

UNITED STATES NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 030-18335/91001(DRSS); No. 040-08819/91001(DRSS);
No. 070-03007/91001(DRSS); No. 999-9003/91001(DRSS)

Docket Nos. 030-18335; No. 040-08819; No. 070-03007; No. 999-90003

License No. 34-14187-02 Category F Priority V
License No. SUD-1417 Category E Priority III
License No. SNM-1941 Category E(2) Priority V
License No. General License

Licensee: Youngstown State University
Youngstown, Ohio

Inspection At: Youngstown State University
Youngstown, Ohio Campus

Site Inspection Conducted: January 30 and 31, 1991

Inspector: J. L. Cameron
J. L. Cameron
Radiation Specialist

2/15/91
Date

Approved By: W. H. Schultz
W. H. Schultz, Chief
Nuclear Materials Safety
Section 1

2-19-91
Date

Inspection Summary

Inspection during period January 30 and 31, 1991 (Reports
No. 030-18335/91001(DRSS); No. 040-08819/91001(DRSS); No. 070-03007/91001(DRSS);
No. 999-90003/91001(DRSS))

Areas Inspected: Routine, announced safety inspection to assess the adequacy of the licensee's overall NRC-licensed operations / licensed under three NRC licenses. The inspection of licensed activities included a review of: organization and management controls; training and instructions to workers; radiation protection procedures; materials, facilities and equipment; receipt and transfer of material; sealed source inventory and leak testing; and waste disposal.

Results: The inspection resulted in the identification of numerous apparent violations and concerns which reflect a need for strengthening the NRC licensed programs with additional management attention to licensed activities. Apparent violations of NRC regulatory requirements were identified and consist of failure to: (1) maintain records of the receipt and disposal of licensed material (Section 9); (2) have a valid license for all materials possessed

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(Section 8); (3) and (4) leak test all specifically and generally licensed sealed sources at required intervals (Section 10); (5) record surveys of incoming packages of radioactive material (Section 9); (6) conduct any physical inventories of sealed and foil sources received and possessed (Section 10); (7) and (8) survey radioactive material use and storage areas at required frequencies (Section 7); (9) and (10) instruct certain ancillary personnel (Section 6); (11) have the Radiation Safety Officer preapprove all orders of radioactive material (Section 9); (12) have packages containing licensed material delivered to the Radiation Safety Officer (Section 9); and (13) have survey all instruments calibrated (Section 8).

DETAILS

1. Persons Contacted

- *M. Powell, Radiation Safety Officer, Since August 1990
- *L. Perry, Director, Environmental and Health Services
- J. Toepfer, Ph.D., Previous Radiation Safety Officer, pre-January 1986 to July 1987
- J. Sich, Ph.D., Previous Radiation Safety Officer, July 1987 to August 1990
- *G. L. Mears, Ed.D., Executive Director, Budget & Institutional Studies
- *B. Gillis, Ph.D., Provost
- *N. Humphrey, Ed.D., University President

The inspector also contacted other licensee employees including researchers, instructors and technicians.

*Denotes those present at the exit meeting conducted on January 31, 1991.

2. Purpose of Inspection

This inspection was conducted to assess the overall adequacy of the University's NRC-licensed activities authorized under the NRC byproduct, source and special nuclear material licenses. During the conduct of the inspection, the inspector learned that the licensee also possessed a general license for the possession and use of a gauging and measuring device. This report includes the results of the inspection of activities conducted under the general license.

3. Inspection History

The only other inspection of activities authorized under the referenced licenses occurred on January 15, 1986. That inspection identified four violations that were presented to the licensee on an NRC Form-591. The violations were for failure to (1) leak test PuBe neutron sources at the proper intervals, (2) maintain records of survey instrument calibrations, (3) maintain records of lab surveys, and (4) maintain control over licensed material contained in the subcritical assembly. None of the previously identified violations were identified as repeat problems during this inspection.

4. Summary of Licensed Program

Youngstown State University is a limited scope licensee authorized under License No. 34-14187-02 to possess small quantities of a few licensed materials in any form for laboratory research and development (R&D) pursuant to 10 CFR 30.4, and student instruction, and as sealed sources for density measurement and gas chromatography. R&D and student instruction are authorized in 20 labs located in three campus buildings using primarily microcurie quantities of licensed material as tracers. At the time of this inspection; however, only one instructional lab was

active, using sub-microcurie quantities of iodine-125 (I-125). Other labs had been active in the past, using sub-millicurie quantities of other licensed materials. Some researchers and instructors stated during the inspection that they had plans in the near future to conduct experiments using licensed material.

The University also possesses separate NRC licenses for 5 curies of PuBe neutron sources and 2500 kilograms of natural uranium in a subcritical assembly, both for laboratory experiments and student instruction. Each of these activities was reviewed during this inspection and findings are described in other sections of this report.

5. Organization

The present Radiation Safety Officer (RSO) has held that position since August 1990. Prior to that, the former RSO held the position from July 1987 to August 1990. The present RSO is a staff member of the University, rather than a faculty member, as were all former RSOs. Previously, the RSOs reported to their respective department chairs, who had little if any involvement in the licensed program.

Presently, the RSO reports to the Director, Environmental and Health Services, who the licensee plans to name as the RSO in the next three to four years. The Director reports to the Executive Director, Budget & Institutional Studies, who reports to the University President. At the time of this inspection, no one above the level of the Director, Environmental and Health Services had any direct involvement in the radiation protection program. The inspector expressed his concern regarding the apparent lack of management involvement in the licensed program. Though not a regulatory or license requirement, management involvement is considered by the NRC to be an essential element in every licensed program.

At the beginning of the inspection, on January 30, 1991, the licensee's RSO presented the inspector with the results of a preliminary audit he had performed soon after assuming the duties of the RSO. The results of that audit were submitted to his immediate supervisor in the form of a memorandum dated September 16, 1990. The memorandum delineated several areas of concern and/or violation regarding the University's licensed material program. Where applicable, the RSO's findings are included in this report.

One concern regarding management involvement was expressed.

6. Training, Retraining and Instructions to Personnel

The inspector reviewed the licensee's training of ancillary personnel who do, or may be required to, enter restricted areas in order to perform their duties. Since May 1, 1989, Item 8(d) of the licensee's application dated August 23, 1988, referenced in Condition 22.A. of License No. 34-14187-02, Amendment No. 04, requires that housekeeping, security, central receiving and maintenance personnel be instructed at hire and annually thereafter in the radiation protection topics that are delineated

in that Item. Prior to May 1, 1989, Item 6(b) of the licensee's letter dated September 2, 1983, referenced in Condition 20 of License No. 34-14187-02, issued on September 19, 1983, required that housekeeping, central receiving and maintenance personnel be instructed at hire and annually thereafter in the radiation protection topics that were delineated in that Item.

While reviewing the training of the above ancillary personnel, the inspector determined that the personnel had not received any training between at least January 1986 and May 1989 and between May 1989 and January 31, 1991.

Failure to instruct ancillary personnel as required appears to be a violation of NRC regulatory requirements.

Since August 16, 1989, Item 10(f)(3) of the attachments to the licensee's application dated July 10, 1989, referenced in Condition 16 of License No. SNM-1941, Amendment No. 02, requires that housekeeping, security and maintenance personnel be instructed at hire and annually thereafter in, among other things, the emergency procedures to be used during a fire or a high risk to exposure to neutron radiation. Prior to August 16, 1989, Item 15(f)(3) of the licensee's application dated May 3, 1984, referenced in Condition 16 of License No. SNM-1941, issued on September 18, 1984, required that housekeeping, security and maintenance personnel be instructed at hire and annually thereafter in, among other things, the emergency procedures to be used during a fire or a high risk to exposure to neutron radiation.

While reviewing the training of the above ancillary personnel, the inspector determined that, between January 1986 and May 1989 and between May 1989 and January 31, 1991, they had not been instructed in the specified emergency procedures.

Failure to instruct ancillary personnel as required appears to be a violation of NRC regulatory requirements.

In his September 16, 1990 memorandum, the RSO indicated that ancillary training had not been conducted in the past, as required. As of January 31, 1991, the RSO was still coordinating a training session for ancillary personnel.

Two apparent violations were identified.

7. Radiation Protection Procedures

The inspector reviewed the licensee's efforts at surveys and monitoring for contamination control with regard to license and regulatory requirements. Item 8(d) of the licensee's August 23, 1988 application, referenced in Condition 22 of License No. 34-14187-02, Amendment No. 04, requires that, after May 1, 1989, the Responsible Person (RP) for each radioactive material use lab perform surveys and wipe tests in the

laboratory facilities at the conclusion of each experiment. All labs where radioisotopes are used will be routinely wipe tested, and, if applicable, surveyed after each use of unsealed sources of radioactive material by the RSO. Appendix A of the licensee's referenced application specifies the frequency of surveys based on the relative hazard of the material used and the amount of material stored and used in the area. Prior to May 1, 1989, Item 15(e) of the licensee's May 13, 1983 application, referenced in Condition 20 of License No. 34-14187-02, issued on September 19, 1983, required that the RSO survey and monitor each laboratory at the conclusion of each experiment. Records of all surveys and monitoring conducted after May 1, 1989 will be maintained by the RSO.

Contrary to the above, several labs where unsealed sources of radioactive material were used had not been surveyed as required. Specifically:

- a. In Cushwa Hall, Rooms No. 2125 and 2127, where millicurie quantities of chromium-51 (Cr-51) and iodine-131 (I-131) were used in the Fall of 1987 and 1989; however, none of the required RSO surveys had been conducted. According to the licensee's referenced procedures, the use of millicurie quantities of Cr-51 and I-131, after May 1, 1989, requires monthly RSO surveys. Prior to May 1, 1989, the RSO was required to perform surveys at the conclusion of each experiment.
- b. In Ward Beecher Hall, Room No. 4019, at least 250 microcuries of hydrogen-3 (H-3, or tritium) were used in the Fall of 1986; however, none of the required RSO surveys had been conducted. According to the licensee's referenced procedures, the RSO was required to perform surveys at the conclusion of each experiment.
- c. In Cushwa Hall, Rooms No. 2095 and 2096, where microcurie quantities of iodine-125 (I-125) were used quarterly, required RSO surveys had not been conducted between May 1989 and August 1990 and between January 1986 and May 1989. According to the licensee's referenced procedures, the use of microcurie quantities of I-125, after May 1, 1989, requires RSO surveys every six months. Prior to May 1, 1989, the RSO was required to perform surveys at the conclusion of each experiment.
- d. In Cushwa Hall, Room No. 2095a, where microcurie quantities of tritium were routinely used, as of August 1990, required RSO surveys had not been conducted. In addition, required RP surveys had not been conducted between May 1, 1989 and January 31, 1991. According to the licensee's referenced procedures, the use of microcurie quantities of tritium, after May 1, 1989, requires RSO surveys every six months. Prior to May 1, 1989, the RSO was required to perform surveys at the conclusion of each experiment.

Failure to survey radioactive material use areas as required appears to be a violation of NRC regulatory requirements.

Items 10 and 12 of the licensee's November 25, 1987 and April 29, 1982 respective applications, referenced in Condition 14 of License No. SUD-1417, require that, twice each year, the neutron fluxes and gamma ray dose rates be checked outside the reactor.

Contrary to the above, between January 1986 and January 31, 1991, the neutron fluxes and gamma ray dose rates outside the reactor had not been checked.

Failure to check neutron fluxes and gamma rays dose rates outside the reactor as required appears to be a violation of NRC regulatory requirements.

Both of the previous RSOs interviewed stated that required surveys around the reactor were never performed. Furthermore, one of the previous RSOs interviewed stated that he was unaware of the laboratory survey requirements until approximately halfway through his term in that position. He further stated that once he became aware of the requirements, he did not have time available to perform his required duties.

In his September 16, 1990 memorandum to first line management, the current RSO noted that required monitoring of use areas by both the RSO and the RP had been delinquent in the past. Although not mentioned in that memorandum, the RSO did perform surveys in August 1990 in all areas where licensed material had been used.

Two apparent violations were identified.

8. Materials, Facilities and Instruments

The inspector reviewed the licensee's available facilities, and survey and counting equipment and its efforts at material accountability. 10 CFR 30.3 requires, in part, that except for persons exempted, no person shall possess or use byproduct material except as authorized by a specific or general license issued pursuant to Title 10, Chapter 1, Code of Federal Regulations.

While auditing the University's radioactive material use and storage areas, the inspector determined that the licensee possessed approximately 165 microcuries of americium-241, as a sealed or foil source, without a valid license and was not exempted from requiring a license. The licensee was not aware of how the source was obtained. The source was adequately packaged and stored in a large vault located in Ward Beecher Hall, Room No. 2022. Licensee personnel stated that the source had been rarely used; however, it had not been tested for leakage or contamination.

Provided that the source is not leaking, 165 microcuries of americium-241 as a sealed or foil source poses no radiation safety hazard to individuals or the environment.

Possession of byproduct material without a valid license or exemption from requiring a license appears to be a violation of NRC regulatory requirements.

Condition 13 of License No. SUD-1417 requires that survey instruments be calibrated on an annual basis by a service company authorized to perform such services.

Contrary to this, between February 24, 1988 to January 31, 1991, the licensee's neutron survey instrumentation had not been calibrated.

The licensee's failure to calibrate survey instruments appears to be a violation of NRC regulatory requirements.

While inspecting the subcritical assembly, the inspector expressed some concerns regarding this area of licensed activities. One of the inspector's concerns was that the moderator for the reactor, light water from the tap, was not deionized prior to its introduction into the assembly. This may have been a contributing factor to the amount of corrosion observed on nearly all horizontal surfaces inside the assembly and some vertical surfaces as well. Another possible contributing factor to the observed corrosion may be that the moderator is not drained from the assembly. The moderator remains in the assembly year-round and make-up water is added whenever the level is reduced due to evaporation. As a resin column was available, the inspector suggested that it be used to deionize the moderator prior to filling the assembly. The inspector further suggested that the moderator be drained each year after use of the assembly to help reduce the amount, and effects, of corrosion on interior components. Appropriate analyses of the moderator should be performed prior to its release to the sanitary sewerage system.

In addition to those regarding the subcritical assembly, the inspector expressed concerns regarding the facilities and equipment, or lack thereof, available to the RSD to receive incoming packages and analyze test samples. In order to analyze required wipe and leak tests, operable equipment to measure alpha, beta and gamma radiations is needed. Also, dedicated facilities to store required records and incoming packages is needed.

Two apparent violations were identified and a several concerns were expressed.

9. Receipt and Transfer of Material

The inspector reviewed the licensee's procedures for ordering and receiving licensed materials and the handling of generated wastes from those materials. 10 CFR 30.51(a) requires that each licensee keep records showing the receipt, transfer, export and disposal of byproduct material.

Contrary to this, the licensee did not keep records of the receipt and disposal of byproduct material. Specifically, the licensee did not keep some records of receipts of byproduct material received and used in Cushwa Hall, Rooms No. 2095, 2095a, and 2096, between January 1986 and January 31, 1991 and did not keep any records of disposals made between January 1986 and January 31, 1991.

Failure to keep accountability records as required appears to be a violation of NRC regulatory requirements.

Item 5 of the licensee's April 14, 1989 letter, referenced in Condition 22 of License No. 34-14187-02, Amendment No. 04, requires that the licensee follow the procedures delineated in "Model Procedures for Safely Opening Packages Containing Radioactive Material," Appendix L, Regulatory Guide 10.8, "Guide for the Preparation of Applications for Medical Use Programs," Revision 2, August 1987. Prior to May 1, 1989, Item 7 of the licensee's September 3, 1985 letter, referenced in Condition 20 of License No. 34-14187-02, issued on September 19, 1983, required that the licensee follow the procedures delineated in "Model Procedures for Safely Opening Packages Containing Radioactive Material," Appendix F, Regulatory Guide 10.8, "Guide for the Preparation of Applications for Medical Use Programs," Revision 1, October 1980. Both of those referenced procedures require that the licensee survey each incoming package of byproduct material and record the results of those surveys.

Contrary to this, from January 1986 to January 31, 1991, the licensee did not record surveys of any incoming packages of byproduct material.

Failure to maintain records of surveys of incoming package that contain byproduct material appears to be a violation of NRC regulatory requirements.

Item 8(a) of the licensee's August 23, 1988 application, referenced in Condition 22 of License No. 34-14187-02 and Item 15(a) of the licensee's May 13, 1983 application, referenced in Condition 20 of License No. 34-14187-02, both titled "Safety Rules," require that:

- a. all purchases of radioisotopes be approved in advance by the RSO and processed by the purchasing department of the University, and
- b. all radioisotopes purchased be delivered to the RSO who will then deliver them to the appropriate user's storage area.

Contrary to the above, from January 1986 to January 31, 1991, purchased radioactive materials have not been:

- a. approved in advance by the RSO. Specifically, radioactive materials purchased for use in Cushwa Hall, Rooms No. 2095 and 2096, were not pre-approved by the RSO, and
- b. delivered to the RSO. Specifically, radioactive materials purchased for use in Cushwa Hall, Rooms No. 2095 and 2096, and in Ward Beecher Hall, Room No. 4042a, were not delivered to the RSO. In both instances, radioactive materials were delivered directly to the individuals who purchased them.

Failures to have the RSO approve all purchases of radioactive materials in advance and have packages containing radioactive materials delivered to RSO appear to be violations of NRC regulatory requirements.

In his September 16, 1990 memorandum, the RSO listed the failure to maintain required accountability records and his concern regarding the

whereabouts of generated radioactive wastes. To obtain a base-line inventory of licensed materials possessed by the University, the RSO distributed a memorandum on November 14, 1990 to all listed users requesting a detailed list of materials possessed, use areas, authorizations, intended procedures, personnel, equipment and monitoring records. To date, January 31, 1991, two users have not responded to his request for information.

Four apparent violations were identified.

10. Sealed Source Inventory and Leak Testing

The inspector reviewed the University's licensed material inventory system and aspects of its sealed source leak testing program. Condition 16 of License No. 34-14187-02, Amendment No. 04, which superseded Condition 25 of License No. 34-14187-02, issued on September 19, 1983, on May 1, 1989, requires that the licensee conduct a physical inventory every six months to account for all sealed and foil sources received and possessed under the license.

Contrary to the above, between October 27, 1987, the effective date of Condition 25, and January 31, 1991, the licensee had not conducted a physical inventory of any sealed and foil sources received and possessed under the license.

Failure to conduct any physical inventories of sealed and foil sources, as required, appears to be a violation of NRC regulatory requirements.

Condition 12(A)(1) of License No. 34-14187-02, Amendment No. 04, which superseded Condition 13(A)(1) of License No. 34-14187-02, issued on September 19, 1983, on May 1, 1989, requires that each sealed source containing licensed material, unless otherwise excepted in this Condition, be tested for leakage and/or contamination at intervals not to exceed six months. Records of leak test results shall be maintained for inspection by the Commission.

Contrary to the above, between December 22, 1987 and May 8, 1989 and between May 8, 1989 and July 26, 1990, the licensee did not test a nominal 10 millicurie nickel-63 source for leakage and was not otherwise excepted from leak testing. In addition, records of the results of the leak test conducted on July 26, 1990 were not maintained for inspection by the Commission.

Failure to leak test foil sources at required intervals appears to be a violation of NRC regulatory requirements.

10 CFR 31.5(c)(2) requires that any person who acquires, receives, possesses, uses or transfers byproduct material in a device pursuant to a general license shall assure that the device is tested for leakage of radioactive material and proper operation of the on-off mechanism and indicator, if any, at no longer than six month intervals or at such other intervals as are specified in the label.

Contrary to this, between October 2, 1987 and January 31, 1991, a generally licensed gauging device containing 30 millicuries of curium-244 and 30 microcuries of americium-241, as sealed sources, was not tested for leakage at the required three year interval specified by the label on the device.

Failure to leak test generally licensed sealed sources at the required interval appears to be a violation of NRC regulatory requirements.

Three apparent violations were identified.

11. Waste Disposal

In addition to the apparent record keeping violations identified in Section 9 above, the inspector expressed concerns that the licensee could not account for waste materials containing millicurie quantities of tritium, carbon-14 and Cr-51 and microcurie quantities of I-125. Although two researcher/instructors stated that they had prepared generated wastes for disposal and then gave the wastes to the RSO for disposal, the RSO involved stated that he had never received wastes from the researchers/instructors and had never disposed of any radioactive materials. The waste materials could not be located on University property. The above mentioned wastes were generated from byproduct materials, primarily 3.5 millicuries of tritium, received and used prior to and after January 1986.

One concern was expressed.

12. Exit Meeting

On January 31, 1991, the inspector held a meeting with those individuals denoted in Section 1 to summarize the scope and preliminary findings of the inspection, the NRC Enforcement Policy and any suggestions for program improvement. The licensee did not identify any of the information in this report as proprietary.

Youngstown State University
Youngstown, Ohio

Apparent Violations

- A. Failure to maintain records of receipt and disposal of byproduct material.
- B. Possession of byproduct material without a valid license or exemption from requiring a license.
- C. Failure to test generally licensed gauging device for leakage at required three year interval.
- D. Failure to record surveys of incoming packages of byproduct material.
- E. Failure to conduct a physical inventory of any sealed or foil source received and possessed under the license.
- F. Failure to test a nominal 10 millicurie nickel-63 foil source for leakage at required six month interval.
- G. Failure to conduct required surveys of byproduct material use areas at license specified frequencies.
- H. Failure to instruct ancillary personnel in license specified radiation protection topics at required intervals.
- I. Failure to instruct ancillary personnel in proper emergency response to incidents involving sealed neutron sources.
- J. Failure to have all purchases of byproduct material pre-approved by the Radiation Safety Officer.
- K. Failure to have all byproduct material packages delivered to the Radiation Safety Officer.
- L. Failure to check to neutron fluxes and gamma ray dose rates outside the subcritical assembly at required frequencies.
- M. Failure to calibrate neutron survey instruments at required frequencies.

Concerns Regarding Licensed Program

Youngstown State University

Byproduct Materials License:

1. Whereabouts of generated radioactive wastes cannot be determined.
2. Lack of available facilities and equipment for the conduct of required activities.
3. Lack of a laboratory/researcher audit program.

Source Materials License:

1. Water moderator should be drained from subcritical assembly when not in use. Evidence of corrosion on most horizontal and some vertical surfaces which could eventually degrade source capsule integrity.
2. Water moderator should be deionized prior to filling subcritical assembly.