MATERIALS LICENSE

Amendment No. 02

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. Rose-Hulman Institute of Technology	In accordance with letter dated May 31, 1996 3. License Number 13-17582-02 is amended in its entirety as follows:
2. 5500 Wabash Avenue Terre Haute, IN 47803	4. Expiration Date May 31, 2004
	5. Docket or Reference No. 030-30904/13-17582-01

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. Americium-241	A. Sealed source (New England Nuclear Model NER-476-A)	A. One source not to exceed 100 millicuries
B. Cesium-137	B. Any	B. 1 millicurie
C. Plutonium-239	C. Encapsulated as Pu-Be neutron sources	C. Eighty (80) grams total in 2 sources

9. Authorized Use:

A. To be used as an exciter source for x-ray fluorescence experiments for teaching.

B. To be used in laboratory experiments for teaching.

C. To be used in a neutron howitzer for laboratory experiments for teaching.

CONDITIONS

10. Licensed material shall be used only at the licensee's facilities located at Rose-Hulman Institute of Technology, 5500 Wabash Avenue, Terre Haute, Indiana.

11. Licensed material shall be used by, or under the supervision of, Granvil C. Kyker, Jr., Ph.D., Bruce Danner, Ph.D. or Daniel L. Hatten, Ph.D.

12. The Radiation Protection Officer for the activities authorized by this license is Daniel L. Hatten, Ph.D.

060024

13. A. Sealed sources and detector cells shall be tested for leakage and/or contamination at intervals not to exceed 6 months or at such other intervals as specified by the certificate of registration referred to in 10 CFR 32.210.

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 3 months.

C. In the absence of a certificate from a transferor indicating that a leak test has been made within 6 months prior to the transfer, a sealed source or detector cell received from another person shall not be put into use until tested.

D. Sealed sources 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 transferred 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.

E. The leak 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 in accordance with 10 CFR 30.50(b)(2), and the source shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. The report shall be filed within 5 days of the date the leak test result is known with the U.S. Nuclear Regulatory Commission, Region III, ATTN: Chief, Nuclear Materials Safety Branch, 801 Warrenville Road, Lisle, Illinois 60532-4351. The report shall specify the source involved, the test results, and corrective action taken.

F. Tests for leakage and/or contamination shall be performed by the licensee or by other persons specifically licensed by the Commission or an Agreement State to Perform such services.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number: 13-17582-02
Docket or Reference Number: 030-30904/13-17582-01
Amendment No. 02

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

15. 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 U.S. 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 March 28, 1994; and

    B. Letters dated May 23, 1994, May 31, 1996 and October 16, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Date 10/29/96

By Kevin A. Kuhlwein
Nuclear Materials Licensing Branch, Region III

COPY

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: 22120
STATUS CODE: 0
FEE CATEGORY: EX 3M 1C
EXP. DATE: 20040531
FEE COMMENTS: 170.11(A)(4)-NONPROFI
DECOM FIN ASSUR REQD: N

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED
APPLICANT/LICENSEE: ROSE-HULMAN INSTITUTE OF TECHNOLOGY
RECEIVED DATE: 960603
DOCKET NO: 3030904
CONTROL NO.: 301380
LICENSE NO.: 13-17582-02
ACTION TYPE: AMENDMENT

S7

2. FEE ATTACHED
AMOUNT: -0-
CHECK NO.: -0-

3. COMMENTS

SIGNED
DATE 6/11/96

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

1. FEE CATEGORY AND AMOUNT: EX 3M FEE EXEMPT

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

3. OTHER

SIGNED AC
DATE 6/12/96

RECEIVED
JUN 14 1996
REGION III

RECEIVED BY LFDCB
Date June 7, 1996
Log Jun 3 III
By AC
Date Completed 6/12/96

Dept. of Physics and Applied Optics
Rose-Hulman Institute of Technology
5500 Wabash Avenue
Terre Haute, IN 47803

May 31, 1996

Attn: Bill Reichhold
Materials Licensing Section
U.S. Nuclear Regulatory Commission
Region III
801 Warrenville Road
Lisle, IL 60532-4351

Re: Proposed Amendment to License #13-17582-02

Dear Mr. Reichhold:

We would like to amend our material license as described below. I am enclosing all of the documents that we submitted at our last license renewal. Most of the items are identical, with the exception of items 5, 7, and 10, which we would like to change as follows:

item 5: In the last sentence on that page, Prof. Mason's name is replaced by Dr. Hatten's name. (We are proposing Dr. Hatten as the new Radiation Safety Officer.)

item 7: Dr. Hatten's qualifications replace those of Prof. Mason's. Also a complete resume is appended at the end of this document.

item 10:

(a) A new survey meter (Bicron Surveyor 50) is added to our list of instruments used for monitoring radiation levels, and an old instrument (which is not used now) is dropped. We are going to use the new meter as our primary calibrated meter.

(b) We are requesting that our license be amended to require calibration of the above meter once a year instead of every six months. We understand that this would be in accord with NRC regulations, and it is difficult for us to comply with the six month interval since calibration requires trips to Indiana State University at times which are inconvenient for them and/or us.

(c) There are some minor changes in the description of our calibration procedure which we believe are in accord with NRC regulations, and more nearly reflect what we are now doing.

170.11(A)(4)
FEE EXEMPT

301380

Since I am retiring in June, and will be here at R.H.I.T. only part of the time, any correspondence about this application would be better addressed to Dr. Hatten than to me. However, I assure you that he and I will be making an effort to cooperate in such a way as to ensure a smooth transition between Radiation Safety Officers.

Thank you for considering this amendment request.

Sincerely,

Paul R. Mason

Paul R. Mason
Radiation Safety Officer
Rose-Hulman Institute of Technolgy

NRC FORM 313 U. S. NUCLEAR REGULATORY COMMISSION

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

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

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)*

- [ ] A. NEW LICENSE
- [X] B. AMENDMENT TO LICENSE NUMBER 13-17582-01
- [ ] C. RENEWAL OF LICENSE NUMBER _____

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include Zip code)*

Rose-Hulman Institute of Technology
5500 Wabash Avenue
Terre Haute, IN 47803

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Rose-Hulman Institute of Technology
5500 Wabash Avenue
Terre Haute, IN 47803

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION: Daniel L. Hatten
Dept. of Physics & Applied Optics

TELEPHONE NUMBER: (812) 877-8929

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 | AMOUNT ENCLOSED $

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 – TYPED/PRINTED NAME AND TITLE	SIGNATURE	DATE
R. J. Fecher, V.P. for Admin. & Finance	R J Fecher	5/22/96

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED $	CHECK NUMBER	COMMENTS
APPROVED BY				DATE	

(5) Radioactive Material

Americium-241:

A sealed source, New England Nuclear model NER-476-A, 100 millicurie. Used as an exciter source for X-ray fluorescence experiments in the undergraduate laboratories.

Cesium-137: 1 millicurie.

This amount is an aggregate amount covering all Cs-137 in our possession and consists of five homemade dry sources (25-50 μCi each) which are in use, and residue from the making of these sources which is not. Four of the sources in use have been sealed by covering them with a plastic laminate and the fifth is uncovered. All are in occasional use in the senior physics laboratories. The unused residue is stored in a secure location in an otherwise unused building, with limited key access (see item 9).

Plutonium 239: 80 grams.

These are encapsulated plutonium-beryllium sources used primarily for low level activation experiments in a "neutron howitzer". These are the two sources added to license no. 13-17582-01 by amendment No. 01 dated April 16, 1980, and described in the letter dated January 26, 1973 to the USAEC Division of Materials and Licensing. The statements and conditions of the January 26, 1973 letter regarding these sources continue to apply, except for the following changes:

(page 1, item 1) the principal officers of the institute are

Dr. Samuel F. Hulbert, President. Address: 315 Hamilton Drive, Terre Haute, Indiana 47803. Citizenship: U.S.

Dr. Roger J. Fecher, Vice President for Administration and Finance. Address: 600 Putter Point Court, Terre Haute, Indiana 47802. Citizenship: U.S.

(page 2, item 5) The programs utilizing the neutron sources will under the direct supervision of Dr. Daniel L. Hatten, who has been designated the Institute's Radiation Safety Officer.

Dr. Hatten's name should replace that of Dr. Danner or Dr. Beam wherever they appear in that letter.

(6) Purpose for which Licensed Material Will Be Used

The radiation sources listed in item 5, together with license-exempt quantities of certain other radionuclides, are used in undergraduate teaching laboratories in nuclear and radiation physics and associated instrumentation and techniques.

In the spring quarter (March through May only) several 25 to 30 person sections of sophomore modern physics laboratory are taught in Moench Hall room CL-117 (shown on attached diagrams #1 and 2). Of the several experiments that the students do, one uses the stronger of the two Pu/Be sources in a "neutron howitzer", for a radioactive half-life experiment involving the activation of small Ag foils, and another uses the Am-241 source as an exciter in an X-Ray fluorescence system using a Ge low-energy photon spectrometer. These two experiments are set up by the radiation safety officer before the quarter begins and the setups are checked to make sure that there are no unacceptable radiation levels. The sources remain in these setups (the Pu/Be source is padlocked in place), and are used, without modification, for the academic quarter. At the end of the quarter the experiments are disassembled by the radiation safety officer and the radiation sources are stored in the "shed" (concrete block building described in item 9). All of these laboratory sections are taught directly by faculty members, who are made aware by the radiation safety officer of the hazards attending any alteration of the experiment setups. Students are not allowed to handle even the activated foils in the silver half-life experiment; the instructor puts the foil in the howitzer and then transfers it to a shielded counter. No other use is made of room CL-117 during the spring quarter, and the room is locked at all times except when laboratories are in session.

In the fall quarter (September through November) a senior laboratory on radiation detection and spectroscopy is taught in Moench Hall room DL105 (shown on attached diagrams #1 and 2). The neutron howitzer and X-Ray fluorescence experiment setups, described above, are also used in this laboratory; and one or more of the sealed 25-50 μCi sources licensed to us are sometimes used. Conditions are similar to those described for the sophomore laboratory except that the number of students involved is usually less than ten, it meets twice a week instead of once, and students rotate among several nuclear physics experiments for about six weeks during the ten week quarter. Only one faculty member is involved in teaching this laboratory; the instructor has usually been Dr. Kyker (previous radiation safety officer...qualifications for handling nuclear materials safely are documented in earlier license applications), although occasionally it has been Dr. Danner (another former radiation safety officer....qualifications also on file).

At present, the licensed radiation sources are used only in the applications described above.

(7) Individual Responsible for Radiation Safety Program

Daniel L. Hatten (Ph.D.. University of Maryland, 1996) has been designated as the Institute's Radiation Safety Officer and the person responsible for safety in the use of radioactive materials.

Dr. Hatten's background includes five years in the United States Navy's Nuclear Program where he worked as an engineer on reactor plant mechanical equipment. Dr. Hatten was cognizant engineer for a large number of valve designs which were in contact with primary plant reactor coolant. He has been through the Navy's Nuclear Power School, where he studied shielding design as well as all aspects of nuclear plant function. He has spent time at several operational nuclear reactors. Dr. Hatten received Navy RADCON training at the D1G reactor prototype power plant at Shippingport, New York. Subsequent to leaving active duty with the Navy, Dr. Hatten joined the United States Naval Reserves where he was the Commanding Officer of a unit charged with providing instruction in the areas of nuclear weapon safety and security. Dr. Hatten will be taking a refresher course in radiation safety this coming summer. He has observed and expects to follow the safety procedures followed by his predecessor, Professor Paul Mason.

(8) Training for Individuals Working in Restricted Areas

There are two Moench Hall areas in which one might encounter radioactive materials at some time during the academic year (see item 6).

(1) Room CL-117 (during spring quarter) Instructors are informed at the beginning of the quarter, by the radiation safety officer, of how the experiments are to be performed, and of the dangers of modifying the experimental setups described above in item 6. Instructors do not handle the licensed sources, and only the instructor in charge of a laboratory is allowed to handle the activated silver foils (no students).

(2) Room DL-105 (during fall quarter) This room is to be used only under the direct supervision of Dr. Kyker or Dr. Danner, both of whom are well versed in safety precautions. One of them will be in charge of giving the seniors who do experiments in this room safety instructions about specific experiments. Student manipulation of sources of licensable activity is kept to a minimum.

[Note: All physics/applied optics faculty, as well as security and housekeeping personnel have key acess to the above rooms. Any of these might, on rare occasions, enter these rooms, although only one or two housekeepers and the faculty teaching in these rooms have reason to do so in the ordinary course of their duties.]

The radiation safety officer has instructed physics faculty in the location of radioactive materials, attendant hazards, warning signs, etc.

The Superintendent of Housekeeping and Grounds (Ron Sclight) has been made aware of the locations in which there are radioactive materials, the areas in which they are stored are marked with standard radiation symbols, and instructions given to the custodial and mantainance people whose duties take them into these areas. The radioactive materials in these locations are stored with sufficient shielding that they should pose no radiation hazard to anyone in any part of the rooms.

The Head of the Security Office (Gary Flora) has also been informed of the location of radioactive materials, and informed of emergency procedures to follow in the event of fire or other emergency.

In the future, safety instruction will be reinforced annually and/or whenever there are new personnel to be informed.

(9) Facilities and Equipment (some of this is described in item 6)

No high-level sources and no radiochemistry are included in our program, so no remote-handling equipment (other than tongs), sealed fume hoods, etc. are in use. General facilities for the program include one small laboratory (room DL105, Moench Hall, which is about 250 square feet) used for all the advanced laboratory experiments involving radioactive materials; and one small outbuilding, which is used for source storage.

The outbuilding ("shed") is a cinder-block building of 100-150 square feet, located about 60 feet northwest of the north end of Moench Hall (the Institute's main class-room building). This outbuilding contains a lead storage vault and is used to store licensable sources (the Pu/Be neutron sources, the Am-241 source, and the Cs-137 sources) when not in use in student laboratories. Keys to this building are strictly limited to the radiation safety officer, and the campus security office. It does not open to the more widely distributed departmental master keys. A key is left with the security office in case of emergency; security officers do not normally enter the shed. Both the shed and shielded storage locations within it are marked with the standard radiation warning symbol.

The radiation levels in the above storage building will be monitored any time changes are made, in order to insure that prescribed levels are not exceeded.

Equipment such as radiation survey meters, used for safety monitoring of experiments, is described under item 10.

(10) Radiation Safety Program

Radiation detection instruments used for monitoring experiment setups include:

(1) Alpha/beta/gamma survey meter, Bicron Surveyor 50 0.01-50 mR/hr

(2) Beta/gamma survey meter, Nuclear Chicago M/2620 0.01-100 mR/hr

(3) Beta/gamma survey meter, Victoreen CDV-700 0.01-50 mR/hr

(4) Neutron survey meter, Nuclear Chicago M/2571 1-25000 n/cm^2s

The low-level alpha-beta-gamma survey meters contain built-in check sources. The Bicron meter is our primary meter for safety surveys, but we have used all of these in the past for routine checks of radiation levels near experiment set-ups. Exposure rates larger than several mR/hr are never encountered. We depend on integral check sources, and on comparison between instruments, for frequent checks on meter function. In addition, the Radiation Laboratory at Indiana State University (also in Terre Haute) makes a standardized source available to us for absolute calibration checks of our Bicron meter. The ISU source which we use for this purpose is 9.5 mCi of Cs-137 (supplied by ICN Radioisotope Division, their serial #1376. Their set-up is sufficient to allow us to calibrate the three scales of the Bicron meter.

Calibration checks are to be carried out by, or under the direct supervision of, Dr. Hatten at least as often as once a year. When survey meters used in monitoring experiments are calibrated, a record of the calibration will be kept showing the response of each instrument at each calibration position before readjustment,the reading after the calibration adjustment, and the expected reading calculated from the source strength and distance. For the 9.5 mCi Cs-137 source mentioned above, readings are taken at nine distances, covering three scales of the meter that is being calibrated. There are check sources attached to the survey meters which provide for rough checks of their adjustment in between more formal calibrations.

Routine surveys of student experiment setups will be performed after each experiment is set up and whenever any changes are made in the setup. Records of these routine surveys will be kept in a log. In the particular experiments which we have been doing (described in item 6) the maximum dose rates to the body of a student engaged in his most direct use of the apparatus are such as would deliver less than 1 millirad in the course of an afternoon's experiment. A more typical student exposure is probably on the order of 1 mrad for the entire course - that is, the entire calendar quarter.

A copy of the general safety instructions posted in room DL105, Moench Hall, where the senior-laboratory experiments are carried out, and where some sources are stored, is appended to this application (attachment #3).

Signs are posted on the storage shed door and in the laboratories where licensable radiation sources are used, giving the name and telephone number of the person (the radiation safety officer, Dr. Hatten) to be contacted in case of any damage or loss to radiation sources or any other accident.

The Radiation Safety Officer, Dr. Hatten, the instructor in charge of the senior nuclear physics laboratory, Dr. Kyker, and a laboratory technician, Mr. Gary Burgess, are maintained on the roster of a TLD dosimetry service (ICN Dosimetry Service, Irvine, CA). Because manipulation of significant sources by students has been so thoroughly minimized (see item 6), we don't badge students, but count on close supervision of students and lab setups to prevent any harmful exposure to students.

When not in use the Pu/Be neutron sources are stored in galvanized steel drums filled with paraffin. The photon sources are stored in lead shields either in room DL105, Moench Hall, or in the outbuilding mentioned in item 9. Shields include a cylindrical "pig" with 3" walls and a well constructed of 2 x 4 x 8" lead bricks. Areas in which radioactive materials are stored are indicated by signs including the standard radiation warning symbol (purple trefoil)

Sealed sources (the Am-241 and Pu/Be sources and the Cs-137 sources which have been sealed as described under item 5) are wipe-tested for leakage at least as often as once every six months. The tests are carried out by the Radiation Safety Officer. Wipes are taken from the appropriate surfaces of the sources themselves and are counted with a thin-end-window Geiger tube and scalar. (The equipment now in use is a model EG-2 GM tube and a model 550 scaler-timer, both from The Nucleus, Oak Ridge, TN.) The counting protocol used is capable of detecting less than 0.001 μCi on a wipe. Thus far no leakage has ever been detected. Should a source ever be found to be leaking, it will be withdrawn from use until it can be dealt with according to NRC regulations.

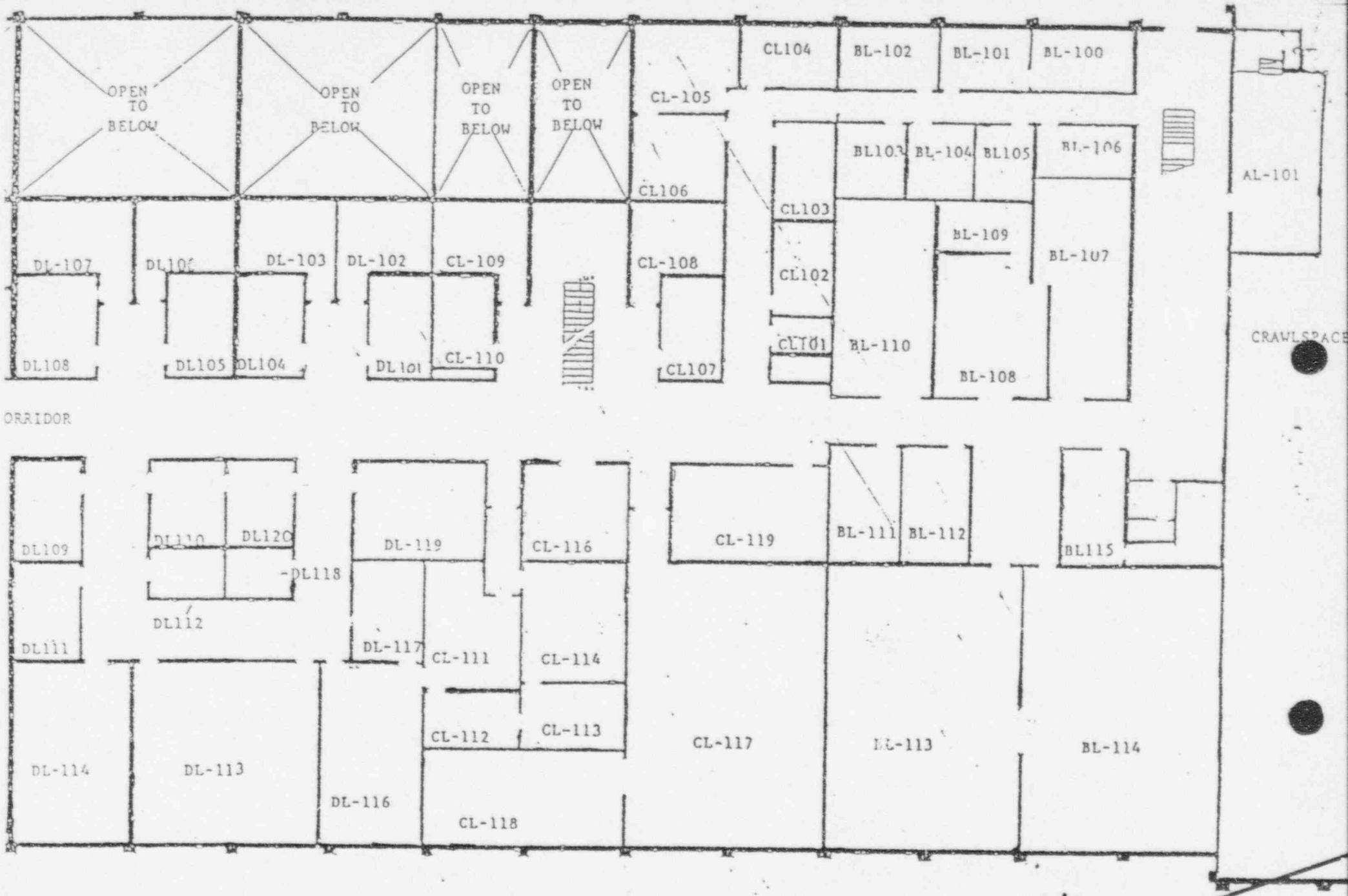
No experiments involving animals, living plants, or licensable quantities of liquid sources have ever been carried out, and none are contemplated. No bio-assay service has ever been used, and none is required.

We do not contemplate ordering any radioactive materials of sufficient quantity to make their transportation or receiving a problem. Against any possibilty that we might do so in the future, procedures are in place to assure the safe and properly supervised receipt of such materials. These procedures are appended as attachment #4.

(11) Waste Management

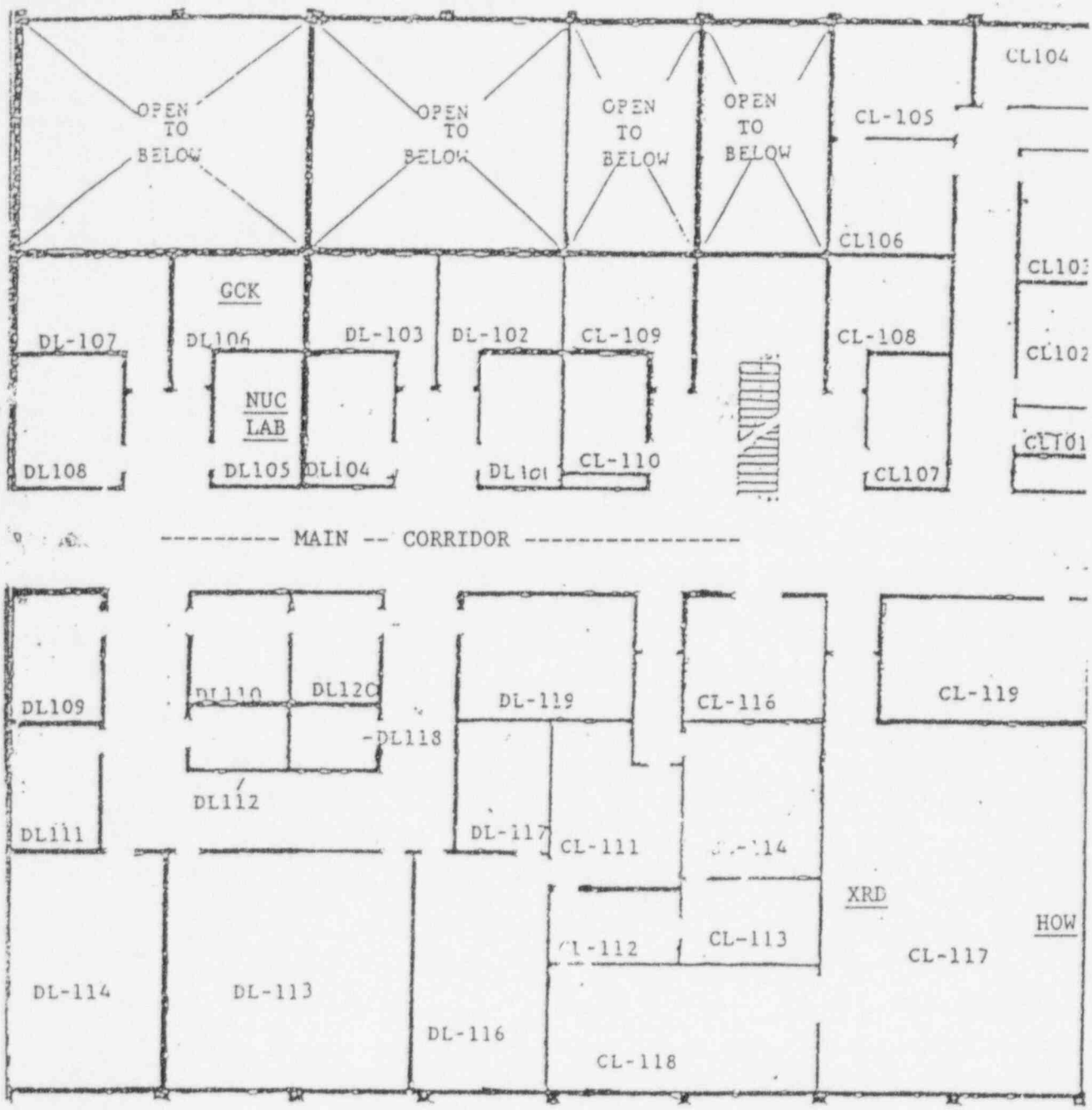
The program described above generates no waste products, and we have never had any occasion to undertake waste disposal. Should any future activities produce any low-level waste, it will be stored until properly supervised disposal can be arranged (but we don't anticipate any of this happening). Dry sources that have decayed past the point of usefulness are simply stored until their activity is undetectable.

The only waste material now on hand is apparently the residue of fabricating some Cs-137 sources many years ago. It is small in activity (less than 0.5 mCi) and in physical size (much less than 0.05 cubic foot) and is currently stored in lead shielding in the limited-access outbuilding described in item 9. No difficulty is foreseen in storing it indefinitely.



MOENCH HALL FLOOR PLAN-LOWER LEVEL ONE

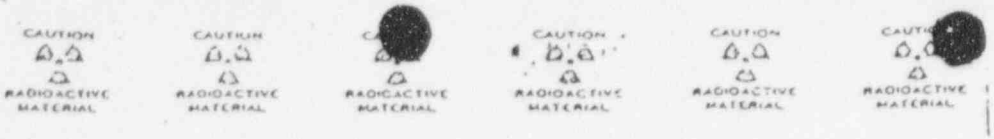
Diagram 1 Department of Physics and Applied Optics, Rose-Hulman Institute of Technology



MOENCH HALL FLOOR PLAN-LOWER LE

N

Diagram 2 Detail of Floor Plan



GENERAL LABORATORY PRECAUTIONS
FOR USE OF RADIOACTIVE MATERIALS

1. The instructor in charge of the laboratory will monitor experimental arrangements and make certain that radiation levels in the laboratory are acceptably low; but as a general principle, any unnecessary contact with radioactive sources is to be avoided.

2. Radioactive materials are to be used only in laboratory areas designated for their use, and stored only in designated storage areas. Sources should never be removed from the laboratory.

3. Maintain good housekeeping at all times in the laboratory.

4. The following are of special importance if any use is made of radioactive material in <u>liquid</u> form, but <u>should</u> be followed in any case:

   -Eating, drinking, smoking, and the use of cosmetics in the laboratory are prohibited.

   -Pipetting by mouth is <u>never</u> permitted. Use a suction device.

   -Gloves and laboratory coats should be worn whenever working with liquid radioisotopes.

   -Before leaving the laboratory, wash hands thoroughly.

5. <u>No</u> radioactive material is to be discarded or disposed of in <u>any</u> way whatever, except under the supervision of the Radiation Safety Officer.

6. In the event of any accidents, losses or spills of radioactive material, possible substantial radiation exposure, or any other emergency, <u>both</u> the instructor in charge of the laboratory <u>and</u> the Radiation Safety Officer should be notified at once.

7. All persons actually handling radioactive sources should wear film badges at all times.

Radiation Safety Officer: G. C. Kyker
Ext 304 or
877-2938

ROSE-HULMAN INSTITUTE OF TECHNOLOGY
BYPRODUCT MATERIAL LICENSE
Attachment #3

Procedure for Receiving Packages Containing Radioactive Materials

Appropriate procedures to be followed upon receipt of any shipment containing radioactive material are outlined below. These are intended to assure the safety of all persons involved.

1. Prior to receipt: When the shipment of any package containing radioactive material(s) in greater than license-exempt quantity is first arranged, the Radiation Safety Officer is to be notified of the shipment and its anticipated date of arrival.

2. Receiving procedure: Any parcel which is labeled or invoiced as containing radioactive material is to be visually inspected for signs of damage immediately upon receipt. Gloves should be worn during this inspection to prevent contamination of the hands. In the event that any sign of possible damage (e.g. wetness, crushing, etc.) appears, the Radiation Safety Officer is to be notified immediately. If no sign of damage is observed, the package is to be placed in an isolated spot and the addressee notified immediately.

3. Opening procedure: All packages containing radioactive material(s) in greater than license-exempt quantity will be opened in accordance with the following procedures, under the supervision of the Radiation Safety Officer. These procedures should be carried out within 3 hours after receipt if received during working hours, or within 18 hours if reveived after working hours, in accordance with the requirements of paragraphs 20.205(a) through (c) of 10 CFR Part 20.

   A. Wear gloves to avoid contamination of the hands.

   B. Visually inspect the package for any sign of damage. If the package is visibly damaged, wipe-test the package for contamination before proceeding further (and see 3.G. below).

   C. Measure the exposure rate at 1 m from the package surface and record it. If this rate exceeds 10 mR/hr do not proceed further, but see 3.G. below.

   D. Measure the exposure rate at the package surface and record it. If this rate exceeds 200 mR/hr do not proceed further, but see 3.G. below.

   E. Open the package with the following precautions:

      (1) Open the outer package (following the manufacturer's directions, if any are supplied) and remove the packing list.

      (2) Open the inner package and verify that the labels on the contents, the packing list, and the original purchase order all agree.

      (3) Check the integrity of the final source container (i.e., inspect for breakage of seals or vials, loss of liquid, and discoloration of packaging materials).

F. Wipe the external surface of the final source container and measure the activity on the wipe. The wipe-test procedure is to be capable of detecting activity in excess of 0.001 uCi (37 dps) on the wipe.

G. If, at any stage in the opening procedure above, a wipe test for surface contamination finds activity in excess of 0.001 uCi (37 dps) on a wipe; or if radiation levels in excess of those given in 3.C. and 3.D. above are detected, the package will be considered damaged. Opening procedures will be suspended, the package will be placed in an isolated spot, and the final delivering carrier and the NRC regional office will be notified in accordance with the regulations.

H. Monitor the packaging materials for contamination before discarding them.

(1) If they are contaminated, treat them as radioactive waste.

(2) If they are not contaminated, obliterate radiation warning labels before discarding them in regular trash.

4. Records: Maintain records of the receipt and of the results of inspecting each package.

Radiation Safety Officer: G. C. Kyker, Jr. (ext. 304 or 877-2938)

ICN Chemical & Radioisotope Division

A Division of International
Chemical & Nuclear Corporation

2727 Campus Drive
Irvine, California 92664
Telephone 714: 833-2500

CALIBRATION CERTIFICATE

Owner Indiana State University

Science Bldg. Room 52B

Terre Haute, Indiana 47809

Nuclide Cesium-137 Amount 9.5 mCi

Capsule type 375 Capsule number 1376

Calibration is made using an ionization chamber and electrometer. Standardization of chamber has been accomplished with ± 2% and ± 3% standards.

Source number 1376 measured 3.1 mrhm

on July 10,1981. Total error is within ± 5%.

Source Department

ROSE-HULMAN INSTITUTE OF TECHNOLOGY
BYPRODUCT MATERIAL LICENSE
Attachment #2

Curriculum Vitae

Daniel L. Hatten

Rose-Hulman Institute of Technology
5500 Wabash Avenue, Box 167
Terre Haute, IN 47803
(812) 877-8929 (w)

EDUCATION:

Ph.D. Physics (Summer 1995)
University of Maryland, College Park, Maryland
Thesis Advisor: Professor Wendell T. Hill III
Thesis Topic: High-Frequency, Intense-Field Dissociative Ionization of Multiply Charged Diatomics

M.S. Physics (Dec. 1992)
University of Maryland, College Park, Maryland

** Nuclear Engineering (Feb. 1982) - (Navy school - training equivalent to M.S.)
Bettis Reactor Engineering School, West Mifflin, Pennsylvania

B.S. Physics (May 1980)
Rose-Hulman Institute of Technology, Terre Haute, Indiana

HONORS:

Outstanding Graduate Teaching Assistant, College of Computer, Mathematical, and Physical Sciences, University of Maryland, College Park (1989)
Ralph D. Meyers Teaching Award, Department of Physics and Astronomy, University of Maryland, College Park (1987)

EXPERIENCE:

Visiting Assistant Professor (Aug. 1994 - present), Rose-Hulman Institute of Technology, Terre Haute, IN
Research Assistant (Sept. 1989 - Fall 1994), University of Maryland, College Park, MD
Instructor (Summer 1989), University of Maryland, College Park, MD
Teaching Assistant (Jan. 1986 - June 1989), University of Maryland, College Park, MD
Instructor (Summer 1987, 88, 89, 90), United States Physics Olympiad Training Camp, University of Maryland, College Park, MD
Nuclear/Mechanical Engineer (Aug. 1980 - July 1985), Naval Sea Systems Command (Code 08), Washington, DC
United States Naval Reserve (1980 - present)

SKILLS:

Lasers and Optics - Operation and maintenance of XeCl, KrF^*, and ArF^* excimer lasers, and various dye lasers. Second harmonic and sum frequency generation using non-linear crystals. Extensive knowledge of UV and visible optical devices and components such as lenses, mirrors, gratings, optical coatings, filters, etc. Use of ion/photon detectors such as microchannel plates,

photodiodes, and photomultipliers. Use of streak camera, spectrometer and multichannel analyzer.
Computers - Knowledge of DOS, Windows, and UNIX operating systems, IDL and Basic programming languages, and a wide variety of commercial software packages. Programming and operational experience using IEEE-488 GPIB, CAMAC, and RS-232 interfaces for instrument control and data acquisition.
Vacuum Systems - Ultra-high vacuum system design, operation, and maintenance including diffusion and turbo-molecular pumps, pressure and leak detectors, vacuum valves, and other components.
Machining and Electronics - Machining involving mill, lathe, and drill. Design and construction of simple electronic circuits.

TEACHING EXPERIENCE:

Visiting Assistant Professor of Physics & Applied Optics (Fall 1994 - Spring 1995), Rose-Hulman Institute of Technology - I taught introductory mechanics and electricity and magnetism, including laboratory sections. I taught two semesters of the advanced undergraduate laboratory for senior physics majors. Additionally, I am teaching a section of the Integrated Freshman Year Curriculum, a program which replaces the traditionally separate physics, mathematics, etc., with a curriculum intended to show the interrelations between these subjects.

Instructor (Summer 1989), Physics Dept., UMCP - Taught introductory physics for engineers. Supervised two teaching assistants who ran laboratory and discussion sections.

Teaching Assistant (Jan. 1986 - June 1989), Physics Dept., UMCP - Taught eight semesters as a graduate teaching assistant. I taught both calculus-based and non-calculus-based courses. My duties involved lab and discussion sections. I provided major input into the writing of the laboratory manuals for three different courses.

Instructor (Summer 1987, 1988, 1989, 1990) - United States Physics Olympiad Training Camp, University of Maryland at College Park. This program prepares twenty exceptionally gifted high school physics students for the International Physics Olympiad competition. Taught laboratory skills and error analysis to the olympiad team members. I wrote the laboratory manual for this training.

Navy Instructor (1985-1988) - I was commanding officer of a unit of Navy instructors whose mission was to teach Navy personnel. (1988-1992) - I was the officer in charge of providing training for a unit attached to a Navy research lab. I have completed the Navy's school for training of instructors.

RESEARCH EXPERIENCE: (Sept. 1989 - present), Laser Photodynamics Group, IPST, UMCP

Research emphasis: Intense Field Laser/Matter Interactions

- Planned and implemented experiments to study energetic dissociative ionization of diatomic molecules in intense (10^{14} - 10^{15} W/cm^2) laser fields. Used time-of-flight mass spectroscopy techniques to interrogate the ionic fragments. Developed a multiphoton dissociative ionization model utilizing both Coulomb and non-Coulomb potentials to explain the processes involved.

Research emphasis: Short Pulse Ultraviolet Laser Physics

- Designed and constructed a pulsed ultraviolet laser system which generated 10 ps pulses of 10 mJ energy at 193 nm. The system used a XeCl excimer laser to pump various dye lasers and amplifiers which were used for pulse generation and compression. A 193 nm, 10 ps seed pulse was obtained by sum frequency generation of two dye laser pulses in a BBO crystal. The seed was amplified in a commercial ArF* excimer laser. This laser system was used in my laser/matter interaction studies.

NUCLEAR/MECHANICAL ENGINEER: (Aug. 1980 - July 1985), Naval Sea Systems Command (Code 08), Washington, DC

- Engineer in reactor plant valves group. Responsible for numerous manual valve designs through all phases of design lifetime: design, engineering testing, manufacture, installation, and in-service trouble-shooting.
- Responsible for all phases of valve procurement including vendor inquiry, contract review and placement, production oversight, and quality control.
- Working knowledge of:
  - reactor plant fluid systems and radiological control.
  - reactor plant materials including corrosion resistant alloys, hardfacing materials, lubricants, and rubber.
  - materials testing including ultrasonic, dye-penetrant, and radiographic testing.
  - manufacturing and repair techniques including casting, forging, rough and finish machining, welding, and hardfacing.

MEMBERSHIP: American Association of Physics Teachers (AAPT)

MILITARY EXPERIENCE:

RESERVE DUTY

- Promoted to Commander, (1993) United States Naval Reserve
- Inspector, (1992 - present) Naval Sea Systems Command (NAVSEA) Detachment 1506- assigned to the office of the NAVSEA Inspector General - conduct inspections of NAVSEA facilities including shipyards, weapons stations, and laboratories.
- Unit Training Officer, (1988-1992) Naval Surface Weapons Center, Detachment 206 - responsible for planning and conducting training to qualify unit officers for mobilization.
- Commanding Officer, (1985-1988) Nuclear Weapons Training Group Atlantic, Detachment 106 - unit mission to teach nuclear weapon effects, security, and safety to fleet personnel.
- Shipboard Instructor School, (1986) Completed the Navy school on lesson preparation and presentation.

ACTIVE DUTY

- Naval Sea Systems Command, Code 08, (1980-1985) Nuclear/Mechanical Engineer (described in detail above)
- Bettis Reactor Engineering School, (1981-1982) Bettis Atomic Power Laboratory, West

Mifflin, PA. - Received equivalent of M.S. in Nuclear Engineering. Curriculum included basic reactor plant physics, reactor plant design and operation, fluid mechanics, materials science, strength of materials, radiological control, shock and vibration analysis, and heat transfer.

- Reactor Plant Prototype Training, (1982) Spent one month at the Navy's DIG reactor plant for indoctrination in all phases of reactor plant operation.
- Naval Reactors Field Office, (1982) Spent one month attached to the Naval Reactors field off ice at Portsmouth Naval Shipyard for indoctrination in shipyard operation and nuclear plant repairs.

PUBLICATIONS:

W.T. Hill III, B.P.Turner, S.Yang, J.Zhu and D.L.Hatten, *Competition Between Multiphoton Fragmentation Channels in H_2 and HD Induced by Intermediate States,* Phys. Rev. A 43, 3668 (1991)

D.L. Hatten, Y. Cui, W.T. Hill III, T. Mikes, and J. Goldhar, *Generation of Intense 10-ps, 193-nm Pulses Using Simple Distributed Feedback Dye Lasers and an ArF^* Amplifier*, Appl. Opt. 31, 7042 (1992)

W.T.Hill III, J.Zhu, D.L.Hatten, Y.Cui, J.Goldhar and S.Yang, *Role of Non-Coulombic Potential Curves in Intense-Field Dissociative Ionization of Diatomic Molecules,* Phys. Rev. Lett. 69, 2646 (1992)

Y.Cui, T.N.Ding, D.L.Hatten, W.T.Hill, and J.Goldhar, *Frequency Tuning of a Distributed Feedback Dye Laser With Two Transmission Gratings*, Appl. Opt. 32, 6602(1993)

W.T.Hill III, S.Yang, D.L.Hatten, Y. Cui, J. Goldhar and J. Zhu, *Intermediate States in Multiphoton Fragmentation of Small Molecules,* NATO ASI Series Coherent Phenomena in Atoms and Molecules in Laser Fields, p.153, eds. A.D.Bandrauk and S.C.Wallace (Plenum Pub. Corp., 1992)

D.L.Hatten, J.Zhu, Y.Cui, J.Goldhar and W.T.Hill III, *Above Threshold Dissociation of CO^{2+} at High Frequencies*, (to be submitted)

J.Zhu, D.L.Hatten, Y.Cui, J.Goldhar and W.T.Hill III, *High Frequency Intense-Field Dissociative Ionization in the Presence of Intermediate States*, (to be submitted)

PRESENTATIONS:

J. Zhu, D.L. Hatten, S. Yang, W.T. Hill III, Y Cui, and J. Goldhar, *Quasi-Coulomb Explosion Model of Intense-Field Dissociative Ionization of Diatoms*, QELS Baltimore 1993

Y. Cui, T.N. Ding, J. Goldhar, D.L. Hatten, and W.T. Hill III, *Frequency Tuning of a Distributed Feedback Dye Laser with Two Transmission Gratings*, CEO Baltimore 1993

S. Yang, Y. Cui, D.L. Hatten, J. Zhu, J. Goldhar and W.T. Hill III, *Photoionization and Predissociation in O_2 at 193 nm*, Third Annual Meeting of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society (DAMOP), Chicago 1992

J. Zhu, D.L. Hatten, S. Yang, Y. Cui, J. Goldhar and W.T. Hill III, *Intense Field Multiphoton Fragmentation of Diatoms with Picosecond 193 nm Radiation*, Third Annual Meeting of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society (DAMOP), Chicago 1992

D.L. Hatten, T.N. Ding, Y. Cui, T. Mikes, W.T. Hill III, and J. Goldhar, *Generation of Picosecond Pulses Using a Simple Distributed Feedback Dye Laser with Holographic Transmission Grating*, CLEO Baltimore 1991

OCT 2 9 1996

Daniel L. Hatten
Radiation Safety Officer
Rose-Hulman Institute of Technology
5500 Wabash Avenue
Terre Haute, IN 47803

Dear Dr. Hatten:

Enclosed is Amendment No. 02 to your NRC Material License No. 13-17582-02 in accordance with your request.

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 III office at (630) 829-9887 so that we can provide appropriate corrections and answers.

Please note we have extended the expiration date of the license for five years in accordance with the regulations (10 CFR 30.36).

Also note, the revised Part 20 (10 CFR 20.1906) modifies the package receipt/opening procedures. You may need to revise your current receipt/opening procedures to comply with the changes in the revised Part 20. Enclosed is Appendix X which provides guidance on complying with the new Part 20 requirements.

Please be advised that your license expires at the end of the day, in the month, and year stated in the license. Unless your license has been 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. Notify NRC, in writing, within 30 days:

   a. When the Radiation Safety Officer permanently discontinues performance of duties under the license or has a name change; or

301380

b. When the licensee's mailing address changes (no fee is required if the location of byproduct material remains the same).

3. In accordance with 10 CFR 30.36(b) and/or license condition, notify NRC, promptly, in writing, and request termination of the license when you decide to terminate all activities involving materials authorized under the license.

4. Request and obtain a license amendment before you:

   a. Change Radiation Safety Officers;

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

   c. Add or change the areas of use or address or addresses of use identified in the license application or on the license; or

   d. Change ownership of your organization.

5. 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 certifying official rather than a consultant.

You will be periodically inspected by 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 Policy and Procedures for NRC Enforcement Actions. 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.

Sincerely,

Original Signed By
W. P. Reichhold
Nuclear Materials Licensing Branch

License No.: 13-17582-02
Docket No.: 030-30904

Enclosures: 1. Amendment No. 02
2. Appendix X

DOCUMENT NAME: M:\03030904.CL6

To receive a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFFICE	DNMS/RIII		DNMS/RIII							
NAME	WREICHHOLD:jaw		KNULL							
DATE	10/24/96		10/ /96							

OFFICIAL RECORD COPY

Dept. of Physics and Applied Optics
Rose-Hulman Institute of Technology
5500 Wabash Avenue
Terre Haute, IN 47803

16 October 1996

Attn: Mr. William Reichhold
Materials Licensing Section
Nuclear Regulatory Commission
801 Warrenville Road
Lisle, IL 60532-4351

Dear Mr. Reichhold

I request that I be listed as the Radiation Safety Officer as part of Rose-Hulman's license amendment request. The following additional information is provided in support of this request in response to your phone conversation record identified with mail control number **301380**:

1. A certificate of completion of a radiation safety training course offered by Engelhardt and Associates is provided as Attachment 1.

2. Attachment 2 details the experience and training I have had with the radionuclides and devices listed on our license.

3. You may remove Paul Mason as an authorized user.

4. Our survey meters will be calibrated by the manufacturer, an Agreement State or NRC licensee authorized to perform survey meter calibrations.

5. Updated General Laboratory Procedures and Package Receipt Procedures that include the new RSO's name and telephone number as Attachments 3 and 4.

Sincerely

Daniel L. Hatten

Daniel L. Hatten
Assistant Professor of Physics
Rose-Hulman Institute of Technology

Pm: 10-16-96

Certificate of Completion

awarded to

Daniel Hatten

for participation in a radiation safety training course

Given by Engelhardt & Associates, Inc.
September 9-11, 1996
New Orleans, LA

Susan J. Engelhardt
Susan J. Engelhardt, M.S.

Dee Kaiser
Dee Ann Kaiser, M.S.

Ralph Grunewald
Ralph Grunewald, Ph.D.

Judith Grunewald
Judith Grunewald, R.N., M.S.

Attachment 1

Attachment 2

Training and Experience of
Dr. Daniel L. Hatten
with respect to radionuclide sources at
Rose-Hulman Institute of Technology

The purpose of this attachment is to describe the training and experience I have pertaining to the radionuclides which we have at Rose-Hulman

Plutonium-Beryllium - I have been trained by the former RSO, Professor Paul Mason, in the proper handling and monitoring of the plutonium-beryllium neutron source. Additionally, I used this source in the performance of neutron activation experiments during the 1995-96 academic year.

Cesium-137 - I have been trained in the proper procedure for leak testing these sources. I have not used them. I do not anticipate that they will be used in the future. They are currently in storage, and we are seeking an appropriate means of disposal for these sources.

Americium-241 - I have used this source in the performance of X-ray fluorescence experiments. The americium source is a commercial sealed source. I received instruction in the proper handling of sealed sources at the radiation safety training course.

Attachment 3

General Laboratory Precautions
For Use of Radioactive Materials

1. The instructor in charge of the laboratory will monitor experimental arrangements and make certain that radiation levels in the laboratory are acceptably low; but as a general principle, any unnecessary contact with radioactive sources is to be avoided.

2. Radioactive materials are to be used only in laboratory areas designated for their use, and stored only in designated storage areas. Sources should never be removed from the laboratory.

3. Maintain good housekeeping at all times in the laboratory.

4. The following are of special importance if any use is made of radioactive material in liquid form, but should be followed in any case:

   ⇒ Eating, drinking, smoking, and the use of cosmetics in the laboratory are prohibited.

   ⇒ Pipetting by mouth is *never* permitted. Use a suction device.

   ⇒ Gloves and laboratory coats should be worn whenever working with liquid radioisotopes.

   ⇒ Before leaving the laboratory, wash hands thoroughly.

5. *No* radioactive material is to be discarded or disposed of in *any* way whatever, except under the supervision of the Radiation Safety Officer.

6. In the event of any accidents, losses or spills of radioactive material, possible substantial radiation exposure, or any other emergency, *both* the instructor in charge of the laboratory and the Radiation Safety Officer should be notified at once.

7. All persons actually handling radioactive sources should wear film badges at all times.

Radiation Safety Officer: D. L. Hatten, ext. 8929 or 299-0176

Attachment 4

Procedure for Receiving Packages
Containing Radioactive Materials

Appropriate procedures to be followed upon receipt of any shipment containing radioactive material are outlined below. These are intended to assure the safety of all persons involved.

1. Prior to receipt: When the shipment of any package containing radioactive material(s) in greater than license-exempt quantity is first arranged, the Radiation Safety Officer is to be notified of the shipment and its anticipated date of arrival.

2. Receiving procedure: Any parcel which is labeled or invoiced as containing radioactive material is to be visually inspected for signs of damage immediately upon receipt. Gloves should be worn during this inspection to prevent contamination of the hands. In the event that any sign of possible damage (e.g. wetness, crushing, etc.) appears, the Radiation Safety Officer is to be notified immediately. If no sign of damage is observed, the package is to be placed in an isolated spot and the addressee notified immediately.

3. Opening procedure: All packages containing radioactive material(s) in greater than license-exempt quantity will be opened in accordance with the following procedures, under the supervision of the Radiation Safety Officer. These procedures should be carried out within 3 hours after receipt of received during working hours, or within 18 hours if received after working hours. In accordance with the requirements of paragraphs 20.205(a) through (c) of 10 CFR Part 20.

   A. Wear gloves to avoid contamination of the hands.

   B. Visually inspect the package for any sign of damage. If the package is visibly damaged, wipe-test the package for contamination before proceeding further (and see 3.G. below).

   C. Measure the exposure rate at 1m from the package surface and record it. If this rate exceeds 10mR/hr do not proceed further, but see 3.G. below.

   D. Measure the exposure rate at 1 m from the package surface and record it. If this rate exceeds 200mR/hr do not proceed further, but see 3.G. below.

   E. Open the package with the following precautions:

      (1) Open the outer package (following the manufacturer's directions, if any are supplied) and remove the packing list.

      (2) Open the inner package and verify that the labels on the contents, the packing list, and the original purchase order all agree.

(3) Check the integrity of the final source container (i.e., inspect for breakage of seals or vials, loss of liquid, and discoloration of packaging materials.)

F. Wipe the external surface of the final source container and measure the activity on the wipe. The wipe-test procedure is to be capable of detecting activity in excess of 0.001 uCi (37 dps) on the wipe.

G. If, at any stage in the opening procedure above, a wipe test for surface contamination finds activity in excess of 0.001 uCi (37 dps) on a wipe; or if radiation levels in excess of those given in 3.C. and 3.D. above are detected, the package will be considered damaged. Opening procedures will be suspended, the package will be placed in an isolated spot, and the final delivering carrier and the NRC regional office will be notified in accordance with the regulations.

H. Monitor the packaging materials for contamination before discarding them.

(1) If they are contaminated, treat them as radioactive waste.

(2) If they are not contaminated, obliterate radiation warning labels before discarding them in regular trash.

4. Records: Maintain records of the receipt and of the results of inspecting each package.

Radiation Safety Officer: D. L. Hatten (ext. 8929 or 299-0176)