DOW CORNING

January 6, 1991

Robert G. Gattone, Jr.
U.S. Nuclear Regulatory Commission
Materials Licensing Section
799 Roosevelt Road
Glen Ellyn, IL 60137

Dear Mr. Gattone:

I have enclosed the additional information on our NRC License Number 21-08362-08 that you requested. I have changed sections 10 F and 11 G of the application to reflect this additional information. I am enclosing two copies of the new application.

Please let me know if you need any further information. I can be contacted at (517) 496-4095. Thank you.

Sincerely,

Janet A. Grappin

Janet A. Grappin
Industrial Hygienist
Dow Corning Corporation
2200 W. Salzburg Road
MS C03101
Midland, Michigan 48686

A/1

5. RADIOACTIVE MATERIAL

Element and Mass Number	Form	Maximum Amount
A. Carbon-14	Any	300 millicuries
B. Hydrogen-3	Any	150 millicuries
C. Chromium-51	Any	200 millicuries

Maximum amount of radioactive material expected to be used in any experiment:

A. Carbon-14	3 millicuries
B. Hydrogen-3	2 millicuries
C. Chromium-51	100 microcuries

6. PURPOSE FOR WHICH LICENSED MATERIAL WILL BE USED:

Radioactive material is to be used in biological tracer studies in plants, animals and micro-organisms and for research and development as defined in 10 CFR Part 30, Section 30.4.

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

A. **Alan J. Isquith, Radiation Safety Officer**

Six month course, Radiation Biology, 1964, Hahnemann Medical College.

One month course, Health Physics 1967, Temple University College of Medicine.

One day Radiation Safety Seminar, 1983, Dow Chemical Company, Midland, Michigan.

1963-1966, graduate student, Hahnemann Medical College, biological tracer studies using Carbon-14, Hydrogen-3, Phosphorous-32.

1966-1968, Post-doctorate at Temple University also RSO for the Microbiology Department.

1968-present, Dow Corning Corporation, Senior Toxicology Specialist. Biological and botanical tracer studies using Carbon-14, Hydrogen-3, Phosphorous-32, Iodine-125, Iodine-131, and Sulfur-35.

Worked with the following isotopes:

Hydrogen-3, Biological and botanical tracer studies, 50 millicuries, 17 years, at Dow Corning, Midland, Michigan

Carbon-14, Biological and botanical tracer studies, 150 millicuries, 26 years, at Dow Corning, Midland Michigan. Biological and botanical tracer studies at Hahnamann Medical College, 10 millicuries, three years.

Phosphorus-32, Biological and botanical tracer studies, 20 millicuries, at Dow Corning, Midland, Michigan, 17 years.

Sulfur-35, Biological and botanical tracer studies, 20 millicuries, at Dow Corning, Midland, Michigan, 17 years.

Iodine-125, Biological and botanical tracer studies, 20 millicuries, at Dow Corning, Midland, Michigan, 17 years.

Iodine-131, Biological and botanical tracer studies, 20 millicuries, at Dow Corning, Midland, Michigan, 17 years.

B. Janet A. Grappin, Alternate Radiation Safety Officer

M.S. in Health Physics & Industrial Hygiene, 1983, University of Minnesota, Minneapolis.

B.S in Chemistry, 1979, Pacific Lutheran University, Tacoma, Washington.

Four week course, Nuclear Plant Systems, 1982, Consumers Power Nuclear Training Center, Midland, Michigan.

One week course, Radioactive Materials Control, 1982, Consumers Power Nuclear Training Center, Midland, Michigan.

One week course, Radioactive Body Burden Analysis, 1982, Canberra Corporation, Meridon, Connecticut.

Two week course, Advanced Health Physics, Consumers Power Nuclear Training Center, Midland, Michigan.

Health Physics Intern, 1980, Dow Chemical Company, Midland, Michigan.

1981-1984, Consumers Power Midland Nuclear Plant, Midland, Michigan, including 1 month at Consumers Power Palisades Nuclear Plant, South Haven, Michigan, and 1 month at Consumers Power Big Rock Point Nuclear Power Plant, Charlevoix, Michigan.

1990-present, Dow Corning Corporation Corporate Radiation Safety Officer.

Worked with the following isotopes:

> Hydrogen-3, 20 curies, Tritiated targets and contaminated pump oil and machine parts along with a contaminated bench top hood with its ductwork were removed from a lab and properly packaged and shipped for disposal. Air sampling and personnel monitoring (by bioassay) were performed at the Dow Chemical Company, Midland Michigan, 1980.
>
> Cesium-137, Cobalt-60, 1 curie, Disposal of contaminated materials, working with contaminated valves and pumps, at Consumers Power's Palisades and Big Rock Point Nuclear Plants, 1981-1984.
>
> Cobalt-60, 300,000 curies, Transferring and wipe testing of sealed sources at Dow Corning, Midland, Michigan, 1991-present.

C. DUTIES AND RESPONSIBILITIES OF RADIATION SAFETY OFFICERS

1. Radiation Safety Officer

   a. Ensures that radioactive material is used by or under the direct supervision of individuals specifically listed on the license.

   b. Ensures that radioactive materials are properly secured against unauthorized removal at all times when not in use.

   c. Performs inspections quarterly of all laboratories using or storing radioactive materials. Areas in which radioactive materials have not been used during that quarter will not be inspected.

   d. Ensures that users wear personnel monitoring equipment when appropriate.

   e. Ensures that the terms and conditions of the license are met, and that all required records are maintained.

   f. Immediately halts any activity judged to be a threat to health, safety, the environment or a violation of the conditions of the license or regulations.

2. Alternate Radiation Safety Officer

   a. Performs duties of RSO during periods when RSO is absent.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS

A. We will establish and implement the model training program that was published in Appendix A to Regulatory Guide 10.8, Revision 2, and have appended a table ATT 8.1 that identifies the groups of workers who will receive training and the method and frequency of training. Hands on work with survey instruments will be included in this training. An exam will be given at the conclusion of the training, requiring a passing score of 70%. Individuals that do not achieve a passing score will receive further individualized training in problem areas from the RSO and will retake the exam.

B. Thomas W. Galbraith

B.S. Applied Arts and Sciences, 1983, Central Michigan University.

5 day, Basic Radiation Safety course, University of Texas Health Science Center, Houston, Texas, 1985.

1984-1987, Baylor College of Medicine, Department of Ophthalmology, Houston, Texas. Used electrophysiologic, autoradiographic and psychophysical techniques to investigate the development of the primate visual system. This work involved radioisotopes.

1987-present, Dow Corning Corporation, Principle Investigator, Toxicology labs. Primary responsibility in the pharmacokinetics lab. Tracer studies using Carbon-14.

Worked with the following isotopes:

Hydrogen-3,Biological tracer studies for three years at Baylor College of Medicine, Houston, Texas using up to 0.5 millicuries per study.

Carbon-14, Biological tracer studies for three years, at Baylor College of Medicine, Houston, Texas involving 2 millicuries per study. Biological and botanical tracer studies with up to 2 millicuries in each study at Dow Corning, Midland, Michigan, four years.

C. Paal C. Klykken

20 hour Radiation Safety Course, Walter Reed, 1972.

1972-1974, U.S. Army, Lab Technician, Walter Reed Institute of Research.

1974-1978, Graduate student, Medical College of Virginia.

1978-1979, Post-doctorate, University of Southern California Medical Center.

1979-1983, Adjunct Assistant Professor, Medical College of Virginia.

1983-1988, Assistant Professor, University of Mississippi Medical Center.

1988-present, Dow Corning Corporation, Toxicology Specialist.

Extensive usage of the following isotopes for whole animal and invitro experimentation since 1972:

Hydrogen-3, Whole animal tracer studies, four years at Medical College of Virginia, 40 millicuries. Invitro studies, University of Mississippi Medical Center, five years, 25 millicuries.

Phosphorous-32, DNA experimentation, six years at Walter Reed Institute of Research, 25 millicuries.

Chromium-51, Whole animal studies at Medical College of Virginia, four years, 40 millicuries. Invitro studies at: University of Southern California Medical Center, one year, 12 millicuries; Medical College of Virginia, four years, 30 millicuries; University of Mississippi Medical Center, five years, 25 millicuries.

Iodine-125, Invitro studies at Medical College of Virginia, four years, 5 millicuries.

Selenium-75, Invitro studies at Medical College of Virginia, four years, 5 millicuries.

Indium-121, Invitro studies at Medical College of Virginia, four years, 150 millicuries.

D. Richard T. Henrich

Certified Radiation Safety Worker, New York State, 1973.

Member of Columbia University Radiation Safety Committee, 1975-1977.

Graduate course, Radiation Biology, 1980, State University of New York, Binghamton.

1972-1976, Technician, Columbia University.

1976-1984, Staff Associate, Columbia University.

1984-1985, Clinical Cytogeneticist, Diagenetics Laboratories.

1985-1990, Toxicologist, Dow Corning.

1990-present, Toxicology Specialist, Dow Corning.

Isotopes worked with:

Hydrogen-3, Invitro postlabelling studies, Columbia University, twelve years, 20 curies.

Carbon-14, Invitro postlabelling studies, Columbia University, eight years, 250 millicuries. Invitro postlabelling studies, Dow Corning, Midland, MI, seven years, 100 millicuries.

Phosphorous-32, Invitro postlabelling studies, Columbia University, twelve years, 250 millicuries.

F. Robert G. Lehmann

PhD., Soil Science, 1986, Washington State University, Pullman, Washington.

0.5 day, Basic Radiation Safety course, and annual updates at the following institutions: Washington State University, Pullman; Columbia National Fisheries Research Laboratory USDI, Columbia MO; and Dow Elanco, Midland, MI.

1978-1981, Columbia National Fisheries Research Laboratory, USDI, Columbia, MO. Research chemist - GS 9. Developed chemical methods of analysis for industrial pollutants and pesticides from water.

1983-1987, Washington State University, Pullman. Examined the fate of plant phenolics in soils. Served on department safety committee.

1987-1991, Dow Elanco, Midland, MI. Constructed environmental fate profiles of new herbicides for EPA registration: degradation and mobility in soil, photolysis and hydrolysis in water. Served as Safety Committee Chair; designed and implemented Midland site safety program.

1991- Dow Corning, Midland, MI.

Worked with the following isotopes:

Carbon-14, Tracer studies for five years, at Dow Elanco, Midland, MI, involving up to 300 microcuries per study. Tracer studies involving 20 microcuries per study Washington State University, Pullman, three years. Tracer studies involving 20 microcuries per study at Columbia National Fisheries Research Laboratory, USDI, Columbia, MO, three years.

F. Ronald B. Annelin, authorized to use only C-14 unsupervised.

Two hour, Radiation Safety course, annually, taught by Larry G. Silverstein, (Dow Corning Corporate RSO until 1990) and Alan J. Isquith (DC-3 Building RSO).

1973-present, Environmental Toxicologist, Dow Corning Corporation, 18 years experience working with Carbon-14, amounts up to 3 millicuries.

Worked with the following isotopes:

Carbon-14, Biological and botanical tracer studies, up to 3 millicuries per study, Dow Corning, Midland, Michigan, 18 years.

G. Suds Varaprath, authorized to use only C-14 unsupervised.

Two hour, Radiation Safety course, annually, taught by Larry G. Silverstein, (Dow Corning Corporate RSO until 1990) and Alan J. Isquith, (DC-3 Building RSO).

1985-present, Dow Corning Corporation, Senior Project Chemist, three years experience working with Carbon-14 up to 50 millicuries.

Worked with the following isotopes:

Carbon-14, Chemical rearrangement, 50 millicuries, Dow Corning, Midland, Michigan, three years.

9. FACILITIES AND EQUIPMENT

A. Radioactive material will be used in several laboratories in DC-3 building. Each lab is equipped with: easily cleaned non-porous bench tops; terrazzo, epoxy painted concrete, or epoxy composite floors; epoxy painted concrete block or poured concrete walls; ceilings with epoxy paint; metal doors and frames; sinks; and bench top and/or walk-in fume hoods. A diagram of a typical lab is attached. Performance of bench top and walk-in fume hoods is evaluated using a Thermo-Systems Incorporated model 8352 Velosicalc (or equivalent) airflow velocity meter.

B. When not in use, radioisotopes will be stored in a locked and labelled refrigerator. Radioactive material may be temporarily stored in an individual lab if it is being actively utilized in an experiment. In such cases it will be stored in a secure manner under the control of an authorized user and the lab will be locked at night. Shielding as recommended by the RSO will be used when storing strong beta and gamma emitters wherever they are stored.

C. Animals to which radioisotopes are administered are housed during and after such administration in an individually vented room dedicated to this use. The animal rooms are constructed of easily cleaned, hard surfaces such as terrazzo, epoxy painted concrete, or epoxy composite floors; epoxy painted concrete block or poured concrete walls; ceilings with epoxy paint; and metal doors and frames. Each room has adequate ventilation, without drafts and no recirculation of air. Rooms generally have floor drains and hose connections, and a few rooms have sinks.

The animal rooms are located in the laboratory area of the DC-3 building. This building is protected by key-card access to the main part of the building and once in the building, an even more restricted key-card access list for the laboratory area. In addition to these measures, each animal room door is locked. The locking door knobs are of the type which always require a key from the outside and can not be inadvertently left unlocked.

Caging that permits collection of all urine and feces is used. In cases where excretion of volatile compounds via the lungs is anticipated, animals are placed in facilities which permit recovery of such material by passage of all expired air through a system of appropriate solvent and cold traps. Animals are maintained in this caging until such time as the excretion of radioisotope is less than the allowable limit. Animal rooms are locked at all times when unattended.

.0. RADIATION SAFETY PROGRAM

A. Radiation Detection Instruments

1. TM Analytical model 5303 liquid scintillation detector, or equivalent, calibrated by TM Analytic Inc., 1842 Elk Grove Village, IL 60007 for wipe tests.

2. Ludlum, model 3, or equivalent, Geiger counter for strong beta or gamma emitters. Calibrated annually by the manufacturer or Applied Health Physics (NRC License # 37-09135).

3. Victoreen model 450 or equivalent, ionization chamber survey meter for strong beta and gamma emitters. Calibrated annually by the manufacturer or Applied Health Physics (NRC License # 37-09135).

B. Personnel Monitoring

1. Personnel working with only Carbon-14 or Hydrogen-3 will not wear film badges.

2. Personnel working with Chromium-51 will wear film badges. These badges will be changed monthly and will be furnished by Landauer.

C. Survey Program

1. Wipe tests of all areas where radioactive materials are used will be performed:

   a. Monthly in areas where quantities less than 200 μCi at any one time are used.

   b. Weekly in areas where quantities greater than 200 μCi are used at any one time.

   c. At the termination of each study.

   d. Wipe tests of common areas of usage (such as the refrigerator) will be performed monthly during periods of active use of radioisotopes in the building and at least every six months during periods of inactivity.

   e. Wipe tests are performed by, swabbing a 12 x 12 inch area with filter paper. The filter paper and an unused filter paper blank are placed in separate scintillation vials with an appropriate scintillation counting cocktail and counted in a liquid scintillation spectrophotometer.

2. Chromium-51 Studies

   a. An area survey will be performed prior to the beginning of Chromium-51 studies to evaluate background radiation levels.

   b. Radiation field surveys to determine whole body and extremity exposure will be done at the beginning of Chromium-51 studies.

   c. Radiation field surveys to determine whole body and extremity exposure will be done weekly during Chromium-51 studies.

   d. Daily surveys of areas and personnel for contamination during active use of Chromium-51 will be performed.

3. Each investigator using radioactive materials will keep records of use in his area of supervision. These records will include the following information concerning the radioactive material used:

   1. Receipt
   2. Use
   3. Monitoring (surveys/wipe tests)
   4. Waste disposal

D. Radiation Safety Program Management

1. The Corporate Radiation Safety Committee meets at least annually to review; new regulations, radiation safety programs at all Dow Corning facilities, acquisition and disposal of radioactive materials, waste storage and any other topics RSO's or committee members deem necessary.

2. The Corporate Radiation Safety Committee performs annual audits of Dow Corning facilities where radioactive materials are used.

3. The DC-3 building Radiation Safety Committee meets at least annually to review the radiation safety program for the License # 21-08362-08.

4. The RSO for License # 21-08362-08 performs periodic audits of radioactive materials use under this license. Audits include examination of individual authorized users records of: receipt and disposal of radioactive material, contamination surveys, area surveys when necessary and personnel monitoring when required, and examination of written safety procedures. These audits are performed quarterly for all laboratories using or storing radioactive materials. Areas in which

radioactive materials have not been used during that quarter will not be audited.

E. Animal Studies

1. The building veterinarian is involved in the planning of experiments using radioisotopes in animals. Animal Care personnel attend the annual training course. Prior to their involvement in any studies utilizing radioisotopes in animals, procedures dealing with proper handling of animals, animal waste, and caging are reviewed.

   Generally the authorized user performs all animal care activities involved with a radioactive isotope study. The authorized user feeds animals, disposes of waste and carcasses and decontaminates caging before it is returned to general use. The Animal Care personnel are normally limited to feeding the animals on weekends in studies involving radioactivity.

2. The pathologist is informed of all necropsies involving animals which have been dosed with radioactivity. Such necropsies will be performed in a fume hood.

F. Bioassays

Bioassays are unnecessary for the following reasons:

1. Carbon-14 and Hydrogen-3 labelling are not done on site. All radioactive materials on site are labelled compounds. These compounds are labelled by an outside vendor and purchased for our use, or non-radioactive materials are sent offsite to be labelled and then returned.

2. Work with volatile compounds will be done in a fume hood.

3. In studies where excretion of a volatile compound via the lungs of the animals is anticipated, animals will be placed in facilities which permit recovery of such material by passage of all expired air through a system of appropriate solvent and cold traps. These traps are tested periodically for radioactivity. Animals are maintained in this caging until such time as the excretion of radioisotope is less than the allowable limit.

4. Typically, even though an entire study may use 2-3 millicuries of Carbon-14, the material is diluted before use and the animals are then dosed in small groups with microcurie amounts of activity. A typical study would involve dosing 10 animals per week with 20

microcuries of Carbon-14 in each animal, dosing 100 animals in a ten week period. In this case the worker would be working with 200 microcuries Carbon-14 per week. If you assumed:

a. One study per week.

b. 200 microcuries per study.

c. 20% of activity lost to work areas.

d. No ventilation.

e. Perfect mixing of room air.

f. Volume of room is approximately 100 cubic meters.

g. MPAC C-14 = 4×10^{-6} µCi/ml

Then the total activity released to the restricted area would be:

$$200 \ \mu Ci \times 20\% / 100 \ m^3 = 0.4 \ \mu Ci/m^3 = 4 \times 10^{-7} \ \mu Ci/ml$$

which is less than the MPAC for Carbon-14. Many of the studies done in this building involve smaller quantities of activity than this.

5. Studies are not done on a continuous basis. Frequently quarters or even years elapse between studies.

G. Ordering and Purchasing

1. No one is allowed to purchase, store, or use radioactive material without first receiving formal training. This training will include basic radiation safety, legal requirements, worker's rights, and review of standard operating procedures. Any purchase of radioactive material must be approved by the Radiation Safety Officer prior to ordering.

2. The authorized user who will perform the study will make a written request that indicates the isotope, compound labelled, activity and supplier.

3. A visual inspection of materials accepted will be made by the Receiving department.

   a. If damaged, the RSO or ARSO will be contacted immediately. The delivery personnel will be detained until it can be determined that neither the driver nor the delivery vehicle is

contaminated.

b. If undamaged, packages will be transported by the Radiation Safety Officer to DC-3 Building. The RSO will check the user request to ensure that the material received is the material that was ordered.

H. EMERGENCY PROCEDURES

1. Notification: The RSO or Alternate RSO must be informed immediately of any accidents involving radioactive materials.

2. Surface Spills:

a. The spill must be contained to the smallest area possible with absorbent material.

b. Inform the RSO.

c. Notify persons in the area that a spill has occurred.

d. Decontaminate the area using an appropriate solvent, if necessary, such as Lift Away® Decontamination Fluid or Dow Bathroom Cleaner® and absorbent paper. Remember that any materials used to effect decontamination such as paper towels should be considered contaminated and disposed of as radioactive waste.

e. Wipe test area following decontamination. Any sink used for decontamination of equipment must also be wipe tested.

3. Clothing: Remove the affected garment as soon as possible. Flood the affected area of skin with lukewarm water followed by soap and water wash. Discard the garment as radioactive waste. Notify the RSO.

4. Cuts: Flood the area with lukewarm water followed by soap and water wash. Control bleeding. Obtain emergency care. Notify the RSO.

11. WASTE MANAGEMENT

A. Scintillation vials containing 0.05 microcuries or less of Hydrogen-3 or Carbon-14 per gram, may be disposed of as ordinary chemical waste.

B. Animal tissue containing 0.05 microcuries or less of Hydrogen-3 or Carbon-14 per gram may be incinerated.

C. No materials, with the exception of water used to rinse equipment after washing, will be discharged into the sanitary sewer system. If there is any doubt as to the radioactivity of any wash or rinse water, an aliquot will be counted and disposed of accordingly.

D. Any solvent that contains less radioactive material than the corresponding 10CFR20 Appendix B value, or less than ten times the quantity specified in 10CFR20 Appendix C, may be disposed of as ordinary solvent waste.

E. Before beginning any study utilizing radioisotope materials, each involved work area will be equipped with properly labelled disposal containers for radioactive waste. A separate container will be used for Chromium-51 wastes. A proper waste container consists of a plastic pail or fiberpak with a tight fitting cover containing a layer of sawdust (or other absorbent material) and lined with a sturdy plastic bag. The top lid and sides (one label on each side, approximately 180 degrees apart) must bear a radioisotope warning label and the words "CAUTION RADIOACTIVE WASTE". When small laboratory waste containers are full, the plastic bag is sealed and the amount and type of radioactivity contained is marked with indelible pen on the bag. The bag is then transferred to the large labelled radioactive waste container in the walk-in cold room.

F. Chromium-51 Waste

   1. Chromium-51 wastes will be stored in a separate container from other radioactive wastes.

   2. When a Chromium-51 waste container is full it will be sealed with tape and an identification tag will be attached. This tag will include:

      a. The date sealed.

      b. The identity of the radioisotope in the container.

      c. The name of the person sealing the container.

3. The container is then transferred to the decay-in-storage (DIS) area.

4. The container is stored for at least 10 half-lives.

5. Prior to disposal as ordinary waste, each container will be monitored as follows:

   a. Any shielding will be removed from around the container.

   b. All surfaces of each individual container will be monitored with a calibrated survey meter in a low-level area (less than 0.05 millirem per hour)

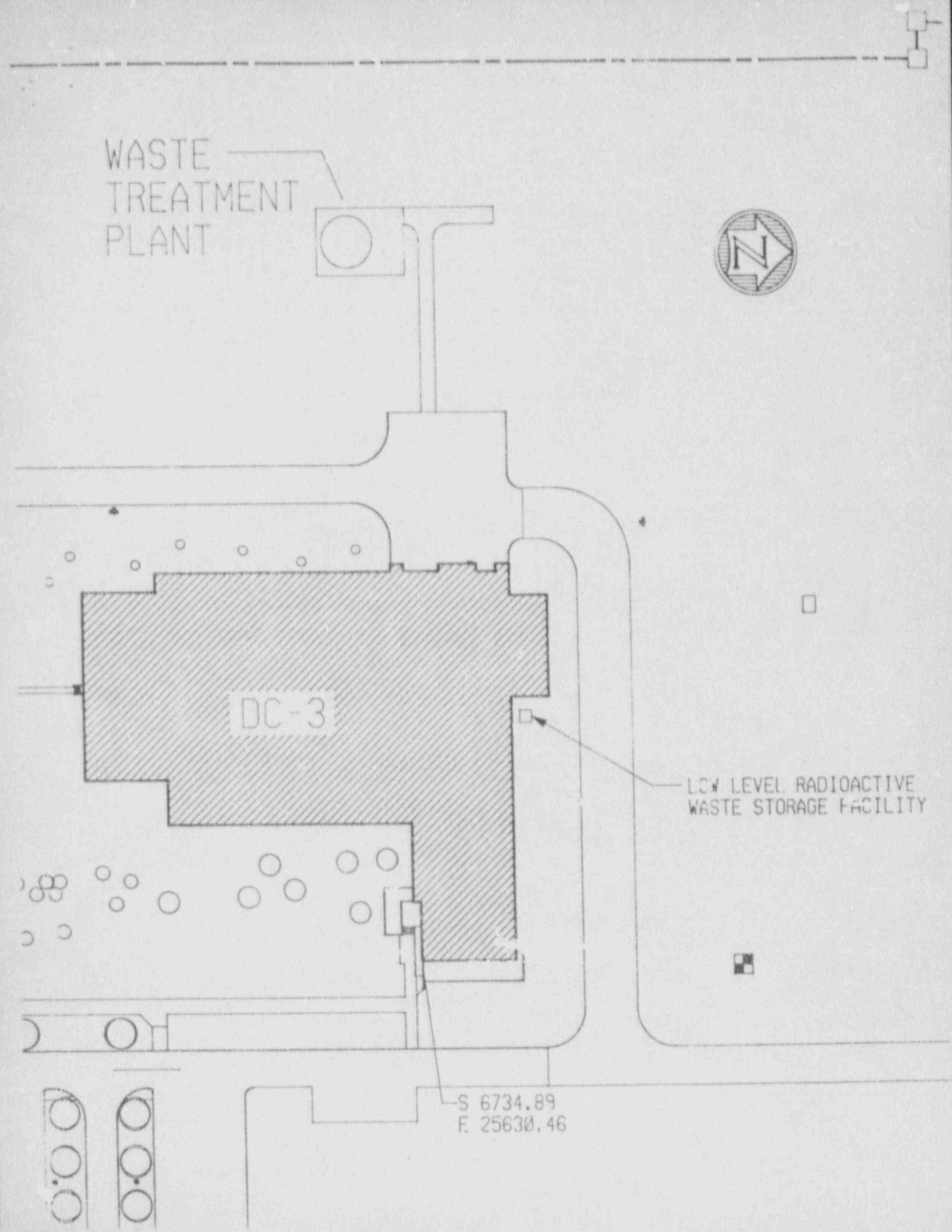
   c. Only those containers that cannot be distinguished from background will be discarded as ordinary waste. The date that the container was sealed, the disposal date and the type of material will be recorded. All radiation labels will be removed or defaced before disposal.

   d Containers that can be distinguished from background levels will be returned to the storage area for further decay or transferred for burial.

G. All other radioactive waste will be stored until such time as it can be transferred to a person properly licensed to receive such waste. Because there is currently no licensed person that will receive low level waste from Michigan licensees, the following arrangements have been made for the temporary storage of this material:

   1. It is assumed that a licensed person that will receive low level waste from Michigan will be found within the next ten years. At that time all low level waste on site in temporary storage will be shipped.

   2. Until that time, low level waste will be stored in a purchased hazardous materials storage locker. This will be located along the north wall of DC-3 building.


WASTE
TREATMENT
PLANT
N
DC-3
LOW LEVEL RADIOACTIVE
WASTE STORAGE FACILITY
S 6734.89
E 25630.46

3. Specifications of storage locker that will be purchased:

   a. Dimensions - (LxWxH) 7'x 7'x 8'

   b. Capacity - 6, 55 gallon drums.

   c. Construction - Steel walls, formed and welded for strength; steel roof, sloped front to back to shed moisture; welded steel secondary containment sump for spill protection; plywood floor, 1" thick, epoxy coated with 6" steel grating at front for drainage; chemical resistant coatings; static bonding/grounding strip and 8'approved grounding rod; hold down assembly.

4. Annual volume of waste is expected to be one 55 gallon drum. Once four drums have been accumulated, they may be sent offsite to be compacted into one drum which would be returned. In this manner it is estimated that up to 15 years worth of waste accumulated at the present rate could be accommodated.

5. The building will be locked at all times when it is unattended and security personnel will visually check the exterior of the locker periodically every night and on weekends.

ATT 8.1

Workers that will receive training (lecture) annually:

1. Authorized users
2. Animal care workers
3. Individuals that work with radioactive material under the supervision of an authorized user.

INSTRUCTIONS FOR INDIVIDUALS USING RADIOACTIVE MATERIALS

1. CONTROL OF RADIOACTIVE MATERIAL

No one is allowed to purchase, store, or use radioactive material without first receiving formal training. This training will include basic radiation safety, legal requirements, worker's rights, and review of standard operating procedures. Any purchase of radioactive material must be approved by the Radiation Safety Officer prior to ordering.

2. PROTECTIVE EQUIPMENT

Workers must wear safety glasses, protective clothing (lab coats or disposable, protective suits), and disposable gloves at all times while handling radioactive materials.

3. SPECIAL PRECAUTIONS

A. Eating, drinking, smoking or applying cosmetics is prohibited in any area where radioactive material are stored or used.

B. Food, drink, or personal effects may not be stored in areas where radioactive material is stored or used.

C. Personnel monitoring devices must be worn at all times while in areas where strong beta or gamma emitters are used. When not being worn, personnel monitoring devices should be stored in a designated low background area.

D. Radioactive wastes must be disposed of only in designated, labeled and properly shielded receptacles.

E. Pipetting by mouth is prohibited.

F. All volatile isotopes must be handled in a functional chemical hood or appropriate (NIOSH/MSHA certified respiratory equipment must be worn). Generally, any amount greater than 10 microcuries should be handled in a hood.

G. Materials/containers that may leak or spill must be handled over drip trays or absorbent paper.

H. Handling and storage of strong beta and/or gamma emitting isotopes.

   1. Prior to any experimental use of these isotope materials, a protocol for conducting the study must be reviewed with the Radiation Safety Officer.

   2. A lab coat, safety glasses, gloves, and a film badge must be worn.

3. Undiluted samples (millicurie amounts) may only be shandled in a fume hood with appropriate shielding. The appropriate shielding must be determined by the RSO.

4. Between uses, each radioisotope must be stored in locked storage with protective shielding. The appropriate shielding must be determined by the RSO.

4. ROUTINE SURVEY AND MONITORING PROCEDURES

A. Each area of use must be wipe tested at the termination of any study utilizing isotope materials. If the study is of long duration, monitoring frequency should be based on prior agreement with the RSO. Areas of common usage such as storage areas will be monitored by the RSO. The frequency of monitoring of these areas will depend on the level of isotope usage in the building, however, it will be performed at least semi-annually. Wipe testing is the recommended method of surface monitoring.

B. Wipe tests are performed by swabbing a 12 x 12 inch area with filter paper. The filter paper and an unused filter paper blank are placed in separate scintillation vials with an appropriate scintillation counting cocktail and counted in a liquid scintillation spectrophotometer.

C. When using strong beta or gamma emitters a hand held survey meter should be used to survey personnel and lab areas for contamination daily.

5. EMERGENCY PROCEDURES

A. Notification: The RSO or Alternate RSO must be informed immediately of any accidents involving radioactive materials.

B. Surface Spills:

1. The spill must be contained to the smallest area possible with absorbent material.

2. Inform the RSO.

3. Notify persons in the area that a spill has occurred.

4. Decontaminate the area using an appropriate solvent, if necessary, such as Lift Away Decontamination Fluid® or Dow Bathroom Cleaner® and absorbent paper. Remember that any materials used to effect decontamination, such as paper towels, should be considered contaminated and disposed of as radioactive waste.

5. Wipe test area following decontamination. Any sink used for decontamination of equipment must also be wipe tested.

C. <u>Clothing</u>: Remove the affected garment as soon as possible. Flood the affected area of skin with lukewarm water, followed by soap and water wash. Discard the garment as radioactive waste. Notify the RSO.

D. <u>Cuts</u>: Flood the area with lukewarm water followed by soap and water wash. Control bleeding. Obtain emergency care. Notify the RSO.

6. TRANSPORTATION OF RADIOACTIVE MATERIALS IN DC-3 BUILDING.

A. Radioactive liquids must be transported in a secondary container capable of containing the entire volume of the radioactive material.

B. Individuals transporting unsealed radioactive materials should wear appropriate protective clothing; lab coat, safety glasses and gloves.

C. A film badge must be worn when transporting strong beta or gamma emitters.

D. Appropriate shielding, as determined by the RSO must be used when transporting strong beta or gamma emitters.

7. STORAGE AND LABELLING

A. When not in use, radioisotopes must be stored in a locked and labelled refrigerator. Radioactive material may be temporarily stored in an individual lab if it is being actively utilized in an experiment. In such cases it must be stored in a secure manner under the control of an authorized user and the lab must be locked at night. Shielding as recommended by the RSO must be used when storing strong beta and gamma emitters, wherever they are stored.

B. Labs must be labelled in the following cases:

1. Any area containing or using isotopes in excess of:

10 millicuries	Hydrogen-3
1 millicurie	Carbon-14
10 millicuries	Chromium-51

must be conspicuously posted with a sign bearing the radiation caution symbol and the words:

CAUTION RADIOACTIVE MATERIALS

2. Any area in which a major portion of the body could receive in any one hour a dose in excess of 5 millirem, or in any 5 consecutive days a dose in excess of 100 millirems, must be conspicuously posted with a sign bearing the radiation caution symbol and the following words:

.AUTION RADIATION AREA

3. Any area in which a major portion of the body could receive a dose in excess of 100 millirem in any one hour must be conspicuously posted with a sign bearing the radiation caution symbol and the following words:

CAUTION HIGH RADIATION AREA

C. Containers must be labelled as follows:

1. Containers that contain more than:

1 millicurie	Hydrogen-3
0.1 millicuries	Carbon-14
1 millicurie	Chromium-51

must be labelled with the radiation caution symbol and the words:

CAUTION RADIOACTIVE MATERIAL

2. All radioactive solutions should be kept in properly shielded containers that are clearly labelled.

8. PERSONNEL MONITORING

A. Personnel monitoring by film badge is required when using strong beta or gamma emitters. Film badges are obtained from the RSO.

B. Finger badges must be used when working with millicurie levels of strong beta or gamma emitters. These badges are obtained from the RSO.

9. WASTE DISPOSAL AND STORAGE

A. Scintillation vials containing 0.05 microcuries or less of Hydrogen-3 or Carbon-14 per gram, may be disposed of as non-radioactive waste.

B. Animal tissue containing 0.05 microcuries or less of Hydrogen-3 or Carbon-14 per gram may be disposed of as non-radioactive waste.

C. No materials, with the exception of water used to rinse equipment after washing, may be discharged into the sanitary sewer system. If there is any doubt as to the radioactivity of any wash or rinse water, an aliquot should be counted and disposed of accordingly.

D. Any solvent that contains less radioactive material than the corresponding 10CFR20 Appendix B value, or less than ten times the quantity specified in 10CFR20 Appendix C, may be disposed of as ordinary solvent waste.

E. Before beginning any study utilizing radioisotope materials, each involved work area must be equipped with properly labelled disposal containers for radioactive waste. A separate container must be used for Chromium-51 wastes. A proper waste container consists of a plastic pail or fiberpak with a tight fitting cover containing a layer of sawdust (or other absorbent material) and lined with a sturdy plastic bag. The top lid and sides (one label on each side, approximately 180 degrees apart) must bear a radioisotope warning label and the words "CAUTION RADIOACTIVE WASTE". When small laboratory waste containers are full, the plastic bag is sealed and the amount and type of radioactivity contained is marked with indelible pen on the bag. The bag is then transferred to the large labelled radioactive waste container in the walk-in cold room. The RSO should be notified as large fiberpaks are filled.

D. Chromium-51 Waste

1. Chromium-51 wastes will be stored in a separate container from other radioactive wastes.

2. When a Chromium-51 waste container is full it will be sealed with tape and an identification tag will be attached. This tag will include:

   a. The date sealed.

   b. The identity of the radioisotope in the container.

   c. The name of the person sealing the container.

3. The container is then transferred to the decay-in-storage (DIS) area.

4. The container is stored for at least 10 half-lives.

5. Prior to disposal as ordinary waste, each container will be monitored as follows:

   a. Any shielding will be removed from around the container.

b. All surfaces of each individual container will be monitored with a calibrated survey meter in a low-level area (less than 0.05 millirem per hour)

c. Only those containers that cannot be distinguished from background will be discarded as ordinary waste. The date that the container was sealed, the disposal date and the type of material will be recorded. All radiation labels will be removed or defaced before disposal.

d. Containers that can be distinguished from background levels will be returned to the storage area for further decay or transferred for burial.

10. RECORDS

A. Each investigator using radioisotopes will keep a record of use in his area of supervision. This record will be current and will include information concerning radioisotope:

1. Receipt
2. Use
3. Monitoring (wipe tests)
4. Waste disposal