the NRC.

4. The Radiation Safety Committee did not authorize the receipt of the shipment.

5. A little bit more time should be allowed to develop plans and procedures for dealing with projects of this nature.

6. No one was hurt in the work. However, end does not justify the means.

7. A memo of understanding between the two groups (RSO and NRC) is essential.

SUMMARY

Sealed sources of ^{60}Co of total activity of 8049 Curies were received as a joint donation from Northrop Corporation and J.S. Shepherd and Associates. The sources will be used to upgrade the gamma irradiation facility. The total value of the donation which includes transportation, leak testing of the sources in the hot cell and manufacturing costs is estimated to be about $70,000 (extimate by Mr. Scott).

The sources were received at WSU on the afternoon of September 29, 1988. The sources were unloaded and stored under water in the nuclear reactor pool; the unloading operation was completed in 4 hours. The radiation exposure to personnel involved in the unloading operation was kept to the minimum achievable levels which were well within the regulatory limits. Direct reading digital dosimeters placed on the work crew personnel revealed less than 1 mRem

radiation dose equivalent per individual for the whole body exposure. It is possible that the radiation dose equivalent to the body extremities (hands and feet) could be as high as 15 mRem, as estimated from rate of radiation exposure x worked time. The driver of the transportation vehicle and the crane operator who provided help were subjected to much lower levels of exposure relative to any personnel in the work crew. The radiation levels in the occupied areas of the building were not increased by the addition of the sources into the reactor pool. The sources show no evidence of leakage.

Copies of all documents related to the planning, shipping papers, radiation survey and pool water analyses are kept at the Radiation Safety Office.

CONCLUSIONS

I returned to WSU on September 19, 1988 to assume the position of the Director of the Radiation Safety Office. On September 22, I was informed abut the imminent shipment of 8049 Curies of sealed sources of ^{60}Co from California to arrive here during the week of September 26. Even though I did not participate in the earlier planning, I assumed charge to ensure radiation safety of personnel during the work connected with the receiving of the shipment. If any lapses are seen in the radiation safety, then I must be held responsible for those lapses.

I give below a list of my conclusions deduced from my participation in the project. I have benefitted from discussions with Dr. David Barbee, Mr. Bill Wilson, Mr. Marshall Scott, Mr. Jerry Neideger and Mr. Fred Miller who have successfully persuaded me to look into different aspects of the same problem. These individuals and others at the NRC and RSO who attended the meeting on September 29 made several useful suggestions to ensure safety in the unloading operation. I thank all these individuals.

I give below my conclusions.

1. In receiving the shipment of ^{60}Co sources, radiation safety considerations were not compromised.

2. The shipment was received, the package opened and the sealed sources removed following a previously established

protocol, modified to some extent because of two surprises: 1) the shipping container was not placed at the expected position on the transportation truck bed and 2) the radiation level at the bottom of the inner lead cask at 2R/hr was higher than expected. I decided to accept the shipment despite these two surprises.

3. All personnel who were involved in the unloading work of the shipment received minimum achievable levels of radiation exposure. I estimate the radiation dose equivalent suffered by individuals as a result of this work is a small fraction (about 1 to 2%) of the maximum permissible level for the calendar quarter.

4. The radiation safety concerns relating to accidents and possibility of over exposure from it were addressed at a special meeting on the day of the arrival of the shipment.

5. I suggest that the NRC and RSO buy a portable radiation meter capable of measuring high radiation fields (say 0 to 50R/hr). Note that the instruments available to us are capable of measuring 2R/hr fields only if the operator remain very close to the source to record [illegible] observation.

6. The NRC and RSO staff who participated in the actual operations worked very well together to ensure safety. It appears to me that some members of the RSO staff may still be concerned about the preparation for the operations. We are working together to allay these concerns.

7. Additionally, I am trying to create a spirit of co-operation among the RSO staff including myself, so that all of us can succeed in our efforts to provide the required services to the researchers at WSU.

JLU

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REPORT

TO: Northrop Corporation

RE: Special Form Testing of USN 368 and AECL C-132 Capsules

IMPACT TEST

No visible physical change to the capsules, except a slight indentation on the weld end which was subjected to the impact. Each capsule was dropped twice. Capsules passed leak tightness test subsequent to the impact testing.

PERCUSSION TEST

This test was performed four times on each capsule; once on each end and twice in the section of the capsule between the ends. Physical damage was detected in the capsule walls; they were dimensionally distorted, however, visible inspection showed no cracks or breaks in the walls or welded areas. Capsules passed leak tightness test subsequent to the percussion testing.

BENDING TEST

Capsules were held in a collet assembly with 1/2 of the capsule protruding. A billet was used to impact the capsules once on the extended end of the capsule. The capsules bent and the walls were distorted at the location of the collet opening. Visible inspection showed no cracks or breaks in the walls or welded areas. Capsules passed leak tightness test subsequent to the bending testing.

A/4

HEAT TEST

The exterior of the capsules were discolored, visible inspection showed no cracks or breaks in the walls of weld areas. Capsules passed leak tightness test subsequent to heat testing.

NOTE: Specification 49CFR 173.469, Section 1, provides that a different capsules may be used for each of the above referenced tests, however J.L. Shepherd & Associates feels it is a much more rigorous testing program to subject one special form capsule to all of the above tests.

J.L. SHEPHERD

DATE: July 28, 1987

JLS

1010 Arroyo San Fernando California 91340 • (818) 898-2361
Irradiation & Calibration Equipment • Lead Shielding • Nuclear Applications

SPECIAL FORM CERTIFICATION

TO: Northrop Corporation, Aircraft Division

RE: USN type 368 and AECL type C-132 Capsules

One each USN type 368 special form capsule fabricated per USN drawing 0B0101 (furnished by J.L. Shepherd & Associates), and one each AECL type C-137, C059, type 66, inactive special form capsules (furnished by Northrop Corp.), were special form tested in accordance with 49CFR 17. Tests performed are as follows:

Impact Test	173.469 (b1)
Percussion Test	173.469 (b2)
Bending Test	173.469 (b3)
Heat Test	173.469 (b4)

All tests were successfully conducted on one source capsule of each type. After each test, leak tightness tests were performed. All sources passed the leak tightness tests, therefore, both capsule configurations are certified to be Special Form.

J.L. SHEPHERD

DATE July 28, 1987

AUG 1987
RECEIVED
FACILITIES

A/5

Before Trans[illegible]

SAMPLE ID/LOC.									
0 Bkg	10.0	1	16	[illegible]	0	0	0		Bkg
1 Sec # 673	10.0	1	[illegible]	[illegible]	[illegible]	2.6	[illegible]		[illegible] X329-1
2 # 626	10.0	3	[illegible]	[illegible]	2.2	1.0	[illegible]		"
3 # 671	10.0	1	16	[illegible]	0	0	[illegible]		"
4 # 677	10.0	1	[illegible]	[illegible]	0	2.2	[illegible]		"
5 # 675	10.0	0	13	657	-0.2	-1.2	-334.0		"
6 # 672	10.0	0	12	[illegible]	-0.3	-0.8	-160.0		"
7 # 678	10.0	[illegible]	[illegible]	900	[illegible]	[illegible]	[illegible]		"
8 # 676	10.0	2	[illegible]	1000	0.3	1.0	[illegible]		"
9 # 679	10.0	0	[illegible]	[illegible]	-0.2	-0.4	[illegible]		"
0 # 623	10.0	[illegible]	18	[illegible]	-0.3	0.4	[illegible]		"
1 # 674	10.0	[illegible]	17	371	0.1	0.2	[illegible]		"
2 # 625	10.0	4	22	933	0.9	1.2	-21.0		"
3 # J 424	10.0	1	[illegible]	677	0	[illegible]	69.4		Dec [illegible]
4 # J 418	10.0	2	[illegible]	960	1.5	2.6	[illegible]		"
5 # J 419	10.0	0	[illegible]	[illegible]	-0.3	4.2	[illegible]		"
6 # J 413	10.0	[illegible]	[illegible]	[illegible]	0.6	1.3	[illegible]		"
7 # J 422	10.0	2	[illegible]	515	0.2	[illegible]	[illegible]		"
8 # J 414	10.0	1	[illegible]	[illegible]	0	[illegible]	[illegible]		"
9 # J 415	[illegible]								
0 # J 423	[illegible]								
1 # J 416	[illegible]								
2 # J 420	10.0	6	85	[illegible]	1.5	13.8	[illegible]		"
3 # J 417	10.0	1	[illegible]	[illegible]	0	[illegible]	[illegible]		"
4 # J 421	10.0	0	41	[illegible]	[illegible]	5.0	[illegible]		"

SAMPLES 41-52 [ARCL-Co60-X329-[illegible]-673] ≅ 6" Long × ½" Dia.

SAMPLES 53-64 [WSUC [illegible]] ≅ 3" Long × ½" Dia.

Removed sources from cage tubes, wiped and stored in J.L.S. storage tank containing 4500 Ci Co-60 sources (annular ring source, 1 stick source). Hot cell sources (????) and 1 - 6" stick source placed in holder rack in center of annular ring source. 5-5-85 J [illegible]. Transferred to J.L. [illegible] for storage 7-26-85 [illegible]

Washington
State University

Nuclear Radiation Center, Pullman, Washington 99164-1300 / 509-335-8641

M E M O R A N D U M

To: Radiation Safety Office

From: Marshall Scott

Date: Sept. 14 1988

Subject: 60 Co Sources

As we discussed the Cobalt sources should be arriving sometime around Sept. 27 or the 28th. This shipment will be sent from G.E. and the contact person should be Todd Tillinghust (415)862-4396. If there are any questions or problems. All the sources will be in one shipping cast and will be removed under water in the reactor pool. They will then be placed in storage for use in the 60 Co irradiation facility. Located in Bill Wilsons file is a list of the sources and their last swipe test. The following information might be useful for the file

Located in the reactor pool are two sources. The first source was irradiated by Picker and had a total activity of 3,500 Ci as of December 17 1981 and the second source was irradiated in the MTR reactor at Idaho Falls and it had a total activity of 15,200 Ci as of April 1 1968 and was tagged as WSU-101. As of today the decayed activity of source #1 is 140 Ci. and source WSU-101 is 1,093 Ci. The sources that are to be delivered in Sept. are listed in the attached correspondence file.

PROCEDURE:

1. Examen the truck and cask upon arrival for day damage and swipe the truck and cask for contamination.

2. Remove pool railing from end of pool and back truck into pool room

3. place cables and clevises on cask and secure to crane hook

4. Slowly raise 6,000 lb. cask from truck and lower into pool.

5. with the cask setting on the bottom of the pool remove the end cap of the cask and set on pool room floor.

6. We will then place the sources on the pool floor temporally till they can be placed in the irradiation holder.

7. The empty cask will be lifted from the pool floor and placed on the truck.

8. Another swipe survey will be made of the cask and truck before the truck leaves the site.

NOTE: Pool water analysis will be made before and after the sources are placed in the pool. Consideration to floor loading and pool contamination has been analyzed. and found to be of little significance.

17/17

General Electric Company
Nuclear Energy
[illegible]
Pleasanton CA 94566

September 23, 1988

J. L. Shepherd & Associates
1010 Arroyo Street
San Fernando, California 91340

Dear Mr. Shepherd:

All surfaces of the following sources have been smeared and the transferable surface activity has been found to be less than 0.005 microcuries for each source.

Isotope	SERIAL	CURIES	DATE SHIPPED
Co-60	AECL XC2094250-670	72	9/26/88
"	-671	"	"
"	-672	"	"
"	-673	"	"
"	-674	"	"
"	-675	"	"
"	-676	"	"
"	-677	"	"
"	-678	"	"
"	-679	"	"
"	-680	"	"
"	-681	"	"

Please let us know if we can provide additional information.

Sincerely,

Todd Tillinghast
Sales Specialist
Irradiation Processing Operation
(415) [illegible]-4396

/lr

A/8

September 23, 1988

J. L. Shepherd & Associates
1010 Arroyo Street
San Fernando, California 91340

Dear Mr. Shepherd:

All surfaces of the following sources have been smeared and the transferable surface activity has been found to be less than 0.005 microcuries for each source.

ISOTOPE	SERIAL	SERIES	DATE SHIPPED
Co-60	USNC J413	16	9/26/88
"	USNC J414	"	"
"	USNC J415	"	"
"	USNC J416	"	"
"	USNC J417	"	"
"	USNC J418	"	"
"	USNC J419	"	"
"	USNC J420	"	"
"	USNC J421	"	"
"	USNC J422	"	"
"	USNC J423	"	"
"	USNC J424	"	"

Please let us know if we can provide additional information.

Sincerely,

Todd Tillinghast
Sales Specialist
Irradiation Processing Operation
(415) 862-4396

/lr

A/9

KEE M. SUGARMAN
Secretary

STATE OF WASHINGTON
DEPARTMENT OF SOCIAL AND HEALTH SERVICES
Olympia, Washington 98504-0095

November 9, 1988

Robert Smith, Dean
The Graduate School
Washington State University
Pullman, Washington 99163

Dear Dean Smith:

The purpose of this letter is to confirm our telephone conversation with your Radiation Safety Officer, B. Srinivasan, on November 4, 1988, ordering Washington State University to immediately cease further manufacture and distribution of Professor Brian Lamb's atmospheric gas chromatographs, cease further receipt of sealed sources for use in the pool irradiator, and to ensure that the Tritium neutron generator will not be used for research until appropriate procedures are submitted to our office for evaluation. Dr. Srinivasan's verbal statement of intent to comply with this order is hereby acknowledged. These actions have been taken for the following reasons:

1. On February 25, 1986, the University requested permission to conduct research and development work on Professor Brian Lamb's atmospheric gas chromatograph. Authorization was granted by Leo Wainhouse of this office, with the stipulation that this office would be notified prior to any distribution, and that NRC Fuel Cycle Directive 84-22 would be followed before distributing the GC units. Contrary to the above, seven gas chromatographs have been manufactured and distributed, two of which were sent out of the country to the People's Republic of China.

2. The radioactive sources received from J. L. Shepherd & Associates for placement in your pool irradiator are of unknown construction. Although a safety evaluation was performed by Dr. Srinivasan prior to receipt of these sources, he was unable to assure us that the sources were evaluated for water immersion. Therefore, we have serious concerns for the potential contamination of the pool, the pool reactor, and the containment building. Sealed sources used in Category 3 pool irradiators must meet ANSI Standard N542-1977. Furthermore, Todd Tillinghast of Vallecitos Nuclear Center stated that the 5,000 curie GE source, serial number GEC-JCS-9147, which they encapsulated prior to delivery to you, was not evaluated for compliance with the ANSI standard.

3. Contrary to your Radiation Safety Office's agreement with us that no research work would be conducted with the Tritium neutron generator until the proper procedures had been received and approved by our office, our recent inspection of the University showed that research work had been conducted using the Tritium neutron generator.

A/10

10.

Other items of concern from our compliance inspection of October 10-13, 1988, will be documented in a formal compliance letter to follow within the next 20 days; however, pursuant to this letter, I am requesting that the University provide the following material to me no later than the close of business, November 18, 1988:

1. An inventory of all sealed sources received from J. L. Shepherd & Associates and placed in your reactor pool, listing the manufacturer, model number, activity, and serial number, where applicable.

2. A copy of the Radiation Safety Officer's safety evaluation for all the above sealed sources.

3. A list of all the firms which received Professor Lamb's gas chromatographs, and copies of their current radioactive materials licenses.

4. Copies of all Radiation Safety Committee meeting minutes in which the manufacture and distribution of the gas chromatograph units, acquisition of sealed sources for the pool irradiator, and/or use of the Tritium neutron generator for research were discussed.

The issues we have raised in our October 10-13, 1988 inspection of your license, and in this letter concerning additional issues, are most serious, requiring an immediate followup inspection and review of radiation safety practices and the activities of the University's Radiation Safety Committee. My staff will be in touch with you regarding acceptable dates for our return visit.

If you have questions, feel free to contact me at (206) 753-3468, or Gary Robertson of my staff at (206) 753-3351.

Sincerely,

T. R. Strong, Chief
Office of Radiation Protection

TRS:kf

cc: B. Srinivasan
Radiation Safety Officer

Jack Hornor
U.S. NRC, Region V

Richard McCartan
Assistant Attorney General

JL SHEPHERD *and Associates*

1010 Arroyo, San Fernando, California 91340 • (818) 898-2361

Irradiation & Calibration Equipment • Lead Shielding • Nuclear Applications

November 14, 1988

Mr. Marshall Scott
Washington State University
Nuclear Radiation Center
Pullman, Washington 99164-1300

Dear Mr. Scott:

The 5,000Ci source which we fabricated for you under Northrup Purchase Order #908262N02 meets the following ANSI specification: E 53434.

NOTE: Although not tested specifically, the other sources supplied as part of the shipment should also meet the same specification.

Sincerely

J.L. Shepherd
President

JLS/mp

RECEIVED
NOV 17 1988

A/11

Washington
State University

Nuclear Radiation Center, Pullman, Washington 99164-1300 / 509-335-8541

MEMORANDUM

TO: Harry North, Region V, NRC

FROM: William E. Wilson, Associate Director

DATE: November 15, 1988

Attached are copies of the information that was [illegible] that were recently received by Washington State University and [illegible] east end of [illegible] reactor [illegible] long, 25.4 mm dia and contains [illegible] is located at the [illegible] end of the [illegible] the [illegible] at the east end.

[illegible] a high [illegible] were placed [illegible] see at the [illegible] of the [illegible]

Enclosures

WEW:crc

A/12

Draft

Bobby reviewed and believed only a morning report was appropriate. JSE 11/16/88 7:30

PRIORITY ATTENTION REQUIRED MORNING REPORT - REGION V DATE: 11/16/88

LICENSEE/FACILITY

Washington State University
Pullman, WN. DN 50-27

NOTIFICATION/SUBJECT

State of Washington Confirmatory Order

EVENT

On November 9, 1988, the State of Washington, Department of Social and Health Services, issued a confirmatory order to Washington State University to cease further receipt of sealed sources for use in the pool irradiator. This order resulted from an inspection conducted by state personnel on October 10-13, 1988. The order addressed several matters subject to the Washington State materials license. The pool irradiator identified in the letter is located in the Triga reactor pool. A total of 27 cobalt-60 sealed sources encapsulated by different manufacturers, containing approximately 8049 curies, are presently in the reactor pool. The Washington State letter notes that the licensees radiation safety officer was unable to assure the State that the sources were evaluated for water immersion in accordance ANSI Standard N452-1977. The largest single source (5000 curies) encapsulated by General Electric Company for Washington State University was reportedly not evaluated for compliance with the ANSI standard. Region V has been in contact with both the State of Washington, Department of Social and Health Services and the licensee. The licensee has increased the frequency of analysis of pool water for Cobalt-60 contamination to three times a week. The Licensing Project Manager, Research Reactors, NRR has been informed. NMSS is evaluating the sources which are in the reactor pool. The SER (NUREG-0911) applicable to the facility identifies the presence of a Cobalt-60 irradiator, licensed by the Washington State, in the reactor pool.

This information is current as of 1200 November 15, 1988.

Contact: G. P. Yuhas, FTS 463-3748, H. S. North, FTS 463-3762.

A/13

B. J. Adams informed 11/22/88 9:05 AM

Washington
State University

Nuclear Radiation Center, Pullman, Washington 99164-1300 / 509-335-8641

MEMORANDUM

TO: Harry North, Region V, NRC

FROM: William E. Wilson, Associate Director WEW

DATE: November 18, 1988

Attached is some additional documentation on the large ^{60}Co source that we recently received from the manufacturer, J. L. Sheppard and Associates.

Attachment

WEW:sra

RECEIVED
NRC
REGION V
88 NOV 18 A9:26

A/14
14.

KEE M. BUCHANAN
Secretary

STATE OF WASHINGTON

DEPARTMENT OF SOCIAL AND HEALTH SERVICES

Olympia, Washington 98504-0095

November 23, 1988

Vandy L. Miller
Assistant Director for
State Agreements Program
State, Local & Indian Tribes Programs
Office of Governmental & Public Affairs
United States Nuclear Regulatory Commission
Mail Stop WF-3-D-23
Washington, D.C. 20555

Dear Mr. Miller:

The purpose of this letter is to request your technical assistance in evaluating a number of old sealed sources used in a Category III pool irradiator located in what is apparently a research reactor secondary fuel storage pool. We are faced with two issues here: (1) what are the legal ramifications of the state continuing to license sources in the research reactor pool (or can these different activities be separated physically as well as licensed separately by our two agencies); and (2) should the sealed sources in the pool (both those recently placed there, as well as those originally authorized by the pre-Agreement State AEC license) be allowed to remain?

Recently, one of our licensees, Washington State University, who is also the holder of an NRC license for a research reactor, received 27 individually sealed sources containing approximately 8,049 curies of Cobalt 60. Washington State University had acquired these sources in order to upgrade its existing irradiator, and was expecting to receive additional sources. The original license for an irradiator was issued by the U. S. Atomic Energy Commission on May 19, 1961, and authorized a total possession for the pool irradiator of 15,000 curies. This original AEC license approved the placement of the irradiator in the Washington State University research reactor pool. In reviewing the licensing history for this irradiator, no specific reference is made by the Atomic Energy Commission license to any particular manufacturers or model numbers of the sealed sources. We took over this license when we became an Agreement State. In the early years of our Agreement State program, we automatically renewed the original license. However, in July of 1985, we attempted to be more specific by stating in Item 7 (chemical and physical form) that the authorized radioactive materials consisted of "Sealed sources - gamma irradiation unit in nuclear reactor pool." We felt this would limit the licensee to only the sources already in the reactor pool. However, as we now know, this too was not specific enough, and Washington State University was able to receive the additional 27 sources from different manufacturers, none of which have been tested to ANSI N542-1977 standards for Category III irradiators.

A/15

15.

The sources which were received by Washington State University on September 29, 1988, were donated by J. L. Shepherd and Northrup Corporation. The following is a description of the 27 sources received.

J. L. Shepherd

- 1 AECL type 132 stick source with an activity of approximately 1400 curies.

- 1 J. L. Shepherd Model 1099 annular source with an activity of approximately 700 curies.

- 1 J. L. Shepherd serial number JEC-JCS-9147 with an activity of approximately 6000 curies.

The Northrup Corporation

- 12 AECL Model XC-309 Cobalt sources with an approximate activity of 72 curies each.

- 12 U.S. Nuclear Corporation type 368 Cobalt 60 sources with an activity of approximately 16 curies each.

Our first concern is whether the state of Washington should continue to have jurisdiction over the irradiator, since it is located in the research reactor pool which is regulated by the U.S. NRC (reference is made to NRC Inspection Manual Part 9900: 10 CFR Guidance - Part 50). I have enclosed a copy of the original application and subsequent license which was issued by the U.S. Atomic Energy Commission to Washington State University for the pool irradiator on May 19, 1961. Also included in this package is a copy of the renewal application and subsequent license issued on May 11, 1966 by the U.S. Atomic Energy Commission and the Washington State University's application dated April 25, 1967, to the state of Washington for a Washington State radioactive materials license, which was issued on May 5, 1967 (see Attachment 1, License History).

Our second concern has to do with the integrity of the original sealed sources and also of those sources recently received by the University. All of these sources appear to pre-date the Agreement State Program; thus, any sealed source evaluations would have been done by the AEC and would appear in your archives. We therefore request technical assistance to assure that there has been an adequate evaluation of both the original sources and the sources received on September 29, 1988. The following is a summary of the sealed source information contained in Attachment 2:

1. Letter from Washington State University acknowledging receipt of the original source from Picker Research Center.

2. Washington State license application and source diagram for the Idaho Nuclear Corporation source.

3. Information for J. L. Shepherd & Associates Model 1099 annular source.

4. Letter from Northrup Corporation regarding the 12 U.S. Nuclear Corporation Type 368 sources, and the 12 AECL C-132 sources and a diagram of the sources.

5. J. L. Shepherd & Associates special form test reports on the U.S. Nuclear Corporation Type 368 and the AECL Model C-132 capsules, and the Model 1099 annular source.

6. A letter from Nordion (formerly AECL) which provides data on the AECL C-132 and XC-309 sources.

A complete report from Washington State University on the evaluation and receipt of the Cobalt 60 sources on September 29, 1988 is included as Attachment 3.

On November 8, 1988, we contacted Steve Baggett of your office and received preliminary information concerning some of the sealed sources. We have since been in contact with Jack Hornor and Dave Yuhus and apprised them of the situation. An order has been issued to the Dean of Graduate Studies at Washington State University to cease receiving further sealed sources for the reactor pool until a determination can be made as to the integrity of all sources now in the reactor pool. Although the sources have passed the Department of Transportation requirements for special form, they have not been tested to the more stringent ANSI N542-1977 Category III irradiator standards.

We would appreciate a response as soon as possible. If you have any questions, feel free to contact me at (206) 586-8949.

Sincerely,

T. R. Strong
Office of Radiation Protection

TRS:kf

Enclosures

cc: Jack Hornor

Dean Kunihiro

Co60 in pool at WSU

TELECOPY TRANSMITTAL

OFFICE OF RADIATION PROTECTION
Airdustrial Park - Building 5
MS LE-13
Olympia, WA. 98504

TELECOPIER NUMBER: (206) 753-1496
VERIFICATION NUMBER: (206) 753-4497

DATE: 11-27-88 NUMBER OF PAGES: Cover + 3

TO:	FROM:
Jack Horner Telecopier Number ( )	Gary Robertson Office Phone Number: ( )

SUBJECT: WSU Reactor Pool

SENDER:

ADDITIONAL REMARKS:

WASHINGTON STATE UNIVERSITY
PULLMAN, WASHINGTON 99164-1302

RADIATION SAFETY OFFICE

(509)335-8916

received 12-12-88 BS

MEMORANDUM

TO: Dr. T. Okita, Chairman, Radiation Safety Committee

FROM: Dr. B. Srinivasan, Director, Radiation Safety Office

B. Srinivasan

DATE: December 5, 1988

SUBJECT: Fred Miller's memorandum of December 1, 1988, to you on the receipt of ^{60}Co sealed sources and my analysis of Mr. Miller's concerns

At the Radiation Safety Committee meeting on December 1, 1988, Fred Miller discussed his continuing concerns about radiation safety associated with the receipt of 8049 curies of ^{60}Co sealed sources. At that meeting, he provided you with a memorandum listing those concerns. A copy of the memo is enclosed. Here I will provide answers to each one of those concerns, drawing upon my own observations and recall of events which happened on September 29, the day on which the aforementioned sealed sources were received at WSU.

In addition, I will provide an analysis of the progress we have made at the Radiation Safety Office (RSO) since my return to WSU on September 19, 1988. I am heartened by even the small amount of progress. At the same time, I am disillusioned by the continued misunderstanding and even distrust which exists between different factions at the Nuclear Radiation Center building. I will try to bring into focus the cause for unhappiness among the staff at the Radiation Safety Office, as I perceive it. Thus, I am writing this memo with the hope that it will provide an opportunity for healthy discussions, satisfactory resolution of conflicts and the emergence of a spirit of cooperation. This must occur soon if we are to succeed in our work at the Radiation Safety Office.

^{60}Co report of November 4, 1988:

Earlier, in a report prepared on November 4, 1988, I provided an analysis of the radiation safety aspects governing the receipt of ^{60}Co sealed sources. I wrote that report to satisfy the following three purposes:

1. A record of events related to the planning and execution of the work;

2. A record of my analysis of radiation safety aspects; and

3. A reference guide for the future.

A/16

Since completing the report, I have sent a copy to DSHS in Olympia to aid in their inspection work.

In preparing the report, I paid special attention to pointing out the cooperation which existed between members of the work crew who carried out the actual unloading operation and other individuals in the building who provided ideas, suggestions and actual help (e.g., managing road barriers, distributing film badges and dosimeters). In that process, I avoided mentioning the conflicts and infights between individuals and groups which had been in existence for several months prior to the arrival of the sources. Nevertheless, the personality conflicts and differences were laid aside, even for a day, in order to complete the unloading operation in the safest possible manner. This was seen by me surely as a sign of progress. However, I see signs of stress again. It is imperative that the root cause of this stress be identified and conflicts resolved. I will address this issue towards the end of this memo, after providing answers to the recently submitted list of specific concerns of Mr. Miller.

Mr. Miller's concerns and my answers:

The six specific concerns listed in Mr. Miller's memo of December 1, 1988, and my answers are given below.

1. The first concern was that David Barbee, NRC Interim Director, and B. Srinivasan both denied that the NRC building residents should be informed about the transfer of 8000 Ci of ^{60}Co from a semitruck in front of the NRC to the reactor pool. My answer follows.

   I took charge on September 22 to deal with the radiation safety matters connected with the expected shipment. I asked Don Elting to join me as a member of the work crew and Fred Miller to help me with the analyses of pool water samples for ^{60}Co content. In addition, Marshall Scott of the NRC had provided copies of communications between him and the donor of the sources to the Radiation Safety Office, even before my arrival at WSU. Furthermore, Mr. Scott wrote a memo to the Radiation Safety Office on September 14 in which he described the proposed plans for unloading the sources. Finally, I did show a copy of my letter addressed to Mr. Verellen of DSHS in which I described the expected shipment to the RSO staff. Thus, the RSO staff were aware of the details about the expected shipment.

The ^{60}Co shipment was expected to arrive at WSU with the shipping container placed near the rear of the truck. If that had happened, the transfer operation would have been a simple one as shown in the written plan of September 14. However, the container was found to have been placed near the middle of the truck. Therefore, the unloading plan drafted earlier had to be modified. The modified plan required moving the inner lead cask towards the rear of the truck. This required further information from the shippers and the services of a movable crane from a local company. We were interested in completing the unloading operation by the end of the day so that the ^{60}Co sources could be placed in a locked area of the building rather than outside the building on the bed of the truck. Thus, a sense of urgency prevailed during the afternoon of September 29. The sources were transferred to the bottom of the pool with full consideration to radiation safety in the operations.

I conclude that it is erroneous to call the transfer operation an emergency.

3. The third concern was that there was no written plan. My answer follows.

To the best of my knowledge, Mr. Scott had been in communication with the RSO staff during the period from July to September, 1988, about the donation of the sources and coordinating his efforts with the RSO in acquiring them. The last communication between the RSO staff and Mr. Scott before my arrival in Pullman was on September 14 in which he had described in writing the plans for unloading the sources.

I conclude that the statement in the third concern is not correct.

4. The fourth concern was that we used untested carrying gear. My answer follows.

Mr. Miller said that the carrying gear was in reference to the straps which were used to attach the inner lead cask to the hooks of the cranes used in the work. The straps and clevises were obtained by Mr. Scott from the WSU Physical Plant in early September. At that time, Mr. Scott was expecting the shipment to arrive in mid-September and thus he was prepared quite early.

The straps and clevises used in the unloading operation are capable of supporting loads of 10,000 lbs. As an additional measure of safety, Mr. Scott used two straps instead of the required one strap. Thus, the lead cask was lifted with a good margin of safety.

Recently (on December 2), I learned from Mr. Scott that he had used the straps instead of chains or cables because these straps are used routinely by Physical Plant personnel to lift heavy loads of about 8,000 lbs. Mr. Scott also learned from them and other heavy machinery operators that straps are superior to chains and cables because of stretching and shock absorbing characteristics.

I conclude that we used the appropriate carrying gear, relying on advice from routine users.

5. The fifth concern was that we moved in unbraced load. My answer follows.

The inner lead cask was kept at the rear of the truck and moved unbraced. In that position, the total distance driven was less than 200 yards and at very low speeds (mostly in the reverse gear). The road was blocked for all other vehicular and pedestrian traffic (other than the work crew). We did not anticipate any accidents during this short trip.

I conclude that the unbraced load did not pose any safety threat to the operation.

6. The sixth concern was that of whether we had satisfied federal NRC regulations for placing the ^{60}Co in the reactor pool. My answer follows.

I believe that Mr. Miller is possibly referring to Terry Strong's letter (from DSHS) dated November 9, 1988, in which Mr. Strong had asked whether the sources were suitable for water immersion. All the sources were manufactured according to the specifications required for special form radioactive materials. Although these sources were not specifically tested for water immersion, the shippers and donors of the sources state that these sources are suitable for safekeeping in the nuclear reactor pool. The ^{60}Co concentration determination of

pool water samples registered no changes relative to pre-September 29 values.

DSHS personnel are investigating further into the question of whether these sources are suitable for water immersion. In view of this, I can give only my opinion that the sources are suitable for water immersion.

Analysis of Mr. Miller's concerns:

I believe that Mr. Miller is repeatedly expressing his concern about the ^{60}Co shipment only to draw attention to the fact that he, Don Elting and Josy Drury (all from RSO) are unhappy about several unconnected events which took place at the NRC and RSO since June, 1988. Mr. Miller has become the spokesman for the above group of individuals. I have had lengthy discussions with Mr. Miller about their concerns. I have tried my level best to create a sense of cooperation between myself and the above-mentioned group. In this endeavor I have been successful to a limited extent. All of us are working together with proper accord to radiation safety. This fact alone should not lead to a false sense of security. Tense working conditions such as these are sure to snap even with the least provocation. I want to establish a permanent and healthy environment at the RSO so that we may succeed in our efforts to better ourselves and to offer better services to the researchers at WSU. In this spirit, I will list some of my findings which are derived from my lengthy discussions with Mr. Miller. I believe that Mr. Elting and Ms. Drury will concur with the views expressed by Mr. Miller and repeated here.

1. Mr. Miller, Mr. Elting and Ms. Drury are distrustful of their superiors. This specifically includes me and Dr. Robert Smith.

2. They do not trust Dr. Barbee. They refuse to believe that Dr. Barbee is trying his best to establish a strong and viable nuclear science program using the reactor facilities.

3. They do not believe in the university ombudsman and in the system which addresses complaints against different factions.

4. They do not believe in finding redress to the safety concerns through established reporting channels at WSU. They have gone to both the ombudsman and DSHS personnel

directly without giving the necessary chances for the local system to succeed.

I want to suggest here that Mr. Miller, Mr. Elting and Ms. Drury be provided an opportunity to write up their grievances and present them to the proper officials toward finding a satisfactory solution for their concerns. I encourage them to address the real grievances and seek solutions for them. In this manner, the root causes for their unhappiness may be eradicated, resulting in a happy, productive working environment.

Enclosures
cc: Members of Radiation Safety Committee
Dr. R.V. Smith, Graduate School
Dr. W. Peterson, University Ombudsman
Members of staff of Radiation Safety Office

BS:crc

Addition to the memorandum from Dr. B. Srinivasan to Dr. T. Okita

Since writing the above memo and providing you with a handwritten copy on 12/5/88, Arden Scroggs, has completed the follow-up inspection on the forenoon of 12/7/88. The same afternoon I met with Dr. Walfred Peterson, WSU Ombudsman, and told him about my desire that the Radiation Safety Program move forward and the users of radioactive materials get the best service possible from us. Towards that end, the RSO staff and I must reaffirm our commitment to our duties and responsibilities at WSU. Here, I will make a personal appeal to the RSO staff to effect a spirit of cooperation.

Appeal to Mr. Don Elting, Mr. Fred Miller and Ms. Josy Drury

During 1982-87, I have worked at the RSO in association with all of you for varying periods of time and found each one of you capable, conscientious and hardworking. I hold the same opinion today.

In the past two and a half months in your zeal to correct events which you perceived to be wrongdoings, you followed a path which by-passed the normal channels of communication and sought the help of Dr. Walfred Peterson, WSU Ombudsman, and Arden Scroggs, Compliance Inspector at DSHS. Because of your direct dealings with neutral observers, I was forced to limit my communications with you so that the integrity of the investigations would not be compromised.

The inspection work by Mr. Scroggs is now complete. We will have to address and remedy the deficiencies which he will be communicating to us. Dr. Peterson has also completed his work to a great extent in addressing your complaints of the past few months. He is of the opinion that we at the RSO must put away the differences which have divided us in the past and move ahead with constructive plans for the future. I liked his advice and I requested his help. He would like all of us to meet together with him and affirm our intent to work together with a cooperative spirit. I have asked Dr. Robert Smith to visit us at our coffee break time on 12/16/88 and inform us about his expectations and define the role for our office in meeting the needs of the University. I will be asking the Staff Personnel Office to provide you with guidelines to obtain redress for your complaints against me.

In summary, I have done my best to begin the process of communication between all of us. I want to succeed in

establishing a good Radiation Safety Program. I want all of you to join me in this endeavor.

WASHINGTON STATE UNIVERSITY
PULLMAN, WASHINGTON 99164-1302

RADIATION SAFETY OFFICE

(509)335-8916

MEMORANDUM

TO: T. Okita, Chair, Radiation Safety Committee

FROM: F. Miller, RSO

DATE: 1 DEC 1988

SUBJECT: Concerns relating to ^{60}Co transfer

My concern on 29Sep88 was that D. Barbee, NRC Director and B. Srinivasan both denied that the NRC building residents should be informed about the transfer of 8000 Ci of ^{60}Co from a semi-truck in front of the NRC to the reactor pool.

At a Radiation Safety Office staff meeting on 30Sep88, I objected to B. Srinivasan's statement that the transfer went smoothly. I stated my concerns that:

the transfer was handled as an emergency;
there was no written plan
we used untested carrying gear;
we moved an unbraced load;
I questioned whether we had satisfied federal NRC regulations for placing the ^{60}Co in the reactor pool.

pc: B. Srinivasan

STATE OF WASHINGTON

NOTICE TO EMPLOYEES

EMPLOYER_____

RADIOACTIVE MATERIALS
LICENSE NUMBER(s) WN-_____

X-RAY
REGISTRATION NUMBER(s)_____

In the Radiation Control Regulations, the Department of Social and Health Services Has Established Standards for Your Protection Against Radiation Hazards

YOUR EMPLOYER'S RESPONSIBILITY

Your employer is required to:

1. Apply these regulations to work involving sources of radiation.
2. Post or otherwise make available to you a copy of the Department of Social and Health Services regulations, licenses, registrations and operating procedures which apply to work you are engaged in, and explain their provisions to you. These documents may be examined _____
3. Post Notice of Violation involving radiological working conditions, proposed imposition of civil penalties and orders. This document may be examined _____
4. Provide adequate radiation safety training to you, including training in the use and handling of radiation producing devices, as appropriate.

YOUR RESPONSIBILITY AS A WORKER

You should familiarize yourself with those provisions of the Department of Social and Health Services regulations, and the operating procedures which apply to the work you are engaged in. You should observe their provisions for your own protection and protection of your co-workers.

WHAT IS COVERED BY THESE REGULATIONS

1. Limits on exposure to radiation and radioactive material in restricted and unrestricted areas;
2. Measures to be taken after accidental exposure;
3. Personnel monitoring, surveys and equipment;
4. Caution signs, labels, and safety interlock equipment;
5. Exposure records and reports;
6. Options for workers regarding Department inspections;
7. Performance standards for x-ray equipment; and
8. Other related matters.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY

1. The Department of Social and Health Services regulations require that your employer give you a written report if you receive an exposure in excess of any applicable limit as set forth in the regulations or in the license. The basic limits for exposure to employees are set forth in WAC 402-24-020, WAC 402-24-030, and WAC 402-24-035 of the regulations. These sections specify limits on exposure to radiation and exposure to concentration of radioactive material in air or water.
2. If you work where personnel monitoring is required, and if you request information on your radiation exposures,
   (a) Your employer must give you a written report, upon termination of your employment, of your radiation exposures, and
   (b) Your employer must advise you annually of your exposure to radiation.

INSPECTIONS

All licensed or registered activities are subject to inspection by the Department of Social and Health Services or its duly authorized representatives. In addition, any worker or representative of workers who believes that there is noncompliance with Chapter 70.98 RCW, the regulations issued thereunder, or the terms of the employer's license or registration with regard to radiological working conditions in which the worker is engaged, may request an inspection by sending a notice of the alleged noncompliance to the Department of Social and Health Services. The request must set forth the specific grounds for the notice, and must be signed by the worker as the representative of the workers. During inspections, Department inspectors may confer in private with workers, and any worker may bring to the attention of the inspectors any past or present condition which he believes contributed to or caused any noncompliance as described above.

INQUIRIES

Inquiries dealing with radioactive materials may be directed to the Department of Social and Health Services, Health Services Division, Radiation Protection, Mail Stop LE-13, Olympia, Washington 98504, Telephone (206) 753-4481. Inquiries dealing with x-ray machines and facilities may be directed to the Department of Social and Health Services, Radiation Protection, Mail Stop B17-14, 217 Pine Street, Seattle, WA 98101; Telephone (206) 464-6840.

POSTING REQUIREMENT

Copies of this notice must be conspicuously posted in a sufficient number of places where employees are employed in activities licensed or registered pursuant to Chapter 402-16 WAC and Chapter 402-22 WAC, by the Department of Social and Health Services, Radiation Protection, to permit employees working in or frequenting any portion of a controlled area to observe a copy on the way to or from such an area.

A/17

DSHS 18-66 (Rev. 11/80) OX A-215
RHF-3

Washington
State University

Nuclear Radiation Center, Pullman, Washington 99164-1300 / 509-335-8641

MEMORANDUM

TO: David Barbee, Gary S. Collins and B. Srinivasan

FROM: Bill Wilson W. C. W.

DATE: February 10, 1989

SUBJECT: Synopsis of current status of the ^{60}Co source deliberations

I have been in contact with the Nuclear Regulatory Commission people in Washington, DC and was informed that the Federal Government and the State of Washington are in the process of making some decisions relevant to the ^{60}Co sources stored in the reactor pool which were recently received by WSU as a gift from Northup. The deliberations can be broken down into the following areas:

1. Jurisdiction - Do the sources fall under Federal or State jurisdiction? The Federal people in charge of the WSU reactor license have made the determination that the State should have primary jurisdiction. This determination, however, has not been approved by the Commissioin management or Commission legal staff. Once a final decision is approved by the Commission management and legal staff, that decision will be forwarded to the State and then on to WSU.

2. Acquisition - During the process of acquiring the sources from Northup, did WSU fulfill all the Federal and State requirements for the acquisition and shipment of such sources? There do not appear to be any direct regulation violations in this area.

3. Safety - Were all the operations involved with transferring the sources to WSU, including placing the sources in the reactor pool, done in a safe and competent manner and were all the requirements of the applicable regulations followed? There does not appear to be any significant problem in this area.

4. Suitability - Do the sources meet all the requirements of ANSI Standard N542-1977 for Category III sources stored or used in the reactor pool? This is the real crux of the situation involving the sources. If the sources are not suitable, WSU will have to remove them from the reactor pool and store them elsewhere or dispose of them.

A/18

4. (cont.) The Commission people from Washington, DC looking into the question have made a site visit to Mr. J.C. Shepard's facilities in California to check out the certification question. I was told that the present documentation from Mr. Shephard does not provide complete evidence that the sources meet the requirements of the Standard. I was also told that Mr. Shephard indicated to the Commission that he had additional documentation that may show that the sources meet the standard. The Commission did not look at the additional documentation but rather has formulated a series of questions that will eventually be sent to WSU once the jurisdiction question is resolved. I presume this means that WSU will, in all likelihood, have to pay Mr. Shepard to provide the additional documentation that he has and/or answer the questions posed by the Commissiion in the area of certification of the sources.

5. Upgrading the gamma irradiation facility in the reactor pool. If the sources are found to meet the requirements of N542-1977, then using the sources to upgrade the gamma irradiation facility is possible. The upgrade procedure would require submission of appropriate documentation to the Federal Government or State, whichever agent is determined to have jurisdiction. The upgrade documentation would need to include a detailed hazard analysis and detailed drawing of the upgraded pool irradiator and associated control and safety systems. Such documentation would need to be reviewed and approved by the Reactor Safeguards Committee and the Radiation Safety Committee if the sources fell under State jurisdiction.

WEW:crc

Washington State University

Office of the Vice Provost for Research and Dean of the Graduate School
Pullman, Washington 99164-1030 / 509-335-3535

March 3, 1989

Mr. Arden C. Scroggs
Radiation Health Physicist
Department of Social and Health Service
Olympia, WA 98504-0095

Dear Mr. Scroggs:

Thank you for your letter of January 23, 1989 and your thoughtful analysis of organizational and operational issues connected with our Radiation Safety Office (RSO). I am pleased that no items of noncompliance were noted as a result of your recent visit; however, we have been very concerned about the issues of communication and cooperation in the RSO as outlined in your letters to me and to President Smith.

Since your visit we have taken several steps to remedy the communication and cooperation issues. Initially, this involved visits with each of the staff members, extensive discussions with the Director, Dr. B. Srinivasan and the Chair of Radiation Safety Committee, Dr. Tom Okita. Our deliberations also included communications with several faculty served by the RSO.

As a result of these activities, we are committed to the following course of action:

1. A new Director of the RSO will be recruited and hired effective August 1, 1989.

2. Dr. William Rayburn (Associate Vice Provost for Research) and I will supervise a planning effort over the next three months which should result in :

   a. An enlargement and improvement in office space allocated to the RSO.

   b. A reevaluation of job descriptions with possible reclassification of staff members.

   c A thorough evaluation of personnel needs of RSO.

   d. An evaluation of chain-of-command and reporting functions of the RSO.

During the planning efforts and the hiring of a new director, we expect to involve fully the present staff and engage in discussions with staff members of the NRC and the University Health and Safety Department. We believe that the results of these efforts will be a safe, compliant and smooth running Radiation Safety Office at WSU.

Following are responses to the specific recommendations made in your letter of January 23, 1988, under headings D., E. and F:

Item D.1. The incinerator operator is provided with a dosimeter. Also, a dosimeter has been placed in the area of temporary storage (before incineration) of radioactive materials, in the incinerator building.

A/19

Item D.2. Thyroid and urine tests for the incinerator operator, at quarterly intervals, will be given. We have completed such tests for the first quarter of 1989.

Item D.3. A special area, marked with proper signs and separated by rope barrier, has been set aside on the southeast side of the incinerator building, for temporary storage of radioactive materials awaiting incineration.

Item D.4. The top inside portion of the incinerator stack was monitored using portable survey instrument as well as by swipe samples. The survey showed that removable radioactivity as well as the radiation dose were close to back ground levels. The results are available for inspection.

Item D.5. Procedures are being developed that will be followed for the disposal of ash at the sanitary landfill site. These procedures will take into account proper disposal methods for the ash in order to minimize radiation exposure to operation personnel and to achieve the least impact on the environment. These procedures can be inspected at the time of your next visit to the site.

Item E. The semiannual visits by RSO staff to the off-campus areas will be implemented to carry out radiation surveys and to provide other required services (transportation of radioactive wastes, radiation safety instruction etc.). In the first quarter of 1989, the Radiation Safety Officer visited the Puyallup Center to offer instruction in radiation safety, survey the laboratories and provide guidelines for safe storage of radioactive wastes.

Item F. We feel that the Radiation Safety Committee minutes have represented accurately the contents of the business transacted at the meetings. However, beginning in February 1989, we are taping all meetings and making extraordinary efforts to assure that the minutes reflect completely the course of all Radiation Safety Committee meetings.

I trust that you will contact me if you have further concerns or suggestions regarding radiation safety at WSU.

Thank you once again for recommendations on our Radiation Safety Office.

Kind regards.

Sincerely,

Robert V. Smith

Robert V. Smith, Ph.D.
Vice Provost for Research and Dean, Graduate School

pc: President Samuel H. Smith
Dr. B. Srinivasan, Director, RSO
Dr. Tom Okita, Chair, Radiation Safety Committee

Washington State University

Nuclear Radiation Center, Pullman, Washington 99164-1300 509-335-8641

March 10, 1989

Alexander Adams, Jr.
Project Manager
Standardization & Non-Power Reactor
Project Directorate
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
MS WF1-11H3
Washington, DC 20555

Dear Mr. Adams:

Over the past year since Dr. Roy Filby resigned as Director of the Radiation Center to become Chairman of the Department of Chemistry and Dr. David Barbee of the Vet School was appointed Interim Director, a number of problems have occurred at the Radiation Center. My health is deteriorating due to a medical problem that is significantly exacerbated by stress and thus I will be retiring on 7/1/89.

It is not clear to me at this point in time what responsibilities I have in relation to the requirements of T.S. 6:10(3)C & D. The ^{60}Co source and other problems may be viewed as being directly related to the manner in which the Center is now being managed. You might want to call Dr. Filby at 509-335-3331 before calling me at 509-335-8317 with any advice. He can give you his view of the situation. He is now a member of the Reactor Safeguards Committee.

Sincerely,

W. E. Wilson

W.E. Wilson
Associate Director

Enclosure
WEW:crc

A/20

Washington
State University

Nuclear Radiation Center, Pullman, Washington 99164-1300 / 509-335-8641

MEMORANDUM

TO: David Barbee, R.V. Smith and Reactor Safeguards Committee

FROM: Bill Wilson W. C. Wilson

DATE: March 9, 1989

SUBJECT: My retirement and its impact on the Radiation Center

My position at the Radiation Center has been one involving long hours and lots of pressure and stress over a long period of time due to the nature of a nuclear reactor operation. The impact of the job over a 20-year period, especially the increased stress over the past two years, has had a significant impact on my health and my wife and family have prevailed upon me to retire from full-time employment on July 1, 1989.

For many years I have been arranging things so that I could retire on or after 10/1/86 when my service to the State, plus military service, equaled 20 years. I spent ten years in various management positions at the University of Washington reactor and the past 20 years in a management position at the Washington State University TRIGA reactor. I have been eligible to retire under PERS I since 10/1/86. I was considering retirement in 1988 but late in the winter of 1987 I elected to continue my employment at the Radiation Center in deference to the impact my retirement would have upon the staff of the Center (overriding my personal interests) due to the eminent possibility of decommissioning or refueling. It is now apparent that these activities will not take place for a few years beyond the time I am willing to work full-time because of health and personal considerations. Accordingly, I intend to retire from full-time employment as previously stated above at the end of June, 1989.

I will consider helping to lessen the impact of my retirement on the Radiation Center by working part-time as is permitted under the State Retirement System regulations. The maximum that I would be allowed to work is 40% (two days a week) and I would not desire to do even this for more than about a year, depending on my health. Such an arrangement should allow my replacement to be hired and qualified while still meeting all the staffing requirements of the reactor license.

WSU and the Radiation Center have one of two formidable tasks which must be completed in the near future. The fuel in the reactor must be changed from HEU to LEU fuel or, if the Administration so chooses, the facility decommissioned. Either of these options will require a very experienced and SRO licensed reactor management person in addition to the Reactor Supervisor. These operations will require a thorough understanding of the Federal regulations as well as the requirements in the facility license and will involve quality assurance considerations, safety analysis of each major operation and criticality considerations. Recently, the Federal government made changes in the regulations concerning decommissioning planning for all non-power reactors. Before July 26, 1990, WSU must submit a preliminary decommissioning plan, including: 1) a cost estimate for decommissioning, 2) a statement indicating the method by which the funds will be provided, and 3) a method of periodically adjusting the cost estimate. The government is essentially forcing all non-power reactor owners to realistically look at the costs of decommissioning and to set up a mechanism or fund to cover the cost of this possible eventuality. I recently received a cost proposal for decommissioning the WSU reactor from the Nuclear and Advanced Technology Division of Westinghouse that will enable WSU to file the required information.

Historically, the Director of the WSU Radiation Center has been an faculty member with a PhD in physical science and with a number of years experience in nuclear science research. The ANSI standard for the selection and training of personnel at research reactors does not give specific requirements for the Level 1 person or director but indicates that he should be a very experienced senior person. One of the unwritten rules in dealing with the Nuclear Regulatory Commission is that they will never, never let you decrease a specified requirement or self-imposed one once established. Thus, I am not certain how the Commission will view the permanent appointment of a director who is not a senior faculty member with a PhD and a number of years of nuclear science experience.

Another point that must be taken into consideration is that in 1969 when I came to work at the WSU reactor there were also two other nuclear engineers on the staff of the facility. Thus, the number of professionally trained nuclear engineers with extensive research reactor experience has dropped from three to one and is about to drop to zero. Obviously, this will not be acceptable to the Commission and probably will be viewed as a violation of the facility license. A professionally trained nuclear engineer with research reactor

experience thus must be hired to replace me as soon as is possible.

The problem that WSU will encounter in hiring someone to replace me is that the pool of qualified people with the requisite academic training and research reactor experience is very, very small. I doubt very much that WSU will find a qualified person to replace me who will come to work at WSU unless WSU offers that person the director's position. The number of people entering nuclear engineering programs has significantly declined in the past ten years and the demand for experienced nuclear people at nuclear power plants has risen recently. There are numerous open faculty positions in the Nuclear Engineering programs of various schools and the University of Texas has had a hard time obtaining a director for their new TRIGA reactor facility. Thus, I highly recommend that consideration be seriously given to collapsing the functions of the Director and Associate Director into one full-time position and that an appropriately qualified person be hired for the combined job. Such a person would need to be qualified and experienced in the areas of reactor physics, reactor operations and neutron activation analysis. This person would also need to obtain an SRO license for the WSU TRIGA reactor and meet the experience requirements of the ANSI standard for such positions. Also, this person should have good managerial skills and get along with the staff of the Center. The need for both a director and associate director no longer exists at the Center since the size of the operation and the number of faculty and staff at the Center has decreased by about a factor of two over the past ten years.

A nuclear reactor is not a toy but rather a very complex system and refueling the core with a new type of fuel is a complicated task. The design of a new core is not a task for reactor operators or senior reactor operators but requires an experienced nuclear engineer. The original TRIGA core was installed by General Atomics and I have redesigned the core arrangement a number of times since then, including shifting to a mixed core of Standard and FLIP fuels. Over the years I have developed a computer code system to simplify the design task. However, it takes someone experienced in nuclear reactor physics and core design at least at the MS level to operate the code and to understand its output. The seven neutron energy group two-dimensional neutronic code that is used to simulate the WSU TRIGA reactor requires 200K of memory space on the University IBM mainframe computer to run and produces a pile of output one inch thick. A new library of cross-section data will need to be added to the code for the

new LEU type fuel and calculated on a new core made with this new data. The reactor license contains a number of constraints on the reactor core related to safety that must be evaluated for each new core. The computer code significantly helps evaluate the safety-related parameters as well as predicting the performance of the core.

WEW:crc

M E M O R A N D U M

TO: Reactor Operating Staff

FROM: Roy H. Filby, Director

DATE: October 6, 1981

SUBJECT: Administrative Procedures

The management policies of the WSU Nuclear Radiation Center relating to the administration and operation of the WSU TRIGA reactor are set forth in the attached Administrative Procedures. The administrative procedures are designed to supplement the Standard Operating Procedures and are intended to clearly define the administrative requirements, responsibilities, and authority within the Reactor Operating Group.

RHF:efm

W.S.U. NUCLEAR RADIATION CENTER

Administrative Procedure

RESPONSIBILITIES AND AUTHORITY OF REACTOR OPERATING STAFF

I. Ultimate Responsibility

The ultimate responsibility for the safe operation of the WSU TRIGA Reactor located at the Radiation Center is the Licensee, which is Washington State University. The university administration delegates this responsibility through the Graduate School to the management of the Radiation Center. Changes in the management of the Radiation Center shall be reviewed by the WSU Reactor Safeguards Committee. The responsibility of the Radiation Center management shall include, but not be limited to:

1) assuring the safe operation and maintenance of the W.S.U. TRIGA Reactor and associated equipment.
2) assuring that the facility is operated in accordance with all applicable state and federal regulations as well as the facility license, and
3) assuring the enforcement of rules for the protection of personnel from excessive exposure to radiation.

The responsibility and authority delegated to the Radiation Center Management for the safe operation of the reactor is vested in the most senior licensed member of the Center Management. At the WSU Radiation Center, this individual is the Associate Director.

II. Associate Director

The Associate Director shall be a licensed senior reactor operator, shall assist the Director in the general direction of the Nuclear Radiation Center and assume the responsibilities of the Director in his absence and shall have the following listed responsibilities and authority:

1) managing the reactor operations group and administrative group,
2) being responsible for assuring the safe operation of the W.S.U. Reactor in accordance with apolicable state and federal regulations and the facility license.

3) approving all procedures and changes of procedures,

4) reviewing and approving the procurement of equipment and supplies for the operation of the reactor,

5) recommending to the Director the hiring and promotion of personnel as required,

6) functioning as the training coordinator and assuring that the proper training is conducted, that the staff is properly qualified as specified by the requalification plan, and assuring that the required training records are maintained,

7) handling all correspondence with the U.S. Nuclear Regulatory Commission,

8) maintaining a Special Nuclear Materials inventory system to meet the requirements of federal regulations and the facility license. This includes the preparation and submission of Material Status Reports and S.N.M. transfer reports,

9) approving all physical changes in or modifications to the reactor core, reactor instrumentation, or other reactor related facilities and equipment,

10) reviewing and approving the safety analysis for proposed 50.59 changes and forwarding them to the Reactor Safeguards Committee for their review,

11) taking part in the designing of experiments for the reactor to ensure that they will be operable, safe, and will not interfere with the operation of the reactor,

12) developing and submitting special plans required by state and federal regulations including 1) physical security plan, 2) reactor operator requalification plan, and 3) emergency response plan,

13) submitting renewal requests to the N.R.C. for reactor operators and senior operators, and

14) preparing applications for facility license amendments and changes to the Technical Specifications of the reactor.

III. Reactor Supervisor

The Reactor Supervisor shall be a licensed senior operator and shall have the following listed responsibilities and authority:

1) supervising all the personnel in the reactor operations group,

2) developing and maintaining operating procedures for assuring the safe operation and maintenance of the W.S.U. reactor in accordance with applicable state and federal regulations and facility administrative procedures and assuring that the applicable procedures are adhered to,

3) reviewing Health Physics surveys for adequacy and initiating additional surveillance as required,

4) maintaining and assuring facility security in accordance with the the physical security plan, including security training for staff and police,

5) assuring that R.O. and S.R.O. operational and supervisory requalification requirements are met,

6) developing and maintaining a record system on reactor operations as required by Facilities License R-76 and the facility administration procedures as listed below:

a) Reactor operating records, including power levels and periods of operation at each power level

WSU Tech Spec/

(7) offsite inventories and transfers
(8) fuel inventories and transfers
(9) facility radiation and contamination surveys
(10) radiation exposures for all personnel
(11) updated, corrected, and as-built drawings of the facility

6.10 Reporting Requirements

In addition to the requirements of applicable regulations, and in no way substituting for those requirements, reports shall be made to the NRC as follows:

(1) A report within 24 hours by telephone and telegraph to the Region V Office of Inspection and Enforcement with a copy to the Director of Reactor Licensing, of

(a) Any accidental release of radioactivity above permissible limits in unrestricted areas whether or not the release resulted in property damage, personal injury, or exposure;

(b) Any violation of the safety limit;

(c) Any reportable occurrence as defined in Section 1.1, "Reportable Occurrence," of these specifications.

(2) A report within 10 days in writing to the Director, Office of Nuclear Reactor Regulation USNRC, Washington, D.C. 20555, with a copy to the NRC Region V Office of Inspection and Enforcement, of

(a) Any accidental release or radioactivity above permissible limits in unrestricted areas whether or not the release resulted in property damage, personal injury, or exposure. The written report (and, to the extent possible, the preliminary telephone or telegraph report) shall describe, analyze, and evaluate safety implications, and outline the corrective measures taken or planned to prevent reoccurrence of the event,

(b) Any violation of a safety limit,

(c) Any reportable occurrence as defined in Section 1.1, "Reportable Occurrence," of these specifications.

(3) A report within 30 days in writing to the Director, Office of Nuclear Reactor Regulation, USNRC, Washington, D.C. 20555, with a copy to the NRC Region V Office of Inspection and Enforcement, of

(a) Any significant variation of measured values from a corresponding predicted or previously measured value of safety-cornected operating characteristics occurring during operation of the reactor,

(b) Any significant change in the transient or accident analysis as described in the Safety Analysis Report,

(c) Any significant changes in facility organization,

(d) Any observed inadequacies in the implementation of administrative or procedural controls.

(4) A report within 60 days after completion of startup testing of the reactor (in writing to the Director, Office of Nuclear Reactor Regulation, USNRC, Washington, D.C. 20555) upon receipt of a new facility license or an amendment to the license authorizing an increase in reactor power level describing the measured values of the operating conditions including:

(a) An evaluation of facility performance to date in comparison with design predictions and specifications,

(b) A reassessment of the safety analysis submitted with the license application in light of measured operating characteristics when such measurements indicate that there may be substantial variance from prior analysis.

(5) An annual report within 60 days following the 30th of June of each year (in writing to the Director, Division of Licensing, USNRC, Washington, D.C. 20555) with a copy to the NRC Region V Office of Inspection and Enforcement providing the following information:

(a) A brief narrative summary of (i) operating experience (including experiments performed), (ii) changes in facility design, performance characteristics, and operating procedures related to reactor safety and occurring during the reporting period, and (iii) results of surveillance tests and inspections;

(b) Tabulation of the energy output (in megawatt-days) of the reactor, hours reactor was critical, the cumulative total energy output since initial criticality, and number of pulses greater than 1.00$;

(c) The number of emergency shutdowns and inadvertent scrams, including reasons for them;

(d) Discussion of the major maintenance operations performed during the period, including the effect, if any, on the safety of the operation of the reactor and the reasons for any corrective maintenance required;

(e) A brief description, including a summary of the safety evaluations of changes in the facility or in procedures and of tests and experiments carried out pursuant to 10 CFR 50.59;

(f) A summary of the nature and amount of radioactive effluents released or discharged to the environs beyond the effective control of the licensee as measured at or before the point of such release or discharge:

Liquid Waste (summarized on a monthly basis)

(i) radioactivity discharged during the reporting period

- total estimated quantity of radioactivity released (in curies),

6.5.2 Composition and Qualifications

The RSC shall be composed of at least five members knowledgeable in fields that relate to nuclear reactor safety. The members of the committee shall include one facility Senior Reactor Operator and WSU faculty and staff members designated to serve on the committee in accordance with the procedures specified by the WSU committee manual. The university's Radiaiton Safety Supervisor shall be an exofficio member of the committee.

6.5.3 Operation

The Reactor Safeguards Committee shall operate in accordance with a written charter, including provisions for

(1) meeting frequency: the full committee shall meet at least semiannually and a subcommittee thereof shall meet at least semiannually

(2) voting rules

(3) quorums: chairman or his designate and two members

(4) method of submission and content of presentations to the committee

(5) use of subcommittees

(6) review, approval, and dissemination of minutes

6.5.4 Reviews

The responsibilities of the RSC or designated Subcommittee thereof shall include, but is not limited to, the following:

(1) review and approval of all new experiments utilizing the reactor facility

(2) review and approval of all proposed changes to the facility license by amendment, and to the Technical Specifications

(3) review of the operation and operational records of the facility

(4) review of significant operating abnormalities or deviations from normal and expected performance of facility equipment that affect nuclear safety

(5) review and approval of all determinations of whether a proposed change, test, or experiment would consititute a change in the Technical Specifications or on unreviewed safety question as defined by 10 CFR 50

(6) review of reportable occurrences and the reports filed with the Commissions for said occurrences

(7) review and approval of all standard operating procedures and changes thereto

(8) biennial review of all standard procedures, the facility emergency plan, and the facility security plan

M. SUGARMAN
Secretary

STATE OF WASHINGTON

DEPARTMENT OF SOCIAL AND HEALTH SERVICES

Olympia, Washington 98504-0095

November 9, 1988

Robert Smith, Dean
The Graduate School
Washington State University
Pullman, Washington 99163

Dear Dean Smith:

The purpose of this letter is to confirm our telephone conversation with your Radiation Safety Officer, B. Srinivasan, on November 4, 1988, ordering Washington State University to immediately cease further manufacture and distribution of Professor Brian Lamb's atmospheric gas chromatographs, cease further receipt of sealed sources for use in the pool irradiator, and to ensure that the Tritium neutron generator will not be used for research until appropriate procedures are submitted to our office for evaluation. Dr. Srinivasan's verbal statement of intent to comply with this order is hereby acknowledged. These actions have been taken for the following reasons:

1. On February 25, 1986, the University requested permission to conduct research and development work on Professor Brian Lamb's atmospheric gas chromatograph. Authorization was granted by Leo Wainhouse of this office, with the stipulation that this office would be notified prior to any distribution, and that NRC Fuel Cycle Directive 84-22 would be followed before distributing the GC units. Contrary to the above, seven gas chromatographs have been manufactured and distributed, two of which were sent out of the country to the People's Republic of China.

2. The radioactive sources received from J. L. Shepherd & Associates for placement in your pool irradiator are of unknown construction. Although a safety evaluation was performed by Dr. Srinivasan prior to receipt of these sources, he was unable to assure us that the sources were evaluated for water immersion. Therefore, we have serious concerns for the potential contamination of the pool, the pool reactor, and the containment building. Sealed sources used in Category 3 pool irradiators must meet ANSI Standard N542-1977. Furthermore, Todd Tillinghast of Vallecitos Nuclear Center stated that the 5,000 curie GE source, serial number GEC-JCS-9147, which they encapsulated prior to delivery to you, was not evaluated for compliance with the ANSI standard.

3. Contrary to your Radiation Safety Office's agreement with us that no research work would be conducted with the Tritium neutron generator until the proper procedures had been received and approved by our office, our recent inspection of the University showed that research work had been conducted using the Tritium neutron generator.

Other items of concern from our compliance inspection of October 10-13, 1988, will be documented in a formal compliance letter to follow within the next 20 days; however, pursuant to this letter, I am requesting that the University provide the following material to me no later than the close of business, November 18, 1988:

1. An inventory of all sealed sources received from J. L. Shepherd & Associates and placed in your reactor pool, listing the manufacturer, model number, activity, and serial number, where applicable.

2. A copy of the Radiation Safety Officer's safety evaluation for all the above sealed sources.

3. A list of all the firms which received Professor Lamb's gas chromatographs, and copies of their current radioactive materials licenses.

4. Copies of all Radiation Safety Committee meeting minutes in which the manufacture and distribution of the gas chromatograph units, acquisition of sealed sources for the pool irradiator, and/or use of the Tritium neutron generator for research were discussed.

The issues we have raised in our October 10-13, 1988 inspection of your license, and in this letter concerning additional issues, are most serious, requiring an immediate followup inspection and review of radiation safety practices and the activities of the University's Radiation Safety Committee. My staff will be in touch with you regarding acceptable dates for our return visit.

If you have questions, feel free to contact me at (206) 753-3468, or Gary Robertson of my staff at (206) 753-3351.

Sincerely,

T. R. Strong, Chief
Office of Radiation Protection

TRS:kf

cc: B. Srinivasan
Radiation Safety Officer

Jack Hornor 415-943-3700
U.S. NRC, Region V

Richard McCartan
Assistant Attorney General

Washington
State University

Institute of Biological Chemistry, Pullman, WA 99164-6340
509-335-3412 FAX 509-335-7643

TO: Mr. Don Elting and the Radiation Safety Office Staff

FROM: T.W. Okita, Chairperson, RSC

DATE: 7 April 1989

During the deliberations of the April 6 meeting of the Radiation Safety Committee it was noted by the Chair that several memos were sent by RSO staff members to University faculty which in nature set policy by your office. In one instance, one memo (dated March 22, 1989) to Ron Sande was fowarded without prior approval or knowledge by your immediate supervisor. It was obvious to the Radiation Safety Committee that this memo created a great deal of misunderstanding between the RSO staff and R. Sande, a situation which should have never occurred. Irrespective of this point, it is totally beyond the responsibilities of staff members to foward official written communications to University faculty, personnel, or relevant state agencies. The University representative and spokesman for your office in business matters is the Radiation Safety Officer. In the future, please direct all University-related business communications through normal channels with the Radiation Safety Officer or his supervisor as the identifying sender with his appropriate signature on all correspondence.

cc: RSC members
B. Srinivasan
W.R. Rayburn

A/4