



The Dow Chemical Company  
Midland, Michigan 48674

Jim Mullauer  
Materials Licensing Branch  
USNRC, Region III  
2443 Warrenville Road, Suite 210  
Lisle, Illinois 60532-4352

January 11, 2010

Mr. Mullauer:

This letter is a response to your request for additional information made via fax on December 2, 2009 regarding The Dow Chemical Company's request to perform non-routine operations on fixed nuclear gauges in their possession under License Number 21-00265-06.

1. *Please confirm that the term source, which is used throughout your request (i.e. ensure shutter is closed and locked while handling the source) means "the gauge, not the source".*

The term "source" in all materials related to this license amendment request refers to the gauge. This request does not cover performing any maintenance or disassembly of the gauge shielding or shutter mechanisms beyond normal lubrication per manufacturer's recommendations.

2. *Please define the acronym AXION which is used on page 3 of 6*

AXION refers to Axion Logistics, Ltd., a contractor that oversees the central receiving area for the Michigan Operations site.

3. *Please provide an example of the sealed source transaction form*

See Attachment 1.

4. *Please provide a copy of the "Michigan Operations site Radiation Program, IH-477", which is discussed on page 5 of 6.*

The current version of the Michigan Operations site Radiation Program, IH-477 is included in Attachment 2. This document will be updated routinely to be kept up-to-date with current operations and procedures, as appropriate.

5. *In a couple places, it is mentioned that prior to beginning the gauge removal process, the crew working on the removal of the gauge must be trained in radiation safety (approximately 1 hour) prior to any contact with the gauge. It is*

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*unclear what a worker is in relation to an authorized user. In a prior amendment for non-routine work of fixed gauge at Dow Chemical, there were 2 individuals that were properly trained and named on the license as authorized to conduct non-routine maintenance. Specifically, removed of a damaged gauge. Please provide a detailed description of a work situation, who will be present, who will supervise the work, and who will actually perform the work. Also, please provide a table of topics that will be included in the 1 hour training session for crew members and your method of assessing their competence to safely perform this type of work*

Dow personnel and contractors involved in the installation and removal of nuclear gauges receive additional radiation safety training on the following topics:

- hazards associated with nuclear gauges,
- dose rates around the source with the shutter closed,
- potential dose rates in the beam with the shutter open, and
- how to perform the work safely and in a manner that will minimize radiation dose

These workers will not be considered authorized users and are not expected to receive a dose in excess of 100 mrem/yr from their involvement in this work.

The installation and removal of nuclear gauges will be overseen and directed by Authorized Users, individuals who have completed the training describes in Item 2 of our October 29, 2009 submittal. The Authorized Users will be responsible for all radiation safety aspects of the work.

For the removal of a nuclear gauge, an Authorized User will close and lock the shutter and verify that the shutter has closed properly using a radiation survey meter. Once the shutter is verified as being closed, the maintenance crew will safely lower the gauge to the ground or to a pallet. An Authorized User will be present during this work to ensure that it is completed safely. Then, an Authorized User will either lock the source to a permanent structure within the facility or have the source transferred to a locked storage building (transported by forklift for heavy gauges).

For reinstallation of a nuclear gauge, the maintenance crew will position and install the gauge in proper position. The shutter on the gauge will be closed and locked during this work, and an Authorized User will be present to ensure that it is completed safely. Once the gauge is installed, the Authorized User will open the shutter and perform an initial radiation survey around the gauge. If excessive radiation levels are measured, the shutter will be closed and locked

and the source will be repositioned until acceptable dose rates around the source are obtained.

- 6. Please confirm that only the manufacturer's or distributors instructions and recommendations will be followed for all gauge installations and removal activities.*

Gauge installation and removal activities will follow manufacturer's or distributors instructions and recommendations.

- 7. Please confirm that only the manufacturer's or distributor's replacement components or parts, lubricants, etc. will be used in the non-routine maintenance process or confirm that these parts and lubricants will be evaluated to ensure that they do not degrade the engineering safety analysis performed and are accepted as part of the device registration.*

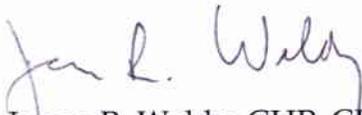
Only the manufacturer's or distributor's replacement parts, lubricants, etc. will be used in the non-routine maintenance process.

- 8. At the bottom of each procedural page is a statement "DOW RESTRICTED". I am not sure how to handle this. If your intent is to withhold this from the public document room, the procedures in 10 CFR 2.390 will need to be addressed*

These statements were left on the bottom of the procedures inadvertently. The documents do not need to be withheld from the public document room.

Please contact me if you have any additional questions.

Sincerely,



James R. Weldy, CHP, CIH  
Radiation Safety Officer  
The Dow Chemical Company  
1803 Building  
Midland, Michigan 48674  
989-636-1440 (phone)  
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Attachment 1  
Sealed Source Transaction Form



Attachment 2  
Michigan Operations Site Radiation  
Program, IH-477

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## IH-477 Control of Ionizing Radiation Hazards

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### Introduction

A written Radiation Safety Program is necessary to provide guidance on the safe use of radioactive material.

This standard establishes procedures for the control of radiation hazards and the use of radiation-producing machines and materials in the Midland location. Assistance in interpretation or implementation of this standard may be gained from the Radiation Safety group. No exceptions to this standard can be implemented without written approval of the Radiation Safety group.

Compliance with all federal and state regulations and Dow procedures or policies shall be mandatory. Completing the requirements of this standard will comply with federal and state regulations and Dow procedures. Additional updates and revisions to this document can be located at the following **EH&S Web Site on the Dow Intranet**: <http://na-ehs.intranet.dow.com/mi-ehs/0605.htm#Operational>

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### Scope

This program applies if a facility has:

- Sealed radioactive sources
- Unsealed radioactive sources
- Radiation Producing Machines, or
- A nuclear reactor.

This program applies to manufacturing facilities, pilot plants, R&D facilities, and maintenance shops at the Michigan Operations site and Larkin Laboratories.

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## IH-477 Control of Ionizing Radiation Hazards, Continued

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## IH-477 Control of Ionizing Radiation Hazards, Continued

### Definitions/ Acronyms

Word	Definition
CFR	Code of Federal Regulations
Loose radioisotopes	unencapsulated radioactive materials
Radiation-producing machine	any equipment which can produce emissions of alpha or beta particles, gamma or X-rays, or neutrons, e.g. X-ray machines, electron microscopes, accelerators, sealed radioactive sources, and nuclear reactors
Radiation-producing material or radioactive material	any material which can produce emissions of alpha or beta particles, gamma or X-rays, or neutrons, e.g. Carbon-14, Cesium-137, Cobalt-60, Nickel-63, and other radioactive isotopes
USNRC	United States Nuclear Regulatory Commission
Sealed sources	encapsulated radioactive material in USNRC approved holders

### Inventory

A current, accurate inventory of radioactive materials and Radiation Producing Machines on the site is kept by the Site Radiation Safety Officer.

[\\Usnt17\ehsglobaltm\Industrial Hygiene\IH Technology\Radiation\To Be Filed](#)  
 (restricted access)

### Licenses/ Regulations

Use of radioactive materials at the Michigan Operations site is controlled under Nuclear Regulatory Commission license 21-00265-06.

Regulations governing the use of radioactive material are available in 10 CFR Parts 20 and 30

### Roles & Responsibilities

The following are Roles & Responsibilities associated with the Michigan Operations IH-477 Control of Ionizing Radiation Hazards Standard:

Role	Responsibility
Radiation Safety Committee	The Midland Site Radiation Safety Committee is responsible to the U.S.N.R.C. and the Michigan Department of Public Health for all licensed radiation-producing machines and materials used in Michigan Operations. They will evaluate all defects or incidents which come to their attention and report them, if necessary, to the regulatory agencies.

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## IH-477 Control of Ionizing Radiation Hazards, Continued

**Roles &  
 Responsibilities**  
 (continued)

Role	Responsibility
Radiation Safety Group	The Radiation Safety Officer (RSO) for this site is responsible for the oversight of the Site Radiation Safety Program. The Health Physics Technician (HP Tech) for this site is responsible for the implementation of the site Radiation Safety Program (see related documents for list).
Owners	<p>A person approved by the Midland Site Radiation Safety Committee or designee shall be responsible for the safe use of radioactive material and for compliance with the federal and state regulations and Dow procedures or policies. This includes sources that are owned, leased, or borrowed that are used at the Midland, Michigan sites of The Dow Chemical Company. The responsibility can be transferred, in writing, only to another person who has been approved by the Radiation Safety Committee or designee. This individual shall keep current copies of the appropriate registration forms sent to them by the Radiation Safety group. Each level of line management is responsible for the safe and legal use of radioactive materials or devices by owners under their jurisdiction.</p> <p>1803 and 1602 Buildings, and Larkin Laboratories have laboratories that are authorized for the use of loose isotopes. The Loose Isotope Laboratory Owner in 1803 Building is the Technical Leader- Biotransformation / Analytical Chemistry, TERC Department. The Loose Isotope Laboratory Owner in 1602 Building is the TRIGA Reactor Administrator. The Loose Isotope Laboratory Owner at Larkin Laboratories is the Senior Project Leader for Dow Water Solutions TS&amp;D. The Loose Isotope Laboratory Owner is responsible for ensuring compliance with the requirements of this program.</p> <p>32 Building is authorized to dispose of C-14 and H-3 via incineration. The Production Leader for the Environmental Operations Business for Michigan Operations is responsible for the safe and legal operation of the incinerator.</p> <p>The TRIGA Reactor Administrator is responsible for the safe and legal operation of the TRIGA reactor.</p> <p>Sealed sources are located in many facilities within Michigan Operations. The plant Production Leader is the owner of sealed sources within a plant. Individual facility safety programs and owners are located <a href="#">here</a>.</p> <p>A list of current contact names for these roles is located <a href="#">here</a>.</p>

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## IH-477 Control of Ionizing Radiation Hazards, Continued

### Roles & Responsibilities (continued)

Role	Responsibility
All employees	All employees who have the potential to come into contact with radioactive material or radiation producing machines are expected to be familiar with and follow the requirements in this program. Any individual who becomes aware of any defect or incident with radiation-producing machines or material which could result in a substantial safety hazard shall report it immediately to the Radiation Safety Officer.

### Identification of Radioactive Sources

#### Category 1

The following precautions must be taken to properly identify areas with potential hazards from radiation:

- Any area or piece of equipment which presents a potential radiation hazard must be identified. Standard signs to be posted in areas and/or equipment are available through the Radiation Safety group. Sealed source containers used in process application shall be painted yellow and identified with the radiation hazard symbol.
- All access openings in closed vessels, manholes, large ducts or pipes, constricted openings or open vessels which have a radioactive sealed source attached to them, must display the following:

**"CAUTION"**  
Possible High Radiation Area  
Call Industrial Hygiene Services, 636-6663  
Before Entering Vessel

All entrances to laboratories that contain radioactive materials must be identified with a standard radiation sign.

### Emergency Procedures

#### Category 2

In case of an emergency, **call 1-2-3**. Be prepared to relay information about the isotope, its activity, chemical and location. Written Radiation Emergency Procedures are available [here](#).

Immediately notify the Radiation Safety group of any potential radioactive contamination of their area, or malfunction of any radiation-producing machines which could affect radiation safety. Security/Emergency Services, 636-4400, should be notified to initiate the Radiation Emergency call list for situations which occur after hours and weekends.

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## IH-477 Control of Ionizing Radiation Hazards, Continued

### Training Category 2

Personnel that work with, or are exposed to radiation during their work, must receive training on the hazards of radiation, and procedures on how to work safely with radioactive materials.

This training will be conducted prior to the use of radioisotopes and whenever there is a significant change in duties, regulations, or the terms of the License.

The following training is required for individuals at Michigan Operations:

Position	Required Initial Training	Required Refresher Training
Loose Isotope User	<ul style="list-style-type: none"> <li>8-hr classroom course, GHRIS Code 260624, <b>Loose Isotope Initial User Training - Michigan Operations</b>. Contact the RSO.</li> </ul>	<ul style="list-style-type: none"> <li>Annual. As specified by Radiation Safety Officer. Documented under GHRIS 260624.</li> </ul>
Worker in Building with Loose Isotopes	<ul style="list-style-type: none"> <li><u>MyLearning</u>, <b>R&amp;D Radiation Awareness</b>, GHRIS CPU074</li> </ul>	<ul style="list-style-type: none"> <li>None.</li> </ul>
Sealed Source Owner	<ul style="list-style-type: none"> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code US00138_365 or classroom, and</li> <li>Review of Certificate of Responsibility. Contact the HP Tech.</li> </ul>	<ul style="list-style-type: none"> <li>Annual. Review of Certificate of Responsibility, and</li> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code US00138_365 or classroom.</li> </ul>
Worker in facility with sealed sources that have a potential to come into contact with the source	<ul style="list-style-type: none"> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code US00138_365 or classroom, and</li> <li>Facility-specific training from training coordinator.</li> </ul>	<ul style="list-style-type: none"> <li>Annual. <b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code US00138_365 or classroom.</li> </ul>
Radiation Producing Machine Owner	<ul style="list-style-type: none"> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code 260646 or classroom, and</li> <li>Review of Certificate of Responsibility. Contact the HP Tech.</li> </ul>	<ul style="list-style-type: none"> <li>Annual. Review of Certificate of Responsibility.</li> <li>Every three years. <b>MI Ops Radiation Producing Machines Recurrent Training</b>, <u>MyLearning</u>, GHRIS Code P661 1095.</li> </ul>
Radiation Producing Machine User	<ul style="list-style-type: none"> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code 260646 or classroom.</li> </ul>	<ul style="list-style-type: none"> <li>Every three years. <b>MI Ops Radiation Producing Machines Recurrent Training</b>, <u>MyLearning</u>, GHRIS Code P661 1095.</li> </ul>
Incinerator personnel	<ul style="list-style-type: none"> <li>1-hr job-specific classroom course. Contact the HP Tech.</li> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code US00138_365 or classroom.</li> </ul>	<ul style="list-style-type: none"> <li>Annual. 1-hr job-specific classroom course. Contact the HP Tech.</li> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code US00138_365 or classroom.</li> </ul>
Miscellaneous Shipping / Receiving Personnel	<ul style="list-style-type: none"> <li>1-hr job-specific classroom course. Contact the HP Tech.</li> </ul>	<ul style="list-style-type: none"> <li>Annual. 1-hr job-specific classroom course. Contact the HP Tech.</li> </ul>
Non-Destructive Examination Personnel	<ul style="list-style-type: none"> <li>1-hr job-specific classroom course. Contact the HP Tech.</li> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code US00138_365 or classroom.</li> </ul>	<ul style="list-style-type: none"> <li>Annual. 1-hr job-specific classroom course. Contact the HP Tech.</li> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code US00138_365 or classroom.</li> </ul>

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## IH-477 Control of Ionizing Radiation Hazards, Continued

**Training**  
**Category 2**  
 (cont.)

Position	Required Initial Training	Required Refresher Training
Emergency Services Personnel	<ul style="list-style-type: none"> <li>1-hr classroom course. Contact the HP Tech.</li> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code CP0409 or classroom.</li> </ul>	<ul style="list-style-type: none"> <li>Annual. 1-hr job-specific classroom course. Contact the HP Tech.</li> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code CP0409 or classroom.</li> </ul>
Medical Personnel	<ul style="list-style-type: none"> <li><b>Radiation Fundamentals</b> training, <u>MyLearning</u>, GHRIS Code CP0409</li> <li>1-hr job-specific classroom course. Contact the RSO.</li> </ul>	<ul style="list-style-type: none"> <li>Annual. 1-hr job-specific classroom course. Contact the RSO.</li> </ul>
Reclamation Personnel	<ul style="list-style-type: none"> <li>1/2-hr job-specific classroom course. Contact the HP Tech.</li> </ul>	<ul style="list-style-type: none"> <li>Every two years. 1/2-hr job-specific classroom course. Contact the HP Tech.</li> </ul>
Maintenance / Construction / Contractor personnel that perform work with potential to come into contact with radioactive sources	<ul style="list-style-type: none"> <li><b>Radiation Awareness</b> training.</li> </ul>	<ul style="list-style-type: none"> <li>Annual, or each time entering site, whichever is less frequent. <b>Radiation Awareness</b> training.</li> </ul>
TICA engineers or other individuals who order equipment for capital improvements	<ul style="list-style-type: none"> <li><b>Radiation Requirements</b> training.</li> </ul>	<ul style="list-style-type: none"> <li>Every three years. <b>Radiation Requirements</b> training.</li> </ul>

**Procurement**  
**Category 2**

All orders of Radioactive sources **must** be approved by the site RSO prior to ordering. This is necessary to ensure compliance with the Midland Nuclear Regulatory Commission License# 21-00265-06 regarding radioactive sources. Follow the Radioactive Material Ordering Procedure for sealed sources or loose isotopes, as appropriate.

New radiation producing machines must be registered with the Radiation Safety Group prior to use to ensure that they can be registered with the State of Michigan.

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## IH-477 Control of Ionizing Radiation Hazards, Continued

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### Receiving Category 2

All loose isotopes will be received by the 1609 Sample Shipping and Receiving group, and delivered to designated delivery locations in approved loose isotope labs. The TERC Radiation Contact, his or her designee, or a member of the Radiation Safety Group, must be notified ASAP of the receipt of radioactive materials. The loose isotope receiving procedures must be followed.

All sealed sources must be received at 779 Building, Door J. Upon receipt, the receiving department personnel shall immediately notify the Radiation Safety group of the receipt of the device. A member of the Radiation Safety group will, complete a wipe test and an initial radiation survey, and place the device in the Michigan Division Radioactive Materials Storage building (1138 building). The Radiation Safety group will then notify the facility that the gauge is ready for installation. Each sealed source shall be marked with a tag that bears the following information: Dow registration number, radiation symbol, identity of the radioisotope and amount of activity in millicuries, and date the activity was determined. All cesium gauges at Michigan Operations must be painted yellow.

The Radiation Safety group shall be notified upon receipt of all radiation producing machines prior to use so they can be registered with the State of Michigan Department of Consumer and Industry Affairs. Machines shall not be used until a State of Michigan registration sticker and a radiation warning sticker are attached. Radiation producing machines that are being transferred into the state (i.e., received from a location other than the vendor) must notify the Radiation Safety group at least 3 days in advance so appropriate notice can be given to the state authorities.

### Security and Storage Category 2

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Radioactive materials must be secured from unauthorized removal or access.

The security and storage procedures for loose isotopes must be followed.

Sealed sources must be secured from unauthorized removal. When sealed sources are not under the direct control of an authorized individual, they must be stored in a locked building or room, secured to a permanent structure, or be in use such that there will be an immediate signal that will indicate that the source has been removed. The total inventory of radioactive material that is accessible at the Michigan Operations site by defeating a single barrier must not exceed the NRC threshold for requiring increased security controls (27 Ci for Cs-137). If new sources are to be installed that will exceed this value, an additional layer of security must be installed to prevent the unauthorized removal of this source. This additional barrier may consist of a locked box around the source, permanent attachment of mounting bolts, or use of wire cable to lock gauge to a permanent structure in the building. Additionally, no more than 27 Ci of Cs-137 may be stored in the Radioactive Storage Building at any one time.

Portable gauges must be secured with two layers of protection when not in use to protect against unauthorized removal of the instrument. Contact the RSO with questions regarding what constitutes an adequate level of security for portable gauges.

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## IH-477 Control of Ionizing Radiation Hazards, Continued

### **Installation of Nuclear Gauges Category 2**

Crafts working on the installation of the gauge must be trained in radiation safety (approximately 1 hour) prior to any contact with the gauge. Contact the Radiation Safety group to schedule a time to conduct this training if the installers have not had radiation safety training.

Transfer of the source to the facility from the 1138 building must be overseen by a trained individual (a member of the Radiation Safety group or their designee). Confirm that a member of the Radiation Safety group or their designee is available to oversee the transfer several days before the scheduled installation. A Sealed Source Transaction Form must be completed and forwarded to the RSO.

After the gauge is installed, the Radiation Safety group must perform an initial installation survey and wipe test prior to use. Following completion of the survey and wipe test, the Radiation Safety group will unlock the shutter on the device, allowing the gauge to be put into service.

The source must be properly painted and posted at all times. Ensure that the source is painted yellow to identify it as a nuclear gauge. Post an 8 x 10 "Caution, Radioactive Material" sign near the source so it is visible from any approach path. Place a vessel entry sign in front of all entry points of the vessel that the nuclear gauge is attached to.

For calibration of the nuclear gauge, contact a nuclear gauge calibrator.

### **Locations of Use Category 1**

Loose isotopes may only be used in laboratories authorized by the Midland site Radiation Safety Committee. Authorized laboratories will have a written Laboratory Approval that describes locations of use and other specific requirements. Laboratory approvals for laboratories in the 1803, 1602 Buildings, and Larkin Labs are located [here](#).

Sealed sources may only be used at approved locations in the Midland Area sites of the Dow Chemical Company. This includes portable gauges, unless the gauge is specifically approved in the Site's License for use at temporary job sites. Contact the RSO for additional information.

Radiation producing machines may only be used in the locations specified on the State of Michigan registration form.

### **Lockout/ Tagout Category 2**

Sealed sources must be secured according to the Site's Lockout/Tagout procedures/requirements before personnel may work in an area that has the potential for exposure to the radiation beam of a sealed source. This includes vessel entry and installation and removal of the source.

#### Written Radioactive Lockout/Tagout Procedures

Contact the HP Tech if you need additional information concerning Lockout/Tagout of radioactive sources.

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## IH-477 Control of Ionizing Radiation Hazards, Continued

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**ALARA Program/  
Policy**

It is the policy of The Dow Chemical Company to maintain all radiation exposure to personnel ALARA (As Low As Reasonably Achievable).

**Category 2**

A copy of the written ALARA Program for this facility is located [here](#)

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**Radiation  
Exposure**

The following methods will be used to assure that radiation exposures from radiation producing machines, sealed sources, loose isotope laboratories, the TRIGA reactor, and the incinerator are within established limits:

**Category 1**

- Use of dosimetry while:
    - working in loose isotope laboratories areas, if required by the laboratory approval (whole body and finger/wrist dosimetry), or
    - working in the vicinity of a sealed source or the TRIGA reactor, if required by the Radiation Safety Officer (whole body and finger/wrist dosimetry), or
    - working with a Radiation Producing Machine (finger/wrist dosimetry only) other than an electron microscope or units designed by the manufacturer to be closed-beam (i.e., X-ray fluorescence unit or electron spectroscopy for chemical analysis (ESCA) units).
  - Annual surveys of the radiation fields by the Radiation Safety group in loose isotope laboratories that contain significant amounts of gamma- or high-energy-beta-emitting radionuclides and in the vicinity of sealed sources and the TRIGA reactor.
  - Initial and periodic radiation surveys in the vicinity of radiation producing machines by the Radiation Safety group.
  - Working in laboratory fume hoods when performing operations that could generate airborne radioactive materials. Lab fume hoods shall be calibrated on a frequency consistent with the Dow Global Laboratory Fume Hood Standard. Lab fume hoods must meet the following performance criteria:
    - The average linear face velocity of at least 100 fpm
    - No single face velocity may be less than 80 fpm
    - The hood must have a regular air flow without any eddies (test with smoke tube)
  - Air monitoring when performing operations that could generate airborne radioactive materials.
  - Bioassays will be conducted for individuals likely to receive, in one year, an intake in excess of 10 percent of the applicable ALI specified in 10 CFR part 20 Appendix B. Bioassays will also be performed in cases of accidental intake.
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## IH-477 Control of Ionizing Radiation Hazards, Continued

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**Shutter Operation** Many sealed source housings contain shutters that cause the radiation beam of the source to be shielded. These shutters are important safety equipment. Therefore they must be periodically tested to assure that they remain in operable condition.

**Category 1**

These operability checks are performed annually by the HP Tech or his delegate.

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**Visual Inspections** A visual inspection must be performed annually to assure compliance with regulations of the following items:

**Category 1**

- The source is in its approved location.
- Appropriate warning signs are present and in good condition.
- Appropriate warning and information labels (attached to the source) are present and in good condition.
- The physical condition of the source is good.
- The source's shielding is appropriate and in good condition.

This inspection is typically performed by the HP Tech. He should be contacted if any problems with the above items are observed between annual inspections.

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**Fetal Protection and Exposure of Minors**

**Category 1**

Employees under 18 years of age are not allowed to work directly with radioactive materials or radiation producing equipment (other than electron microscopes) at the Michigan Operations site.

The dose to a declared pregnant employee is limited to 500 mrem over the course of the pregnancy, or an additional 0.05 rem if the dose received is 0.45 rem or greater at the time of declaration. A pregnant woman may or may not declare her pregnancy and may withdraw her declaration at any time during her pregnancy. Declarations of pregnancy must be in writing and be sent to the RSO. It is recommended that declarations of pregnancy are made as early in the pregnancy as possible, in order to discuss any changes in their job that may be necessary to provide appropriate protection to the fetus. For more information, review the Nuclear Regulatory Commission [Regulatory Guide 8.13](#), Instruction Concerning Prenatal Radiation Exposure. To declare a pregnancy, complete the [Michigan Operations Declaration of Pregnancy Form](#) and send to the Radiation Safety Officer.

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**Dosimetry**

**Category 2**

Dosimetry is processed by Landauer. All employees who wear dosimetry, including users of radiation producing machines, should turn their dosimetry in quarterly to the Dosimetry Coordinator, when their new dosimetry is received in order to send the dosimeters in for processing.

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## IH-477 Control of Ionizing Radiation Hazards, Continued

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**Contamination**  
**Category 1**

In order to ensure that loose isotopes are contained in their proper location, an individual designated by the Radiation Safety group will:

- monthly wipe test areas where sources of loose isotopes are used or stored, or

In order to ensure that sealed sources are intact and not releasing contamination, the Radiation Safety group will:

- wipe test sealed sources:
  - quarterly for alpha-emitting radionuclides;
  - annually for sealed sources with certificates of registration that authorize wipe testing sources at intervals of annually or greater;
  - every ten years for sealed sources in storage; and
  - semi-annually for all other sources, except those containing only a radioactive gas such as Hydrogen-3 or Krypton-85, which do not require wipe testing.

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**Monitoring**  
**Category 1**

To ensure that radiation survey instruments used for monitoring at this facility are accurate, annual inspection and calibration are performed. The calibration and inspection program is conducted by the Radiation Safety group.

Wipe tests are analyzed by liquid scintillation analysis by the Toxicology and Environmental Research Consultants (TERC) Group in 1803 Building, Midland, MI. This laboratory is authorized by the NRC to perform this analysis.

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**Transfer**  
**Category 2**

The RSO or the HP Tech, must be notified before any internal or external transfers of loose isotope or sealed sources. This includes transfer of ownership of the sources and returns to the supplier.

Registration certificates for radiation-producing machines must be kept up-to-date. Approval is required from the Radiation Safety Group prior to transferring the machine to another location (different laboratory, building, or transfer to another site).

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**Shipping**  
**Category 2**

Shipping of loose isotopes is regulated by local authorities. The RSO or the HP Tech must be notified/consulted before the shipping of any radioactive materials or radiation producing machines.

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## IH-477 Control of Ionizing Radiation Hazards, Continued

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### Disposal

#### Category 1

Loose isotopes may only be disposed of according to waste procedures contained in the loose isotope procedure book,

- Long Lived
- Short Lived.

Only C-14 and H-3 may be disposed of at the Midland site incinerator without special RSO approval. Follow the procedure for disposing of C-14 and H-3 in the Midland site incinerator. If disposal consists of a mixed-waste (loose isotope and hazardous waste), consult with the Radiation Safety group for proper labeling, storage, disposal options.

The Radiation Safety group shall ensure the safe disposal of all radioactive materials. Owners of radioactive material or a radiation producing machine should transfer it only with the notification, approval, and assistance of the Radiation Safety group. All disposal of radioactive material using external contractors will meet the requirements of the Dow External Waste Management standard.

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### Radiography

#### Category 2

Security/Emergency Services, Non-Destructive Examination, and the Radiation Safety group shall be notified when the contractor arrives at the site. A written guideline, "Procedures for Radiation Sources brought into the Plant for Radiographic Inspections," available from the Radiation Safety group, shall be followed for radiography to protect Dow employees from incidental radiation exposures.

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### Audits/ Self-Assessment

#### Category 1

Loose Isotope Laboratories and the TRIGA reactor are audited by the Radiation Safety Group at least annually. The overall radiation safety program is audited annually by a qualified individual who is not a part of the Midland radiation program.

The written radiation program is reviewed annually to confirm that the program is updated to reflect changes in the radiation safety program.

Self-assessments shall be performed by the facilities periodically using the facility portion of the self-assessment checklist.

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### Records

#### Category 2

Documentation of the requirements of this program must be kept and maintained consistent with the global records retention manual.

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## IH-477 Control of Ionizing Radiation Hazards, Continued

### Related Documents

**PROCEDURES:** [\\Mdn26\miopsehs\Approved\Procedures\Responsible Care\Standards\IH477 Control of Ionizing Radiation Hazards](#)

**TRAINING:** [\\mdnt26\miopsehs\Approved\Training\Responsible Care\Standards\IH477 Control of Ionizing Radiation Hazards](#)

**SELF ASSESSMENTS:** [\\Mdn26\miopsehs\Approved\Checking & Corrective Action\Self Assessments\Standards\IH477 Control of Ionizing Radiation Hazards](#)

**CHECKLISTS:** [\\Mdn26\miopsehs\Approved\Checking & Corrective Action\Checklists\IH477 Control of Ionizing Radiation Hazards](#)

**OTHERS:** [\\Mdn26\miopsehs\Approved\Responsible Care\Employee Health & Safety\Industrial Hygiene Standards\IH477 Control of Ionizing Radiation Hazards](#)

### Approvals

This standard was approved by:

Brad Fedorchak/Responsible Care Leader  
 (Name/Job Title)

04/15/09  
 (Date)

### MOC

MOC# 179020090400002 Date Approved: 04/15/09

### Revision history

The following information documents at least the last 3 changes to this document, with all the changes listed for the last 6 months.

Date	Revised By	Changes
01/09/09	J. Weldy	Fixed links, updated link to latest version of license, updated contact information, updated lab approvals, updated loose isotope storage procedures, added long-lived waste procedure.
04/06/09	J. Weldy	Removed requirement for users of closed-beam RPMs to wear dosimetry, per the State of Michigan letter of interpretation.
04/15/09	L. Wegener	Moved to Approved, formatting updates
01/08/10	J. Weldy	Annual review and update. Deleted references to reactor location. Updated contact names.

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The Dow Chemical Company  
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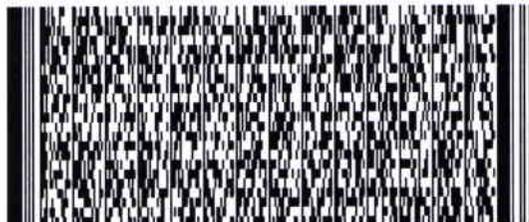


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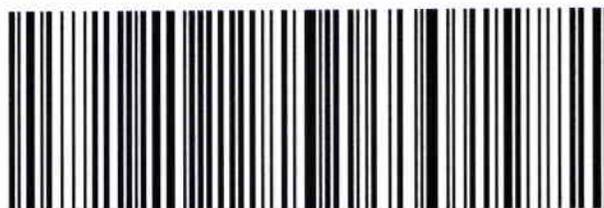
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