NRC FORM 374
(7-94)

U.S. NUCLEAR REGULATORY COMMISSION

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Radiation Science, Inc. 2. 10 South River Road, Suite 1005 Cranbury, New Jersey 08512	3. License Number 29-30310-01 4. Expiration Date September 30, 2001 5. Docket or Reference No. 030-34154

6. Byproduct, Source, and/or Special Nuclear Material	7. Chemical and/or Physical Form	8. Maximum Amount that Licensee May Possess at Any One Time Under This License
A. Any byproduct material with atomic number 1-83	A. Analytical Samples	A. 1 millicurie
B. Cesium 137	B. Sealed Source (Industrial Reactor Lab Series 2, 3M CO 4P6E, 4F6S, Isotope Products Lab 193, 225, Amersham CDC.800 Series, or Shepherd 6810)	B. Not to exceed 220 millicuries

9. Authorized use

A. Taking of leak test samples; analysis of test samples as a service for other persons as defined in 10 CFR 20.1003.

B. In a J.L. Sheppard Model 10 Calibrator for calibration of instruments as a service for other persons as defined in 10 CFR 20.1003.

CONDITIONS

10. Licensed material may be used only at the licensee's facilities located at 10 South River Road, Suite 1005, Cranbury, New Jersey and at temporary job sites of the licensee anywhere in the United States where the U.S. Nuclear Regulatory Commission maintains jurisdiction for regulating the use of licensed material.

11. The licensee may not possess and use materials authorized in Items 6, 7, and 8, until: (1) the licensee has constructed the facilities and obtained the equipment described in the application and supporting documentation; and (2) the U.S. Nuclear Regulatory Commission, Region I, ATTN: Chief, Nuclear Materials Safety Branch, 475 Allendale Road, King of Prussia, Pennsylvania 19406 has been notified in writing that activities authorized by the license will be initiated.

In accordance with the requirements set forth in 10 CFR 30.36(b), 40.42(b), and 70.38(b), the licensee shall promptly notify the Nuclear Regulatory Commission, in writing, of a decision not to complete the facility, acquire equipment, or possess and use authorized material.

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MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number
29-30310-01

Docket or Reference Number
030-34154

12. Licensed material shall be used by, or under the supervision of, Thomas P. Bracke or Scott Dennerlein.

13. The Radiation Safety Officer for this license is Thomas P. Bracke.

14. A. Sealed sources and detector cells containing licensed material shall be tested for leakage and/or contamination at intervals not to exceed six months or at such other intervals as are specified by the certificate of registration referred to in 10 CFR 32.210, not to exceed three years.

B. Notwithstanding Paragraph A of this Condition, sealed sources designed to emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed three months.

C. In the absence of a certificate from a transferor indicating that a leak test has been made within six months prior to the transfer, a sealed source or detector cell received from another person shall not be put into use until tested.

D. Each sealed source fabricated by the licensee shall be inspected and tested for construction defects, leakage, and contamination prior to any use or transfer as a sealed source.

E. Sealed sources and detector cells need not be leak tested if:

(i) they contain only hydrogen-3; or

(ii) they contain only a radioactive gas; or

(iii) the half-life of the isotope is 30 days or less; or

(iv) they contain not more than 100 microcuries of beta and/or gamma emitting material or not more than 10 microcuries of alpha emitting material; or

(v) they are not designed to emit alpha particles, are in storage, and are not being used. However, when they are removed from storage for use or transfer to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source or detector cell shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.

F. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission and the source or detector cell shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. The report shall be filed within five days of the date the leak test result is known with the U.S. Nuclear Regulatory Commission, Region I, ATTN: Chief, Nuclear Materials Safety Branch, 475 Allendale Road, King of Prussia, Pennsylvania 19406. The report shall specify the source or detector cell involved, the test results, and corrective action taken.

G. The licensee is authorized to collect leak test samples for analysis by licensee. Alternatively, tests for leakage and/or contamination may be performed by persons specifically licensed by the Commission or an Agreement State to perform such services.

15. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders by the licensee.

16. The licensee shall not acquire licensed material in a sealed source or device unless the source or device has been registered with the U.S. Nuclear Regulatory Commission pursuant to 10 CFR 32.210 or equivalent regulations of an Agreement State.

17. The licensee shall conduct a physical inventory every six months to account for all sealed sources and devices containing licensed material received and possessed under the license.

18. The licensee is authorized to hold radioactive material with a physical half-life of less than or equal to 120 days for decay-in-storage before disposal in ordinary trash, provided:

A. Waste to be disposed of in this manner shall be held for decay a minimum of ten half-lives.

B. Before disposal as ordinary trash, the waste shall be surveyed at the container surface with the appropriate survey instrument set on its most sensitive scale and with no interposed shielding to determine that its radioactivity cannot be distinguished from background. All radiation labels shall be removed or obliterated.

C. A record of each such disposal permitted under this License Condition shall be retained for three years. The record must include the date of disposal, the date on which the byproduct material was placed in storage, the radionuclides disposed, the survey instrument used, the background dose rate, the dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal.

19. The licensee is authorized to transport licensed material in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number: 29-30310-01

Docket or Reference Number: 030-34154

20. 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 May 10, 1996
B. Letter dated August 9, 1996

Date SEP 21 1996

For the U.S. Nuclear Regulatory Commission

By Original Signed By:
John R. McGrath

Division of Nuclear Materials Safety
Region I
King of Prussia, Pennsylvania 19406

SEP 21 1996

License No. 29-30310-01
Docket No. 030-34154
Control No. 123237

Thomas P. Bracke, P.E.
President
Radiation Science, Inc.
10 South River Road, Suite 1005
Cranbury, NJ 08512

Dear Mr. Bracke:

Please review the enclosed document carefully and be sure that you understand all conditions. If there are any errors or questions, please notify the U.S. Nuclear Regulatory Commission, Region I Office, Licensing Assistance Team, (610) 337-5093 or 5239, so that we can provide appropriate corrections and answers.

Please be advised that your license expires at the end of the day, in the month, and year stated in the license. Until your license is terminated, you must conduct your program involving byproduct materials in accordance with the conditions of your NRC license, representations made in your license application, and NRC regulations. In particular, note that you must:

1. Operate in accordance with NRC regulations 10 CFR Part 19, "Notices, Instructions and Reports to Workers; Inspections," 10 CFR Part 20, "Standards for Protection Against Radiation," and other applicable regulations.

2. Not possess and use materials authorized in Items 6, 7, and 8, on the license until:

   a. you have constructed the facilities and obtained the equipment described in the license application and supporting documentation; and

   b. you have notified the U.S. Nuclear Regulatory Commission, Region I, ATTN: Chief, Nuclear Materials Safety Branch, 475 Allendale Road, King of Prussia, Pennsylvania 19406 in writing, that activities authorized by the license will be initiated.

3. Notify NRC, in writing, within 30 days:

   a. when an authorized user or Radiation Safety Officer, permanently discontinues performance of duties under the license or has a name change; or

b. when the mailing address on the license changes (no fee is required if the location of byproduct material remains the same).

4. In accordance with 10 CFR 30.36(b) and/or license condition, notify NRC, promptly, in writing, and request termination of the license:

   a. when you decide to terminate all activities involving materials authorized under the license; or

   b. if you decide not to complete the facility, acquire equipment, or possess and use authorized material.

5. Request and obtain a license amendment before you:

   a. permit anyone to work as an authorized user under the license;

   b. change Radiation Safety Officer;

   c. order byproduct material in excess of the amount, or radionuclide, or form different than authorized on the license;

   d. add or change the areas of use, or address or addresses of use identified in the license application or on the license; or

   e. change ownership of your organization.

6. Submit a complete renewal application with proper fee or termination request at least 30 days before the expiration date of your license. You will receive a reminder notice approximately 90 days before the expiration date. Possession of byproduct material after your license expires is a violation of NRC regulations. A license will not normally be renewed, except on a case-by-case basis, in instances where licensed material has never been possessed or used.

In addition, please note that NRC Form 313 requires the applicant, by his/her signature, to verify that the applicant understands that all statements contained in the application are true and correct to the best of the applicant's knowledge. The signatory for the application should be the licensee or a certifying official of the licensee rather than the Radiation Safety Officer or a consultant.

You will be periodically inspected by the NRC. Failure to conduct your program in accordance with NRC regulations, license conditions, and representations made in your license application and supplemental correspondence with NRC will result in enforcement action against you. This could include issuance of a notice of violation, or imposition of a civil penalty, or an order suspending, modifying or revoking your license as specified in the "General Statement of Policy and Procedure for NRC Enforcement Actions," (Enforcement Policy), NUREG 1600.

Since serious consequences to employees and the public can result from failure to comply with NRC requirements, prompt and vigorous enforcement action will be taken when dealing with licensees who do not achieve the necessary meticulous attention to detail and the high standard of compliance which NRC expects of its licensees.

Thank you for your cooperation.

Sincerely,

Original Signed By:
John R. McGrath
for Francis M. Costello, Chief
Nuclear Materials Safety Branch 3
Division of Nuclear Materials Safety

License No. 29-30310-01
Docket No. 030-34154
Control No. 123237

Enclosures:
1. License No. 29-30310-01
2. 10 CFR Parts 2, 19, 20, 30, and 170
3. NRC Forms 3 and 313

DOCUMENT NAME: R:\WPS\MLTR\L2930310.01
To receive a copy of this document, indicate in the box: "C" = Copy w/o attach/encl "E" = Copy w/ attach/encl "N" = No copy

OFFICE	DNMS/RI	N	DNMS/RI					
NAME	Reber/eh	E	Costello					
DATE	09/09/96		09/17/96		09/ /96		09/ /96	

OFFICIAL RECORD COPY

RADIATION SCIENCE, INC.
SCIENTISTS & ENGINEERS SINCE 1988

10 SOUTH RIVER ROAD, SUITE 1005
CRANBURY, NJ 08512

September 5, 1996

030-34154

Mr. Eric H. Reber
Licensing Assistant Section
Nuclear Materials Safety Branch
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Subject: License Application Mail Control # 123237

Dear Mr. Reber:

We spoke with the source manufacturer (J.L. Shepard & Associates) regards the appropriate calibrator model number. There is no difference in the shield design of the two models, model 10 and 10-1. Please accept our application listing the model 10 calibrator and the maximum total activity identified in the attached table.

Thank you for your consideration.

Sincerely,

Thomas P. Bracke P.E.

OFFICIAL RECORD COPY ML 10

123237
SEP 10 1996

TELEPHONE (609) 395-1996 FACSIMILE (609) 395-1178

RADIATION SCIENCE, INC.
SCIENTISTS & ENGINEERS SINCE 1988

10 SOUTH RIVER ROAD, SUITE 1005
CRANBURY, NJ 08512

5. **RADIOACTIVE MATERIAL**

Item	Element & Mass Number	Chemical and Physical Form	Maximum Total Activity
a	Cs-137	J.L. Shepard & Associates Model 10 Calibrator or equivalent	≤ 220 mCi
b	Any radioactive isotope with atomic number from 1 to 83	Any	≤ 1 mCi total activity

6. **PURPOSE FOR WHICH THE MATERIAL WILL BE USED**

a) Cs-137 Sealed Source - To be used dose rate calibration of Ion Chambers, GM detectors, and gamma scintillators.

b) Any radioactive isotope with atomic number from 1 to 83 for use as analytical samples.

TELEPHONE (609) 395-1996 FACSIMILE (609) 395-1178

RADIATION SCIENCE, INC.
SCIENTISTS & ENGINEERS SINCE 1988

10 SOUTH RIVER ROAD, SUITE 1005
CRANBURY, NJ 08512

August 21, 1996

Mr. Eric H. Reber
Licensing Assistant Section
Nuclear Materials Safety Branch
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Subject: License Application Mail Control # 123237

Dear Mr. Reber:

We spoke with the source manufacturer regards the calibrator model number and also reconsidered the chosen source strength to include a higher calibration range. We have looked into the impact of the larger source on our facility considerations and determined the working space to be adequate. All conditions of our license application remain as previously stated with exception of: (1) the maximum dose rate at the rear wall of the facility during calibrations, (2) annual total effective dose at the boundary, and (3) the restriction on annual hours of source exposure. The maximum dose rate at the rear wall of the building will be 2mR/hr above background and hours of operation will be limited to maintain cumulative, annual exposure less than 100 mR at the side wall boundaries of our facility.

Consistant with the above description, material possession and use should be as indicated on the attached revisions to the material and use sections of our application.

Thank you for your consideration.

Sincerely,

Thomas P. Bracke P.E.

OFFICIAL RECORD COPY

ML 10

123237
AUG 26 1996

TELEPHONE (609) 395-1996
FACSIMILE (609) 395-1178

FAX RECD 8/23/96

RADIATION SCIENCE, INC.
SCIENTISTS & ENGINEERS SINCE 1988

10 SOUTH RIVER ROAD, SUITE 1005
CRANBURY, NJ 08512

5. **RADIOACTIVE MATERIAL**

Item	Element & Mass Number	Chemical and Physical Form	Maximum Total Activity
a	Cs-137	J.L. Shepard & Associates Model JLS-4405, Series 10-1 Calibrator or equivalent	≤ 200 mCi
b	Any radioactive isotope with atomic number from 1 to 83	Any	≤ 1 mCi total activity

6. **PURPOSE FOR WHICH THE MATERIAL WILL BE USED**

a) Cs-137 Sealed Source - To be used dose rate calibration of Ion Chambers, GM detectors, and gamma scintillators.

b) Any radioactive isotope with atomic number from 1 to 83 for use as analytical samples.

TELEPHONE (609) 395-1996 FACSIMILE (609) 395-1178

RADIATION SCIENCE, INC.
SCIENTISTS & ENGINEERS SINCE 1988

10 SOUTH RIVER ROAD, SUITE 1005
CRANBURY, NJ 08512

August 19, 1996

MS 16
L-3

Mr. Eric H. Reber
Licensing Assistant Section
Nuclear Materials Safety Branch
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Subject: License Application Mail Control # 123237

Dear Mr. Reber:

Based on our conversation today, I am modifying our license application regards the licensable material and use. Exempt quantity material has been removed. Items listed in our application which were not exempt quantities; items "c" (Sr-90) and "m" (Am-241), will not be possessed in other than exempt quantities. We realize that there is no exempt quantity for Am-241, that isotope will not be possessed. Material possession and use should be as indicated on the attached revisions to the material and use sections of our application.

Thank you for your consideration.

Sincerely,

Thomas P. Bracke P.E.

OFFICIAL RECORD COPY ML 10

123237

AUG 26 1996

TELEPHONE (609) 395-1996 FACSIMILE (609) 395-1178

FAX Rec'd 8/26/96

RADIATION SCIENCE, INC.
SCIENTISTS & ENGINEERS SINCE 1988

10 SOUTH RIVER ROAD, SUITE 1005
CRANBURY, NJ 08512

5. RADIOACTIVE MATERIAL

Item	Element & Mass Number	Chemical and Physical Form	Maximum Total Activity
a	Cs-137	Sealed Source, North American Scientific Model # IND1154 or equivalent	≤ 16 mCi
b	Any radioactive isotope with atomic number from 1 to 83	Any	≤ 1 mCi total activity

6. PURPOSE FOR WHICH THE MATERIAL WILL BE USED

a) Cs-137 Sealed Source - To be used dose rate calibration of Ion Chambers, GM detectors, and gamma scintillators.

b) Any radioactive isotope with atomic number from 1 to 83 for use as analytical samples.

TELEPHONE (609) 395-1996 FACSIMILE (609) 395-1178

TELEPHONE CONVERSATON RECORD	Date: 8/19/96	Time: 2 pm
Mail Control No.: 123237	**License No.:** 29-30310-01	**Docket No.:** 030-34154
Person Called: Thomas P. Bracke, President	**Organization:** Radiation Science, Inc.	**Telephone Number:** (609) 395-1996
Person Calling: Eric H. Reber / (215) 337-5276		
Subject: Sources and Possession Limits		
Summary: What total possession limits do you want? Are any of your sources distributed as exempt quantities? generally licensed quantities?		
Action Required/Taken:		
Signature: Eric H. Reber	**Date:** 8/19/96	

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RADIATION SCIENCE, INC.
SCIENTISTS & ENGINEERS SINCE 1988

10 SOUTH RIVER ROAD, SUITE 1005
CRANBURY, NJ 08512

MS16
L-3

August 9, 1996

Mr. Eric H. Reber
Licensing Assistant Section
Nuclear Materials Safety Branch
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Subject: License Application Mail Control # 123237

Dear Mr. Reber:

Thank you for reviewing our application. We are providing additional information in response to your questions raised during our telephone conversation on Thursday (8/1/96). Your questions and our corresponding responses are listed below. "Items" refer to RSI's application.

Calibrating Survey Equipment

Q1. Please confirm that you will "establish and implement the model procedure for calibrating survey instruments that was published in Appendix B to Regulatory Guide 10.8, Revision 2, or confirm that you will not calibrate survey meters for medical institutions.

A1. RSI will not calibrate survey meters for medical institutions.

Q2. Also, you obtain a sealed source containing 85 mCi of Cs-137 or 21 mCi of Co-60 if you want to calibrate survey meters for medical institutions.

A2. See above response

Q3. Please resubmit your procedure with all applicable items in 10.3.1 addressed. (1/3 and 2/3 of each scale, for example).

A3. Calibration procedures are enclosed for your review.

Q4. Provide step-by-step procedures for calibrating survey meters.

A4. Calibration procedures are enclosed for your review.

Leak-Testing Services

Q5. Possession of contaminated leak test samples.

A5. Item 5.0, Radioactive Material, is hereby amended to include any byproduct material with atomic number from 1 to 83 up to 1 milli curie total for use as analytical samples. Item 5.0 is amended as follows:

TELEPHONE (609) 3

FACSIMILE (609) 395-1178

RADIATION SCIENCE, INC.
SCIENTISTS & ENGINEERS SINCE 1988

10 SOUTH RIVER ROAD, SUITE 1005
CRANBURY, NJ 08512

Item	Element & Mass Number	Chemical and Physical Form	Maximum Activity per Source
n	Any radioactive isotope with atomic number from 1 to 83	Any	≤ 1 mCi total activity

Q6. Storage/Disposal of leak test samples.

A6. Item 11, Waste Management, is amended to include consideration of analytical samples. Item 11.0, Waste Management is amended as follows:

11. WASTE MANAGEMENT

RSI will consider any and all options available within Subpart K of 10 CFR Part 20 for the disposal of licensed material and analytical samples. Disposal of sealed sources shall be considered utilizing a licensed transporter and disposal facility such as that site managed by Chem Nuclear at Barnwell, SC or may be returned to the manufacturer or other licensee under the provisions for transfer of material in accordance with the applicable regulations.

Q7. Are you going to perform leak test at customers' facilities or just leak test sample analysis.

A7. RSI will perform leak tests at customers' facilities. Samples will be analyzed at RSI's laboratory. The procedures for performing these tests are attached.

Q8. Confirm instruments used for leak test analysis will be calibrated before use.

A8. Before leak test samples are analyzed, but no more frequently than daily, a NIST traceable standard having an accuracy of at least ± 5% shall be counted on the corresponding quantitative counting instrument to verify calibration. The instrument will be deemed to be properly calibrated if the resulting measured count rate is within 3 standard deviations of the mean count rate as determined by performing ten, ten minute counts of the standard at the time of calibration. The result will be plotted on a control chart maintained for each instrument.

Q9. Provide example of a calculation for converting leak-test sample counting results to microcuries.

A9. example: RSI performs a leak test on a I-129 pencil source by wiping the entire source with a damp cotton swab. The sample is counted in a

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SCIENTISTS & ENGINEERS SINCE 1988

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CRANBURY, NJ 08512

calibrated gamma counter. The count rate is 1040 cpm with a background of 42 cpm. The following equation is used to calculate the resulting activity:

$$A = \frac{(CR - Bkg)}{eff \times 2.22 \times 10^{6}}$$

where:

A = Activity of the sample, micro curies
CR = Count-rate, cpm
Bkg = background count rate, cpm
eff = detector efficiency

For this example, CR = 1,040 cpm, Bkg = 42 cpm, eff = 55.4%, and the count time equals one minute for both background and sample count time. The calculated activity of the sample is 0.001 micro-curies.

Q10. Confirm that you will not distribute leak test kits.

A10. Radiation Science, Inc. will not distribute leak test kits.

If you have any further questions please do not hesitate to call myself or Scott Dennerlein at the numbers listed here. Thank you for your consideration.

Sincerely,

Thomas P. Bracke P.E.

TELEPHONE (609) 395-1996 FACSIMILE (609) 395-1178

Sealed Source Leak Tests
Sample Collection

Purpose This procedure applies to the collection of Leak Test samples as required by the Nuclear Regulatory Commission for the periodic verification of the integrity of sealed radiation sources.

Applicability Leak testing is required for sealed sources containing all byproduct material with a half-life of more than 30 days and greater than 100 microcuries of beta/gamma or 10 microcuries of an alpha emitting material.

Caution Wear eye protection and disposable laboratory gloves when performing this procedure. Contact the RSO for special instructions before performing this procedure on sources greater than 10 millicuries.

Equipment dose rate meter
contamination survey meter
cotton swabs or filter paper, DI water
leak test performance record

Procedure

1. Survey the area around the source for gross contamination. If unusually high dose rates or evident surface contamination are encountered, do not proceed. Restrict access to the area and contact the RSO.
2. Complete sections 1,2, and 3 of the leak test performance record and identify the wipe sample by cross-referencing the sample container and sample ID.
3. Moisten the swab or filter paper with DI water and wipe the entire surface of the sealed source or at least 100 cm^2 of the closest accessible surface of the device in which the source is mounted or contained. Place the wipe sample into the sample container.
4. Perform a general area survey to confirm pre-test conditions.

Sealed Source Leak Testing
Leak Test Performance Record

Purpose This procedure is written to ensure the collection of accurate and complete information to insure compliance with the licensed activity of performing a sealed source leak test.

Caution Entries must be legible and accurate.

1. Client Information:

Name: _____

Address: _____

Testing Location: _____

Person to Contact: _____ Phone: _____

2. Identification of Source or Device Containing the Source

source ☐

Description: _____ device ☐

Manufacturer: _____

Model Number: _____

Serial Number: _____

Isotope: _____ Activity: _____ micro curies

3. Leak Test Performance Data

General area survey results _____ mR/hr Evident surface contamination _____

Date Tested: _____ Next Scheduled Testing: _____

Test Method: ☐paper wipe ☐cotton swab ☐other _____

Description of area wiped: _____

Sample ID # _____

by: _____ for Radiation Science, Inc. Dated: _____

4. Sample Analysis Results

Type of Analysis: ☐Gamma Counting ☐Liquid Scintillation

Sample ID# _____ Sample Activity _____ micro curies

by: _____ for Radiation Science, Inc. Dated: _____

5. Approved

by: _____ for Radiation Science, Inc. Dated: _____

Sealed Source Leak Testing
Wipe Sample Analysis by Automatic Gamma Counting

Purpose This procedure is written to ensure the accurate and reproducible analysis of wipe samples by gamma counting.

Caution Wear eye protection and disposable laboratory gloves when performing this procedure.

Equipment Gamma Counting System
Test Samples and Leak Test Performance Record

Procedure

1. Verify that all requested information on the Leak Test Performance Record is complete. Incomplete paperwork should be brought to the attention of the RSO before proceeding.
2. Confirm that the Gamma Counting System has been calibrated to a NIST traceable primary radiation standard with the last twelve months.
3. Place each wipe sample into a counting vial and place the vial into the sample changer rack position corresponding to the wipe sample identifier.
4. Load the sample changer racks into the gamma counter ensuring that the appropriate program indicator is positioned onto the first rack.
5. If automatic background correction is not selected, skip one space after the last sample then place the background vial at the end of each batch.
6. Place the QC rack containing the appropriate NIST traceable primary radiation standard after the last batch of samples followed by the STOP rack. Initiate the counting sequence by pressing the *enable* and *forward* keys simultaneously.
7. When the batch has completed counting record the QC standard counts on the control chart and verify the source counts are within the acceptable range. File the QC record in the folder on top of the counter.
8. Calculate the sample activity micro curies using the following formula:

$$A = \frac{(cts - bkg)}{(\text{source counts/standard dpm}) \times 2.22 \times 10^6}$$

where:

A = Activity of the sample, micro curies
cts= sample counts, cpm
bkg = background counts, cpm
source counts = primary radiation standard as counted, cpm
standard dpm = know standard disintegration rate

9. Complete the Leak Test Performance Record and submit the paper work including wipe sample results to the RSO for review.

Sealed Source Leak Testing
Wipe Sample Analysis by Manual Gamma Counting

Purpose This procedure is written to ensure the accurate and reproducible analysis of leak test wipe samples by gamma counting.

Caution Wear eye protection and disposable laboratory gloves when performing this procedure.

Equipment Well Counter
Test samples and Leak Test Performance Record

Procedure

1. Verify that all requested information on the Leak Test Performance Record is complete. Incomplete paperwork should be brought to the attention of the RSO before proceeding.
2. Confirm that the Well Counter has been calibrated to a NIST traceable primary radiation standard within the last twelve months by checking the calibration label affixed to the instrument.
3. Perform the checklist items to insure that the proper instrument settings are active and that the threshold and window settings are adjusted properly to include the region of interest.
4. Place the wipe sample into a counting vial and insert the vial into the well. Count the sample for two minutes. Record the count rate data in the counting log.
5. Place an empty counting vial into the well. Perform a two minute background count. Record the count rate data in the counting log.
6. Place a NIST traceable primary radiation standard into the well and count the standard for two minutes. Record the NIST standard counts on the control chart and verify the souce counts are within the acceptable range. File the QC record in the folder for the well counter.
7. Calculate the sample activity micro curies using the following formula:

$$A = \frac{(cts - bkg)}{(\text{source counts/standard dpm}) \times 2.22 \times 10^{6}}$$

where:

A = Activity of the sample, micro curies
cts= sample counts, cpm
bkg = background counts, cpm
source counts = primary radiation standard as counted, cpm
standard dpm = know standard disintegration rate

8. Complete the Leak Test Performance Record and submit the paper work including wipe sample results to the RSO for review.

Sealed Source Leak Testing
Wipe Sample Analysis by Liquid Scintillation Counting

Purpose: This procedure is written to ensure the accurate and reproducible analysis of leak test wipe samples by gamma counting.

Caution: Wear eye protection and disposable laboratory gloves when performing this procedure.

Equipment Liquid Scintillation Counting System
Leak Test Performance Record

Procedure

1. Verify that all requested information on the Leak Test Performance Record is complete. Incomplete paperwork should be brought to the attention of the RSO before proceeding.
2. Confirm that the Liquid Scintillation System has been calibrated to a NIST traceable primary radiation standard within the last twelve months.
3. Place each wipe sample into a counting vial and dispense 5 milliliters of scintillation cocktail into the vial, cap, and invert the vial several times to insure thorough wetting of the wipe sample. Place the vial into the sample changer rack position corresponding to the wipe sample identifier.
4. Run the auto calibrate program to adjust the gain settings of the LSC by placing the NIST calibration standard in position #1; select the auto calibrate program; press *return* and *manual count* to initiate the counting sequence. The system will return to the ready state.
5. Load the test sample rack into the LSC. Wait fifteen to twenty minutes prior to initiating counting to allow sufficient time for photo excitation of the cocktail to subside. Ensure that the proper program indicator is positioned onto the first rack.
6. If automatic background correction is not selected, skip one space after the last sample then place the background vial at the end of each batch.
7. Place the QC rack containing the NIST traceable primary radiation standard or standards to be used to verify calibration after the last batch of samples followed by the STOP rack. Initiate the counting sequence by pressing the *return* and *auto count* keys.
8. When the batch has completed counting record the QC standard counts on the control chart and verify the source counts are within the acceptable range. File the QC record in the folder on top of the counter.

9. Calculate the sample activity in micro curies using the following formula:

$$A = \frac{(cts - bkg)}{(\text{source counts/standard dpm}) \times 2.22 \times 10^6}$$

where:

A = Activity of the sample, micro curies
cts = sample counts, cpm
bkg = background counts, cpm
source counts = primary radiation standard as counted, cpm
standard dpm = know standard disintegration rate

10. Complete the Leak Test Performance Record and submit the paper work including wipe sample results to the RSO for review.

Sealed Source Leak Testing
Certificate of Conformance

Purpose: This procedure is written to provide the client with a certification of the sealed source leak test as required by federal law.

Caution: This certificate is only issued following successful completion of the sealed source leak test which has been approved by an authorized personnel of Radiation Science, Inc..

Certification:

Whereas: Radiation Science, Inc. is licensed by the Nuclear Regulatory Commission of the United States Government to perform commercial sealed radiation source leak testing in compliance with 10 CFR Part 35.59, Requirements for possession of sealed sources and brachytherapy sources, and whereas:

Radiation Science, Inc. has conducted testing on the sealed radiation source or device containing the sealed source listed below in accordance with ANSI Standard N542-1977,

Name: _____

Address: _____

Testing Location: _____

Person to Contact: _____ Phone: _____

source ☐
Description: _____ device ☐

Manufacturer: _____

Model Number: _____

Serial Number: _____

Isotope: _____ Activity: _____ micro curies

and Whereas: the analysis of the test samples demonstrate that the sealed source is in compliance with 10 CFR Part 35.59 Paragraph (3). I attest that the source listed above is leak free.

Approved

by: _____ for Radiation Science, Inc. Dated: _____

Date of Next Required Leak Test in six months _____

Instrument Calibration
Linearity Check and Efficiency Calibration

Purpose This procedure satisfies the requirements of 10CFR Part 35.51 for the proper and periodic calibration of radiation detection instruments.

Applicability Gas Proportional detectors, end window GM detectors, and alpha or beta Scintillation detectors. Not for neutron or dose rate calibration.

Equipment NIST traceable radiation source
Calibrated pulse generator
Manufacturer's Operations Manual.

Procedure

1. Check the meter and probe for obvious signs of damage. Give particular attention to the cables, electrical connections, and mylar on the probe face. Install fresh batteries and check the basic operation of the meter using a check source. If any of the meter functions are inoperable, contact the RSO before proceeding further.
2. With the power in the "off" position, adjust the meter display to zero.
3. Replace the batteries and check the high voltage indication. If the meter does not have a voltage indication, record the value indicated using the pulser's voltmeter in the following steps.
4. Connect the meter to the pulse generator. Set the pulse amplitude to manufacturers specifications. Use 60 millivolts as a default value.
5. Select the highest meter scale and set the pulse rate to correspond to a point approximately 2/3 of the highest adjustable scale. Adjust the range potentiometer so that the meter reading corresponds to the standard.
6. Set the pulse rate to correspond to a point approximately 1/3 scale deflection of that scale and record the meter response. The meter reading should not differ from the known pulse rate by no more than 10%. If the meter reading is off by more than 10% but less than 20% of the known value, plot the reading against the known value and complete the plot for the remaining calibrations. Record the calibration point and the meter response on the calibration certificate.
7. Select the next lower scale and repeat steps 5 and 6 until all lower scales have been calibrated.
8. Place an appropriate NIST traceable radiation source on the calibration jig. Locate the center of the detector over the source.
9. Increase the high voltage over the manufacturer's recommended range in 50 volt increments recording the count rate at each level. Plot the data on a curve of operating voltage versus count rate.

10. Set the meter high voltage adjustment at an operating voltage near the middle of the voltage plateau.
11. Count the radiation source. Calculate the efficiency. Record the information on the calibration certificate.
12. Submit all data to the RSO for approval. Do not proceed without approval.
13. Complete and affix calibration sticker to meter.

Instrument Calibration
Radiation Field Test

Purpose This procedure is satisfies the requirements of 10CFR Part 35.51 for the proper and periodic calibration of radiation detection instrumentation and conforms to ANSI standard N323-1978, "Radiation Protection Instrumentation Test and Calibration".

Applicability Ion Chambers, GM detectors, and Scintillator detectors (except end window detectors). Not for neutron detectors.

Equipment NIST traceable radiation source
Manufacturer's recommended calibration procedures.

Procedure

1. Check the meter and probe for obvious signs of damage. Give particular attention to the cables, electrical connections, and mylar on the probe face. Install fresh batteries and check the basic operation of the meter using a check source. If any of the meter functions are inoperable, contact the RSO before proceeding further.
2. With the power in the "off" position, adjust the meter display to zero.
3. Check the HV setting according to the manufacturers specifications.
4. Select the lowest meter scale which will display an exposure rate of 1000 millirem per hour. Expose the unit to a NIST tracable radiation source. Select the radiation field to correspond with an approximate 2/3 scale deflection and adjust the gain using the range potentiometers until the meter display corresponds to the known value. Rotate the detector 90^0 and check the meter reading (geotropism). Note any difference above 2%. Record the calibration point and the meter response on the calibration certificate.
5. Expose the unit as in step 4 to a known radiation field corresponding to an approximate 1/3 scale deflection and check the meter reading. The meter reading should not differ from the known field by more than 10%. If the meter reading is off by more than 10% but no more than 20% of the known value, plot the reading against the known value and complete the plot for the remaining calibrations. Record the calibration point and the meter response on the calibration certificate.
6. Select the next lower scale and repeat steps 4 and 5 until all lower scales have been calibrated.
7. Complete the Certificate of Calibration, calibration sicker, and submit all records and data to the RSO for approval.

Certificate of Calibration

Owner: _____

Meter: _____ model # _____ serial # _____

Detector: _____ model # _____ serial # _____

NIST Source: Nuclide _____ activity # _____ serial # _____

Calibration Date: _____

Calibration Data

Meter Range	Certified Exposure Rate	Meter Exposure Rate	Correction Factor
x1000			
x100			
x10			
x1			
x0.1			

The calibration performed satisfies the requirements of 10CFR Part 35.51 for the proper and periodic calibration of radiation detection instrumentation and conforms to ANSI standard N323-1978, "Radiation Protection Instrumentation Test and Calibration". This calibration has been performed using an appropriate, certified NIST traceable radiation standard.

Calibrated by: _____ dated _____

Approved by: _____ dated _____

TELEPHONE CONVERSATON RECORD	Date: August 1, 1996	Time: 11:00am.
Mail Control No.: 123237	License No.:	Docket No.: 030-34154
Person Called: Thomas P. Bracke	Organization: Radiation Science, Inc.	Telephone Number: (609) 395-1996
Person Calling: Eric H. Reber / (215) 337-5276		
Subject:		

Summary:

Task FC 413-4 Calibrating Survey Equipment

Please confirm that you will "establish and implement the model procedure for calibrating survey instruments that was published in Appendix B to Regulatory Guide 10.8, Revision 2" or confirm that you will not calibrate survey meters for medical institutions.

Also, you obtain a sealed source containing 85 mCi of Cs-137 or 21 mCi of Co-60 if you want to calibrate survey meters for medical institutions.

Please submit your procedure with all applicable items in 10.3.1 addressed. (1/3 and 2/3 of each scale, for example)

Provide step-by-step procedures for calibrating survey meters.

Leak-Testing Services

Possession of contaminated leak test samples. "Any licensed material"????

Storage/Disposal of leak test samples.

Are you going to perform leak tests at customers' facilities or just leak test sample analysis. - they will be going to customers' facilities

Confirm instruments used for leak test analysis will be calibrated before use.

Provide example of a calculation for converting leak-test sample counting results to microcuries.

Confirm you will not distribute leak test kits They will not distribute

Action Required/Taken:	
Signature: Eric H. Reber	Date: 8/1/96

Filed 8/2/96

NRC FORM 313 (10-94)
10 CFR 30, 32, 33, 34, 35, 36, 39 and 40

U. S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIAL LICENSE

APPROVED BY OMB: NO. 3150-0120
EXPIRES 6-30-96

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 9 HOURS. SUBMITTAL OF THE APPLICATION IS NECESSARY TO DETERMINE THAT THE APPLICANT IS QUALIFIED AND THAT ADEQUATE PROCEDURES EXIST TO PROTECT THE PUBLIC HEALTH AND SAFETY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0120), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

LICENSING ASSISTANT SECTION
NUCLEAR MATERIALS SAFETY BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION II
101 MARIETTA STREET, NW, SUITE 2900
ATLANTA, GA 30323-0199

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
801 WARRENVILLE RD.
LISLE, IL 60532-4351

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-8064

L&L 30310
030-34154
03225

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S.NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*
   - [X] A. NEW LICENSE
   - [ ] B. AMENDMENT TO LICENSE NUMBER _____
   - [ ] C. RENEWAL OF LICENSE NUMBER _____

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include Zip code)*
Radiation Science, Inc.
10 South River Road
Suite 1005
Cranbury NJ 08512

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED
10 South River Road
Suite 1005
Cranbury NJ 08512

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION
Thomas P Bracke P E

TELEPHONE NUMBER
(609)395 1996

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSEE FEES *(See 10 CFR 170 and Section 170.31)*
FEE CATEGORY 3P
AMOUNT ENCLOSED $ 570

13. CERTIFICATION. *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39 AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER'S PRINTED NAME AND TITLE	SIGNATURE	DATE
Thomas P Bracke P.E. President	Thomas P Bracke	5/10/96

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			$		

APPROVED BY _____ DATE _____

OFFICIAL RECORD COPY

ML 10

123237

MAY 15

NRC FORM 313 (10-94)

PRINTED ON RECYCLED PAPER

RADIATION SCIENCE, INC.
SCIENTISTS & ENGINEERS SINCE 1988

10 SOUTH RIVER ROAD, SUITE 1005
CRANBURY, NJ 08512

May 10, 1996

Licensing Assistant Section
Nuclear Materials Safety Branch
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415

To Whom It May Concern:

Enclosed please find our application for nuclear materials license to perform instrument calibration and sealed source leak testing. Our check # 3915 in the amount of $570 is enclosed. Your attention is greatly appreciated.

Sincerely,

Thomas P. Bracke P.E.

TELEPHONE (609) 395-1996 FACSIMILE (609) 395-1178

5. RADIOACTIVE MATERIAL

The following is a list of standard sources used for instrument calibration. All sources used for instrument calibration will have a minimum accuracy of ±5% and will be NIST traceable.

Item	Element & Mass Number	Chemical and Physical Form	Maximum Activity per Source
a	C-14	Sealed Disc Source, North American Scientific, Model CAL2702 or equivalent	≤ 10 µCi/source
b	Cl-36	Sealed Disc Source, North American Scientific, Model CAL2702 or equivalent	≤ 5 µCi/source
c	Sr-90	Sealed Disc Source, North American Scientific, Model CAL2702 or equivalent	≤ 5 µCi/source
d	Tc-99	Sealed Disc Source, North American Scientific, Model CAL2702 or equivalent	≤ 5 µCi/source
e	Co-60	Sealed Rod Source, Amersham, Type 15/100, or equivalent	≤ 1 µCi/source
f	Cs-137	Sealed Rod Source, Amersham, Type 15/100, or equivalent	≤ 1 µCi/source
g	Ba-133	Sealed Disc Source, North American Scientific, Model CAL2602, or equivalent	≤ 5 µCi/source
h	I-129	Sealed Rod Source, Amersham, Type 15/100, or equivalent	≤ 5 µCi/source
i	H-3	Sealed Source, Liquid Scintillation Standard, Bechman Instruments Inc. , or equivalent	≤ 100 µCi/source

Item	Element & Mass Number	Chemical and Physical Form	Maximum Activity per Source
j	C-14	Sealed Source, Liquid Scintillation Standard, Bechman Instruments Inc. , or equivalent	≤ 10 µCi/source
k	Cs-137	Welded Gamma Source, North American Scientific Model # IND1154	≤ 15.0 mCi/source
l	Cs-137	Sealed Source, J.L. Sheppard & Asso., Series 10A or equivalent	≤ 15.0 mCi/source
m	Am-241	Sealed Disc Source, North American Scientific Model # CAL2500	≤ 1 µCi/source

6. PURPOSE FOR WHICH THE MATERIAL WILL BE USED

a) C-14 Sealed Disc Source - To be used for low energy beta response calibration of gas proportional counters, ionization chambers, GM detectors, and gamma scintillators.

b) Cl-36 Sealed Disc Source - To be used for medium energy beta response calibration of gas proportional counters, ionization chambers, GM detectors, and gamma scintillators.

c) Sr-90 Sealed Disc Source - To be used for high energy beta response calibration of gas proportional counters, ionization chambers, GM detectors, and gamma scintillators.

d) Tc-99 Sealed Disc Source - To be used for low energy beta response calibration of gas proportional counters, ionization chambers, GM detectors, and gamma scintillators.

e) Co-60 Sealed Rod Source - To be used for high energy gamma response calibration of GM detectors, and gamma scintillators used for sealed source leak testing.

f) Cs-137 Sealed Rod Source - To be used for high energy gamma response calibration of GM detectors, and gamma scintillators used for sealed source leak testing.

g) Ba-133 Sealed Disc Source - To be used for medium energy gamma response calibration of GM detectors, and gamma scintillators.

h) I-129 Sealed Rod Source - To be used for low energy gamma response calibration of GM detectors, and gamma scintillators.

i) H-3 Sealed Source - To be used for low energy beta response calibration of liquid scintillation counting systems used for sealed source leak testing.

j) C-14 Sealed Source -To be used for low energy beta response calibration of liquid scintillation counting systems used for sealed source leak testing.

k) Cs-137 Sealed Source - To be used dose rate calibration of GM detectors, and gamma scintillators.

l) Cs-137 Sealed Source - To be used dose rate calibration of GM detectors, and gamma scintillators.

m) Am-241 Sealed Disc Source - To be used for alpha response calibration of gas proportional, ionization, GM detector, and scintillation detection instruments.

7. INDIVIDUALS RESPONSIBLE FOR RADIATION SAFETY - THEIR TRAINING AND EXPERIENCE

Responsible Individuals

Thomas P. Bracke P.E. and Scott W. Dennerlein are named as the "responsible individuals" for RSI's licensed activities. Mr. Bracke is named as the Radiation Safety Officer (RSO) on the license. Mr. Bracke will be assisted by Mr. Dennerlein with the day-to-day administration of the radiation protection program, employee training, and supervision of the licensed activities.

Mr. Bracke or Mr. Dennerlein will review all test data and certify as to the proper calibration of the instrument or integrity of the tested sealed source.

Training and Experience

Resumes describing the training and experience for Mr. Bracke and Mr. Dennerlein are attached to this application.

Mr. Bracke and Mr. Dennerlein will, from time-to-time, enroll in Continuing Education (CE) courses offered through the Health Physics Society or other qualified institutions on topics relevant to the scope of this application. Currency with state-of-the-art methods and technologies will be maintained by regular association with professional trades such as the Health Physics Society or the American Nuclear Society.

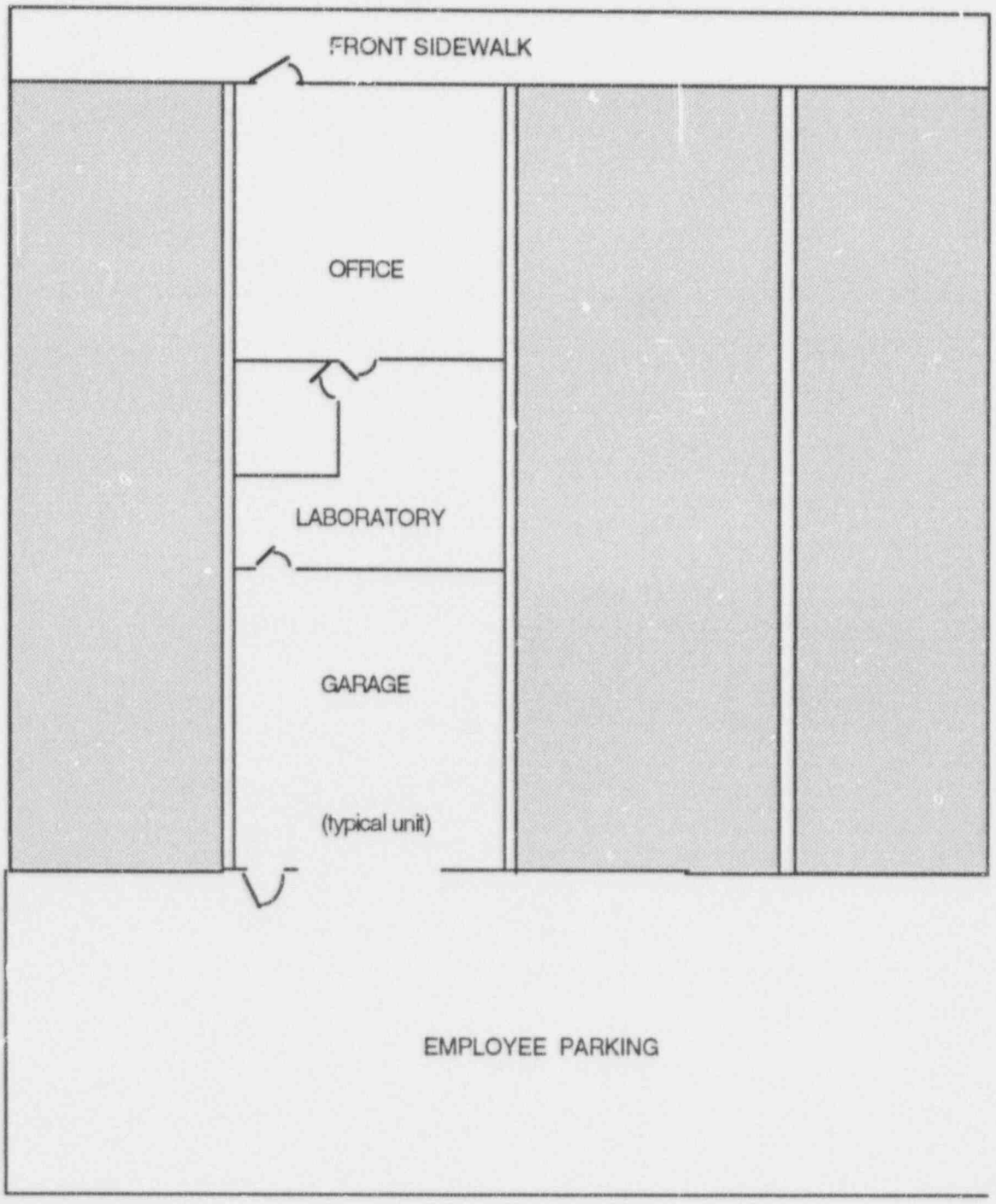
8. TRAINING FOR EMPLOYEES

General Employee training will be given to all company employees. Such training will cover the basic principles and fundamentals of radiation, radiation safety, and site specific emergency and safety procedures. Such training will be administered prior to their use or contact with radioactive materials and at least annually thereafter as part of required refresher training. Such training would normally last 1 to 2 hours. Technicians who will be performing instrument calibrations or sealed source leak tests under the supervision of the responsible individuals will receive additional training in specific procedures, safety precautions, special instructions, and equipment. Such training will be provided prior to the performance of any duties under the license. Initial training will be approximately 8 hours in duration. Periodic refresher training (2 to 4 hours) will be required at least semiannually and include a review of current manufacturers specifications, procedures, and pertinent literature.

All training will be conducted by the responsible individuals named in item #7. Training will be documented and maintained with the employees records.

9. FACILITIES AND EQUIPMENT

Radiation Science, Inc. is located in an industrial park at 10 South River Road, Suite 1005, in Cranbury, NJ. The building in which RSI is located is a single story, cinderblock and steel construction, housing six (6) office/warehouse condominium units, and zoned for light


FRONT SIDEWALK
OFFICE
LABORATORY
GARAGE
(typical unit)
EMPLOYEE PARKING

industrial use. Each suite is self-contained and provided with individual security entrances, heating and air conditioning units, separate utilities, and no common interior spaces. Sixteen (16) foot ceilings (steel beam construction) are common to each area of the suite with eight (8) foot drop ceilings in both the office area and laboratory spaces. The attached floor plan shows the layout of the facility and proximity to adjoining units. The front of the unit faces a common exterior walkway and the rear, a common parking area.

The office area is used for normal administration functions including a conference area and computer workstations. The laboratory contains instruments and ancillary equipment for the purpose of receiving and analyzing samples and performing calibration of contamination monitors and electronic equipment. The garage area normally contains equipment, vehicles, and supplies. Dose rate calibrations will be performed this area.

Dose rate calibrations will be performed using a Cs-137 source (item #k or l) located at one end of the garage as indicated on the attached diagram. The beam will be centered at one end of the room and directed toward the rear of the building. No portion of the beam will intersect the side walls. The maximum dose rate at the rear wall of the building will be 125 µR/hr. The garage will be designated as a restricted area whenever the source is in use. The exposed source will be constantly attended so that no posting of the radiation area is required. Exposure of the source will be limited to 600 hours per year with a maximum continuous exposure period of eight (8) hours so that the total effective dose equivalent at any interior wall is less than 100mR per year.

The large Cs-137 dose rate calibration source will be stored in the garage. All other licensed sources will be held in secure storage when not in continuous use.

Sealed sources will not be received for leak testing at this facility.

10. RADIATION PROTECTION PROGRAM

Personnel Monitoring Equipment

All Radiation Science employees will wear thermoluminesent dosimeters (TLD's) during the performance of duties authorized under the license. Badges will be exchanged, read, and reported quarterly. This badge service will be provided by a NVLAP accredited vendor.

Radiation Detection Instruments and Instrument Calibration

The following radiation detection instruments are available to conduct routine surveys of the facility and perform the licensed activities. All instruments will be calibrated in-house on an annual basis and after servicing (excluding general service items, such as battery replacement, which do not change the electronic response or geometry of the detector).

TYPE	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE	USE
1. Portable thin-window Tissue equivalent micro-rem survey meter	2	gamma	0 - 200 mR/hr	General area survey
2. Hand-held alpha/beta survey meter	2	alpha / beta	100 / 1000 dpm per 100 cm^2	Surface contamination survey and α-source leak test sample analysis
3. Fixed geometry, Shielded 2" NaI scintillator with single channel analyzer	1	hi-energy gamma	10^{-6} microcuries	Sample analysis
4. Hand-held gas proportional survey meter	1	alpha, beta	50 / 200 dpm per 100 cm^2	Surface contamination survey
5. Shielded NaI Well crystal with single channel analyzer	1	low-energy gamma	10^{-5} microcuries	Sample analysis and γ-source leak test sample analysis
6. Automated Liquid Scintillation counting system	2	low energy beta	10^{-6} microcuries	Sample analysis and β-source leak test sample analysis
7. Automated Gamma counting system	1	low-energy gamma	10^{-5} microcuries	Sample analysis and γ-source leak test sample analysis

Operating and Emergency Procedures

Emergency procedures will be posted in each area of the facility were the licensed activities will be performed. Each individual performing an instrument calibration will be instructed to obtain a copy of the calibration procedure for the type of instrument being calibrated. Additionally, the individual will be required to obtain and review the manufacturer's instructions and any special instructions contained in the operating proceduras for the instrumentation being calibrated.

Emergency Procedures

Emergency procedures will contain the following basic information:

1. Identification of industrial hazards particular to the procedures or the facility in which the licensed activity is to be performed.
2. Identification of emergency conditions.
3. Listing of emergency response actions appropriate for each abnormal condition likely to be encountered.
4. Identification of emergency response contacts and access phone numbers including the RSO and public emergency response teams.

Instrument Calibration Procedures

Instrument calibrations will be performed for all types of radiation survey meters except for neutron detection, and for survey instruments used for contamination monitoring. Instrument calibration procedures will contain the following basic information as appropriate to the type of calibration being performed:

1. General Information - Each procedure will contain a statement of applicability, including the purpose for which it is written, appropriate use, and identify any limitations of the procedure. This section will also provide a synopsis of the procedure and intended result.
2. Equipment and Facilities - Identification of special equipment and/or facilities required for each procedure including: NIST traceable radiation source or sources to be used during the calibration, documentation forms, any special hardware, and electronic equipment.
3. Special Precautions - Identification of any special precautions that must be observed during the procedure, including handling and use of the radioactive source or sources, and any precautions that should be observed during use of electronic equipment. This section will identify any other equipment considerations such as geometric effects caused by location of ancillary equipment.
4. Basic function - The procedure will first instruct the user to inspect the detector and meter, including electronic cables and external connections, or "windows" which are part of the detector/meter system for any signs of damage or contamination which could affect the function of the instrument. Instructions will be provided to test the function of electronic adjustments and set the electronic characteristics of the meter, including zero adjustments, power supply, high voltage, etc. to the manufacturer's specifications.
5. Linearity - A NIST calibrated pulse generator will be used to adjust the meter response at the mid-point of each scale for which adjustment is provided. After adjustment, linearity shall be checked by recording the meter response at two points representing the mid-point of each half of each adjustable scale. Meter response within ±10% of the known value will be considered acceptable.
6. Radiation Calibration - All sources used for instrument calibration will have a minimum accuracy of ±5% and will be NIST traceable. The instrument will be exposed to a NIST traceable radiation source appropriate for the response of the detector. Calibration will be performed by adjusting or charting the meter response to the known radiation standard. Any adjustments will be made near the mid-point of each adjustable range coincident and within the practical range of the calibration source.

7. Calibration Documentation - Record of the calibration will be made which will identify the individual performing the work and containing the calibration data. The data will be reviewed by one of the responsible individuals identified in Item 7, approved, and a calibration certificate issued. Each certificate will list: the owner's identification, instrument identification, testing documentation, calibration source used, and calibration information identified above. Each instrument calibrated will be labeled with the calibration date, the signature of the responsible person, any energy correction or calibration factors, instrument response to an identifiable check source, and the due date for re-calibration.

Sealed Source Leak Test Procedures

Sealed source leak check procedures will contain the following basic information as appropriate to the type of source being examined:

1. General Information - Each procedure will contain a statement of applicability, including the purpose for which it is written, appropriate use, and identify any limitations of the procedure. This section will also provide a synopsis of the procedure and intended result.
2. Equipment and Facilities - Identification of special equipment and/or facilities required for each procedure including: NIST traceable radiation source or sources to be used (if applicable), documentation forms, any special hardware, and electronic equipment.
3. Special Precautions - Identification of any special precautions that must be observed during the procedure, including handling and use of the radioactive source or sources, and any precautions that should be observed during use of electronic equipment.
4. Basic function - The procedure will require an initial survey to determine suitable conditions for performance of the leak test. Such survey will consist of a measurement of the dose rate and gross removable contamination in the area around the source. Indication of abnormally high radiation levels or gross contamination will require attention of the RSO.
5. Testing - A quantifiable sample of any removable contamination from the source, or immediate area around the source as appropriate, will be obtained and analyzed on NIST traceable calibrated instrumentation appropriate to detect the radiation emitted by the source isotope.
6. Testing Certification - Record of the leak test will be made which will identify the individual performing the work and containing the calibration data. The data will be reviewed by one of the responsible individuals identified in Item 7, approved, and a leak testing certificate issued. Each certificate will list: the owner's identification, sealed-source identification, testing documentation, and data identified above.

11. WASTE MANAGEMENT

RSI will consider any and all options available within Subpart K of 10CFR Part 20 for the disposal of licensed material. Disposal of sealed sources shall be considered utilizing a licensed transporter and disposal facility such as that site managed by Chem Nuclear at Barnwell, SC or may be returned to the manufacturer or other licensee under the provisions for transfer of material in accordance with the regulations.

Thomas P. Bracke, P.E.

RESUME

EMPLOYMENT EXPERIENCE

7/88 - Present — **RADIATION SCIENCE INC.**

President and Senior Staff Engineer: Responsible for; design and sale of radiological characterization, decontamination, and decommissioning projects by RSI; development of the scope of work, planning, scheduling, and work-plan execution for these projects; generation of analytical, managerial, and regulatory compliance reports in support of all company activities. Supervises the job performance and worker safety of Health Physics personnel during site survey and decontamination work. Generally responsible for management and operation of a $300,000 Health Physics services company.

Work on decontamination projects includes handling radioactive materials, packaging, and conducting release surveys. Materials handled include C-14, H-3, Gd-153, U and Th nat., Ra-226, Tc-99, K-40, and Cs-137 in micro curie amounts.

6/87 - 7/88 — **S.M. STOLLER CORPORATION, INC.**

Manager - Sales and Marketing: Completed a major review and assessment of this nuclear fuels and engineering consulting firms' business. The resulting analysis helped initiate the process of focusing the company's objectives and led to the sell-off of related businesses. As a result of these activities, the company now has a significant position in the large market for radiological characterization and remediation of former DOE weapons sites.

9/77 - 6/87 — **COMBUSTION ENGINEERING, INC.**

Sales engineer: Responsible for promoting the sale of the companies engineering services and products to the Nuclear Power Industry. Personal accounts were the largest single nuclear utility base assigned by the company, representing 10% of the installed U.S. nuclear generating capacity. Assisted a project team in developing these non-OEM clients and was directly involved in contract negotiations and selling of engineering service contracts in excess of $10 million.

Marketing and Strategic Planning: Participated in company-wide business planning cycles and also lead the marketing plan development for a segment of the company's nuclear services group. Additionally, coordinated the "due-diligence" review for the acquisition of a $2 million equipment manufacturing company.

Manager- Information Resource Center: Decreased the operating budget of this vital corporate resource significantly while enhancing the services provided by introduction of computer technology and greater utilization of available on-line databases. Responsible for the implementation of the plan, personally attending to staff reductions and hiring replacement.

Engineering Analyst and Designer: Participated in all aspects of the engineering design process including concept , analysis, testing, fabrication and field installation of nuclear plant components. Major accomplishments were design completion and analysis of fuel arrangement for re-load reactor cores and design and installation of plant equipment.

Physics Department: Responsible for analysis and design of shielding materials using radiation transport calculation codes and computer simulations.

EDUCATION & CERTIFICATIONS

University of Connecticut
Hartford, CT
MBA Marketing & Finance

University of Virginia
Charlottesville, VA
MS Nuclear Engineering

May 1983 January 1978

University of Virginia
Charlottesville, VA
BS Engineering & Applied Science
May 1975

Registered Professional Engineer # 12754 CT

PROFESSIONAL AFFILIATIONS

American Society of Professional Engineers
American Nuclear Society - Vice Chairman/NJ chapter 1991
American Health Physics Society

SPECIFIC PROJECT EXPERIENCE

Founder of Radiation Science, Inc. and development of the company from its beginning in 1992 to address the provision of Health Physics Services. Supervision of Health Physics professionals in the development of radiation programs for worker protection and facility decommissioning.

Marketing and Sales
Performed market research and development of a business plan for entry of a radiochemistry laboratory into the area of mixed waste analysis and environmental sampling at major DOE cleanup sites. Subsequently responsible for implementing the plan, making customer contacts, preparing proposals, and participated in the negotiation of contracts worth over $200 million.

Decontamination & Decommissioning of Rare Earth Processing Facility
Currently directing the decontamination and decommissioning of 40,000 ft^3 of warehouse, contaminated with uranium and thorium. The project involves the planning, and execution of heavy equipment removal and dismantling. Aggressive cleaning involving high pressure water and steam were employed. Soil contamination along a railroad spur was evaluated with specially designed radiation detection equipment. The site contained mixed waste, that is both RCRA hazardous and radioactive.

Laboratory Decommissioning
Planning and execution of the decontamination of a laboratory used for Tritium and C14 compound synthesis for a major pharmaceutical facility. Involved cleaning and dismantling of fume hoods and ductwork. Waste packaging including large contaminated metal components.

Site Characterization
Planning, supervision, and data analysis for multiple projects involving radiological characterization at large outdoor facilities. Soil sampling and dose rate measurements were used to determine remedial planning and background characterization.

Operation of a 2 Megawatt Research Reactor
While a research assistant at the University of Virginia operated a nuclear reactor in conjunction with undergraduate and graduate studies. Performed numerous studies regarding neutron activation and shielding experiments. Also conducted gamma irradiation experiments on biological materials using multi-Curie Co-60 irradiator.

Scott W. Dennerlein

RESUME

EMPLOYMENT EXPERIENCE

9/93 - Present — **RADIATION SCIENCE INC.**
Senior Health Physicist: Responsible for site health and safety on decontamination and decommissioning projects. Develop and present site specific training to contract workers. Generate reports, workplans and procedures for surveying and waste packaging.

2/90 - 9/93 — **TELEDYNE ISOTOPES**
Manager - Health Physics Department: Managed four to eight technicians that performed radiological surveys both in-house and commercially. Responsible for operational compliance of seven radioactive material licenses, including bioassay program, air and water effluent monitoring, and license amendments. Also managed laboratory decontamination's, instrument calibration service and review and distribution of reports.

1/89 - 2/90 — **APPLIED RADIOLOGICAL CONTROL**
Senior Health Physicist: Responsible for radiological surveys, job planning and supervision during refueling outages at several nuclear power plants in the U.S.. Operated a decontamination system to remove radioactive particles from used reactor coolant pump oil.

9/86 - 11/88 — **NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION**
Radiation Physicist: Major responsibility was the assessment of public health risk and environmental impact due to radiologically contaminated sites. Lead Health Physicist for emergency drills with nuclear power plants in NJ.. Provided technical review of documents to support siting efforts of a low level radioactive waste facility in the state.

1/85 - 9/86 — **TELEDYNE ISOTOPES**
Health Physics Technician: Initial duties were the calibration of instruments, monitoring of air and water effluents from a transuranic-contaminated metals recovery lab and preparation of radioactive waste shipments. Performed radiation safety surveys at pharmaceutical labs, including x-ray machines and sealed source monitoring. Radiation safety officer for radiotracer studies at various oil refineries operated by Exxon.

9/81 - 12/83 — **HYDRO NUCLEAR SERVICES**
Decontamination Specialist: Duties included decontamination of containment building, reactor cavity, steam generators and torus at several nuclear power plants. Operated 8,000 psi hydro-lasing decontamination tool and remote monitoring dosimeters. Prepared shipments of high activity resins for disposal.

EDUCATION & CERTIFICATIONS

Rutgers University
New Brunswick, New Jersey
M.Sc. Radiation Science
October 1991

University of Rhode Island
Kingston, Rhode Island
B.S. Zoology
May 1981

Currently enrolled at Columbia University as a candidate for a Doctorate in Public Health at the School of Public Health.

Registered Radiation Protection Technologist - 1990
American Board of Health Physics - Certified Part I - 1991

Scott W. Dennerlein

RESUME

PROFESSIONAL AFFILIATIONS

American Nuclear Society - member since 1987
American Public Health Association - member since 1990
National Health Physics Society - member since 1988
NJ Chapter of the Health Physics Society - member since 1989, President 1992

COMMUNICATION EXPERIENCE

Developed and presented specific radiation safety training at all levels, from tradesman to research scientist. As a member of the NJ Health Physics Society speakers bureau, presented demonstrations to high schools and the New Jersey Science Teachers Association. Former chairman of the public education committee of the radiological Health section of the American Public Health Association. Acted as a technical consultant to town mayors and citizen activist groups with regards to a local contaminated Dept. of Energy site. Provided hands- on training to many technicians in decontamination techniques, environmental sampling and measurements.

SPECIFIC PROJECT EXPERIENCE

Well Injection of Radioactive Tracers: Prudhoe Bay, Alaska

This ten day project was designed to model sub-surface flow of produced oil and injected brine solutions. Responsible for calculating expected exposure rates, disposal concentrations and developing specific health physics procedures to be employed in - 40^{o} temperatures. A total of 300 curies of tritium and 4 curies of cobalt - 60 were injected with a maximum individual dose of 100 millirem. Another 35 - 40 days were spent on projects of a similar nature at oil refineries in Louisiana and Montana.

D & D Project for a Pharmaceutical Research Lab: King of Prussia, PA

Supervised onsite five technicians to survey and decontaminate a 25,000 ft^2 complex of buildings in a two month project. Removed approximately 600 ft3 of radioactive waste including 240 linear feet of exhaust duct. Performed a complete demolition of a carbon - 14 synthesis lab. Sole author of the site specific HASP, decontamination plan and D & D report following NUREG/5849 recommendations. Decontamination equipment included cement scabblers, jack hammers and heavy gauge metal cutting shears.

Environmental Sampling and Assessments: Montclair, NJ

Surveyed, sampled and assessed contamination levels at over thirty homes constructed on radium contaminated fill. Much of the work involved informal discussion of the results with homeowners, as well as meetings with town officials and regulatory agencies.

DIVISION OF ACCOUNTING AND FINANCE
REQUEST FOR REFUND TO EMPLOYEE/VENDOR

JUL 3

THE EMPLOYEE/VENDOR IDENTIFIED BELOW HAS OVERPAID THE NUCLEAR REGULATORY COMMISSION FOR GOODS AND/OR SERVICES PROVIDED AND IS DUE A REFUND

EMPLOYEE/VENDOR/PAYEE CODE: _____

NAME: RADIATION SCIENCE, INC.

ADDRESS: ATTN: THOMAS P. BRACKE, PRESIDENT

ADDRESS: 10 SOUTH RIVER ROAD, SUITE 1005

CITY: CRANBURY STATE: NJ ZIP: 08512

TRANS CODE: PX

TRANS TYPE: FE	FUND: X5280	JOB CODE: _____	AMOUNT: $40.00
TRANS TYPE: IR	FUND: R1435	JOB CODE: INTR	AMOUNT: _____
TRANS TYPE: IR	FUND: R1099	JOB CODE: ADCH	AMOUNT: _____
TRANS TYPE: IR	FUND: R1099	JOB CODE: FINE	AMOUNT: _____

TOTAL REFUND AMOUNT: $40.00

COMMENTS: NEW LIC/MAIL CON 123237/APPL FEE OVRPYT

(limit comments to 40 characters, including spaces)

PREPARED BY: Brenda Brown DATE: 6/25/96

AUTHORIZED BY: Sandra Kimberly DATE: 7/3/96

ORIGINAL INV. NO: _____ DATE PAID: _____ AMOUNT: _____

REFUND ENTERED INTO COLLECT BY: _____

REFUND DETERMINED BY: _____ DATE: _____

PLEASE ATTACH APPROPRIATE SUPPORTING DOCUMENTATION

I (46)
June 13
APPL DTD 5/14/96
3P FEE (APPL) IS $530
(123237)

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: 03225
STATUS CODE: 3
FEE CATEGORY: ---
EXP. DATE: 0
FEE COMMENTS: ---
DECOM FIN ASSUR REQD: _

LICENSE FEE TRANSMITTAL

A. REGION I

1. APPLICATION ATTACHED
APPLICANT/LICENSEE: RADIATION SCIENCE, INC.
RECEIVED DATE: 960515
DOCKET NO: 3034154
CONTROL NO.: 123237
LICENSE NO.:
ACTION TYPE: NEW LICENSEE

2. FEE ATTACHED
AMOUNT: $570.00
CHECK NO.: 3915

3. COMMENTS

SIGNED W. A. Perkins
DATE 5/24/96

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED N/A)

1. FEE CATEGORY AND AMOUNT: 3.D K SK Rev OK $530

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:
AMENDMENT ---
RENEWAL ---
LICENSE ✓

3. OTHER ---

SIGNED B Brown
DATE 6/24/96

I (94)
Log Rec'd 1-3
Planner
Check No. 3915
($570) Refunded $40
3C
NRR
6/24/96
B Brown

1996 MAY 28 AM 10:53