

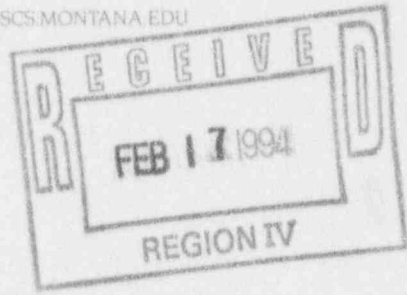
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February 15, 1994

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011

SUBJECT: Reply to Notice of Violation (NRC Inspection Report 030-00871/93-01)

This letter is in reply to (1) the NRC's routine, unannounced safety inspection conducted by Mr. Mark R. Shaffer on November 3-4, 1993; (2) the correspondence dated January 3, 1994 (signed by Mr. Dwight D. Chamberlain, Acting Director, Division of Radiation Safety and Safeguards); and (3) the Notice of Violation (dated January 3, 1994 that accompanied Mr. Chamberlain's letter).

GENERAL RESPONSE

Montana State University is committed to the implementation of an effective Radiation Safety Program - one that is comprehensive in scope with regard to the radiological protection of its employees and the general public. Additionally, the University is committed to fulfilling all of the requirements contained in its Broad Scope (A) License, License Application, supplemental letters to the License Application, and in the body of the Code of Federal Regulations, Title 10, Chapter 1 that specifically apply to its licensed operations. The University Administration and Radiation Sources Committee will spare no effort in acquiring these objectives.

The University pursues these goals within a three-tiered structure. The primary tier involves "on-the-spot" radioactive material use assistance, consultation, and support (e.g., spill response, shielding, isotope delivery, waste processing, etc.). The second tier is comprised of scheduled procedures which ultimately provide direct indication that operations are being conducted in a radiologically safe manner (e.g., survey/monitoring, instrument calibration, audit, training, etc.). The tertiary tier involves the preparation, review, and archive of documentation in support of the physical activities performed within the first two tiers (e.g., leak test records, survey records, use proposals, Radiation Sources Committee meetings, etc.). Tier one is considered "reactive", tier two is "proactive", and tier three is "post-active" (although a significant degree of RSC business is proactive).

It is understood by the University's Administration that many of the problems associated with the current violations stem from an inadequate allowance of resources for mandatory operational

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health physics activities. The University's radiological control program failed because the ten-percent FTE staffing allowance was not sufficient to cover the scope of our radiological operations.

To ensure that the forementioned objectives are met, Montana State University has recently hired an experienced health physicist to serve as the full-time Radiation Safety Officer for our licensed activities. The qualifications of this individual have been presented to NRC licensing authorities, and an amendment adding this individual to our license has been issued (see Attachment A). This action has been taken in response to the concerns regarding weaknesses in management oversight.

Many of the required corrective measures to put this license back in full regulatory compliance will be included in the University's license renewal application (pending). It should be understood that some of these measures cannot yet be applied because they will require specific amendment action on the part of the NRC. However, the proposed procedural specifics will be included with each pertinent response.

In order to support the necessary procedural adjustments in radiological monitoring activities, Montana State University will be providing the Radiological Safety Officer with adequate facilities and equipment. To that end, the following equipment has either been purchased or is currently on order:

- Victoreen 450P Ion Chamber with 450-1A Communicator (radiation survey)
- Two Eberline ESP ratemeters equipped with GM probes (contamination monitoring)
- Ludlum Model 2200 Single Channel Analyzer (radioiodine bioassay procedures)
- 2 Ludlum Model 44-3 Gamma Scintillators (low-energy gamma survey/bioassay)
- Ludlum Model 43-1 Alpha Scintillator (alpha contamination survey)
- Ludlum Model 500-2 Electronic "Pulser" (instrument calibrations)
- Packard Model 1900TR Liquid Scintillation Analyzer (contamination monitoring)
- DEC LPv 486/66 - 8 MB RAM - 240 MB Drive (data acquisition/record keeping)

Additionally, a dedicated laboratory area shall be established from which the operational aspects of the radiation safety program will be conducted (e.g., survey analysis, waste processing, calibration activities).

In closing, it is anticipated that the Nuclear Regulatory Commission will acknowledge the sincere effort that Montana State University has apportioned toward reestablishing confidence in our capacity to appropriately manage a broad-scope radioactive materials license. However, we will gladly welcome any advice or suggestions that the NRC staff deem appropriate in that regard.

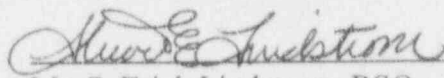
For Montana State University,



Dr. Robert Swenson, Vice President
Research and Creative Activities



Dr. Clifford Bond, Chairman
Radiation Sources Committee



Mr. S. Erick Lindstrom, RSO
Safety and Risk Management

SPECIFIC RESPONSES TO VIOLATIONS

Description of Violation A(1)

License Condition 24 requires, in part, that licensed material be used in accordance with the statements, representations, and procedures contained in the application dated September 24, 1982, and letter dated October 14, 1983.

1. Item 1B of the letter dated October 14, 1983, states that the Radiation Sources Committee will review work in process and exposure records to further implement the ALARA commitment. These reviews are to include, in part, (1) an examination of the exposure records from film badge use each year, and (2) an audit of the amounts of radioisotopes purchased and disposed under various proposals each year. From these figures one or two projects will be selected for a detailed review involving additional input from the project supervisor so that the RSC can establish whether the amounts used are reasonably consistent with the results obtained.

Contrary to the above, between September 13, 1991, and November 4, 1993, the licensee's Radiation Sources Committee had not examined the exposure records from film badge usage each year, nor had an audit been performed of the amounts of radioisotopes purchased and disposed under various proposals each year.

This is a Severity Level IV violation (Supplement VI).

Reasons for Violation A(1)

The violation occurred because of two (tier 3) errors in program continuity. These are addressed individually as follows:

1. The dosimetry/exposure records were not presented to the Radiation Sources Committee as a matter of Committee business. The failure is attributed to both the Radiation Safety Officer's workload commitment, and to a lack of diligence on the part of the Committee.
2. Isotope receipt/use evaluations and annual audits were not performed as a result of an insufficient administrative commitment of resources to the tasks required of the Radiation Safety Officer.

Corrective Steps Taken and Results Achieved

As mentioned in the opening comments, Montana State University has committed resources toward the hiring of a full-time Radiation Safety Officer. This individual will be responsible for maintaining an accurate dosimetry database and disseminating related exposure data to the user community as well as to the Radiation Sources Committee. Additionally, the RSO will be

responsible for the conduct of annual audits of the activities of authorized users under the University's License (to include isotope receipt/use evaluations).

Specifically:

1. Information regarding dosimetry results will be presented (when available) to the Radiation Sources Committee at the scheduled quarterly meetings of that committee.
2. Comprehensive annual audits will be conducted of the activities of all individuals in possession of Radiation Use Permits. The Radiation Safety Officer or his designee will conduct an annual interview with the individual in charge of each authorized activity. Specific attention shall be focused on items such as changes in procedure, incidents, exposure levels, accuracy of inventory, waste handling, and training. The status and relevant information shall be presented to the Committee by the Radiation Safety Officer. Continuance of the user's Authorization will be contingent on the results of the annual audit. Renewal, per se, is not an element (i.e., regeneration of identical paperwork) of the audit process. If the authorized user is in compliance with the original conditions of his/her RUP and requests to continue work, then the RUP is deemed current and valid by the Committee. All presently authorized work shall be audited by January 31, 1995.

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur.

Date When Full Compliance Will be Achieved

Compliance with License Condition 24 (Item 1B of the letter dated October 14, 1983) has not yet been fully realized. This is due in part to the proximity in time of the delivery of the Notices of Violation and the arrival of the new Radiation Safety Officer (the first week in January 1994). The time necessary for this individual to get acquainted with the details of the University's licensed activities (to include the implementation of revised procedures) will require a minimum of six months. However, it is projected that full compliance will be achieved on or before June 30, 1994.

Description of Violation A(2)

2. Item 2 of the supplemental letter dated October 14, 1983, states, in part, that G-M type survey meters which are used most frequently for checking incoming packages and for surveys will be checked (calibrated) at intervals of approximately 6 months by taking a series of readings at various distances from a cesium-137 source with a nominal activity of 30 millicuries.

Contrary to the above, between September 13, 1991, and November 4, 1993, the licensee's G-M type survey meters used for checking incoming packages had not been checked at 6-month intervals by taking readings at various distances from a cesium-137 source. Specifically, survey meters with serial numbers 85591, 98140, 80356, and 032697 had not been calibrated at the required frequencies.

This is a Severity Level IV violation (Supplement VI).

This is a repeat violation.

Reasons for Violation A(2)

The violation occurred because of problems inherent to program continuity in tier 2. These are addressed as follows:

1. There were no adequate procedures implemented for the timely calibration of radiation detection equipment used for both package receipt and general survey operations.

Corrective Steps Taken and Results Achieved

As mentioned in the opening comments, Montana State University has committed resources toward the hiring of a full-time Radiation Safety Officer. This individual will be responsible for implementing a number of new procedures that will ensure the timely calibration of all radiation detection equipment. These new procedures will include:

1. A revised instrument calibration procedure will be instituted. Calibration tracking and chronology will be done through the use of a task database. A database generated list is to be updated and printed out on a monthly basis, and will inform the RSO/technicians of the chronological obligations that pertain to licensed activities. The check list is sorted by the type of task to be performed, with tasks/activities normally executed in a group fashion. When a task is completed in the field, a notation (date and initials of person performing the task) is made adjacent to the task entry. This prevents tasks from being executed redundantly, and serves as an indicator of performance. The completed check list is subsequently held as an internal record. Additional records (e.g., calibration certificates) will be kept on file in the Radiation Safety Office as evidence of performance.
2. A revised package receipt, distribution, and inventory program shall be implemented as follows:

Ordering and Receipt of Radioactive Materials

- a. The Authorized User will place orders for radioactive material as needed, but shall ensure that the requested materials and quantities have been authorized by the

Committee. Stock and waste inventory should be consulted prior to placing an order (to ensure that the addition of the newly ordered material does not exceed the User's specific on-hand limits).

- b. The following requirements shall be adhered to when ordering and receiving radioactive material:
- 1) For routinely used materials, written records that identify the authorized user, isotope, chemical form, activity, and supplier will be maintained. These records will be checked by the RSO or his designee to verify that radioactive materials are being ordered through proper channels.
 - 2) Vendors and carriers shall be specifically instructed to deliver radioactive material directly to the Radiation Safety Officer.
 - 3) Every effort shall be made to ensure that all deliveries are scheduled during normal working hours.

Package Opening Procedures

- a. The following procedure will be performed by either the Radiation Safety Officer or a trained technician:
- 1) Don protective latex surgical gloves.
 - 2) Visually inspect the package for any sign of damage (e.g. wetness, physically crushed). If damage is evident, stop the procedure and notify the Radiation Safety Officer.
 - 3) Measure the exposure rate at one meter from the package surface and record the results in the Receipt Log. If the exposure rate at one meter from the package surface exceeds 10 mR/hr or twice the Transport Index given on the package or packing list, stop the procedure and notify the Radiation Safety Officer.
 - 4) Measure the exposure rate at the surface of the package and record the results in the Receipt Log. If the exposure rate at the surface of the package exceeds 200 mR/hr, stop the procedure and notify the Radiation Safety Officer.
 - 5) Open the outer package (following the manufacturer's directions, if supplied) and remove the packing slip. Open the inner package to verify the contents (compare requisition, packing slip, and container label).

Check the integrity of the final source container (inspecting for breakage of seals or vials, loss of liquid, discoloration of packaging material). In case of irregular findings, notify the Radiation Safety Officer.

- 6) If leakage or contamination is suspected, determine the extent of the contamination (to enable initiation of safety procedures commensurate with the level of contamination) by wiping the external surface of the final source container with a cotton swab; assay and record the results in the Receipt Log.
 - 7) Count low-energy beta emitters in the liquid scintillation counter for H-3, C-14, S-35, P-33.
 - 8) Count low-energy gamma emitters with a ratemeter attached to a low-energy gamma scintillation (e.g., Ludlum 44-3) probe.
 - 9) Count high energy beta emitters with a ratemeter attached to a Geiger-Müller probe.
 - 10) If any samples show contamination greater than 11,100 dpm per wipe (using geometry correction), the material shall be held for decontamination or transfer back to vendor (following appropriate containment).
- b. Check to ensure that the shipment of radioactive material does not exceed the possession limit (of both the end user and the University).
- c. Monitor the packaging material and packages for contamination prior to discarding.
- 1) If contaminated (above twice the background rate), treat as radioactive waste.
 - 2) If not contaminated, obliterate the radiation labels before discarding in the regular trash (going to sanitary landfill).
- d. Deliver the materials to the indicated end user. Ensure that the user (or a representative of the user) signs a copy of packing list as a record of receipt. Retain the packing list copy for inventory and receipt verification records.
- e. Additional guidance may be found the U.S. Nuclear Regulatory Commission Regulatory Guide 7.3 - Procedures for Picking up and Receiving Packages of Radioactive Material.

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur.

Date When Full Compliance Will be Achieved

Compliance with Item 2 of the supplemental letter dated October 14, 1983 has not yet been fully realized. However, it is projected that full compliance will be achieved on or before June 30, 1994.

Description of Violation A(3)

3. Item 3 of the supplemental letter dated October 14, 1983, states that experiments using iodine-125 for iodinations of proteins or cells will be performed in a specially designed (fume) hood equipped with a Bendix 4-19102 air sampler. This air sampler is used to draw measured air samples through charcoal filters which can then be counted.

Contrary to the above, between September 13, 1991, and November 4, 1993, fume hoods used for performing iodinations with iodine-125 were not equipped with a Bendix 4-19102 air sampler. Specifically, the fume hood located in Linfield Hall, Room 123A, was used to perform iodinations during the specified period, and an air sampler was not in place during these procedures.

This is a Severity Level IV violation (Supplement VI). This is a repeat violation.

Reasons for Violation A(3)

1. The primary reason for the violation of air monitoring procedures stems from the unrealistic rationale for radioiodine air monitoring that the University committed to in the supplemental letter dated October 14, 1983, and the letter dated December 13, 1991.
2. Secondly, the University currently possesses only one of these air monitoring devices, and the logistical complications of communicating the need, facilitating the delivery, and ensuring the proper use (and evaluation of results) could not have possibly been met in a timely and compliant manner.
3. It is recognized that in at least one case the authorized user failed to initiate the monitoring activities outright. This conduct has been reprimanded by the Radiation Sources Committee.

In summary, the failure to adhere to the requirement is derived originally from an impractical assessment of the coordination involved to implement fulfillment of the task. Subsequently, those responsible for implementation of this requirement had neither the instructions nor the mechanism on how to best follow through.

Corrective Steps Taken and Results Achieved

We presently see no evidence linking the performance of these procedures to an occupational dose reduction dividend (based on the activities of iodine-125 used, and the requirement that a properly functioning fume hood be utilized in the iodination procedure).

In the pending renewal application, the University will not propose as an absolute requirement the need to air monitor iodination procedures. We feel that this type of monitoring activity should be left to the discretion of the Radiation Safety Officer, determined by the variables involved with a specific application that may deviate from normal iodination procedures.

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur. We do, however, intend to re-evaluate and curtail the air monitoring commitment that the University is presently obligated to sustain.

Date When Full Compliance Will be Achieved

The University seeks to eliminate the air monitoring requirement. We propose to do this through the pending license renewal application, or through an amendment of the current license under which the University is operating. However, until such changes in program commitments are approved by the NRC, the University will conduct operations per Item 3 of the supplemental letter dated October 14, 1983. Compliance will be effective immediately.

Description of Violation A(4)

4. Item 14 of the supplemental letter dated October 14, 1983, states that the "instructions to workers" are intended as a first step in the training or retraining of persons working under a particular proposal. Individuals supervising persons working with millicurie amounts of radioisotopes should provide further training in this area either by themselves or working through the Radiological Safety Officer.

The Radiation Sources Committee will check the individual projects selected for audit each year to ensure that further training is proceeding and that at least part of this training is recorded.

Contrary to the above, between September 13, 1991, and November 4, 1993, the Radiation Sources Committee had not selected individual projects for audit nor checked individual projects to ensure that further training was proceeding.

This is a Severity Level IV violation (Supplement VI).

Reasons for Violation A(4)

The violation occurred because of problems inherent to program continuity in tier 2. These are addressed as follows:

1. There were no adequate procedures implemented for the timely training and annual retraining of occupationally exposed personnel. Additionally, there were no adequate procedures implemented for the timely training and periodic retraining of support personnel whom may enter radiologically controlled areas as a consequence of their employment.

Corrective Steps Taken and Results Achieved

1. As indicated in the response to Violation A(1), comprehensive annual audits will be conducted of the activities of all individuals in possession of Radiation Use Permits. In conjunction with the annual audit, refresher training shall be given to all occupationally exposed employees who have gone one year or more without the necessary training.
2. Researchers in possession of Radiation Use Permits will be required to send all new employees/students working in controlled areas to radiation safety training. This training will be conducted by the University's Radiation Safety Officer, and will be offered on an "as needed" basis. Under no circumstances will individuals without proper training be allowed to handle radioactive materials.
3. The Radiation Safety Officer shall inquire as to the nature of support work taking place in radiologically controlled areas. After proper evaluation of the radiological hazards associated with such work, the Radiation Safety Officer will conduct training for the individuals tasked with those support obligations.
4. The specifics of the training procedures are given as follows:

Training for Individuals Working in or Frequenting Controlled or Restricted Areas

Formal Training for New Users

- a. The responsibility for instruction of new users falls jointly to the Radiation Safety Officer and the individual's supervisor. The Radiation Safety Officer will conduct an introductory lecture for new users. These lectures will be conducted as needed.

Instruction in matters specific to projects will be presented by the supervisor. This training will include:

- 1) The nature of radiation and its interaction with matter. (Radiation Safety Officer)
- 2) Definitions and units of dose, quantity, etc., and methods of calculating and measuring radiation levels for an appropriate variety of sources. (Radiation Safety Officer)
- 3) Biological effects of chronic and acute doses of various radiations. (Radiation Safety Officer)
- 4) Personnel dosimetry and bioassay procedures. (Radiation Safety Officer)
- 5) Standards set by regulations and license conditions. (Radiation Safety Officer)
- 6) Methods of control and measurement of surface contamination. (Supervisor and Radiation Safety Officer)
- 7) The proper use of protective clothing and equipment. (Supervisor and Radiation Safety Officer)
- 8) Operating and emergency procedures specific to the individual user's group. (Supervisor and Radiation Safety Officer)
- 9) Proper maintenance of records of receipt, use, transfer, and disposal. (Supervisor and Radiation Safety Officer)

Periodic Retraining (Refresher Training)

- a. Periodic retraining will be presented by Radiation Safety Officer, and would include instruction in:
 - 1) Changes in regulations, NRC license conditions, local authorizations and their consequences to the individual's operations.
 - 2) Changes in operating procedures.
 - 3) Emergency procedures.

Annual Training for Project Managers and Principal Investigators

- a. Principal Investigators will meet annually with the Radiation Safety Officer and the to review the following subjects:
 - 1) Pertinent changes in regulations or license conditions.
 - 2) New techniques or procedures in isotope handling.
 - 3) Waste processing.
 - 4) Laboratory responsibilities and liability.

Radiation Protection Training for Support Personnel

- a. Radiation protection for support personnel consists of scheduled annual meetings with the various support staff that have reason to frequent controlled or restricted areas. This includes plant operations and custodial personnel.
- b. The program will consist of the showing of a videotape entitled RADIATION PROTECTION FOR SUPPORT PERSONNEL, by NUS Corporation. An additional training video entitled "*Radiation and Our Environment*" produced by the Canadian Atomic Energy Control Board, Office of Public Information may also be used.
- c. In addition to the video presentations, the Radiation Safety Officer will elicit questions from support staff and answer them fully. Important concepts such as the types and use of warning signs and labels will be reviewed. The Radiation Safety Officer will ensure that the support staff have the means and understanding to immediately and directly contact the Radiation Safety Officer, at any time, in the event of a real or apparent accident involving radioactive materials.

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur.

Date When Full Compliance Will be Achieved

Compliance with Item 14 of the supplemental letter dated October 14, 1983 has not yet been fully realized. However, following a comprehensive program audit (including a survey regarding

training deficiencies), the training procedure as described above will be implemented as soon thereafter as practicable. It is projected that full compliance will be achieved on or before June 30, 1994.

Description of Violation A(5)

5. Item 16D(5) of the supplemental letter dated October 14, 1983, states that projects involving the use of quantities of radioactive materials larger than 10 times the (applicable) limits specified in Appendix C to 10 CFR Part 20 will receive visits, inspections, and/or surveys approximately four times a year, at intervals of 6 months or less.

Contrary to the above, between September 13, 1991, and November 4, 1993, laboratories using quantities of radioactive materials larger than 10 times the applicable limits specified in Appendix C to 10 CFR Part 20 did not receive visits, inspections, and/or surveys at the intervals specified above. Specifically, the laboratories located in Johnson Hall Rooms 725 and 815, and Linfield Hall Room 123A were not visited, inspected, or surveyed at the specified frequency.

This is a Severity Level IV violation (Supplement VI).

Reasons for Violation A(5)

The violation occurred because of problems inherent to program continuity in tier 2. These are addressed as follows:

1. The violation is the result of an insufficient administrative commitment of resources for the accomplishment of tasks required within the scope of the University's license. Such tasks would include timely inquiries on the part of the RSO to see that the required monitoring had been performed.

Corrective Steps Taken to Avoid Further Violations

The proposed corrective step the University will take to address this problem will consist of the following program elements:

1. Radiation and contamination survey chronology and performance will be tracked through the use of a task database. A database generated list is to be constantly updated and printed out on a monthly basis, and will inform the RSO/technicians of the chronological obligations that pertain to licensed activities. The check list is sorted by the type of task to be performed, with tasks/activities normally executed in a group fashion. When a task is completed in the field, a notation (date and initials of person performing the task) is made adjacent to the task entry. This prevents tasks from being executed redundantly, and serves as an indicator of performance. The completed check list is subsequently held

as an internal record. Additional records (calibration certificates, survey reports, leak test results, etc.) will be kept on file in the Radiation Safety Office as evidence of performance.

2. Laboratories using quantities of radioactive materials larger than 10 times the applicable limits specified in Appendix C to 10 CFR Part 20 will be surveyed for radiation/contamination at least quarterly, with intervals not to exceed 6 consecutive months.

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur.

Date When Full Compliance Will be Achieved

Compliance with Item 16D(5) of the supplemental letter dated October 14, 1983 has not yet been fully realized. However, following a comprehensive program audit (including a appraisal of monitoring deficiencies), the radiation and contamination survey procedure and chronology as described above will be implemented as soon thereafter as practicable. It is projected that full compliance will be achieved on or before June 30, 1994.

Description of Violation A(6)

6. Item 16G of the supplemental letter dated October 14, 1983, states, in part, that new film badges are distributed and old film badges are returned once each month.

Contrary to the above, between September 13, 1991, and November 4, 1993, several film badges were not returned for processing each month. Specifically, individuals assigned film badge numbers 87, 88, 234, 304, 332, 337, 338, and 339 had not sent their film badges in for processing for periods of up to 5 months after the date of issuance.

This is a Severity Level IV violation (Supplement IV).

Reasons for Violation A(6)

Violation of Item 16G of the supplemental letter dated October 14, 1983 has occurred primarily because the responsibility for timely dosimeter collection and processing was diluted to a degree that guaranteed ineffectiveness.

Corrective Steps Taken and Results Achieved

The newly hired Radiation Safety Officer has compiled a comprehensive database for the purpose of tracking both dosimetry distribution and external radiation monitoring results. The RSO will track the return of individual dosimeters, ensuring timely return and processing. The RSO will investigate each instance of non-return, and document the circumstances accordingly. Additionally, Montana State University will be converting to a quarterly monitoring period. It can be reasoned that this will significantly diminish the burden of issue and exchange.

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur.

Date When Full Compliance Will be Achieved

Compliance with Item 16G of the supplemental letter dated October 14, 1983 will be accomplished on or before June 30, 1994.

Description of Violation A(7)

7. Item 16I of the supplemental letter dated October 14, 1983, states, in part, that for transportation of radioactive material off site (portable moisture/density gauges), when secretaries receive notification of a trip to a field site, they will convey the information directly to the RSO, and that in approximately 10 percent of the cases the vehicle will be examined and surveyed by the RSO or a designated representative.

Contrary to the above, between September 13, 1991, and November 4, 1993, the RSO or a designated representative had not examined and surveyed approximately 10 percent of the vehicles transporting radioactive material off site. Specifically, of approximately 60 shipments of radioactive material off site during calendar year 1993, none of the vehicles were examined or surveyed by the RSO or his designated representative.

This is a Severity Level IV violation (Supplement VI).

Reasons for Violation A(7)

The violation occurred because of problems inherent to program continuity in tier 2. These are addressed as follows:

1. The violation is primarily the result of an insufficient administrative commitment of resources for the accomplishment of tasks required within the scope of the University's

license obligations. Such tasks would include timely inquiries on the part of the RSO to see that the required monitoring had been performed.

2. The necessary communication mechanisms for informing the Radiation Safety Officer of the events relating to the off-site transport of radioactive materials were not suitably established. This resulted in user's removing radioactive materials off-site without formally notifying the Radiation Safety Officer.

Corrective Steps Taken and Results Achieved

The University's Radiation Safety Officer is presently compiling a computerized itinerary of the projected off-site usage of radioactive materials. The majority of materials that will be transported off-site are the CPN and Troxler soil moisture/density gauges (AmBe). Communicat-ing with the individual material users is the primary mechanism for constructing the itinerary. The RSO will be responsible for informing those users of the importance of performing vehicular inspections/surveys, along with establishing that the proper shipping papers always accompany the materials in question.

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur.

Date When Full Compliance Will be Achieved

Compliance with Item 16l of the supplemental letter dated October 14, 1983 has not yet been fully realized. This is due in part to the proximity in time of the delivery of the Notices of Violation and the arrival of the new Radiation Safety Officer (the first week in January 1994). The time necessary for this individual to get acquainted with the intricacies of the University's

licensed activities (to include the implementation of revised procedures) will require a minimum of six months. However, it is projected that full compliance will be achieved on or before June 30, 1994.

Description of Violation B

- B. 10 CFR 20.201(B) requires that each licensee make such surveys as may be necessary to comply with the requirements of Part 20 and which are reasonable under the circum-stances to evaluate the extent of radiation hazards that may be present. As defined in 10 CFR 20.201(a), "survey" means an evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions.

Contrary to the above, as of November 4, 1993, the licensee did not make surveys to assure compliance with that part of 10 CFR 20.101 that limits the radiation exposure to the whole body to 1.25 rems per calendar quarter. Specifically, on several occasions, film badges worn by individuals had not been returned for processing for periods of up to 5 months and an evaluation of these individual's exposures had not been performed to assure compliance with 10 CFR 20.101.

This is a Severity Level IV violation (Supplement IV).

Reasons for Violation B

1. Violation of 10 CFR 20.101 has occurred primarily because the responsibility for timely dosimeter collection and processing was diluted to a degree that guaranteed ineffectiveness.
2. There was no follow-up or evaluation of the potential exposures received by the individuals to whom the dosimeters were assigned. This failure can be attributed to an insufficient administrative commitment of resources for the accomplishment of tasks required within the scope of the University's license obligations.

Corrective Steps Taken and Results Achieved

The newly hired Radiation Safety Officer has compiled a comprehensive database for the purpose of tracking both dosimetry distribution and external radiation monitoring results. The RSO will track the return of individual dosimeters, ensuring timely return and processing.

The RSO will investigate each instance of non-return, and document the circumstances accordingly. Integral to the "lost-dosimeter" investigation will be a thorough evaluation of potential dose received by the individual to whom the dosimeter had been assigned. Such an evaluation would include an examination of the individual's exposure history, and a review of the procedures under which radioactive materials or radiation producing equipment was handled.

Additionally, Montana State University will be converting to a quarterly monitoring period. It can be reasoned that this will significantly diminish the burden of issue and exchange.

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur.

Date When Full Compliance Will be Achieved

Compliance with 10 CFR 20.101 will be accomplished on or before June 30, 1994.

Description of Violation C

- C. 10 CFR 30.35(g) requires, in part, each person licensed under 10 CFR Part 30 or Parts 32-35 shall keep records of information important to the safe and effective decommissioning of the facility in an identified location until the license is terminated by the Commission. Information the Commission considers important to decommissioning consists, in part, of: (1) records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site, (2) as-built drawings and modifications of structures and equipment in restricted areas where radioactive materials are used and/or stored, and (3) records of cost estimates performed for the decommissioning funding plan or the amount of the certified for decommissioning, and the method used for assuring funds if either a funding plan or certification is used.

Contrary to the above, as of November 4, 1993, the licensee had not kept records of information important to the safe and effective decommissioning of the facility in an identified location.

This is a Severity Level IV violation (Supplement VI).

Reasons for Violation C

The violations of 10 CFR 30.35(g) were the result of the result of an insufficient administrative commitment of resources for the accomplishment of tasks required within the scope of the University's license. Such tasks would include timely inquiries or actions on the part of the RSO

to see that the required monitoring and performance recording had been conducted. This would include documentation of routine survey activities, spill response results, etc.

Corrective Steps Taken and Results Achieved

The University's Radiation Safety Officer is presently developing a series of facility drawings/maps of areas where radioactive materials are used or stored. These drawings will be used as references when routine radiation and contamination surveys of those areas are conducted. The following steps shall be taken to accomplish the survey tasks:

1. The Radiation Safety Officer shall perform, or oversee the performance of, thorough exposure rate and area contamination surveys in all radioisotope handling or storage areas.
2. These surveys will be conducted at least monthly for high-use laboratories, and at least quarterly for lesser use areas. Survey periodicity shall be based on an evaluation of the quantity of RAM used, and the potential for external and internal exposures. Survey

periodicity shall also be linked to the 10CFR20 Annual Limit on Intake (ALI) values, and the potential for radiation exposure induced risk based on the studies of the NCRP, ICRP and BEIR Committees.

3. Areas will be surveyed for direct radiation levels around storage and waste areas, and for surface contamination in general laboratory areas. Contamination surveys will be conducted as follows:
 - a. Wipe samples of about 100 square centimeters will be obtained from potentially contaminated surfaces and analyzed either by alpha, gamma, or beta counting techniques.
 - b. For areas where removable contamination levels exceed 200 dpm, decontamination procedures will be implemented and the area will be resurveyed.
 - c. For areas where removable contamination levels exceed 2000 dpm, the user is notified and work is curtailed until decontamination is accomplished.
 - d. An area is considered decontaminated when a measurement of not greater than twice the general background rate is made using a low-level survey meter.
 - e. Records shall be kept for all laboratory area surveys. These records shall include a drawing of the areas surveyed, exposure rate and contamination survey results, the name of the surveyor, the date of the survey, and a description of any actions taken as a result of excessive results. The record shall be reviewed and maintained by the RSO.
4. The procedures outlined in (3) above shall be implemented for responding to and for the documentation of any radioactive spills or releases that may occur on the campus of Montana State University.

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur. We are confident that the records of routine and special surveys will provide the necessary information, both in degree and kind, for the effective implementation of decommissioning procedures and for evaluating the costs associated with decommissioning activities.

Date When Full Compliance Will be Achieved

Compliance with 10 CFR 30.35(g) will be accomplished on or before June 30, 1994.

Description of Violation D(1)

- D. 10 CFR 71.5(a) requires that a licensee who transports licensed material outside of the confines of its plant or other place of use, or who delivers licensed material to a carrier for transport, comply with the applicable requirements of the regulations appropriate to the mode of transport of the Department of Transportation (DOT) in 49 CFR Parts 170-189.
1. 49 CFR 177.817(a) requires that a carrier not transport a hazardous material unless it is accompanied by a shipping paper prepared in accordance with 49 CFR 172.200-203. Pursuant to 49 CFR 172.101, radioactive material is classified as hazardous material.

Contrary to the above, on several occasions between September 13, 1991, and November 4, 1993, the licensee transported licensed material outside the confines of its plant, and the shipping papers accompanying the shipment were not prepared in accordance with 49 CFR 172.200-203. Specifically, the shipping papers prepared for the licensee's portable moisture/density gauges containing radioactive sources did not contain the proper hazardous materials description, shipping name, and identification number.

This is a Severity Level IV violation (Supplement V).

Reasons for Violation D(1)

The violation occurred because of problems inherent to program continuity in tier 2. These are addressed as follows:

1. The violation is primarily the result of an insufficient administrative commitment of resources for the accomplishment of tasks required within the scope of the University's license obligations. Such tasks would include timely inquiries on the part of the RSO to see that the required vehicle monitoring had been performed and that proper shipping papers accompanied the devices to be transported off-site.
2. The necessary communication mechanisms for informing the Radiation Safety Officer of the events relating to the off-site transport of radioactive materials were not suitably established. This resulted in user's removing radioactive materials off-site without formally notifying the Radiation Safety Officer.

Corrective Steps Taken and Results Achieved

The University's Radiation Safety Officer is presently compiling a computerized itinerary of the projected off-site usage of radioactive materials. The majority of materials that will be transported off-site are the CPN and Troxler soil moisture probes (AmBe). Communicating with the individual material users is the primary mechanism for constructing the itinerary. The RSO will be responsible for informing those users of the importance of performing vehicular

inspections/surveys, along with establishing that the proper shipping papers always accompany the materials in question (see Attachment B "Transportation Certificate for Nuclear Gauge").

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur.

Date When Full Compliance Will be Achieved

Compliance with 49 CFR 172.200-203 has not yet been fully realized. This is due in part to the proximity in time of the delivery of the Notices of Violation and the arrival of the new Radiation Safety Officer (the first week in January 1994). The time necessary for this individual to get acquainted with the details of the University's licensed activities (to include the implementation of revised procedures) will require a minimum of six months. However, it is projected that full compliance will be achieved on or before June 31, 1994.

Description of Violation D(2)

2. 49 CFR 173.415(a) requires that each shipper of a DOT Specification 7A Type A package must maintain on file for at least one year after the latest shipment a complete documentation of tests and an engineering evaluation or comparative data showing that the construction methods, packaging design, and materials of construction comply with the specification as described in 49 CFR 178.350.

Contrary to the above, as of November 4, 1993, the licensee shipped its portable moisture/density gauges containing americium-241 and/or cesium-137 in a package marked DOT Specification 7A Type A and did not maintain for a period of at least 1-year following that shipment documentation of tests and an engineering evaluation or comparative data showing that the package complied with the applicable DOT specification.

This is a Severity Level IV violation (Supplement V).

Reasons for Violation D(2)

The violation occurred because of problems inherent to program continuity in tier 3. These are addressed as follows:

1. The violation is primarily the result of an insufficient administrative commitment of resources for the accomplishment of tasks required within the scope of the University's

license obligations. Such tasks would include having accurate records "on-hand" of all applicable activities regarding the storage, transportation, and use of radioactive materials.

Corrective Steps Taken and Results Achieved

The containers for which the required DOT documentation was not available for inspection are manufactured and tested for compliance with DOT integrity specifications by the manufacturer's of those containers. These manufacturers (Campbell Pacific Nuclear Corp. and Troxler Electronic Laboratories, Inc.) provide certification of the physical integrity of these containers with the delivery of each moisture/density gauge.

Each of Montana State University's Troxler and CPN gauges were originally transferred with a "Type A Package Certification" that states that the package is in compliance with DOT regulations, and that the engineering and testing data are on file at Campbell Pacific Nuclear and Troxler Electronic Laboratories.

Montana State University has in its possession the manufacturer's original certifications for the DOT's physical integrity requirements. Currently, these certifications are not physically present with each instrument.

We have depended on this certification in the past. However, after contacting RSPA (Research and Special Programs Administration of the Department of Transportation) we were informed that this certificate did not meet the needs, and that we (as a licensee) should have the complete testing and engineering data on file. Montana State University has requested these data from both Campbell Pacific Nuclear and Troxler Electronic Laboratories.

To address the violation, Montana State University will prepare the manufacturer's updated certification of compliance (to include complete testing and engineering data) with 49 CFR 173.415(a) requirements and include a copy with each moisture/density gauge container (see Attachment C).

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur.

Date When Full Compliance Will be Achieved

Compliance with 49 CFR 173.415(a) requirements has not yet been fully realized. This is due in part to the proximity in time of the delivery of the Notices of Violation and the arrival of the new Radiation Safety Officer (the first week in January 1994). The time necessary for this individual

to get acquainted with the details of the University's licensed activities (to include the implementation of revised procedures) will require a minimum of six months. However, it is projected that full compliance will be achieved on or before June 30, 1994.

Description of Violation D(3)

3. 49 CFR 173.476(a) requires, in part, that each shipper of special form radioactive materials maintain on file, for at least 1-year after the latest shipment, a complete safety analysis that demonstrates that the special form material meets the requirements of 49 CFR 173.469. 49 CFR 173.469(b) specifies the tests to be conducted for the safety analysis.

Contrary to the above, as of November 4, 1993, the licensee shipped packages containing americium-241 and/or cesium-137 in special form and did not maintain for a period of at least 1-year following each shipment documentation that the special form material met the requirements of 49 CFR 173.469.

This is a Severity Level IV violation (Supplement V).

Reasons for Violation D(3)

The violation occurred because of problems inherent to program continuity in tier 3. These are addressed as follows:

1. The violation is primarily the result of an insufficient administrative commitment of resources for the accomplishment of tasks required within the scope of the University's license obligations. Such tasks would include having accurate records "on-hand" of all applicable activities regarding the storage, transportation, and use of radioactive materials.

Corrective Steps Taken and Results Achieved

The special form radioactive material for which the required DOT documentation was not available for inspection is manufactured and tested for compliance with DOT integrity specifications by the manufacturer's of that special form material. These manufacturers (Campbell Pacific Nuclear Corp., Troxler Electronic Laboratories, Inc.) provide certification of the physical integrity of these materials with the delivery of each moisture/density gauge.

Each of Montana State University's Troxler and CPN gauges were originally transferred with a "Special Form Certification" that states that the radioactive material is in compliance with DOT regulations, and that the engineering and testing data are on file at Campbell Pacific Nuclear and Troxler Electronic Laboratories.

Montana State University has in its possession the manufacturer's original certifications for the DOT's physical integrity requirements. Currently, these certifications are not physically present with each instrument.

We have depended on this certification in the past. However, after contacting RSPA (Research and Special Programs Administration of the Department of Transportation) we were informed that this certificate did not meet the needs, and that we (as a licensee) should have the complete testing and engineering data on file. Montana State University has requested these data from both Campbell Pacific Nuclear and Troxler Electronic Laboratories.

To address the violation, Montana State University will prepare the manufacturer's updated certification of compliance (to include complete testing and engineering data) with 49 CFR 173.476(a)/49 CFR 173.469 requirements and include a copy with each moisture/density gauge container (see Attachment D).

Corrective Steps Taken to Avoid Further Violations

Through implementation of the above mentioned procedures, combined with diligent program oversight on the part of the Radiation Safety Officer, we are confident that this type of violation will not recur.

Date When Full Compliance Will be Achieved

Compliance with the requirements of 49 CFR 173.476(a)/49 CFR 173.469 have not yet been fully realized. This is due in part to the proximity in time of the delivery of the Notices of Violation and the arrival of the new Radiation Safety Officer (the first week in January 1994). The time necessary for this individual to get acquainted with the details of the University's licensed activities (to include the implementation of revised procedures) will require a minimum of six months. However, it is projected that full compliance will be achieved on or before June 30, 1994.

ATTACHMENT

A

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number
25-00326-06

Docket or Reference number
030-00381

Amendment No. 45

Montana State University
of Bozeman
Bozeman, Montana 59717

In accordance with letter dated November 26, 1993, License Number 25-00326-06 is amended as follows:

Condition 12 is amended to read:

- 12. A. Licensed material shall be used by, or under the supervision of, individuals designated by the Radiation Sources Committee.
- B. The Radiation Safety Officer for this license is S. Erick Lindstrom.

Condition 24 is amended to read:

- 24. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.
 - A. Application dated July 11, 1980
 - B. Application dated September 24, 1982
 - C. Letter dated October 14, 1983
 - D. NRC memo dated August 14, 1984
 - E. Letter dated September 26, 1984
 - F. Letter dated February 7, 1985
 - G. Letter dated February 21, 1989
 - H. Letter dated November 26, 1993

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

By *Livian H. Campbell*
 Nuclear Materials Licensing Section
 Region IV
 Arlington, Texas 76011

Date JAN 20 1994

ATTACHMENT
B

**TRANSPORTATION
CERTIFICATE FOR
NUCLEAR GAGE**

NATURE AND QUANTITY OF CONTENT					PACKAGE			
Proper Shipping Name	Radio- nuclid	Group	Form	Activity		Category	Transport Index	Type
For U.S. Shipments See Section 2 CAB 82, Tariff 6-D	Name Or Symbol of Principal Radioactive Content	Group Number of Groups I To VII	Chemical Form And Physical State (Gas/ Liquid/Solid) or Special Form, or Special Encapsulation	Number Of Curies, or Milli- Curies	Number Of Packages	I-White or II-Yellow or III-Yellow Label	For Yellow Label Categories Only	Industrial or Type A, or Type B
Radioactive Materials, Special Form (n.o.s.) IATA Article # 2129		III I	Special Form		I	II - Yellow	0.1	Type A

This certifies that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, labelled and in proper condition for transportation according to applicable national government regulations.

This certificate must be filled in and carried in the front seat with the driver at all times.

DATE	DESTINATION	DATE	DESTINATION

SHIPPING PAPER

This shipping paper must be filled out for any transfer of radioactive materials by motor vehicle from Montana State University. The shipping paper must be available in a prominent position on the passenger seat or the dashboard during transportation. It can be used as the written notice of the completion of the trip by adding the date of return and sending it to the office of the vice president for research, Montana Hall. A separate form is required for each trip made with any soil moisture probe. See the back side for a summary of Montana State University regulations regarding the transportation of radioisotopes and the use of this and similar forms.

FORM 1, TYPE A SEALED SOURCES

FORM 1A Troxler soil moisture probes

Material: 100 mCi Am-241

Form: Type A sealed source
Am/Be neutron source

Date of trip: _____

Starting from: Linfield Hall, Montana State University

Destination: _____

Returning to: Linfield Hall, Montana State University

Expected date of return: _____

Returned: time: _____

date: _____

Persons on the trip and/or using this source:

ATTACHMENT
C

SHIPPING PAPER

This shipping paper must be filled out for any transfer of radioactive materials by motor vehicle from Montana State University. The shipping paper must be available in a prominent position on the passenger seat or the dashboard during transportation. It can be used as the written notice of the completion of the trip by adding the date of return and sending it to the office of the vice president for research, Montana Hall. A separate form is required for each trip made with any soil moisture probe. See the back side for a summary of Montana State University regulations regarding the transportation of radioisotopes and the use of this and similar forms.

FORM 1, TYPE A SEALED SOURCES

FORM 1A Troxler soil moisture probes

Material: 100 mCi Am-241

Form: Type A sealed source
Am/Be neutron source

Date of trip: _____

Starting from: Linfield Hall, Montana State University

Destination: _____

Returning to: Linfield Hall, Montana State University

Expected date of return: _____

Returned: time: _____

date: _____

Persons on the trip and/or using this source:

excerpts from the REGULATIONS OF THE RADIATION SOURCES COMMITTEE

from 3G, page 7: Transportation of radioactive materials to any location other than the main campus, the experiment farm west of Bozeman, or the Fort Ellis site requires a substantially larger amount of paperwork. The field site must be approved by both the Radiation Sources Committee and by the Nuclear Regulatory Commission. Such approval usually cannot be obtained in less than one month, and may take longer. After the use of a particular field site is authorized, every transfer of radioactive material to or from the field site must be documented. Two notifications are required for each trip. These requirements apply to all radioisotope transport, including the use of sealed sources in Am-Be neutron probes for soil moisture measurement.

First, at least thirty minutes before the vehicle is scheduled to leave the campus of Montana State University a call must be placed to the Research Office at 994-2891 giving information on the time and place of departure to one of the secretaries. The second required notification shall be in writing, including the time of departure, time of return, and amounts of radioactive material transported in each direction. It must be sent to the Radiological Safety Officer, Dr. Reed Howald, Chemistry Department, Gaines Hall, within one week of the return date.

When the secretaries receive notification of a trip to a field site, they will call 994-5415 or 994-4801 and convey the information directly to the Radiological Safety Officer or leave a message for the Officer. In approximately ten percent of the cases the vehicle will be examined and surveyed by the Radiological Safety Officer or a designated representative. Persons transporting radioisotopes must cooperate fully whenever they are selected for such an audit or if they are requested to contact the Radiological Safety Officer immediately upon return. It is essential that regulations assuring the safety and control of transported material are always followed. Audits are necessary to provide records showing full compliance with these regulations.

from 3Q5 page 10: Whenever the source is moved it must be secured to prevent loss and accompanied by shipping papers. The following steps should be taken:

- a: notification by telephone that the source will be leaving campus--call the reserach office at 994-2891 giving the place and time of departure at least 30 minutes before departure.
- b: cooperate with the Radiological Safety Officer or his representative in a survey of the vehicle to assure spoper security, sufficient distance from people, and the presence of proper shipping papers.
- c: On return of the source, send written notification to the Radiological Safety Officer (R. Howald, Chemistry Department), stating the time and date of departure, the materials transported, the individuals on the trip and those using the source, and the time and date of return. Dr. Howald should receive the written notification within one week of the date of return.

Additional note: A separate shipping paper should be used for each trip, and the additional information requested above can be added to this form at the end of the trip, and it can be used for the written notification.

ATTACHMENT
C

PACKAGING

49 CFR 173.415 Authorized Type A Packages.

(a) Each shipper of a Specification 7A package must maintain on file for at least one year after the latest shipment, and provide to the DOT on request, a complete documentation of tests and an engineering evaluation or comparative data showing that the construction complies with the specifications (173.350 Specification Definitions, and 173.24 General Requirements and Marking, 173.403 Definitions, and 173.465 Type A package tests).

49 CFR 173.465 Type A Packaging Tests

(a) Water Spray test

Prior to each of the following tests, the package was sprayed for a period of one hour at a rate that would deposit two inches of water on the package. Some entry of water into the package was observed but since the package is constructed of aluminum or plastic, which are non-hydroscopic, no weakening or loss of integrity of the package was observed.

(b) Free drop test

The loaded package was dropped from a height of 1.2 meters on its corner to a concrete surface. The aluminum case deformed, the plastic case cracked, but in all cases the package remained intact.

(c) Compression test

Five loaded cases were stacked on top of a sixth case for a period of 24 hours. No visible deformation was observed.

(d) Penetration test

A brass rod 1.25" diam, with a hemispherical end, weighing 13.2 lbs was dropped from a height of one meter onto the top of the case. The aluminum case dimpled, but no cracking or other significant deformation occurred.

Engineering Evaluation

The package meets the requirements of 49 CFR 173.415

Douglas Carter

CPN

Douglas Carter

Radiation Safety Officer

November 10, 1992

Troxler Electronic Laboratories, Inc.
Testing results for Type A Packages for Troxler Gauges/Cases as required by USDOT and IAEA

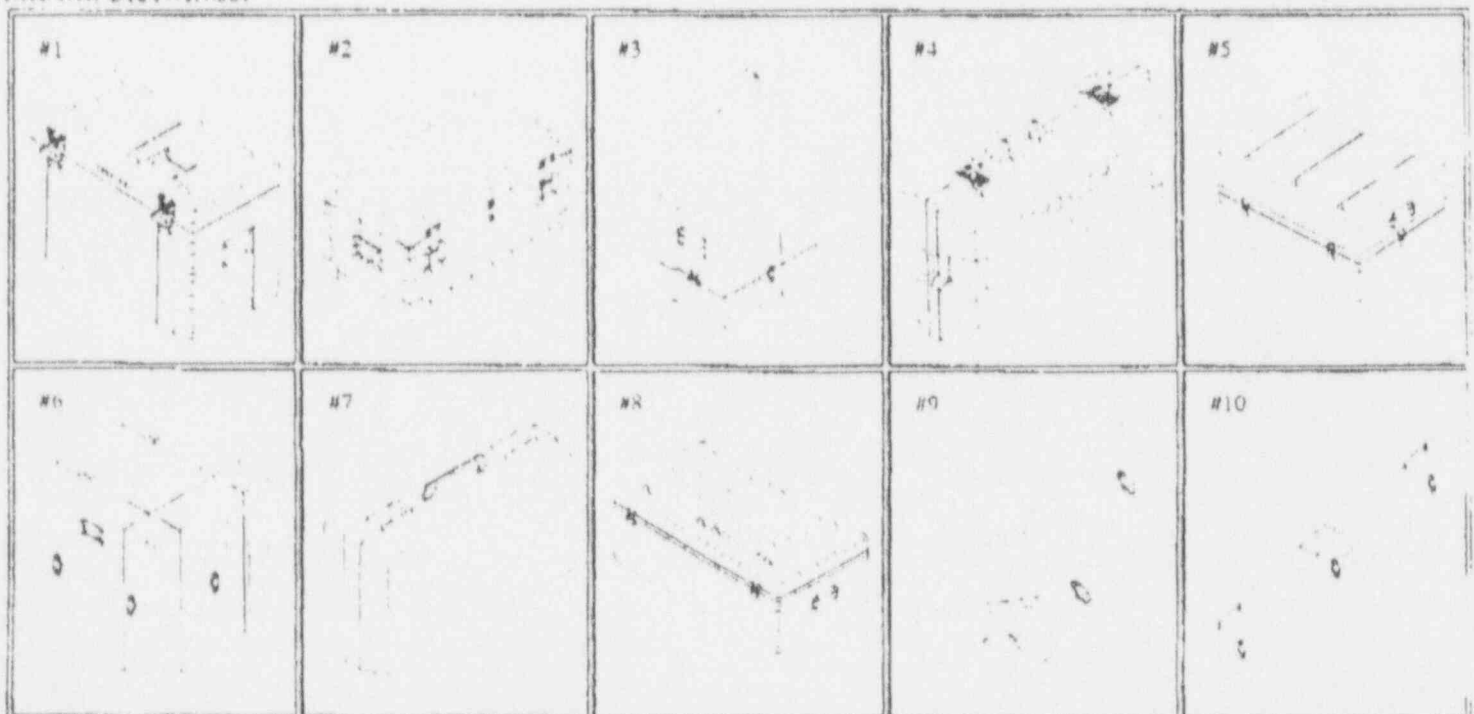
INSTRUCTIONS FOR FINDING YOUR 7A TYPE A TESTING RESULTS:

- 1) Determine which gauge/case combination you possess by first looking at the case drawings (below) to determine the correct case.
- 2) Look down the first column (on next page) and find the applicable column for your gauge.
- 3) Find the corresponding case in the second column (next page) adjacent to the first column.
- 4) Gauges that are no longer in production may not be listed. Please contact your Troxler representative or the Troxler home office if you need any assistance.

TESTING PERFORMED & RESULTS (unless otherwise indicated in footnotes):

- **Water Spray:** Subjected the package to a water spray simulating rainfall of approximately two (2) inches per hour for one continuous hour.
Results: No physical damage to the package was observed, unless otherwise noted in footnotes.
- **Vibration:** The package was vibrated with a displacement of 0.1" at approximately 12 Hz for a period of 24 continuous hours.
Results: No physical damage to the package was observed, unless otherwise noted in footnotes.
- **Free Drop:** The package was dropped from a height of four (4) feet onto a non-yielding surface from a position to cause maximum damage to the package.
Results: The case was scratched due to the abrasiveness of the concrete, but no other physical damage to the package was observed, unless otherwise noted in footnotes.
- **Penetration:** The package was placed on a non-yielding surface. A 1 1/4" diameter, 13 pounds steel cylinder with a hemispherical end was dropped in the vertical position from a height of 40" onto the package to a point to cause maximum damage to the package.
Results: No physical damage to the package was observed, unless otherwise noted in footnotes.
- **Compression:** Package was placed on a non-yielding surface and subjected to a compressive load of 265 pounds per square foot multiplied by vertically projected area of the package, in square feet, for 24 continuous hours.
Results: No physical damage to the package was observed, unless otherwise noted in footnotes.

PACKAGE DRAWINGS:



- 1) Engineering Evaluation - Water exposure of the magnitude required by regulations would not affect the shielding or containment integrity.
- 2) Compressive load at date of test was specified as being derived using the "maximum horizontal cross-section of the package," in place of the "vertically projected area of the package."
- 3) Cosmetic damage was observed.
- 4) Package material was exempt from this test per regulations at the time of testing.
- 5) Package tested with full weight plus 20 pounds added.
- 6) Package weight not available (case is no longer in production).
- 7) Engineering Evaluation - Test not practical due to case geometry.
- Test results were obtained from the most current Type A Package testing and evaluation documentation.

FOOTNOTES:

GAUGE MODEL	CASE/ DRAWING #	WATER EXPT	Vibration	FREE DROP	Penetration	Compression	PACKAGE Weight (lbs)	DATE TEST COMPLETED
3400 SERIES - 3401, 3401-B 3411, 3411-B 3430, 3430-M 3440, 3440-M	WATER RES/#1	(1)	/	/	/	/	110, (5)	9/91
	TRUNK/#2	(1)	/	/	/	/	115, (5)	9/91
	PYRAMID/#3	(1)	/	/	/	/	93, (5)	9/91
	BLOWMOLD/#4	(1)	/	/	/	/	81	5/85
3241 SERIES - 3241-A, 3241-B 3241-C, 3241-M 3242	WATER RES/#1	(1)	/	/	/	/	103, (5)	9/91
	PLYWOOD/#6	(4)	/	/	/	/	(6)	3/81
	GAUGE CTRY	(1)	/	/	/	/	95	1/83
	PLASTIC/#7	(1)	/	/	/	/	70, (5)	6/91
3218, 3217	PLASTIC/#7	(1)	/	/	/	/	70, (5)	6/91
	PYRAMID #3	(1)	/	/	/	/	93, (5)	9/91
	PLAS (OLD)/#8	(4)	/	/	/	/	(6)	4/80
4543	TRUNK/#2	(1)	/	/	/	/	145, (5)	9/91
	WATER RES/#1	(1)	/	/	/	/	110, (5)	9/91
4640	TRUNK/#2	(1)	/	/	/	/	93	6/84
	WOODEN/#9	(4)	/	/	/	/	77	3/81
3565	ALUMINUM/#10	(4)	/	/	/	/	(2)	3/81
	PLAS IC/#7	(1)	/	/	/	/	70, (5)	6/91
4440 SERIES	WATER RES/#1	(1)	/	/	/	/	120, (5)	9/91
	PLAS IC/#7	(1)	/	/	/	/	70, (5)	6/91

Consult the table below for applicable testing results, following the instructions on the previous page.

A / in the table below indicates the applicable test was performed, with the results as stated on previous the page of this document, unless otherwise stated in the referenced footnotes.

RESULTS OF TESTING

ATTACHMENT

D

SPECIAL FORM

49CFR173.476 Approval of special form radioactive materials.

- (a) Each shipper of special form radioactive materials shall maintain on file for at least one year after the latest shipment, and provide to the RSPA on request, a complete safety analysis, including documentation of any test, demonstrating that the special form material meets the requirements of Paragraph 173.469. An IAEA Certificate of Competent Authority issued for the special form material may be used to satisfy this requirement.

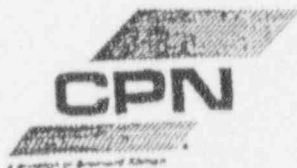
49CFR173.469 Tests for special form radioactive materials

- (1) Impact Test Free fall of capsule from a height of 9 meters onto a granite block of smooth surface. No shattering or breaking observed.
- (2) Percussion Test Capsule placed on a 1/4" sheet lead on concrete. Steel rod 25 mm in diameter by 330 mm long was dropped from a height of one meter. No shattering or breaking observed.
- (3) Bending Test Not applicable due to small length.
- (4) Heat Test Capsule heated to a red hot glow (1475° F) with torch. Maintained for 10 minutes and allowed to air cool. Discoloration but no melting or dispersement observed.

Leakage test performed after each test. No activity in excess of .005 microcurie observed.

The radioactive material encapsulated in CPN's sealed source capsule identified as model number CPN-131 has been tested for and is in compliance with the requirements for special form radioactive material. IAEA Certificates of Competent Authority have been issued as follows:

<u>CPN GAUGES</u>	<u>ACTIVITY & NUCLIDE</u>	<u>IAEA NO.</u>
MG-1,2,3	10 mCi Cs-137 and	GB/24/S or USA/0356/S
501/DR -	50 mCi Am-241/Be	GB/281/S-85 or USA/0331/S
503/DR	50 mCi Am-241/Be	GB/281/S-85 or USA/0331/S
AC-2/R	100 mCi Am-241/Be	GB/281/S-85 or USA/0331/S
MG-S-24	10 mCi Cs-137 and	GB/113/S
	50 mCi Am-241/Be	



Douglas Carter

 Douglas Carter, RSO

revised: Oct. 1, 1992