~~DOCS~~

VOID SHEET

TO: License Fee Management Branch

FROM: RIII - COLLEEN C. CASEY

SUBJECT: VOIDED APPLICATION

Control Number: 39999 2

Applicant: CAYMAN CHEMICAL CO.

License Number: 21-24683-01

Docket Number: 030-29143

Date Voided: MAY 14, 1996

Reason for Void: Licensee needs time to resubmit amendment request in entirety due to significant personnel change and addition to request - Voided after partial review. Licensee wants us to keep the original fee void action now & will re-activate with re-submission in a few weeks to a month. Reviewer agreed on 5/13/96.

Colleen C. Casey
Signature

5/14/96
Date

Attachment:
Official Record Copy of
Voided Action

FOR LFMB USE ONLY

___ Refund Authorized and processed

✓ No Refund Due

___ Fee Exempt or Fee Not Required

Comments: _____

Log completed ✓

Processed by: SAC 6/12/96

ML 2/1
30
SD

140060

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: 02410
STATUS CODE: 0
FEE CATEGORY: 3P
EXP. DATE: 19960331
FEE COMMENTS: REDISTRIBUTION
DECOM FIN ASSUR REQD: N

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED
APPLICANT/LICENSEE: CAYMAN CHEMICAL COMPANY
RECEIVED DATE: 960229
DOCKET NO: 3029143
CONTROL NO.: 399992
LICENSE NO.: 21-24683-01
ACTION TYPE: AMENDMENT

5b

2. FEE ATTACHED
AMOUNT: 1500
CHECK NO.: 13212

3. COMMENTS

SIGNED D. Hersey
DATE 3-7-96

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

1. FEE CATEGORY AND AMOUNT: ~~3P~~ 3M $1500

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

3. OTHER

SIGNED JC
DATE Mar. 13, 1996

Log Mar 3 10
Remitter
Check No. 13212
Amount $1500
Fee Category 3P 3M upgraded
Type of Fee APPL
Date Check Rec'd 3/4/96
Date Completed 3/13/96
By: JC

give copy to Stanley when completed

RECEIVED
MAR 22 1996
REGION III

NRC FORM 313
(3-92)
10 CFR 30, 32, 33,
34, 35 and 40

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIAL LICENSE

APPROVED BY OMB NO. 3150-0120
EXPIRES 6-30-93

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 3.25 HOURS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, 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 MATERIAL SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOUR ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLDAND, 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 SAFETY SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION II
101 MARIETTA STREET, NW, SUITE 2900
ATLANTA, GA 30323

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
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

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

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVEDA, OREGON, WASHINGTON AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:

NUCLEAR MATERIALS SAFETY SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION V
1450 MARIA LANE
WALNUT CREEK, CA 94596-5368

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 21-24683-01
- [ ] C. RENEWAL OF LICENSE NUMBER _____

2. NAME AND MAILING ADDRESS OF APPLICANT *(Includes Zip Code)*

Cayman Chemical Company
690 KMS Place
Ann Arbor, MI 48108

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

Cayman Chemical Company
690 KMS Place
Ann Arbor, MI 48108

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Camilla A. Mauzy, Ph.D.

TELEPHONE NUMBER: (313)662-6758

SUBMIT ITEMS 5 THROUGH 11 ON 8½ 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 AND EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTRED 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: 3M

AMOUNT ENCLOSED: $ 1500.00

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, 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 OFFICE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

SIGNATURE – CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
[signature]	Kirk M. Maxey MD	President	2-28-96

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS

AMOUNT RECEIVED	CHECK NUMBER

APPROVED BY

RECEIVED
FEB 29 1996
REGION III

399992

CAYMAN CHEMICAL

February 28, 1996

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

Dear Sirs:

We are submitting two copies of a new proposed amendment to Cayman Chemical Company NRC License No. **21-24683-01.**

In addition to the materials listed in our current license, we are adding several new isotopes, and will be using small amounts of the isotopes for research purposes. In accordance with NRC fee regulations, we are also submitting an application fee in the amount of $1500.00 for this amendment which will expand our use to the 3M category.

All research will be done on the premises (690 KMS Place) and comprise *in vitro* experimentation only.

If you have questions regarding the application or usage, please feel free to call or fax me.

Sincerely,

Camilla A. Mauzy

Camilla A. Mauzy, Ph.D.
Manager, Molecular Biology Div.
Cayman Chemical Co.

CAYMAN
CHEMICAL

690 KMS Place
Ann Arbor, MI
48108 USA

Phone:
(800) 364-9897
(313) 662-6756

Fax:
(313) 662-6896

5. Radioactive material(in addition to isotopes listed in original License 21-24683-01):

	Element/ Mass No.	Chemical form	Max. amount
5a.	^{33}P	adenosine-[^{33}P]-triphosphate	10 mCi
5b.	^{33}P	deoxynucleotide-[^{33}P]- triphosphate	10 mCi
5c.	^{32}P	Adenosine 5'-[α-^{32}P]-triphosphate, triethylammonium salt	25 mCi
5d.	^{32}P	Adenosine 5'-[γ-^{32}P]-triphosphate, triethylammonium salt	25 mCi
5e.	^{32}P	deoxynucleotide-α-[^{32}P]-triphosphate	25 mCi
5f.	^{35}S	L-[^{35}S]-methionine	20 mCi
5g.	^{35}S	Deoxyadenosine 5'-α-[^{35}S]thiotriphosphate, triethylammononium salt	20 mCi
5h.	^{3}H	[^{3}H] eicosonoid(s)	100 mCi

6. Purpose(s) for which licensed Material will be used (in addition to material uses listed in original License 21-24683-01):

	Element/ Mass No.	Chemical form	Purpose
6a.	^{33}P	adenosine-[^{33}P]-triphosphate	DNA Probe labelling
6b.	^{33}P	deoxynucleotide-[^{33}P]-triphosphate	DNA Probe labelling, sequencing
6c.	^{32}P	Adenosine 5'-[α-^{32}P]-triphosphate, triethylammonium salt	DNA Probe labelling
6d.	^{32}P	Adenosine 5'-[γ-^{32}P]-triphosphate, triethylammonium salt	DNA Probe labelling
6e.	^{32}P	deoxynucleotide-α-[^{32}P]-triphosphate	DNA sequencing
6f.	^{35}S	L-[^{35}S]-methionine	Protein Labelling
6g.	^{35}S	Deoxyadenosine 5'-α–[^{35}S]thiotriphosphate, triethylammononium salt	DNA Sequencing
6h.	^{3}H	[^{3}H] eicosonoid(s)	Development of product line

7. Individual(s) responsible for radiation safety program and their training and experience.

7.1 Authorized Users for Medical Use

None. All work will be performed *in vitro*.

7.2 Authorized Users for Nonmedical Use

See ATT 7.2.1, 7.2.2, 7.2.3, 7.2.4, and 7.2.5. The primary user of radioactive material will be Camilla A. Mauzy, Ph.D. (ATT 7.2.1).

7.3 Radiation Safety Officer

Camilla A. Mauzy has been appointed Radiation Safety Officer and is responsible for ensuring the safe use of radiation. The Radiation Safety Officer is responsible for managing the radiation safety program; identifying radiation safety problems; initiating, recommending, or providing corrective actions; verifying implementation of corrective actions; and ensuring compliance with regulations. The Radiation Safety Officer is hereby delegated the authority necessary to meet those responsibilities.

2-28-96
(date)

Kirk Maxey, M.D.
President, Cayman Chemical Company

8. Training For Individuals Working in or Frequenting Restricted Areas.

Cayman Chemical Company - Training Policies

All individuals who work in, or frequent, a Restricted Area or who use radioactive materials will receive appropriate training. The level of training will be appropriate to the duties of the individual who works with radiation. Training may be abridged for personnel (e.g., Shipping or Security personnel) whose duties require less potential exposure or less involved procedures.

1. Personnel will be instructed before assuming duties with, or before assuming duties in the vicinity of, radioactive materials.

2. Refresher training will be provided annually.

3. Personnel will be retrained as appropriate whenever there is a significant change in their duties, the regulations, or the terms of the NRC license.

4. Individuals will receive two types of training:

   a. general training on the nature of radiation, risks, protective measures (as specified below). This training is the responsibility of the RSO.

b. training on how to safely perform the specific steps of particular procedures. This training is the responsibility of the authorized user.

5. The RSO will maintain records of the content of training and the individuals who received the training.

General training syllabus

General training will comprise the following topics.

1. Radiation physics. Information on the basic nature of radioactive decay, radioactive materials, properties of ionizing radiation, and interactions of radiation and matter.

2. Radiological health quantities and units.

3. Biological effects of radiation.

4. Risks from exposure to low-level radiation.

5. Control of radiation exposure. Protecting from external exposure. Protecting from internal exposure. Protective devices. General rules of handling radioactive materials and good laboratory practices.

6. Areas at Cayman where radioactive material is transferred, used, or stored. Notices, signs and labels. Radiation monitoring programs.

7. The role of the RSO and the authorized user.

8. Radiation dose limits, MDPH and NRC. Other important applicable regulations and terms of the license. Rights and responsibilities of employees.

9. Facilities and Equipment

9.1. Annotated Drawing

See ATT 9.1.

9.2 Survey Instrument Calibration

Cayman Chemical Company Policy - Survey Instrument Calibration

1. Survey instruments used for health protection purposes will be calibrated annually and after every servicing.

2. Survey instruments which read in radiological health units (e.g., mR/hr) shall be calibrated with a radioactive source. Survey instruments which respond only in cpm will not be used for health protection purposes (they could be used, for example, to look for a lost source).

Procedure

1. The source used must be approximately a point source.

2. Either the apparent source activity or the exposure rate at a given distance from the source must be traceable by documented measurements to a standard certified within 5 percent accuracy by the National Institute of Standards and Technology.

3. A source that has approximately the same photon energy as the environment in which the calibrated instrument will be employed should be used for the calibration.

4. The calibration source should be of sufficient strength to produce an exposure rate of about 30 mR/hr at 100 cm.

5. The inverse square law and the law of radioactive decay must be used to correct for change in exposure rate due to changes in distance or source decay.

6. A record will be made of each survey meter calibration.

7. A single point on a survey meter scale may be considered satisfactorily calibrated if the indicated exposure rate differs by the calculated exposure rate by less than ten percent.

8. Three kinds of scales are frequently used on survey meters.

    a. Meters on which the user selects a linear scale must be calibrated at no less than two points on each scale. The points should be at approximately 1/3 and 2/3 of full scale.
    b. Meters that have a multi decade logarithmic scale must be calibrated at no less than one point on each decade and no less than two points on one of the decades. Those points should be at approximately 1/3 and 2/3 of the decade.

c. Meters that have an automatically ranging digital display device for indicating rates must be calibrated at no less than one point on each decade and no less than two points on one of the decades. Those points should be at approximately 1/3 and 2/3 of the decade.

9. Readings above 1,000 mR/hr need not be calibrated. However, such scales should be checked for operation and approximately correct response.

10. At the time of calibration, the apparent exposure rate from a built-in or owner-supplied check source must be determined and recorded.

11. The report of a survey meter calibration should indicate the procedure used and the data obtained. The record of the calibration will include:

    a. The owner or user of the instrument;

    b. A description of the instrument that includes manufacturer, model number, serial number, and type of detector;

    c. A description of the calibration source, including exposure rate at a specified distance on a specified date, and the calibration procedure;

    d. For each calibration point, the calculated exposure rate, the indicated exposure rate, the deduced calibration factor (calculated exposure rate divided by the indicated exposure rate), and the scale selected on the instrument;

    e. The reading indicated with the instrument in the "battery check" mode (if available on the instrument);

    f. The angle between the radiation flux field and the long axis or long dimension of the detector (for external cylindrical GM or ionization-type detectors, this will usually be "parallel" or "perpendicular" indicating photons traveling either parallel or perpendicular to the central axis of the detector; for instruments with internal detectors, this should be the angle between the flux direction and a specified dimension of the instrument;

    g. For detectors with removable shielding or build-up cap, an indication of whether the shield or cap was in place during the calibration;

    h. The apparent exposure rate from the check source;

    i. the name of the person who performed the calibration and the date on which the calibration was performed.

12. The following information will be attached to the instrument as a calibration sticker or tag:

    a. The source used to calibrate the instrument;

b. The proper deflection in the battery check mode (unless this is clearly indicated on the instrument);

c. For each scale or decade, one of the following:

(1). The average correction factor
(2). A graph or graphs from which the correction factor for each scale or decade may be deduced, or
(3). An indication that the scale was checked for function but not calibrated, or an indication that the scale was inoperative.

d. The angle between the radiation flux and the detector during calibration;

e. The apparent exposure rate from the check source.

Note: One word reminders or symbols that are explained on the Survey Meter Calibration Report may be used on the calibration sticker or tag.

Cayman Chemical Company may have its survey meters calibrated by a reputable vendor which can perform calibrations to the above standard.

9.3. Dose Calibrator Calibration

N/A

9.4 Personnel Monitor Program

Cayman Chemical Company Policy - External Personal Monitoring

1. Every individual who is occupationally exposed to external ionizing radiation in a manner which is likely to result in a radiation dose in excess of ten percent of any applicable limit will be required to wear an individual radiation monitor (e.g., film badge or thermoluminescent (TLD) dosimeter). In addition, at the discretion of the Radiation Safety Officer, other individuals may be monitored.

2. Individuals who handle radioactive material will be issued a TLD ring monitor if the dose to the fingers is likely to exceed ten percent of the applicable limit.

3. The RSO will promptly review all exposure reports to look for workers whose exposure is unexpectedly high or low, and to ensure that exposures are as low as reasonably achievable (ALARA). This review does not apply to backup monitor records, for example, pocket ionization chambers when the monitor of record is a film or TLD dosimeter.

4. External dosimeters will be processed by a contractor which meets the National Voluntary Laboratory Accreditation Program (NVLAP) standard for radiation dosimetry.

References

[1]Code of Federal Regulations, Title 10, Part 20, Paragraph 20.1201, *Occupational dose limits for adults*.

[2]Code of Federal Regulations, Title 10, Part 20, Paragraph 20.1502, *Conditions requiring individual monitoring of external and internal occupational dose*.

9.5 Imaging Equipment

N/A

9.6 Other Equipment and Facilities

Criteria for Facilities and Equipment for Radiation Research Laboratories, Cayman Chemical Company

General Criteria

Approval or disapproval by the Radiation Safety Committe of proposed use of radioactive material will depend on adequate facilities and equipment to be provided by the user to insure ALARA exposures and compliance with regulatory requirements.

Each laboratory will be evaluated case-by-case. Acceptable criteria for facilities and equipment will depend on the categories of laboratory described.

Low Level Tracer Laboratories (less than 100 mCi)

1. Benches, sinks, walls, and floors. Provide benches, sinks, walls, and floors with smooth, nonporous, and easily decontaminated surfaces.
2. Absorbent Bench Paper.
   Provide absorbent, plastic-backed (or equivalent), and easily discarded bench paper on the bench surface for catching and disposing small amounts of contamination from drips or spills from laboratory apparatus and glassware.
3. Laboratory Coats and Gloves
   Provide protective laboratory coats and rubber or disposable plastic gloves to avoid direct contact with radioactive materials.
4. Radioactive Waste Containers
   Provide specially labeled containers for laboratory radioactive wastes. These containers may be shielded as necessary, placed near the waste-generating area and distant from the area frequently occupied by personnel.
5. Sinks for Radioactive Washing or Effluents
   a. Designate special sinks to receive any small amounts of radioactive washings or effluents.
   b. Keep records of estimated amount of radioactive disposal in these sinks to ensure compliance. The disposal limit of each radioactive isotope used in each laboratory will be determined by the RSO in accordance with NRC regulation Section 20.303 of 10 CFR Part 20. These sinks should be connected to the main pipes. They should not be connected to open channels or devices resulting in the accumulation of radioactivity.

6. Sharp Corners, Cracks or Pores
   Design laboratories with a minimum of sharp corners, cracks, or porous surfaces where radioactive material can lodge.

7. Plumbing, Traps, and Ductwork
   Design plumbing, traps, and ductwork to avoid radioactive contamination build-up that can create sources of external radiation exposure, cross-contaminate drinking water or air-supply lines.

8. Ventilation
   a. Provide adequate ventilation for processing of radioactive materials that may lead to airborn contamination by volatilization, dispersion of dust, spraying or splattering.
   b. Airflow should be at least 100 ft. per minute.
   c. Provisions should be made for shutting down the ventilation system in the event of accidents to contain radioactivity.

9. Separate Room for Coats and Belongings
   Provide separate rooms for coats and personal belongings to avoid contamination.

10. Lighting
    Provide adequte lighting for laboratory areas to avoid spills and other accidents resulting in contamination build-up.

Facilities For Use of Alpha Emitters

High quality factor of alpha particles may require some special provisions for use of alpha emitters.

1. Glove Box
   Provide a glove box as may be required and shielded as necessary, to contain alpha emitters.

2. Leaded Gloves
   Provide leaded gloves as may be required to prevent from radiation exposure.

3. Shielding
   Provide bench-top lead shields as may be necessary to be determined by the RSO.

4. Remote Handling Equipment
   Provide tongs, forceps, or other remote handling equipment.

High-level Beta-Gamma Laboratories (equal to or greater than 100 mC)

In addition to the minimum criteria required for low-level tracer laboratories, the minimum criteria for high-level beta-gamma laboratory in possession of at least 100 millicuries of radioactive materials include the following requirements:

1. Drip Tray
   Provide suitable drip trays that can be easily cleaned for handling radioactive materials where spills may occur. These drip trays may be covered with absorbent plastic-backed (or equivalent) material to soak up minor spills.

2. Lead shields

Provide bench-top lead shields for low energy gamma emitters or high-level radioactivity. Lead sheets with adequate thickness may be used. Protective viewing windows with adequate thickness may be used. Protective viewing windows with adequate leaded glass in combination with the lead shielding should be provided as necessary.

3. Remote Handling Equipment
   Provide as necessary, tongs, forceps, or other remote handling equipment.
4. Leaded Gloves
   Provide leaded gloves as necessary.
5. Laboratory Shoe Covers
   Provide special disposable shoe covers if floors are likely to be contaminated.

Radioiodine Use

In order to prevent thyroid uptake by the personnel, special safety measures are required for handling I^{125}. In addition to the minimum criteria required for low-level tracer laboratories and those required for high-level beta-gamma laboratories, the following criteria will be satisfied:

1. Ventilation and Fume Hoods
   a. Provide adequate ventilation so that handling of radioiodine is limited to the area with airflow of at least 100 ft/min. Fume hoods may be required unless ventilation is adequate.
   b. Provide adequate filtration of both intake air and exhaust air to avoid increasing environmental exposures as necessary.
   c. Fume hoods, if required, should be designed to avoid eddy currents that would disperse radioactive materials outside the hood area.
   d. If appreciable levels of activity is used, as determined by the RSO, the hood should have its own exhaust system to avoid transmission of airborn contamination to other laboratories.
2. Radioactive Waste Storage
   Provide radioactive waste containers which may be effectively enclosed to prevent airborn contamination of radioiodine.

10. Radiation Safety Program

10.1 Radiation Safety Committee/Radiation Safety Officer

Cayman Chemical Company - Radiation Safety Committee Bylaws

Policy
Radioactive material will be used safely, in accordance with NRC and State of Michigan regulations, and in accordance with our NRC license and MDPH registration. To achieve this objective, the following procedures are established.

Procedures

1. The Radiation Safety Officer (RSO) will be appointed by Dr. Kirk Maxey, President, Cayman Chemical Company.

2. Application to the RSO to use radiation and radioactive material should be made in writing by the proposed user. The application should include the radionuclide identity, radionuclide chemical and physical form, the activity which will be possessed and the maximum activity which will be used per procedure, and a safety evaluation of the proposed activity. The safety evaluation should address the adequacy of the training and experience of the proposed users, the adequacy of facilities and equipment, the administrative controls to be instituted to ensure safety, forseeable reasonable accident scenarios, and procedures to be followed in the event of an accident.

3. The RSO is responsible for the safety of all radioactive materials at Cayman Chemical Company, whether regulated by NRC or the State of Michigan. The RSO is responsible for:

   a. providing general surveillance over all activities using radiation or radioactive material, and acting as the executive of Cayman Chemical's policies.

   b. formulating policies which result in occupational exposure, public exposure, and releases of radioactive material to the environment which are as low as reasonably achievable (ALARA).

   c. directing authorized users to conduct a safety analysis of operations before operations are started and at any time after operations are approved.

   d. reviewing and approving/disapproving operations involving the use of radiation based upon the risks and benefits of the proposed operation, the adequacy and conclusiveness of the safety analysis provided by the project supervisor, the adequacy of facilities and equipment, the training and experience of project personnel, the operating and emergency procedures, and the adequacy of engineered and administrative controls, and the ALARA principle.

   e. discontinuing operations not meeting safety standards.

f. ensuring that operations are conducted in accordance with applicable state and federal laws and requlations and our license and registrations.

g. reviewing annually, the policies and procedures of the radiation safety program, and the adequacy of their implementation.

h. posting signs and notices, and keeping safety records.

References

[1]Code of Federal Regulations, Title 10, Part 33, Paragraph 33.14 *Requirements for issuance of a Type B license of broad scope*.

10.2 ALARA Program

Cayman Chemical Company Policy - ALARA Program

Cayman Chemical Company is committed that individual and collective occupational radiation doses, radiation doses to members of the public, and releases of radioactive materials to the environment, be maintained as low as reasonably achievable (ALARA).

Procedures

To meet the policy stated above, the following procedures are adopted.

1. Occupational radiation doses, both collective and individual, releases of radioactive materials to the environment, and doses and potential doses to members of the public (e.g., radiation levels in unrestricted areas), and records of surveys will be reviewed quarterly by the RSO.

2. The ALARA principle will be one of the considerations in reviewing and approving operating procedures submitted to the RSO by authorized users and proposed authorized users.

3. Modifications to operating and maintenance procedures will be made if they reduce radiation exposures unless, in our opinion, the cost is unjustified. A record of modifications which have been made to meet the ALARA principle and modifications which have been considered but which have not been made due to cost will be kept by the RSO.

4. The RSO will annually review the radiation safety program. One element of this review will be to examine radiation safety programs, policies, procedures, and user operating procedures from the ALARA standpoint.

5. Occupational radiation exposures will be reviewed regularly by the RSO, to evaluate whether exposures are consistent with ALARA. A record of this evaluation will be made. Investigational levels are established as follows: Investigational Level I, 10 percent of any applicable limit; Investigational Level II, 30 percent of any applicable limit. To permit a quarterly ALARA review, annual limits will be prorated to a quarterly basis. This scheme produces the following table:

Investigational Levels (mrem/quarter)		
	Level I	Level II
Total Effective Dose Equivalent (TEDE)	125	375
Lens of eye	375	1125
Shallow dose equivalent to skin or extremity (SDE)	1250	3750

Table 1. Investigational levels.

a. Except when deemed appropriate by the RSO, no further action will be taken in cases where an individual's quarterly dose is less than Investigational Level I as given in Table 1.

b. In cases where an individual's quarterly dose is greater than or equal to Investigational Level I but less than Investigational Level II, the RSO will review the circumstances and report the results of the review following the quarter when the dose was recorded. No action related specifically to the exposure is necessary unless deemed appropriate by the RSO. The RSO will review each such dose in comparison with those of others performing similar tasks as an index of the ALARA program quality and will record the review.

c. In cases where an individual's quarterly dose is equal to, or greater than, Investigational Level II, the RSO will investigate the circumstances and causes in a timely manner and, if warranted, will take corrective action. A report of the investigation, any actions taken, and a copy of the individual's Form NRC5 or its equivalent will be recorded by the RSO following completion of the investigation.

d. In a case where a worker's dose needs to exceed an existing investigational level, a new, higher, investigational level may be established for that individual on the basis that it is consistent with good ALARA practice. Justification for the new investigational level will be documented. The RSO will review the justification and must approve or disapprove of all revisions of investigational levels.

6. Records of radiation surveys in restricted and unrestricted areas will be reviewed quarterly by the RSO to monitor that radiation fields and contamination levels meet standards and are ALARA.

7. The RSO will ensure that authorized users, workers, and ancillary personnel who may be exposed to radiation will be instructed in the ALARA philosophy. These individuals will be informed that management, the RSC, and the RSO are committed to implementing the ALARA concept.

8. Radiation workers will be given opportunities to participate in formulating the procedures that they will be required to follow. The ALARA concept will be an element of these procedures. The RSO will establish a method whereby workers may make suggestions on improving health physics practices in operating procedures.

9. The RSO will investigate all known instances of deviations from good ALARA practices and, if possible, determine the causes. When the cause is known, the RSO will implement program changes to maintain doses ALARA.

10. Authorized users will consult the RSO during the project planning phase to ensure that procedures are developed that will maintain doses ALARA.

11. The ALARA principle, and its relationship to work practices and work conditions, will be an element of the training program which will be routinely provided to radiation workers. Workers will be instructed in the recourse available if they feel that ALARA is not being promoted on the job.

Responsibility

1. Development of policies and procedures to meet the ALARA goal is the responsibility of the RSO.

2. Implementation of ALARA policies as they relate to authorized users is the responsibility of the authorized users and the RSO, who will assert authority to maintain practices consistent with ALARA.

References

[1]Code of Federal Regulations, Title 10, Part 20, Paragraphs 20.1101(b), and 20.1101(c) *Radiation Protection Programs.*

Management Commitment

We, the management of Cayman Chemical Company, are committed to the program described herein for keeping individual and collective doses as low as is reasonably achievable (ALARA). In accord with this commitment, we hereby describe an administrative organization for radiation safety and will develop the necessary written policy, procedures, and instructions to foster the ALARA concept within our company.

I hereby certify that this institution has implemented the ALARA Program set forth above.

2-28-96
(date)
Kirk Maxey, M.D.
President, Cayman Chemical Company

Camilla A Mauzy 12/11/95
(date)
Camilla A. Mauzy, Ph.D.
Radiation Safety Officer, Cayman Chemical Company

10.3 Leak Test

Cayman Chemical Company - Leak Tests of Sealed Sources

Cayman Chemical Company is not requesting at this time to possess any sealed sources.

If we wish to possess sealed sources, a procedure for leak testing them will be submitted with the application to possess such sources.

10.4 Safe Use of Radiopharmaceuticals

N/A

10.5 Spill Procedures

Cayman Chemical Company - Spill Procedures

1. **Estimate the activity spilled.** Initiate a major or minor spill procedure based upon the activity spilled.

Radionuclide	Millicuries
H-3	100
C-14	20
S-35	40
P-32	10
P-33	10
Fe-55	20
I-125	1

Table 1. Spills greater than the tabulated activity are major spills. Spills less than the tabulated activity are minor spills.

For major spills of liquids or solids.

1. **Clear the area.** Notify all persons not involved in the spill, and who will not be needed, to leave the room.

2. **If you are contaminated or injured, call for help.** If you are contaminated enlist a colleague to attend to steps 3 -5 below. If injured, take care of your own medical needs first. Use the available safety equipment such as the eyewash. Discard contaminated clothing and use an emergency shower if necessary. Skin contamination is most effectively removed by washing *gently* (so as not to break the skin) with mild soap and lukewarm water. Later, use a diluted radioactive decontaminant such as Isoclean to remove the final traces of radioactivity. If radioactivity remains, some can be removed by covering the skin with plastic to induce perspiration and subsequently washing away the perspiration.

3. **Prevent the spread.** Cover the spill with absorbent paper. Pay particular attention to the possibility of radioactive powders becoming airborne (in this case, use damp paper.

Do not attempt to clean up the spill now. If clothes or shoes are contaminated, leave them in the contaminated area. Limit the movement of personnel so that the contamination is not spread. If possible, and if the radiation level is low (e.g., pure beta emitters), mark the area of the spill with a marker or tape.

4. **Shield the source if possible.** This should be done only if it can be done without spreading contamination and there is no significant increase in radiation exposure (i.e., radiation level is low [pure beta emitter] and you are not contaminated).

5. **Secure the area.** Lock the room or enlist the assistance of a colleague to prevent access by others.

6. **Notify the RSO immediately.** The RSO will supervise spill cleanup and will prepare a report of the incident.

For minor spills of liquids or solids.

1. **Notify.** Notify persons in the area that a spill has occurred.

2. **Prevent the spread.** Prevent the spread by covering the spill with absorbent paper. If a powder was spilled, use damp paper to prevent the powder from becoming airborne.

3. **Clean up.** Clean up the spill using disposable gloves and absorbent paper (e.g., paper towels). Wipe from the outside of the contaminated area towards the center; wiping in a circular motion tends to spread contamination. Carefully fold the paper with the clean side out and place in a plastic bag for transfer to a radioactive waste container. Use a dilute soap or decontaminating solution such as Isoclean for the final stages of the cleanup. Change gloves often, placing contaminated gloves in the trash bag.

4. **Survey.** Survey the spill area with an appropriate low-range radiation detector. A GM counter is appropriate for P-32, P-33, and I-125. For tritium, S-35, and C-14, wipe tests counted on the liquid scintillation counter will be necessary. Check hands, clothing, and shoes for contamination.

5. **Report the incident to the RSO.** The RSO will follow up on the successful cleanup of the spill and will complete a report giving the details of the spill.

10.6 Ordering and Receiving

Cayman Chemical Company Policy - Ordering

1. The Radiation Safety Officer (RSO) or a designee must authorize each order for radioactive material before the order is placed with a supplier. Purchasing will not proceed with an order for radioactive materials unless it is also signed by the RSO.

2. Prior to authorizing a purchase of radioactive materials, the RSO will ensure that the acquisition of the material is consistent with the possession limits, chemical form, and physical form authorized by our license. The RSO will also ensure that the material will be used by an individual named in the license and for the purposes authorized.

3. The RSO will establish and maintain a record keeping system which will identify the isotope, activity, chemical and physical form, supplier, and the authorized user. The RSO will also provide a method of ensuring that the ordered material was, in fact, ordered through proper channels.

4. No radioactive materials may be brought to the Cayman site without the express approval and prior knowledge of the RSO.

5. The RSO will inform and train Receiving and Security personnel as to where and how to deliver received packages of radioactive materials during normal working hours and off-hours.

6. If deliveries are to be made during off-hours, the RSO will inform carriers of where to make deliveries.

Cayman Chemical Company Policy - Receipt of Radioactive Packages

1. Instructions to Receiving Personnel:

   a. Receiving or Security personnel on duty may accept delivery of packages containing radioactive material from any carrier. Radioactive packages which contain substantial quantities of radioactive material can be recognized by the DOT Radioactive White I, Yellow II, or Yellow III label. Some packages contain small enough quantities of radioactive material so that they do not need to be labeled with the White 1, Yellow II, or Yellow III label. These packages may be identified by the shipping papers or invoice.

   b. Packages containing radioactive material should be visually inspected for any sign of damage (such as leaking, crushed, torn, wet). If the package shows signs of damage, immediately deliver it on the bench in room 12B. Use handling techniques specified by the Radiation Safety Officer (RSO). Immediately call the RSO or one of the other individuals listed below.

   If the package appears undamaged, deliver it to the refrigerator of room 12B or the freezer of room 12A. Make sure the room is locked when you leave. Notify the authorized user that a radioactive package has arrived. If the authorized user is unavailable, notify the RSO. If the package is received after normal working hours, leave a message or the invoice for the authorized user designated on the packing slip so that the package will be sure to be checked at the start of the next working day.

   If the package is a Yellow II or a Yellow III package, do not handle it for a prolonged period. Transport it using a cart.

   If Receiving or Security personnel have any questions on how to follow this policy, contact the RSO.

   Persons to contact for an emergency off hours:

Radiation Safety Officer	**Camilla Mauzy Ph.D.**	**313-741-9758**
Authorized user	**Jeff Johnson Ph.D.**	**313-996-1281**
Authorized user	**Jim MacDonald**	**313-971-4170**

10.7 Opening Packages

Cayman Chemical Policy

Receipts of packages containing radioactive materials bearing a DOT Radioactive White I, Yellow II, or Yellow III label, or packages which are wet, crushed, or damaged, will be monitored as required by federal regulations[1]. Maximum radiation levels[2] and contamination levels[3] are specified by federal regulations.

It is the policy of Cayman Chemical Co. to monitor all incoming packages of radioactive materials.

Monitoring will consist of exposure rate measurements and wipe test surveys of the inner and outer shipping container.

Materials

Liquid scintillation counter (LSC) or well counter
Geiger-Mueller (GM) Counter
Ionization chamber survey meter or GM counter calibrated in mR/hr
Filter disks or alcohol pads for wipe tests
Forceps or tongs
Protective gloves

Procedure

1. For packages in apparently good condition, the Receiving personnel will, upon receipt, deliver packages which contain radioactive material to room 12A or room 12B. These packages will be delivered unopened. If a package appears damaged, crushed, or wet, Receiving personnel will deliver the package to a designated location in room 12B using techniques specified by the Radiation Safety Officer (RSO). In the case of an apparently damaged package, Receiving will immediately notify the RSO. If a package cannot be delivered promptly, Receiving will notify the RSO.

2. The monitoring of WHITE I, YELLOW II, and YELLOW III packages must be done within three hours of receipt or, if the package is not received during working hours, within three hours of the start of the next working day. All packages should be monitored (surveyed) promptly after receipt.

3. Surveys will be performed by qualified personnel designated by the RSO. Before making a survey, make sure that the survey instrument has been

checked that day with the appropriate check source and is functioning properly. Detailed procedures are as follows:

a. Turn on the survey meter(s) and allow to stabilize. Record the background reading. With this reading and all others, the actual numerical value must be recorded, not "same as background" or "less than ..."

b. Wear gloves when surveying packages.

c. Visually inspect the package for any sign of damage (e.g., wet, torn, crushed). If damage is noted, stop. Notify the RSO.

d. Measure the exposure rate at three feet from the package and record. Verify that the exposure rate at three feet is equal to, or less than the transportation index on the package. If the exposure rate at three feet is greater than the transport index, or if it is greater than 10 mR/hr, stop. Follow the notification procedure in paragraph 4.

e. Measure the exposure rate at the surface of the package and record. If the exposure rate at the package surface is greater than 200 mR/hr, stop. Follow the notification procedure in paragraph 4.

f. Open the package and check the inner container for breakage, wetness, or discolorization which could indicate leakage.

g. Wipe test a 100 square cm area of both the external surface of the shipping container and the external surface of the lead shield of the inner container. If there is no lead shield, wipe test the inner container.

h. Assay the wipe tests using an appropriate, calibrated counter. For pure beta emitters, a liquid scintillation counter is appropriate. For photon emitters, a sodium iodide well counter or liquid scintillation counter may be used. Assay a background (blank) specimen also. Calculate the disintegrations per minute as follows.

$$\text{dpm} = \frac{\text{gross cpm} - \text{background cpm}}{\text{efficiency}}$$

i. Record the data in the radioactive shipment receiving log.

j. If the activity on the wipe of the outer shipping box exceeds 2200 dpm, follow the notification procedure in paragraph 4. If the activity on the wipe of the inner container exceeds 2200 dpm, notify the RSO.

k. With the source container removed, monitor the packaging materials with the appropriate detector. For pure beta emitters, a GM counter must be used. If the packaging materials show any radioactivity, handle them as radioactive waste. If the packaging material is not contaminated, obliterate labels indicating radioactivity, remove the packing slip or invoice if needed, and discard the remainder as ordinary trash.

4. Notifications. If any of the measurements of exposure rate or of removable contamination exceed the specified limits, notify:

   a. the Radiation Safety Officer

   b. NRC Region III office. The NRC must be notified by telephone (NRC Region III's phone number is 708-829-9500).

   c. the final delivering carrier.

References

[1]U.S. CFR Title 10 Part 20, Paragraph 20.1906, *Procedures for receiving and opening packages.*

[2]U.S. CFR Title 10 Part 71, Paragraph 71.47, *External radiation standards for all packages.*

[3]U.S. CFR Title 10 Part 71, Paragraph 71.87, *Routine determinations.*

10.8 Unit Dosage Records

N/A

10.9 Multidose Vial Records

N/A

10.10 Molybdenum Concentration Records

N/A

10.12 Area Survey Procedures

Cayman Chemical Company Policy - Area Surveys

Area surveys will performed in all laboratory areas where radioactive materials are stored, handled or used, areas where a spill has occurred, areas where leaking radioactive containers are known to have been present (e.g., Shipping if a package has leaked), the radioactive waste storage area, and other areas designated by the Radiation Safety Officer.

The quantities of radioactive material licensed for possession by Cayman do not emit significant photon radiation. Consequently, area survey efforts will be done by wipe test and will be directed towards discovering contamination incidental to laboratory experiments and unsuspected spills or leakages.

Procedures

1. Wipe tests will be performed routinely on a monthly basis for all areas which reasonably could be contaminated with radioactive material. This includes radioactive material storage and use areas and the radioactive waste storage area.

2. When an experiment is in progress, the experimental area will be posted with the "Caution - Radioactive Materials" sign. Such areas will be treated as radioactive by the staff, and will not be considered non-radioactive until proven to be uncontaminated by wipe tests. Wipe tests will be performed promptly upon completion of the experiment.

3. The wipe test procedure should be sufficiently sensitive to detect the presence of 2000 dpm/100 cm^2 of removable contamination (200 dpm/100 cm^2 for isotopes of iodine). Equipment used to assay the radioactivity on wipe samples shall be calibrated, using standards traceable to the National Institute of Standards and Technology (NIST), in such a way that the dpm of wipe test samples can be calculated from the measured cpm.

4. The RSO shall be immediately notified if the results of wipe tests are unexpectedly high or exceed action levels.

5. Areas found to exceed the action levels (Table 1.) will be decontaminated to levels below those specified in Table 1. before return to service. If an area cannot be decontaminated to levels less than those specified in Table 1. the RSO will take further steps to remove the radioactive material and/or to restrict use of the area.

Action Levels in dpm/100 cm^2		
	P-32, P-33, I-125	**H-3, C-14, S-35, Fe-55**
Unrestricted areas, personal clothing	**200**	**2,000**
Restricted areas, protective clothing used only in restricted areas, skin	**2,000**	**20,000**

Table 1. Action levels for radioactive surface contamination.

Records

1. Records of contamination surveys must include:
   a. the date, areas surveyed, and the equipment used
   b. the name or initials of the person making the survey
   c. a drawing of the surveyed areas with a notation of the action levels given in Table 1
   d. measured contamination levels in dpm/100 cm^2
   e. procedures taken for those areas where excessive contamination was discovered and follow up actions taken.

2. The RSO will review the records at least monthly and also promptly in those cases where action levels have been exceeded.

10.13 Air Concentration Control
N/A

10.14 Radiopharmaceutical Therapy
N/A

10.15 Implant Therapy
N/A

10.16 Other Safety Procedures
N/A

11. Waste Management

11.1 Waste Disposal

Cayman Chemical Company Policy - Radioactive Waste Disposal

Radioactive waste will be disposed of by decay-in-storage (DIS), release to the sanitary sewer, evaporative release to the atmosphere, or by transfer to an authorized recipient.

When determining a waste disposal method, the entire impact on the environment and the company's resources will be considered. Factors such as occupational and public radiation exposure, other hazards (e.g., pathogens) of the waste, as well as expense, will be considered.

Procedures - General

1. Prior to disposal of radioactive material which has become non-radioactive due to decay-in-storage (DIS), or non-radioactive packaging materials which bear radioactive markings or logo, all labels indicating radioactive material and the radiation logo must be removed or defaced prior to disposal.

2. Non-radioactive waste such as leftover reagents, boxes, non-radioactive gloves, should not be mixed with radioactive waste. The RSO will occasionally monitor all waste-generating procedures to ensure that radioactive waste is not generated unnecessarily.

3. The RSC and RSO will review all new procedures to ensure that waste generated is a minimum and that generation and handling procedures are consistent with established good practices.

4. Every effort will be made to avoid generating waste which is both radioactive and also hazardous waste under EPA's RCRA regulations. Such waste ("mixed waste") poses especially-difficult disposal problems.

5. NRC exemptions for disposal to the atmosphere or the sanitary sewer only exempt the radioactivity. No exemption in the NRC rules relieves the waste disposer from complying with other waste regulations, such as EPA regulations which govern hazardous waste.

Procedures - Disposal by evaporative release

1. Liquids and gases may be disposed of by evaporative release. However, most of the materials used by Cayman are not volatile; for such materials evaporative release is not an option.

2. The RSO will ensure that disposal to the atmosphere is done in accordance with applicable regulations[1]. Limits on permissible air concentrations apply at the boundary of the restricted area.

3. A record of releases to the atmosphere must be made which includes the date, radionuclide, estimated activity that was released (in millicuries or microcuries), the estimated concentration, and the vent site from which the material was released.

Procedures - Disposal to the sanitary sewer

1. Material released to the sewer must be readily soluble or dispersable biological material. There are daily, monthly, and annual limits.

2. The RSO will ensure that disposal to the sewer is be done in accordance with specific NRC exemptions[2,3].

3. A record of releases to the sanitary sewer must be made which includes the date, the radionuclides, the estimated activities that were released (in microcuries or millicuries), and the sink at which the material was released.

Procedures - Liquid scintillation waste

1. Liquid scintillation waste may be disposed of as if it were not radioactive if it contains only H-3 or C-14 and the activity concentration is 0.05 microcurie or less per gram of liquid scintillation medium[3]. Other waste laws (e.g., RCRA) still apply. This exemption does not apply to radionuclides other than H-3 and C-14.

Procedures - Decay in storage (DIS)

1. Radionuclides of half life less than 90 days may be disposed of by DIS. This includes P-32, P-33, S-35, and I-125.

2. Since the waste must eventually be surveyed with no shielding, no shielding material may be placed in a waste container.

3. When an waste container (e.g., plastic bag) is full, seal it and tag it with the nature of the contents, the longest-lived radionuclide present, the date, and the initials of the person sealing the container. Transfer this container to the DIS area.

4. Retain the material in a restricted area for ten half lives of the longest radionuclide present in the container.

5. Prior to disposal as ordinary nonradioactive trash:
   a. Check the radiation survey meter for proper operation.
   b. Monitor the waste containers in a low radiation (less than 0.05 mR/hr) areas.
   c. Monitor all surfaces of each individual container, using the most sensitive scale on the meter.
   d. Discard to the ordinary trash only those containers for which the radiation level is indistinguishable from background. Record the date the container was disposed of,

c. Monitor all surfaces of each individual container, using the most sensitive scale on the meter.
d. Discard to the ordinary trash only those containers for which the radiation level is indistinguishable from background. Record the date the container was disposed of, the type of waste, the disposal date, and the initials of the person performing the monitoring and disposal. Make sure that no radiation labels are visible.
e. Containers, for which the radiation survey is above background, must be returned for further DIS or disposed of by transfer to authorized recipient (burial).

Procedures - Disposal by transfer to authorized recipient

1. Dry solid waste which contains radionuclides with half lives too long for DIS must be disposed of by transferring the waste to an authorized radioactive waste contractor who will arrange for the waste to be buried at a licensed low-level adioactive waste disposal site.

2. Before generating waste, obtain the restrictions on waste form from the burial site operator.

3. Waste for burial must contain absolutely no loose liquids. Loose liquids must be completely absorbed by proper absorbent.

4. For disposal, follow the instructions provided by the burial site operator and the waste disposal contractor.

References

[1]Code of Federal Regulations, Title 10, Part 20, Appendix B, Table 2, Column1.
[2]Code of Federal Regulations, Title 10, Part 20, Paragraph 20.2003, *Disposal by release into sanitary sewerage.*
[3]Code of Federal Regulations, Title 10, Part 20, Paragraph 20.2005, *Disposal of specific wastes.*

11.2 Other Waste Disposal

N/A

ATT 7.2.1

Cayman Chemical Company
Radiation Authorized User Form

Name: Camilla A. Mauzy, Ph.D.

Title: Manager, Molecular Biology

Date: September 26, 1995

1. Training

Type	Location	Duration	Content
Class Work Physical Biochemistry	Purdue University W. Lafayette, IN	2 semesters	B,C
Radiation Safety Training	Purdue University W. Lafayette, IN	1 day seminar	A,B,C,D
Radiation Safety Training	Parke-Davis Pharaceuticals Co. Ann Arbor, MI	2 day seminar	A,B,C,D

Content Code:
(A) Principles and Practices of radiation protection
(B) Radioactivity measurements, standardization, and monitoring techniques and instruments
(C) Mathematics and calculations basic to the use and measurement of radioactivity
(D) Biological effects of radiation

2. Experience with Radiation (actual use)

Isotope	mCi used at one time	Location	Clock hrs	Type of use
^{32}P	<0.1 mCi	Purdue University W. Lafayette, IN	30 hr	DNA Probe labeling
	<0.1 mCi	Purdue University W. Lafayette, IN	60 hr	DNA Sequencing
^{35}S	<0.1 mCi	Purdue University W. Lafayette, IN	>80 hr	DNA Sequencing
	<0.1 mCi	Purdue University W. Lafayette, IN	30 hr	Protein Labeling

ATT 7.2.1

Isotope	mCi used at one time	Location	Clock hrs	Type of use
^{14}C	<0.1 mCi	Purdue University W. Lafayette, IN	20 hr	Protein Labeling
^{3}H	<0.1 mCi	Purdue University W. Lafayette, IN	20 hr	Binding Assays
^{33}P	<0.1 mCi	Parke-Davis Pharmaceutical Co. Ann Arbor, MI	20 hr	DNA Sequencing
^{32}P	0.1 mCi	Parke-Davis Pharmaceutical Co. Ann Arbor, MI	40 hr	DNA Probe labeling
^{35}S	<0.1 mCi	Parke-Davis Pharmaceutical Co. Ann Arbor, MI	>80 hr	DNA Sequencing
^{125}I	0.001 mCi	Parke-Davis Pharmaceutical Co. Ann Arbor, MI	40 hr	Cell Binding Assays

ATT 7.2.2

Cayman Chemical Company
Radiation Authorized User Form

Name: Krishna Rao Maddipati, Ph.D.

Title: Director, Research and Development

Date: September 26, 1995

1. Training

Type	Location	Duration	Content
On the Job	The Pennsylvania State Univ University Park, PA	12 hrs	A,B,C,D
On the Job	Wayne State University	3 hr	A,B,C,D

Content Code:
(A) Principles and Practices of radiation protection
(B) Radioactivity measurements, standardization, and monitoring techniques and instruments
(C) Mathematics and calculations basic to the use and measurement of radioactivity
(D) Biological effects of radiation

2. Experience with Radiation (actual use)

Isotope	mCi used at one time	Location	Clock hrs	Type of use
^{3}H	25 mCi	The Pennsylvania State Univ University Park, PA	4 hrs	Sodium Borhydride Reduction of organic compounds
^{3}H	1 mCi	The Pennsylvania State Univ University Park, PA	8 hrs	Enzymatic Reaction
^{14}C	<0.5 mCi	Wayne State Univ Detroit, MI	48 hrs	Enzymatic Reaction
^{3}H	2 mCi	Wayne State Univ Detroit, MI	10 hrs	Enzymatic labeling

ATT 7.2.3

Cayman Chemical Company
Radiation Authorized User Form

Name: James W. MacDonald

Title: Manager, EIA Division

Date: September 26, 1995

1. Training

Type	Location	Duration	Content
Class (Immunolog. Tech.)	Colorado St. Univ, Ft. Collins, CO	1 semester	B,C
Class (Biochem. Lab.)	Colorado St. Univ, Ft. Collins, CO	1 semester	B,C

Content Code:
(A) Principles and Practices of radiation protection
(B) Radioactivity measurements, standardization, and monitoring techniques and instruments
(C) Mathematics and calculations basic to the use and measurement of radioactivity
(D) Biological effects of radiation

2. Experience with Radiation (actual use)

Isotope	mCi used at one time	Location	Clock hrs	Type of use
^{3}H	50 mCi	Nat'l Jewish Hospital, Denver, CO	80	Sample Purification

ATT 7.2.4

Cayman Chemical Company
Radiation Authorized User Form

Name: Jeffrey K. Johnson, Ph.D.

Title: Manager, Biochemistry

Date: September 26, 1995

1. Training

Type	Location	Duration	Content
5-credit course	Bemidji State Univ Bemidji, MN	10 weeks	A, B, C, D
Short course	North Dakota State Univ Fargo, ND	4 hr	A

Content Code:
(A) Principles and Practices of radiation protection
(B) Radioactivity measurements, standardization, and monitoring techniques and instruments
(C) Mathematics and calculations basic to the use and measurement of radioactivity
(D) Biological effects of radiation

2. Experience with Radiation (actual use)

Isotope	mCi used at one time	Location	Clock hrs	Type of use
^{14}C	0.005 mCi	North Dakota State Univ Fargo, ND	10 hrs	Labeling experiment
^{32}P	0.02 mCi	North Dakota State Univ Fargo, ND	2 hrs	Nick translation

ATT 7.2.5

Cayman Chemical Company
Radiation Authorized User Form

Name: Jennifer L. Johnson

Title: Biochemistry Research Assistant

Date: September 26, 1995

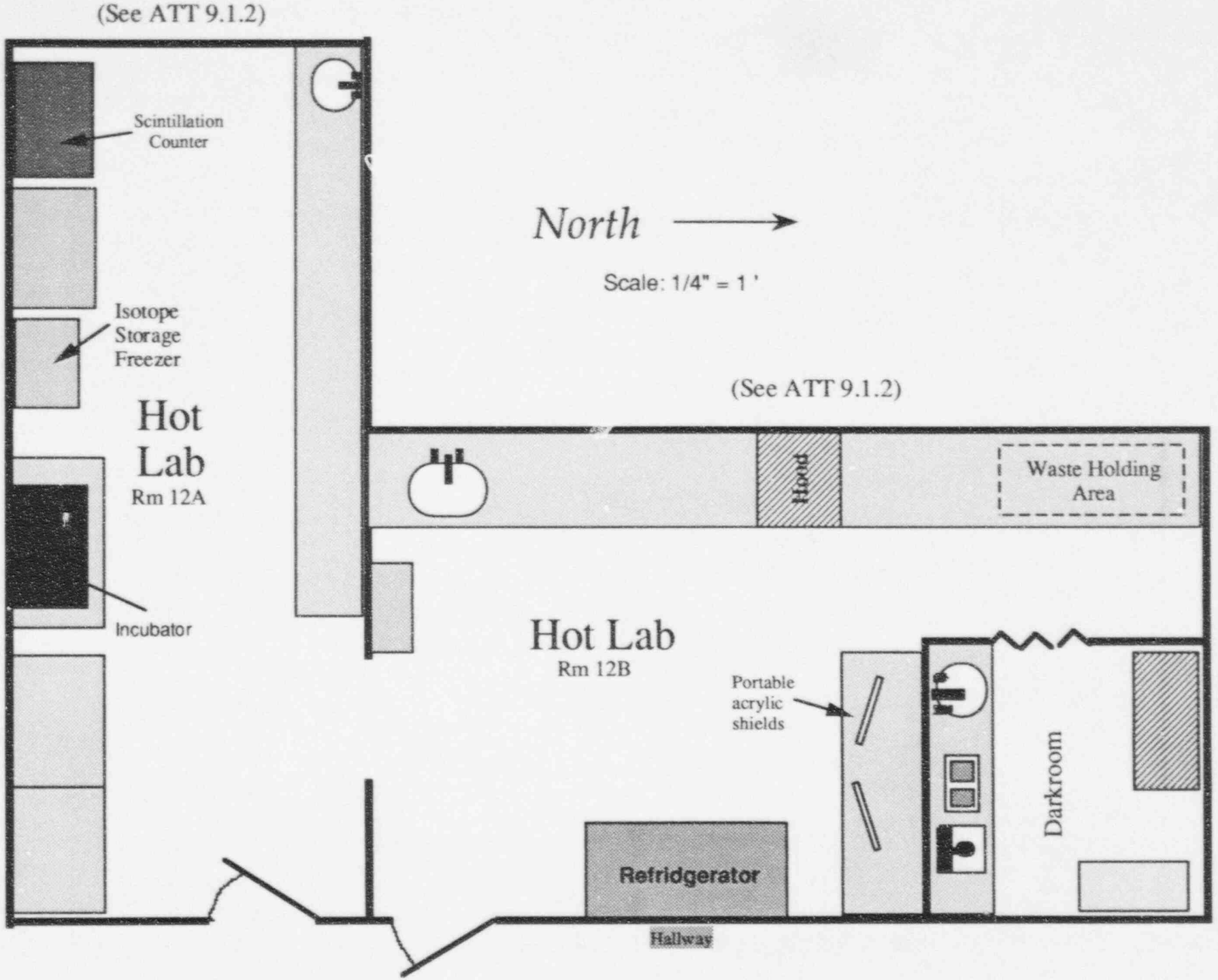
1. Training

Type	Location	Duration	Content
Radiation Therapy	University of Toledo Toledo, OH	9 weeks	B,C,D
Radiation Training	University of Toledo Toledo, OH	1 week	A,B,C

Content Code:
(A) Principles and Practices of radiation protection
(B) Radioactivity measurements, standardization, and monitoring techniques and instruments
(C) Mathematics and calculations basic to the use and measurement of radioactivity
(D) Biological effects of radiation

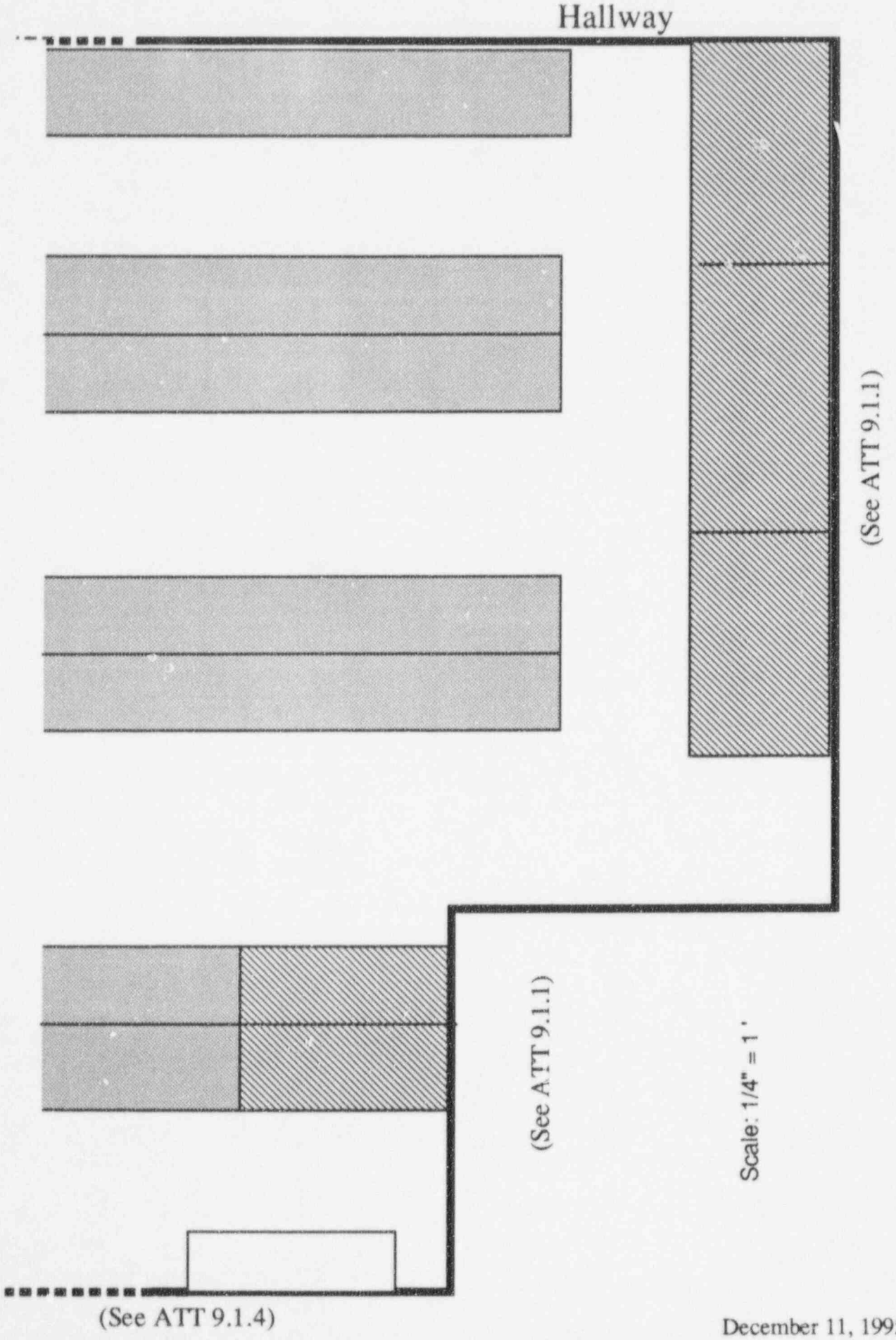
2. Experience with Radiation (actual use)

Isotope	mCi used at one time	Location	Clock hrs	Type of use
^{35}S	< 0.005 mCi	University of Toledo Toledo, OH	10 hrs	*in vitro* translation


(See ATT 9.1.2)
Scintillation Counter
North
Scale: 1/4" = 1 '
Isotope Storage Freezer
(See ATT 9.1.2)
Hot Lab
Rm 12A
Hood
Waste Holding Area
(See ATT 9.1.3)
Incubator
Hot Lab
Rm 12B
Portable acrylic shields
Darkroom
Hallway
Refridgerator
Hallway

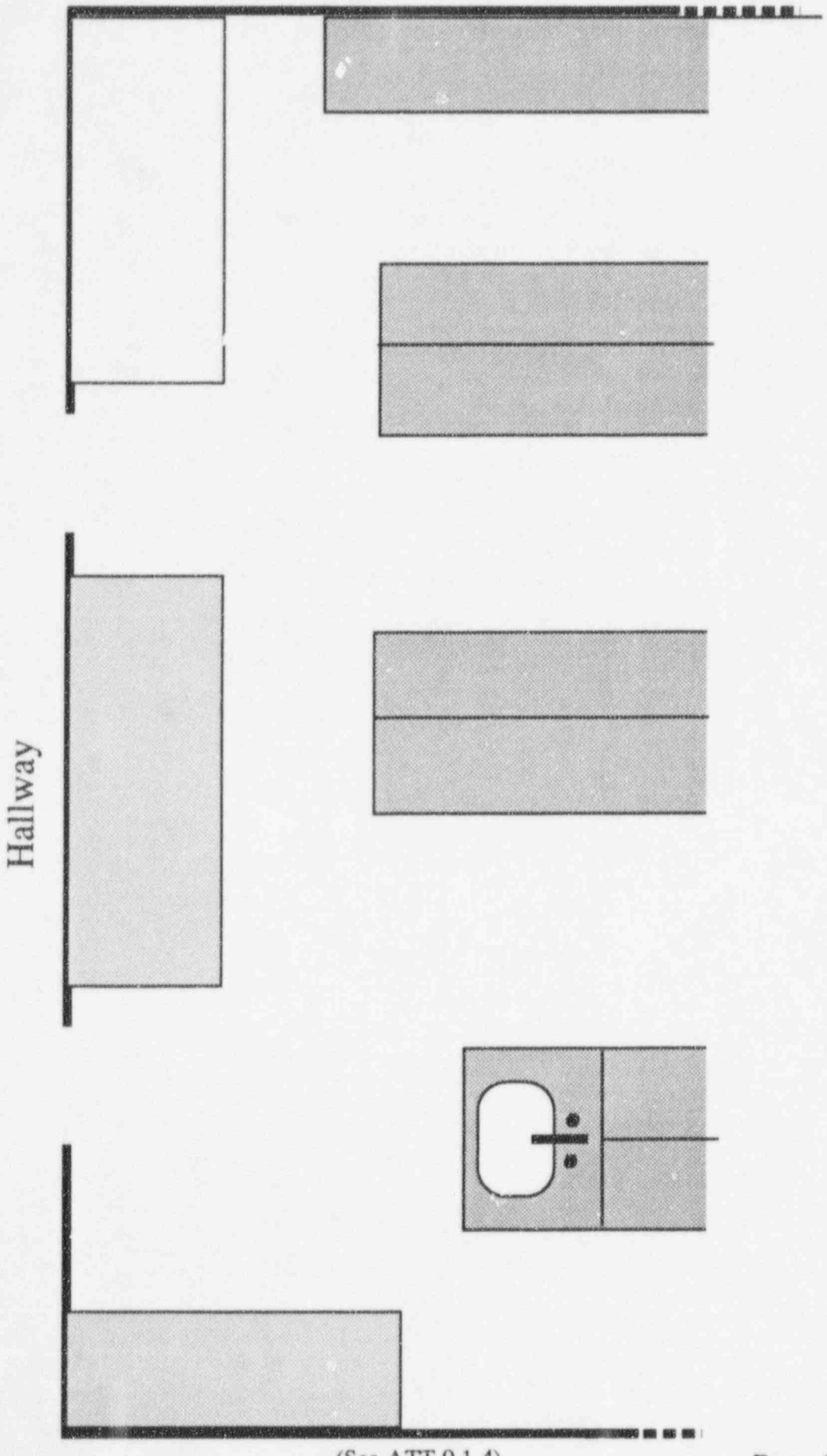
ATT 9.1.1

ATT 9.1.2a



December 11, 1995

ATT 9.1.2b



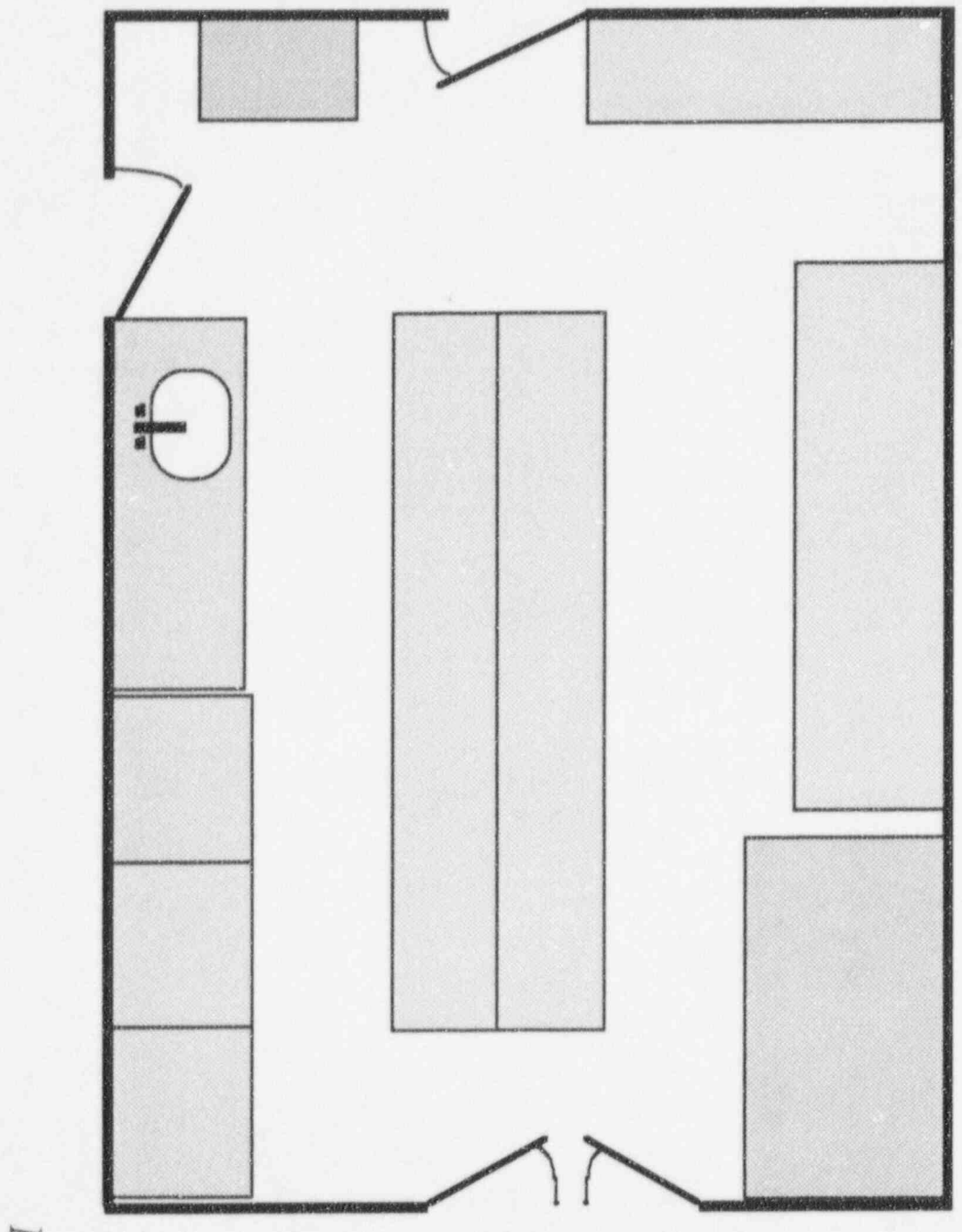
(See ATT 9.1.2b)
Scale: 1/4" = 1 '

(See ATT 9.1.4)

ATT 9.1.3

Scale: 1/4" = 1'

(See ATT 9.1.4)



(See ATT 9.1.1)

Hallway

North

CONVERSATION RECORD

TIME

DATE 5/13/96

TYPE

☐ VISIT ☐ CONFERENCE ☒ TELEPHONE ☒ INCOMING ☒ OUTGOING

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU	ORGANIZATION (Office, dept., bureau, etc.)	TELEPHONE NO.
Camilla Mauzy, Ph.D. - self Rao Maddipati, Ph.D.	Dr. M: Cayman Chemical Co	313-662-6756

SUBJECT

CN 399992 4N 21-24683-01

ROUTING	
NAME/SYMBOL	INT

SUMMARY

Dr. Mauzy called C. Casey to inform NC that she left Cayman Chem. in March 1996. She may want to send us a letter, as information only, advising us that she no longer has any affiliation with Cayman. I noted that she is named RSO & primary user for amdt & request dtd 2/28/96 so I called Cayman for Dr. Mauzy, who is out. Dr. Maddipati', Dir. of Research, returned my call & explained that they will find & name replacement for Dr Mauzy. They also want to further expand scope of their redistribution activities. As they need time to prepare this & need to resubmit 2/28/96 virtually in entirety, I suggested we void action for now, keep the fee & reactivate when they send in resubmission. This buys everyone some time. Dr. Maddipati' agreed.

I voided action on 5/14/96 after partial review; we keep the fee; & will reactivate the case upon resubmission.

SIGNATURE Colleen C. Casey | TITLE Licensing Reviewer | DATE 5/14/96

CAYMAN CHEMICAL

May 2, 1996

Materials Licensing Section
U.S. Nuclear Regulatory Commission
Region III
801 Warrenville Road
Lisle, IL 60352-4351
Attn.: Ms. Colleen Casey

Reference: Amendment of our NRC license. Control No. 399992

Dear Ms. Casey,

We have recently submitted an application to amend to our NRC License No. 21-24683-01. The control number for this application is 399992. In the application we forgot to include the isotope ^{14}C, which we plan to use along with other radionuclides listed in section 5 of our amendment application. We request you to include the following information at the end of section 5.

5i.	^{14}C	[^{14}C] eicosanoids	20 mCi

If you have any questions regarding the application, please contact me at 313-662-6756.

Thanking you,

Sincerely,

Krishna Rao Maddipati, Ph.D.
Director, Research and Development

CAYMAN
CHEMICAL

690 KMS Place
Ann Arbor, MI
48108 USA

Phone:
(800) 364-9897
(313) 662-6756

Fax:
(313) 662-6896