NOTICE OF VIOLATION
(Revised)

Georgia Institute of Technology
Atlanta, Georgia

Docket No. 50-160
License No. R-97

During an NRC inspection conducted on April 22-24, May 7, 23, 29-31, and June 4, 1996, violations of NRC requirements were identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR Part 2, Appendix C, the violations are listed below:

A. Technical Specification 4.2.a requires that the channels listed in Table 4.2 shall be calibrated as indicated. Table 4.2 specifies an annual known parameter source calibration.

Technical Specification 1.27 specifies that the frequencies of periodic surveillance tests, checks, calibrations, and examinations shall be performed within the specified intervals. These intervals may be adjusted by plus or minus twenty-five percent (± 25%).

Contrary to the above, the licensee failed to calibrate the G-M gas monitor within the annual period ± 25% in that the gas monitor was calibrated on October 20, 1993 and not calibrated again until March 3, 1995, a period exceeding the allowable time period specified in the Technical Specifications.

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

B. 10 CFR 71.5 requires each licensee who transports licensed material outside the confines of its plant or other place of use to comply with the applicable requirements of the Department of Transportation (DOT) in 49 CFR Parts 170 through 189.

49 CFR 172.704(a) specifies the general awareness, function specific, and safety training requirements for hazmat employees.

49 CFR 172.704(c) specifies that a hazmat employee employed after July 2, 1993 shall be initially trained prior to October 1, 1993 and at least once every two years thereafter.

49 CFR 172.704(d)(4) requires certification that the hazmat employee has been trained and tested as required by this subpart.

49 CFR 171.8 defines a hazmat employee as an individual employed by a hazmat employer who, during the course of employment, loads or unloads or handles hazardous materials; prepares hazardous material for transportation; is responsible for safety of transporting hazardous materials; or tests, reconditions, modifies, marks, or otherwise represents containers, drums, or packagings as qualified for use in the transportation of hazardous materials.

Enclosure 2

49 CFR 172.702(d) requires each hazmat employer to ensure that each hazmat employee is tested by appropriate means on the training subjects covered in 49 CFR 172.704.

Contrary to the above, since January 31, 1996, the licensee failed to train and appropriately test all hazmat employees on the subjects covered in 49 CFR 172.704 in that the hazmat employees had not received the specified training with the exception of one employee who was trained on the safety portions of the requirements of 49 CFR 172 in December 1995.

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

Pursuant to the provisions of 10 CFR 2.201, Georgia Institute of Technology is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with copies to the Regional Administrator, Region II, and the Chief, Fuel Facilities Branch, Region II, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. If an adequate reply is not received within the time specified in this Notice, an order or Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

Dated at Atlanta, Georgia
this 9th day of September, 1996

Georgia Institute of Technology
NEELY NUCLEAR RESEARCH CENTER
900 ATLANTIC DRIVE
ATLANTA, GEORGIA 30332-0425
USA
(404) 894-3600

July 18, 1996

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Georgia Institute of Technology
License No. R-97. Docket No. 50-160
Reply to a Notice of Violation
Inspection Report No. 50-160/96-02

Gentlemen:

Pursuant to 10 CFR 2.201, please find Attachment I, A Response to Two Notices of Violation in Inspection Report No. 50-160/96-02 and Attachment II, A Response to a Notice of Deviation.

Should you have any question, please call me at (404) 894-3600.

Sincerely,

R.A. Karam, Ph.D., Director
Neely Nuclear Research Center

Enclosure

cc: Mr. S. Ebneter
U.S. Nuclear Regulatory Commission, Region II
101 Marietta Street, N.W.
Atlanta, GA 30323
Chief Fuel Facilities Branch, Region II
Dr. John White, Dean of Engineering
Dr. Jean-Lou Chameau, Vice Provost
Mr. Alfred L. Evans, Senior Asst. Attorney General
Mr. Randy Nordin, Chief Legal Advisor

Telex: 842507 GTRIOCAATL
Fax: 404-853-9325 (Verify 404-894-3600)

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ATTACHMENT I

Georgia Institute of Technology
Reply to Notice of Violation 50-160/96-02

Violation 50-160/96-02-A

A. Technical Specification 4.2.a requires that the channels listed in Table 4.2 shall be calibrated as indicated. Table 4.2 specifies an annual known parameter source calibration.

Technical Specification 1.27 specifies that the frequencies of periodic surveillance tests, checks, calibrations, and examinations shall be performed within the specified intervals. These intervals may be adjusted by plus or minus twenty-five percent (± 25%).

Contrary to the above, the licensee failed to calibrate the G-M gas monitor within the annual period ± 25% in that the gas monitor was calibrated on October 20, 1993, and not calibrated again until March 3, 1995, a period exceeding the allowable time period specified in the Technical Specifications.

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

Reply

1. Admission or denial of violation:

The Georgia Institute of Technology admits the violation as stated.

2. The reason for the violation:

The health physicist responsible for the gas monitor calibration failed to calibrate the gas monitor in a timely manner. The reason given by the HP technician is simple oversight. In reality, this staff member was planning for his retirement and that may have contributed to the oversight.

3. Corrective steps which have been taken and results achieved:

A meeting was held with all the Office of Radiation Safety staff. The importance of compliance with all regulatory requirements was stressed to all. Also stressed was the need to communicate among the staff that if slippage in schedule is unavoidable, the Director of the facility must be informed. In this case, the Manager of the Office of Radiation Safety knew about the slippage but did not inform the Director. The Director stressed that non-performance by anyone will not be tolerated!

The retired HP technician was replaced with a well-trained health physicist with an MS degree in Health Physics. All HP staff were sensitized to the need to meet all regulatory requirements.

4. Corrective steps which will be taken to avoid further violations:

   See answer to item 3 above.

5. Date when full compliance will be achieved:

   Full compliance was achieved 3/3/95.

Violation 50-160/96-02-B

B. 10 CFR 71.5 requires each licensee who transports licensed material outside the confines of its plant or other place of use to comply with the applicable requirements of the Department of Transportation (DOT) in 49 CFR Parts 170 through 189.

   49 CFR 172.704(a) specifies the general awareness, function specific, and safety training requirements for hazmat employees.

   49 CFR 172.704(c) specifies that a hazmat employee employed after July 2, 1993, shall be initially trained prior to October 1, 1993, and at least once very two years thereafter.

   49 CFR 172.704(d)(4) requires certification that the hazmat employee has been trained and tested as required by this subpart.

   49 CFR 171.8 defines a hazmat employee as an individual employed by a hazmat employer who, during the course of employment, loads or unloads or handles hazardous materials; prepares hazardous material for transportation; is responsible for safety of transporting hazardous materials; or tests, reconditions, modifies marks, or otherwise represents containers, drums, or packagings as qualified for use in the transportation of hazardous materials.

   49 CFR 172.702(d) requires each hazmat employer to ensure that each hazmat employee is tested by appropriate means on the training subjects covered in 49 CFR 172.704.

   Contrary to the above, since October 1, 1993, the licensee failed to train and appropriately test all hazmat employees on the subjects covered in 49 CFR 172.704 in that the hazmat employees had not received the specified training with the exception of one employee who was trained on the safety portions of the requirements of 49 CFR 172 in December 1995.

Reply

1. Admission or denial of violation:

The Georgia Institute of Technology admits that all employees at the Neely Nuclear Research Center were not all trained and appropriately tested for safe handling, packaging, and shipping of hazardous material. One staff member was however trained in OSHA-approved "Hazardous Material Control and Emergency Response" course. The course covered not only safety portions of 49 CFR 172 requirements but also the general awareness, function specific, and emergency response requirements. The staff member was not only trained but also tested and certified in all requirements of 49 CFR 172.704

Until January 31, 1996, when the Georgia Institute of Technology shipped the unirradiated fuel to Oak Ridge, no hazardous material was shipped from NNRC under the license from the Nuclear Regulatory Commission. All shipments containing radioactive material from Georgia Tech were made under the broad license from the State of Georgia. Consequently, Georgia Tech is wondering why NRC Region II issued this violation. It would be appreciated to receive clear and well-defined boundaries specifying jurisdictional areas of responsibility between NRC and the State.

We are also concerned about the statement, "...the licensee failed to train and appropriately test all hazmat employees on subjects covered in 49 CFR 172.704..." Does this mean that all NNRC employees need to be trained and certified? We have in place a detailed procedure covering radioactive material shipment, Procedure 9510 (appended). All of Georgia Tech's health physics staff were trained on this procedure. It is believed that this procedure covers regulatory requirements of NRC and DOT adequately. It is our belief that our training of the material covered in Procedure 9510 meets or exceeds requirements in 49 CFR 172.704. A deficiency however exists in that we did not test the trainees on their proficiency of all relevant materials in Procedure 9510. This deficiency will be removed by June 1997.

2. Reasons for the violation:

No violation was committed under NRC license. A violation may be cited under State of Georgia regulations based on the fact that our training did not include testing.

3. Corrective steps which have been taken and results achieved:

One staff member was trained in an OSHA-approved course and certified. All appropriate personnel were trained in Procedure 9510. All shipments under NRC's license were made in compliance with all regulations.

4. Corrective steps which will be taken:

   All personnel who ship radioactive materials will be enrolled in the OSHA-approved course by January 1, 1997. Retraining and testing of personnel will be instituted at NNRC by June 1997.

5. Date when full compliance will be achieved:

   June 1997.

Attachment II

Georgia Institute of Technology
Reply to a Notice of Deviation

During an NRC inspection conducted on April 22-24, May 7, 23, 29-31, and June 4, 1996, a deviation of written commitments was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR Part 2, Appendix C, the deviation is listed below:

> In a response dated June 19, 1995, to a Notice of Violation, the licensee committed to revise Procedure 3600, "Special Nuclear Material Inventory," and submit the revision to the Nuclear Safeguards Committee for review and approval by July 20, 1995.
>
> Contrary to the above, as of April 24, 1996, Procedure 3600 had not been revised and had not been submitted to the Nuclear Safeguards Committee for review and approval.

Reply

1. Admission or denial of deviation:

   The Georgia Institute of Technology admits the deviation as stated.

2. Reasons for the deviation:

   Simple oversight.

3. Corrective steps taken and results achieved:

   Procedure 3600 was revised, submitted to the Nuclear Safeguards Committee and approved on June 13, 1996.

4. Corrective steps which will be taken to avoid further deviations:

   None.

5. Date when full compliance will be achieved:

   Full compliance was achieved 6/13/96.

1.0 **PURPOSE**

To describe a method for packaging and shipping of radioactive materials to ensure that package integrity is maintained during transportation and to ensure compliance with DOT/NRC regulations regarding the transportation of radioactive materials.

2.0 **SCOPE**

This procedure is applicable to offsite shipments of TYPE A, Limited Quantity, Surface Contaminated Objects (SCO), and Low Specific Activity (LSA) radioactive material from the Georgia Tech campus.

3.0 **RESPONSIBILITIES**

3.1 It is the responsibility of individuals involved with the packaging and shipment of radioactive material and waste to ensure that the instructions of this procedure are followed and that the criteria specified in this procedure for packaging, surveying and documenting each shipment is met.

3.2 It is the responsibility of the Manager, Office of Radiation Safety (MORS), or her/his designee, to review all shipping documentation prior to shipment to ensure accuracy and adequacy of the papers.

4.0 **REFERENCES**

4.1 **Requirements and Specifications**

4.1.1 49 CFR, Parts 100-199, Department of Transportation Regulations

4.1.2 10 CFR 71, Packaging and Transportation of Radioactive Materials

4.1.3 39 CFR 124, Postal Service Regulations

4.1.4 State of Georgia, Rules and Regulations for Radioactive Materials, Chapter 391-3-17.

spontaneously emits ionizing radiation and has a specific activity in excess of 70 Bq/g (0.002 μCi/g) of material.

5.2.1.2 Radioactive Material Special Form - Sealed sources that primarily represent a direct radiation hazard rather than a contamination hazard because of its high physical integrity.

5.2.1.3 Radioactive Material Normal Form - Any radioactive material that does not qualify as Special Form, i. e., loose radioactive material.

5.2.1.4 A_1 Activity - The maximum activity of Special Form radioactive material that may be transported in a Type A package (various radionuclides have different permissible activities - see 49 CFR 173.435).

5.2.1.5 A_2 Activity - The maximum activity of Normal Form radioactive material, other than special form, Surface Contaminated Objects (SCO), or Low Specific Activity (LSA) radioactive material that is permitted in a Type A container (various radionuclides have different permissible activities - see 49 CFR 173.435).

5.2.1.6 Type B Quantities - A quantity which exceeds the A_1 or A_2 value for the radionuclide(s) of interest (see MORS for such shipments).

5.2.1.7 LSA Radioactive Material - Materials in which the radioactivity specific activity meets the following limits:

5.2.1.7.1 LSA-I, naturally occurring radioactive ores, depleted uranium, material where A_2 is unlimited, contaminated soil, concrete, rubble that has uniformly distributed radioactivity less than 10^{-6} A_2/g.

5.2.1.7.2 LSA-II, tritiated water; less than (0.8 TBq/L or 0.8 x 10^{12} Bq/L) (20 Ci/L) and radioactive material less than 10^{-4} A_2/g for solids and gases and less than 10^{-5} A_2/g for liquids.

5.2.1.7.3 LSA-III, radioactive material distributed in solid (concrete/ceramic, etc), is insoluble and specific activity is less than 2 x 10^{-3} A_2/g.

5.2.1.8 Package - Represents the packaging together with its radioactive contents as presented for transport (e.g. excepted, Type A, Type B and Industrial I, II, & III).

5.2.1.9 Transport Index - A dimensionless number (rounded up to one decimal place) placed on the label of a package to designate the degree of control to be exercised by the carrier during transportation and represents the maximum radiation level in [(mSv/hr)x100] (mrem/hr) at one meter from the external surface of the package.

5.2.1.10 Surface Contaminated Object - Surface Contaminated Object (SCO) is a solid object which is not itself radioactive but has radioactivity distributed on its surfaces in one of two groups of surface activity:

SCO-I: Contamination that does not exceed 4 Bq/cm^2 Beta/gamma or 0.4 Bq/cm^2 alpha for non-fixed contamination or 40,000 Bq/cm^2 Beta/gamma or 4,000 Bq/cm^2 alpha for fixed contamination.

SCO-II: Contamination that exceeds SCO-I but does not exceed 400 Bq/cm^2 beta/gamma or 40 Bq/cm^2 alpha for non-fixed or $8x10^5$ Bq/cm^2 beta/gamma or $8x10^4$ Bq/cm^2 alpha for fixed. (See 49 CFR 173.403 for details and exceptions).

5.2.2 **Shipment Preparation**

NOTE: A Quality Assurance Checklist is attached as Appendix B to assist in the preparation of radioactive materials for transportation. This Form, RS-88, shall be utilized in preparation of radioactive materials for shipment and shall be retained along with copies of the shipping papers as permanent facility records.

5.2.2.1 Preparation of packages of radioactive materials for shipment will normally be carried out in the HP laboratory facilities. Preparation of waste for shipment will normally take place in the Barn.

5.2.2.2 Each container of radioactive material which is to be transported shall have an inner lining in addition to the external container so that in the case of breach of the inner or the outer package, one layer of packaging will remain intact to ensure that the radioactive material is not disbursed to the environment.

5.2.2.3 The majority of packages shipped from the NNRC are of the type defined as Limited Quantity or Low Specific Activity (LSA) material and consequently, are dealt with specifically below.

NOTE: For preparation of shipments of highway controlled quantities, Type B, or fissile material, contact the MORS for further information.

5.2.2.4 Ensure that shipping papers, Form RS-87, are completed appropriately. All radiological units are to be reported in SI units followed by customary units in parenthesis. (49 CFR 172.203 (d)(4)).

5.2.2.5 **Limited Quantity Shipments** (49 CFR 173.421 and 173.425)

5.2.2.5.1 Definition - Limited quantity shipments are radioactive materials whose activity per package does not exceed the limits specified in 49 CFR 173.425 (Table 7) and which are excepted from DOT specification packaging, shipping paper and certification, marking and labeling requirements.

5.2.2.5.2 The radioactive material shall be packaged in strong, tight packages that will not leak under conditions normally incident to transportation.

5.2.2.5.3 The package shall have two layers of packaging, i. e., an inner lining as well as the external packaging itself, i. e., the container.

5.2.2.5.4 The outside of the inner lining shall be marked "RADIOACTIVE."

5.2.2.5.5 Enclosed in the package shall be a notice which provides the name and address of the shipper (NNRC) and which states (enclosing a copy of Appendix C will fulfill this requirement):

"This package conforms to the conditions and limitations specified in 49 CFR 173.421 for excepted radioactive material, limited quantity, n.o.s., UN 2910; or 49 CFR 173.424 for excepted radioactive material, instruments and articles."

5.2.2.5.6 The removable contamination on the external surface of the package shall not exceed 0.41 Bq/cm^2 (2200 dpm/100 cm^2) for beta/gamma emitting radionuclides or 0.04 Bq/cm^2 (220 dpm/100 cm^2) for alpha emitting radionuclides. (49 CFR 173.443)

5.2.2.6 **Transport Requirements for Low Specific Activity and Surface Contaminated Radioactive Material**
(49 CFR 173.427)

5.2.2.6.1 Low specific activity (LSA) is defined in 5.2.1.7. Surface contaminated objects (SCO) are defined in 5.2.1.10.

5.2.2.6.2 The LSA and SCO radioactive materials shall be packaged in strong, tight containers, or in industrial packages specific for each LSA type.

5.2.2.6.3 Radiation levels and removable contamination levels shall meet the criteria specified in Steps 5.2.8 and 5.2.9.

5.2.2.6.4 Shipments must be loaded by consignor (Georgia Tech) or contractor and unloaded by consignee.

5.2.2.6.5 The exterior of each package must be stenciled or marked "RADIOACTIVE - LSA." or "RADIOACTIVE - SCO", respectively.

NOTE: Once the radioactive materials are appropriately labeled for transport, the "Radioactive Material" labeling requirements of 10 CFR 20.1904 are no longer applicable.

5.2.2.6.6 There must be no leakage of radioactive materials from the package during transport. Therefore, a careful visual inspection shall be made of each empty drum or box prior to loading in the vehicle to ensure its integrity (radioactive waste truck surveys shall be performed before and after loading of the radioactive material as applicable - common carriers are exempt from surveys.).

5.2.2.6.7 The truck shall be radiologically clean, i. e., no measurable removable radioactivity above background levels.

5.2.2.6.8 All shipments of LSA and SCO material shall be consigned as exclusive use. The truck shall display placards that state: "RADIOACTIVE."

5.2.3 **Shipping Papers** (49 CFR 172.202)

5.2.3.1 Shipping papers shall be prepared for all shipments of radioactive material, including waste, in accordance with the requirements of 49 CFR 172.202 and shall include the information referenced in Form RS-87, Radioactive Materials Shipment Papers, as appropriate.

5.2.3.1.1 Determine that the intended recipient has a license on file at the NNRC. Specify the license number and the expiration date of the license on the shipping papers. If a license is not on file, the radioactive material shall not be sent.

NOTE: For a waste shipment, the license of the Burial facility must be on file.

5.2.3.1.2 The license of the recipient shall be checked to ensure that possession of the radionuclide to be shipped is permissible and to ensure that the quantity of the radionuclide to be shipped is allowed by the license.

5.2.3.1.3 List the name and address of the shipment recipient.

5.2.3.1.4 Each shipment of radioactive material shall have a unique number. The number shall consist of five digits, the first two of which will represent the calendar year and the last three will represent the number of the shipment for the calendar year.

EXAMPLE: Shipment #90-001 is the first shipment made during the calendar year, 1990.

5.2.3.1.5 Determine the proper shipping name and identification number preceded by "UN" (49 CFR 172.101) using the assistance provided in Appendix A. Write the proper shipping name and identification number preceded by UN number on the appropriate blank of the shipping paper.

5.2.3.1.6 Enter the physical and chemical forms of the material to be shipped on Form RS-87.

5.2.3.1.7 List the name and quantity of each radionuclide (49 CFR 173.435) in S.I. Units (e.g. TBq, Bq) for each package.

5.2.3.1.8 Specify the total quantity of radionuclides that are present in the entire shipment.

5.2.3.1.9 The category of label applied to each package, i. e., Radioactive White-I, Radioactive Yellow-II or Radioactive Yellow-III shall be specified on the shipping papers.

5.2.3.1.10 The Transport Index (radiation level in [(mSv/hr)x100 (mrem/hr) at 1 meter) for each package bearing Radioactive Yellow-II or Radioactive Yellow-III label shall be stated on the shipping papers and the two (2 labels.

5.2.3.1.11 For a package approved by the USNRC, a notation of the package identification marking as prescribed in the applicable USNRC approval shall be specified (ex., Type B USA/5507/BF) (49 CFR 172.203(d)(vii) and 173.471).

5.2.4 **Shipper's Certification** (49 CFR 172.204)

5.2.4.1 The shipping papers shall contain a certification statement which attests to the fact that the material being offered for transport is ready for shipment.

NOTE: The statement shall read: "This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper

condition for transportation according to the applicable regulations of the Department of Transportation (DOT)."

5.2.4.2 For shipments being made by passenger-carrying aircraft, in addition to the requirement for a T. I. of < 3, and the certification statement specified in Step 5.2.4.1, an additional certification is required which states:

> "I certify that this shipment contains radioactive material intended for use in, or incident to research, medical diagnosis or treatment."

5.2.4.3 The certification statements required by Step 5.2.4.1 and/or Step 5.2.4.2 shall be signed by an appropriate NNRC staff or management person, usually the Manager, Office of Radiation Safety.

5.2.5 **Marking of Packages** (49 CFR 172.301 and 172.310)

5.2.5.1 Each person who offers hazardous materials for transportation with a weight in excess of 50kg (110 pounds) shall mark each package, freight container and transport vehicle.

5.2.5.2 The markings required include proper shipping name, identification number preceded by "UN," gross weight, and the Type of packaging, i. e., Type A or Type B.

5.2.6 **Labeling** (49 CFR 172.400)

5.2.6.1 No person may offer for transportation any package bearing a hazardous material label unless the package actually contains the hazardous material specified on the label.

5.2.6.2 Any material classified as radioactive material that also meets the definition of another hazard class shall be labeled as required for both hazards.

5.2.6.3 The proper label for a package of non-fissile radioactive material is based on the radiation level at the surface of the package.

5.2.6.4 There are three categories of labels (49 CFR 172.403) based on the level of radiation at the surface of the package:

5.2.6.4.1 White-I - Radiation Level ≤ 0.005 mSv/hr (0.5 mrem/hr);

5.2.6.4.2 Yellow-II - Radiation Level is > 0.005 mSv/hr (0.5 mrem/hr) but ≤ 0.5 mSv/hr (50 mrem/hr); and

5.2.6.4.3 Yellow-III - Radiation Level is > 0.5 mSv/hr (50 mrem/hr) but ≤ 2 mSv/hr (200 mrem/hr).

NOTE: For fissile material, see 49 CFR 172.403.

5.2.6.5 The label specifications for each label type is specified in 49 CFR 172.436, 172.438 and 172.440.

5.2.7 **Placarding** (49 CFR 172.500)

5.2.7.1 No placard may be displayed on a vehicle unless the vehicle actually contains the hazardous material specified on the placard.

5.2.7.2 The vehicle must be placarded on each end of the vehicle and on each side with a placard reading "RADIOACTIVE"

(only LSA and SCO, and Radioactive Yellow-III shipments, [49 CFR 172.504], Table 1 are required to be placarded).

5.2.7.3 It is the responsibility of the shipper to provide the placards and ensure that the placement on the shipment is correct. If the carrier has placards, these may be used.

5.2.8 **Radiation Levels** (49 CFR 173.441)

5.2.8.1 Packages loaded for transport may not have radiation levels at any point on the surface of a package (contact dose rate readings) in excess of 2 mSv/hr (200 mrem/hr) and may not exceed 0.1 mSv/hr (10 mrem/hr) (T. I. = 10) at one meter from the package unless the packages are transported in an exclusive use, closed transport vehicle.

5.2.8.2 Use of a closed, exclusive vehicle permits transportation of packages with radiation levels up to 10 mSv/hr (1000 mrem/hr) at the surface of the package provided that the package is secured within the vehicle so that it remains fixed during transport and provided there is no loading/unloading between the beginning and end of transportation.

5.2.8.3 In the case of the closed, exclusive use vehicle, radiation levels at the outer surface of the vehicle may not exceed 2 mSv/hr (200 mrem/hr) (including both top and bottom of the vehicle) and the dose rate may not exceed 0.10 mSv/hr (10 mrem/hr) at any point 2 meters from the outer lateral surfaces (excluding the top and bottom).

5.2.8.4 In addition to the above, the dose rate in any space which is normally occupied by personnel, i. e., the cab of the truck shall be less than 0.02 mSv/hr (2 mrem/hr).

5.2.8.5 All radiation level readings for each package and exclusive-use vehicles shall be documented on Form RS-28, Miscellaneous Survey Form. Appropriate survey maps shall be drawn.

5.2.9 **Contamination Control** (49 CFR 173.443)

5.2.9.1 Contamination control data shall be collected and documented using Form RS-28, Miscellaneous Survey Form, to show where smears were taken. Actual count data shall be documented on Form RS-35 (see attached forms).

5.2.9.2 The smear surveys taken shall be sufficient in number to demonstrate that each package was adequately surveyed. Exclusive use vehicles shall be surveyed before and after loading.

5.2.9.3 **Non-exclusive Use Vehicle**

5.2.9.3.1. The level of removable contamination by smears from the external surface of each package shall not exceed 0.41 Bq/cm^2 (2200 dpm/100 cm^2) for beta/gamma emitting radionuclides, radionuclides with half-lives less than ten days, and natural uranium/thorium.

5.2.9.3.2 For other alpha emitting radionuclides, the level of removable contamination by smears from the external surface of each package shall not exceed 0.04 Bq/cm^2 (220 dpm/100 cm^2).

5.2.9.4 **Exclusive Use Vehicle**

5.2.9.4.1 When transporting via exclusive use vehicle, the permissible removable contamination at the beginning of transport may not exceed those levels specified in Step 5.2.9.3.1 and 5.2.9.3.2.

5.2.9.4.2 At any time during transport, the removable contamination levels may not exceed ten times the levels specified in Step 5.2.9.3.

5.2.9.4.3 For vehicles used under the provisions of Step 5.2.9.4, a vehicle may not be returned to service until the dose rate at each accessible surface is less than 0.05 mSv/hr (5 mrem/hour) fixed contamination.

5.2.9.4.4 Step 5.2.9.4.3 does not apply when the enclosed, exclusive use vehicle is dedicated for the sole use of transportation of radioactive material by highway. In this situation, the vehicle must be stenciled with a sign that states: "For Radioactive Material Use Only."

6.0 **RECORDS**

6.1 Forms RS-28, RS-35, RS-87 and RS-88 or equivalent shall be completed during the preparation of radioactive materials for transport.

6.2 A copy of Form RS-87, Radioactive Materials Shipping Papers, and the original of Form RS-88 or equivalent, Transportation Quality Assurance Checklist, shall be maintained for the life of the facility. Forms RS-28 and RS-35 which contain the survey data for the shipment shall be maintained along with the shipping papers for the life of the facility.

APPENDIX A

PROPER NAME AND RELATED PARAMETERS

1. **RADIOACTIVE MATERIAL, N.O.S., UN 2982**

   Shipping name used when no other category is appropriate. Activity/package shall not exceed the A_2 value for a Type A package (49 CFR 173.435).

2. **RADIOACTIVE MATERIAL, EXCEPTED PACKAGE, N.O.S., UN2910**

   Activity/package shall not exceed the limits specified in 49 CFR 173.423, Table 7
   Radiation Level <0.005 mSv/hr (< 0.5 mrem/hr) on package surface
   < 15 grams U-235/package
   Container shall be strong, tight.
   Excepted packages of instruments, articles, DU, Natural uranium, limited quantities and "empties".

3. **RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY, N.O.S., UN2912**

   Radioactivity uniformly dispersed.
   Activity concentration shall not exceed that of Step 5.2.2.5.1

4. **RADIOACTIVE MATERIAL, SPECIAL FORM, N.O.S. UN2974**

   Activity of special form material shall not exceed the "A_1 value for a TYPE A package.

5. **NOT CLASSIFIED AS RADIOACTIVE**

   Activity is uniformly distributed.
   Specific activity is < 70 Bq/g (0.002 μCi/g)

6. **RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECT, SCO, UN 2913**

   See surface contamination definition 5.2.1.10

RADIOACTIVE MATERIAL SHIPPING PAPERS

Neely Nuclear Research Center
Georgia Institute of Technology
900 Atlantic Drive
Atlanta, GA 30332
(404) 894-2500 (Georgia Tech Police)

Date _____ NNRC Shipment No. _____

TO: _____ Carrier: _____

_____ Shipped Via: _____

_____ Waybill No.: _____

PROPER SHIPPING NAME/ID NO.: _____

PRINCIPAL RADIONUCLIDES AND QUANTITIES: _____

_____

PHYSICAL FORM : Solid _____ **Liquid** _____ **Gas** _____ **Weight** _____

CHEMICAL FORM: _____

Normal Form: _____ **Special Form:** _____ **Limited Quantity** _____

TRANSPORT INDEX: _____ **PACKAGE TYPE (A/B/STRONG, TIGHT)** _____
(Excepted, Industrial I, II or III)

LABEL(S) APPLIED TO PACKAGE(S): _____

PLACARDS TENDERED: YES _____ **NO** _____

Radiation Surveys - Surface of Inner Container mSv/hr
Beta _____ Gamma _____

- Surface of Outer Container mSv/hr
Beta _____ Gamma _____

Smearable Contamination Outer Container Bq/cm^2
- Beta/Gamma _____ Alpha _____

CERTIFICATION - This is to certify that the above named materials are properly classified, packages, described, marked and labeled & in proper condition for transportation according to the applicable regulations of the Department of Transportation. This shipment is within the limitation prescribed for passenger/cargo aircraft only.

Certified by: _____ Date _____

Reviewed by: _____ Date _____

APPENDIX B
TRANSPORTATION QUALITY ASSURANCE CHECKLIST

Directions: All blanks shall be completed. For those instances in which a designated activity has been completed for the shipment under consideration, initial the blank to the right of the statement. For those activities which are not performed for a particular shipment, write N/A in the blank to the right.

Date: _____ Shipment No.: _____

1. Intended Recipient license is on file _____
   Specify expiration date _____

2. Package provided inner lining. _____

3. LIMITED QUANTITY SHIPMENTS _____

   a. Strong, tight package _____

   b. Inner Lining marked "Radioactive" _____

   c. Step 5.2.2.5.5 Notice Enclosed in Package _____

   d. Removable Contamination Below Limits _____

      < 0.41 Bq/cm^2 (2200 dpm/100 cm^2) beta/gamma _____

      < 0.04 Bq/cm^2 (220 dpm/100 cm^2) alpha _____

   e. Direct Radiation < 0.005 mSv/hr (0.5 mrem/hr) external surface _____

4. LOW SPECIFIC ACTIVITY OR SURFACE CONTAMINATED OBJECTS SHIPMENTS _____

   a. DOT Specification 7A, TYPE A package or Industrial Package if not exclusive use vehicle _____

   b. Strong, tight package if exclusive use vehicle _____

   c. Removable Contamination Below Limits _____

      < 0.41 Bq/cm^2 (2200 dpm/100 cm^2) beta/gamma _____

      < 0.04 Bq/cm^2 (220 dpm/100 cm^2) alpha _____

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d. External Radiation levels <2 mSv/hr (200 mrem/hr) at 1 meter (for non-exclusive use vehicle) _____

e. T. I. ≤ 10 [(0.1 mSv/hr) x 100] or (10 mrem/hr) _____
NOTE: A T.I. = [(mSv/hr) X 100] at 1 meter

f. For closed, exclusive use vehicle, see 49 CFR 173.441 _____

g. Shipment loaded by Consignor or Contractor _____

h. Exterior of each package marked: "RADIOACTIVE - LSA" or "RADIOACTIVE -SCO" _____

i. Visual inspection of package - intact _____

j. Vehicle "clean" (no smearable activity) _____

k. Shipment braced to prevent movement _____

l. Placards applied to truck "RADIOACTIVE" _____

5. PREPARATION OF SHIPPING PAPERS

a. Name & address of shipper affixed _____

b. Name & address of recipient affixed _____

c. Proper Shipping Name Identified (see Appendix A) _____

d. Special/Normal form identified _____

e. Physical form identified _____

f. Major Nuclides & Quantity [Bq (mCi)] listed _____

g. List Label applied to each package _____

h. T. I. for each package specified _____

i. If USNRC approved package, specify approval _____

j. Certification completed _____

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k. If placards tendered, indicate on papers _____

6. LABELING _____

a. More than Radioactive Hazard _____

b. Radioactive White - I _____

c. Radioactive yellow - II _____

d. Radioactive yellow - III _____

e. "Radioactive" - Outside Inner Package for Ltd Qty _____

7. PLACARDS TENDERED - LSA, SCO AND RADIOACTIVE YELLOW - III _____

8. RADIATION/CONTAMINATION SURVEYS COMPLETE _____

9. PACKAGE MARKINGS: (On Outside of Package)

a. Type of Package (A/B) _____

b. Type A (> 13 mm (1/2") high) _____

c. Name & Address of Consignee or Consignor _____

d. Proper Shipping Name, I.D. # (UN #) _____

e. Gross weight if > 50 kg (110 lbs) _____

f. If liquid present: "This End UP" _____

g. With dry ice present: "ORM-A" on one side below proper shipping name. _____

8. OTHER LABELS AS REQUIRED

"CARGO AIRCRAFT ONLY" (if T. I. > 3.0) _____

"CORROSIVE" (nitric acid solutions of UF) _____

"OXIDIZER" (Reg 173.419) (solid U or Th nitrates) _____

"PYROPHORIC" (Reg 173.418) _____

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9. OTHER REQUIREMENTS:

Security Seal(s) Type & No. _____

Absorbent material for liquids (2x volume capacity) _____

T. I. < 3.0 for passenger aircraft and following statement included: "This shipment contains radioactive material intended for use in, or incident to, research, medical diagnosis or treatment." _____

T. I. >3.0 for cargo aircraft only and "CARGO AIRCRAFT ONLY" label applied to package. _____

For air shipment, send 2 copies of shipping papers _____

Vehicle placarded (if Radioactive Yellow-III SCO or LSA) - Check "Placards Tendered" on the shipping papers. _____

Notify Police Department that package has been shipped and give details of shipment. _____

Prepared by: _____ Date: _____

Reviewed by: _____ Date: _____

APPENDIX C

GEORGIA INSTITUTE OF TECHNOLOGY
NEELY NUCLEAR RESEARCH CENTER
900 ATLANTIC DRIVE
ATLANTA, GA 30332

(404) 894-2500 (Georgia Tech Police)

"This package conforms to the conditions and limitations specified in 49 CFR 173.421 for excepted radioactive material, limited quantity, n.o.s., UN 2910; or 49 CFR 173.424 for excepted radioactive material, instruments and articles."

LIMITED QUANTITY SHIPMENT

RS-28 MISCELLANEOUS SURVEY MAP FORM

DATE_____ TIME _____ RWP # _____

SURVEY INST.	SERIAL #	CAL DUE
_____	_____	_____
_____	_____	_____

COMMENTS _____

_____

PERFORMED BY: _____ DATE _____

REVIEWED BY: _____ DATE _____

RS-35
(5-90)

SURVEY DATA SHEET

Job Description ______________ Power Level ______________

Date ______________ Time ______________

Counter Used ______________ Alpha Efficiency ______________ Bkg ______

Cal Due Date ______________ Beta Efficiency ______________ Bkg ______

Survey Inst Model ________ Serial # ________ Cal Due Date ________

Background ______________

Location	Smear dpm/100 cm2		Resmear dpm/100 cm2		mR/hr	cpm
	alpha	beta/gamma	alpha	beta/gamma		

Comments: ______________________________

Performed by: ______________________ Date: __________

Reviewed by: ______________________ Date: __________