



Union Carbide Corporation
A Subsidiary of The Dow Chemical Company
PO Box 8361
3200/3300 Kanawha Turnpike
South Charleston, WV 25303
U.S.A.

August 18, 2003

SUBJECT: NRC License Amendment Request for License Number 47-00260-02

This is to request an amendment to License number 47-00260-02. We are requesting a change in our license from a Broad scope to Specific. The radiation activities for Union Carbide Corporation, a subsidiary of the Dow Chemical Company in South Charleston, WV have been significantly diminished. Additionally, we are requesting a change in the program's Radiation Safety Officer. The new RSO will be Michael B. Boyd.

As a result of the Dow-Union Carbide merger, nearly all of the radiation activities performed at Union Carbide's South Charleston, WV and Institute, WV facilities have been eliminated or transferred to a Dow facility. Therefore, we are consolidating the radiation activities into one license and will be utilizing one Radiation Safety Officer. The consolidation will result in significant cost savings to Union Carbide in addition to significantly reducing the radiation hazards across West Virginia Operations.

The facilities that comprise West Virginia Operations include the South Charleston Technical Center, South Charleston Plant, and the Institute Plant. The Institute Plant is controlled by Bayer, but Dow operations exist within the facility and are within the scope of our license request. When radioactive materials are procured or utilized by Dow operations, we will work in conjunction with the Institute Plant's RSO to ensure their awareness of our radiation activities.

After reviewing the enclosed license amendment request, please feel free to contact me for additional information.

Thanks,

Michael B. Boyd
WVO R&D EHS Delivery
Assistant RSO
Union Carbide Corporation



Union Carbide Corporation

A Subsidiary of The Dow Chemical Company
PO Box 8004
437 McCorkle Avenue SW
South Charleston, WV 25303
U.S.A.

July 29, 2003

TO WHOM IT MAY CONCERN:

Subject: SENIOR MANAGEMENT SUPPORT FOR THE RADIATION

As a representative of senior management for Union Carbide Corporation, A Subsidiary of The Dow Chemical Company, I hereby delegate the requisite authority to the Radiation Safety Officer (RSO) to communicate with, enforce and direct West Virginia Operations personnel regarding Nuclear Regulatory Commission (NRC) regulations and license provisions. The Radiation Safety Program will be provided with sufficient resources to support the program.

We also delegate to the RSO the authority to conduct periodic management audits of the program to assure safe operations and compliance with the regulatory requirements. . The results of these audits and any corrective actions will be communicated to me.

A handwritten signature in black ink, appearing to read "J. L. Blatt".

J. L. Blatt
Responsible Care Leader
West Virginia Operations
Union Carbide Corporation

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Material License Application

1. This is an application for an (b) Amendment to License Number 47-00260-02.
2. Name and mailing address of applicant:

Union Carbide Corporation, a subsidiary of The Dow Chemical Company
3200 Kanawha Turnpike
South Charleston, WV 25303

3. Addresses where licensed material will be used or possessed:

Technical Center

South Charleston Plant b) 437 MacCorkle Avenue
South Charleston, WV 25303

Institute Plant c) Route 25
Institute, WV 25112

4. Name of person to be contacted about this application:

Michael Boyd
3200 Kanawha Turnpike
MS 740-3416
South Charleston, WV 25303
304-747-7974
boydmb@dow.com

5. Radioactive material:

Element and mass number	Chemical and/or physical form	Maximum amount possessed at any time
H-3	Static meters, analytical samples	250 mCi
Ra-226	Calibrator	1 mCi
Ni-63	Electron capture detector	<15 mCi
Cd-109	Lead detectors	<20 mCi

6. Purpose(s) for which licensed material will be used:

The above materials will be used for:

- Research and development as defined in 10 CFR 30.4(q)
- In gas chromatographs and measurement devices for sample analysis
- Instrument calibration

7. Individuals responsible for radiation safety program and their training experience

Senior management has delegated sufficient authority to the Radiation Safety Officer to communicate and direct personnel regarding U. S. NRC regulations and license conditions. They have also committed to provide adequate resources to support the activities, which fall under the scope of the Radiation Safety Program.

Radiation Safety Officer Responsibilities

The RSO is responsible for:

- Overall development and implementation of the Radiation Safety Program
- Ensure program is periodically audited
- Conduct radiation safety evaluation of proposed uses
- Review procedures for controlling and maintaining inventories, procurement of radioactive material, possession limits, and material transfers
- Ensure users are adequately trained
- Annually review the Radiation Safety Program
- Ensuring wipe tests and inventories are performed at least every six months
- Ensuring radioactive materials are shipped and received properly
- Providing necessary information on radiation protection to personnel at all levels of responsibility
- Oversight of radiation dosimetry to ensure exposure levels are as low as reasonably achievable
- Dosimetry documentation is maintained in permanent files
- Evaluation of dosimetry results
- Recommend corrective actions
- Conduct training of proper procedures for the use of radioactive materials
- Ensure radioactive wastes are disposed of properly
- Ensure radioactive materials are secured
- Ensuring periodic calibration of radiation survey instruments
- Ensuring compliance with terms of U.S. NRC license
- Immediately terminating any activity that is found to be a threat to public health and safety or property
- Supervising decontamination and recovery operations
- Maintaining records of receipts, transfers, and surveys of packages

Radiation Safety Program Support

The responsibilities of those providing direct support to the Radiation Safety Program include:

- Supporting the RSO and the terms of the U.S. NRC license
- Performing wipe tests and surveys
- Film badge distribution and collection
- Training users
- Record keeping
- Evaluating and auditing the Radiation Safety Program

Those responsible for executing, evaluating, and auditing the Radiation Safety Program will include at least:

The Radiation Safety Officer, a Certified Industrial Hygienist, and an Industrial Hygiene Technician who has received formal training in the handling, hazards, and controls of radioactive materials and executing the Radiation Safety Program.

Union Carbide Corporation, a subsidiary of the Dow Chemical Company, will additionally utilize other Dow Chemical RSO's for resources and program auditing.

8. Training for individuals working with radioactive materials or radiation producing devices. There will be no restricted areas.

Training will be provided to all users of radioisotopes and radiation producing machines commensurate with the level of hazard. This training will be conducted prior to the use of radioisotopes and whenever there is a significant change in tasks, duties, regulations, or terms of the License. The training will be provided by the RSO or delegate. Users must pass a written test prior to using radioactive materials or radiation producing machines.

All personnel that have a potential for exposure to radioactive materials will be trained. This training will be provided annually to emergency response, security staff, shipping, receiving.

The training will cover at least:

- Applicable regulations and license conditions
- Areas where radioactive material is used and stored
- Potential hazards associated with radioactive material
- Appropriate radiation safety procedures
- Individuals obligation to report unsafe conditions to the RSO
- Appropriate response to emergencies or unsafe conditions
- Worker's right to be informed of occupational radiation exposure results
- Locations of pertinent regulations, licenses, specific policies and procedures
- Individual's responsibilities

Emergency response training will be commensurate with the level of risk and will also cover treatment priorities, access and control boundaries, who may enter authorized areas, dosimetry, how to use a radiation survey meter, and health effects of exposure.

Additional training may be conducted when there is a significant change in hazards or at users request.

The Training Coordinator assigned to the users work group will maintain training records.

9. Facilities and equipment

Prior approval from the RSO must be obtained before ordering, procuring, or using radioactive material. Material may only be used at West Virginia Operations locations for the Dow Chemical Company. Currently, Union Carbide Corporation is a subsidiary of the Dow Chemical Company. Locations that are considered part of West Virginia Operations are:

- | | | |
|------------------------|----|---|
| Technical Center | a) | 3200 Kanawha Turnpike
South Charleston, WV 25303 |
| South Charleston Plant | b) | 437 MacCorkle Avenue
South Charleston, WV 25303 |
| Institute Plant | c) | Route 25
Institute, WV 25112 |

Sealed sources may be stored in the Radiation Room in Building 747 or the Radiation Storage Building. Building 747 is a concrete block building. Equipment supplies, documents, and testing will be housed or performed in the Radiation Room. The Radiation Storage Building is a concrete building surrounded by a six foot fence. The Radiation Room in Building 747, the Radiation Storage Building, and the gate on the fence will be kept locked at all times when unattended.

The RSO will maintain at least one Geiger counter, two FAG meters and one Protean Ion Counter (PIC). The PIC will be used to analyze wipe tests. The survey meters will be calibrated every 6 months, not to exceed 7 months.

Instruments used in the Radiation Program will meet the radiation monitoring instrument specification published in Appendix M to NUREG-1556, Vol. 7, 'Program Specific Guidance About Academic, Research and Development, and other Licenses of Limited Scope', dated December, 1999. We reserve the right to upgrade the survey instruments as necessary.

10. Radiation Safety Program

Prior approval from the RSO must be obtained before ordering, procuring, transferring, or using radioactive material. Any person using radioactive material in West Virginia Operations will comply with ALARA principles. The Radiation Safety Program will be maintained by the RSO. It will be reviewed annually by the RSO, an Industrial Hygiene representative, and a qualified individual not directly associated with the WVO Radiation Safety Program.

An inventory of radioactive materials will be kept. An inventory and wipe tests will be performed every 6 months, not to exceed 7 months. The inventory and wipe tests will be performed by the RSO or qualified and trained delegate.

Any individual expected to receive a dose from an external source in excess of 10 percent of the dose limits specified in 10 CFR 20 and any individual entering a high radiation area will be provided with a film badge. Film badges will be processed quarterly by a NVLAP accredited processor.

An estimate of potential exposure will be made by the RSO or delegate for employees that are required to enter restricted areas where radiation fields above background are present. This estimation will be based on the expected occupancy time and the exposure rate of the radiation field. If it is determined that an employee's estimated dose exceeds 10 percent of the dose limits specified in 10 CFR 20, they will be required to wear monitoring devices.

If an individual receives an internal exposure greater than or equal to 10% of the ALI specified in 10 CFR 20, an investigation will be performed to determine the cause of the exposure and identify methods to reduce future exposures.

11. Waste Management

All radioactive waste will be transferred to a licensed user or facility.

12. License Fees

13. Certification

The applicant and any official executing this certification on behalf of the applicant, named in item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Parts 30, 32, 33, 34, 35, 36, 39, and 40, and that all information contained herein is true and correct to the best of their knowledge and belief.

Certifying Officer: Michael B. Boyd Date: 8/18/03

WVO Radiation Safety Program

WVO Radiation Safety Program

This Program documents the work process for ensuring radioactive materials are handled properly and that employees, contractors, and the general public is protected from radioactive hazards in West Virginia Operations (WVO).

WVO Radiation Principles

It is the policy of the Dow Chemical Company to conduct its radiological operations in a manner that ensures the health and safety of all its employees, contractors, and the general public.

Radiation exposures to employees and the public, and releases of radioactivity to the environment will be maintained ALARA (As Low As is Reasonably Achievable).

Senior management is fully committed to implementing a radiological control program of the highest quality that consistently reflects this policy.

Assignment of Responsibilities

Radiation Safety Officer (RSO) – the RSO is responsible for coordination, development, implementation and documentation of the Radiation Program. The RSO is Michael Boyd 304-747-7974 (work) [REDACTED]

In the event of an emergency and the RSO is not available, please contact:

- Tom Bloss, 304-747-4779 (work) [REDACTED]

- Manhar Patel, 304-747-3750 (work) [REDACTED]

- Or the Incident Commanders office at 304-747-2358.

The Site RSO is responsible for oversight and auditing of the Radiation Program.

NRC Occupational Exposure Limits

Nuclear Regulatory Commission (NRC) occupational exposure limits are specified in 10 CFR 20.

Total Effective Dose Equivalent (TEDE) is the summation of external exposure and internal exposure.

Annual TEDE must be less than 5 rems (0.05 Sv).

ALARA

Control of External and Internal Exposure

Internal and external exposures will be kept ALARA (As Low As is Reasonably Achievable).

Individuals will not occupy areas where radiation exposure levels are above background levels unless it is necessary in the performance of their job.

Adequate ventilation or respiratory protection will be used with volatile and/or dusty materials to control internal exposures.

Good housekeeping and contamination control will be practiced in all radioactive material use and storage areas to control internal exposures.

Radioactive material will be used in WVO, such that the general public will not receive exposures exceeding 2 mr/hr (two milli-rem per hour) and 100mr/year (one hundred milli-rem per year).

Investigational Levels

The following actions will be taken at the Investigational levels listed in the table below:

Personnel dose less than Investigational Level I.

- Except when deemed appropriate by the RSO, no further action will be taken.

Personnel dose equal to or greater than Investigational Level I, but less than Investigational Level II.

- The RSO will review the dose and report the results to employee's administrative leader. If the dose does not equal or exceed Investigational Level II, no action related specifically to the exposure is required. The RSO will review each such dose in comparison with those of others performing similar tasks as an index of ALARA Program quality.

Personnel dose equal or greater than Investigational Level II.

- The RSO will investigate in a timely manner the causes of such a dose and if warranted will take action. A report of the investigation, any actions taken, and a copy of the individual's Form NRC-5 or its equivalent will be reported to the employees administrative leader and the appropriate EH&S Delivery Leader.

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ALARA, Continued

**Investigational
Levels**
(continued)

Reestablishment of Investigational levels to levels above those listed in Table 1.

- In cases where a worker's or a group of workers' doses need to exceed an Investigational level, a new, higher Investigational level may be established for the individual or group on the basis that it is consistent with good ALARA practices. Justification for new Investigational levels will be documented.

Table 1

Affected Area	Investigational Level I mr/quarter	Investigational Level II mr/quarter
1. TEDE	125	375
2. Skin or extremities	1250	3750
3. Lens of the eyes	375	1125
4. Organ or tissue other than lens of eye	1250	3750

**Dose to Members
of the Public**

Areas accessible to members of the public will have exposure rates of <2 mr/hr. Unless occupancy times keep doses <100 mr/yr.

Surveys will be performed and documented to ensure occupational dose limits are not exceeded.

Effluents

ALARA goals for effluents are < 10% of 10 CFR, Appendix B, Table II limits. If effluents with higher concentrations must be released, the RSO must review and approve.

**Administrative
Control Levels**

Administrative controls should be established at challenging levels, well below the regulatory limit, taking into consideration the exposure history of the facility.

The Dow Administrative Control Level for WVO has been set at 500 mr/yr.

Special approval by the RSO is required prior to allowing an individual to exceed this exposure level.

All employees working with radioactive materials should receive formal training on the applicable administrative control levels and on their responsibilities for ensuring these levels are not exceeded without proper approval.

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ALARA, Continued

ALARA Goals	Annually, the RSO will set ALARA goals based on input received from radioisotope users and review of historical doses.
ALARA Training	<p>General Employees – All employees who enter areas where radioactive materials are used or stored must receive initial radiation safety orientation training.</p> <p>Radiological Workers – All employees who work with radioactive materials will receive ALARA training during their initial and annual refresher training. ALARA training for Radiological Workers will include:</p> <ul style="list-style-type: none">• Dow's ALARA Policy• Basic protective measures such as:<ul style="list-style-type: none">• Reduction of radioactive inventory• Time, distance, shielding• Ventilation• Contamination control• Responsibility of radiation workers and researchers to reduce exposure and contamination.• Site/job specific procedures to reduce exposure and contamination. <p>Emergency Response Personnel – All employees who may be summoned for help during an emergency will receive initial and annual training, at an appropriate level, will include:</p> <ul style="list-style-type: none">• Awareness of Radioactive materials in WVO• Hazards and controls associated with inventoried radioactive materials• Determining a safe perimeter• Radioactive monitoring devices• Exposure minimization techniques, including:<ul style="list-style-type: none">• Distance, shielding, and time• Contamination control• Decontamination

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ALARA, Continued

**Internal
Assessments and
Audits**

The ALARA program will be reviewed during annual (not to exceed 15 months) audits of the Radiation Safety Program.

Findings of Radiation Safety Program Audits will be documented and communicated.

The number of individuals exceeding administrative exposure control levels and a summary of justification for these exposures will be include in the audit report.

Information in these reports will be reported to the Site Leadership Team.

**Radiological
Design Review**

All new facilities where radioactive materials will be used should be reviewed by the RSO.

**Radiological
Work/Experiment
Planning**

New types of work and experiments involving radioactive materials must be reviewed and approved by the RSO before acquisition of radioactive materials.

Records

Documentation must be kept of:

- Major actions taken to maintain occupational exposures ALARA.
- Training lesson plans, attendance records, exams, audits, surveys, personnel exposures, records of material receipt and transfer, and inventories.

These records must be retained for the period specified in Dow's Records Retention Policy.

WVO Loose Isotope Radiation Safety Program

Introduction	A written Loose Isotope Radiation Safety Program is necessary to provide guidance on the safe use of unsealed radioactive material.
Inventory	The site RSO keeps accurate current inventory of loose isotopes.
Responsibility	<p>The Radiation Safety Officer for WVO is Michael Boyd. He is responsible for the oversight of the Site Loose Isotope Radiation Safety Program.</p> <p>The Loose Isotope Laboratory Owner is responsible for ensuring compliance with the requirements of this program.</p>
Emergency Procedures	<p>In case of an emergency involving radioactive material, activate an emergency alarm and contact the site RSO.</p> <p>Be prepared to relay information about the isotope, its activity, chemical and location.</p> <p>Written <u>Loose Isotope Emergency Procedures</u> must be available at each lab, which uses loose isotopes.</p>
Training	<p>Personnel that work with, or are exposed to radiation, must receive training on the hazards of radiation, and procedures on how to work safely with radioactive materials. The level and frequency of this training must be commensurate with the hazard.</p> <p>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.</p> <p>Training requirements for personnel that work with or around loose isotopes, Training for individuals working in or frequenting restricted areas, are available from the RSO.</p>
Procurement	<p>The Site RSO must approve all orders for radioactive materials prior to ordering.</p> <p><u>Ordering and Receiving Procedures</u> must be followed when obtaining radioactive material.</p>
Receiving	<p>All loose isotopes that will be used at the Technical Center must be received at Building 725. All loose isotopes that will be used at the South Charleston Plant must be received at Building 300. All loose isotopes that will be used at the Institute Plant must comply with the host company's receiving policy. Arrangements must be made between the WVO RSO and Institute Site RSO. The site RSO or designee must be notified ASAP of the receipt of radioactive materials. All packages containing loose isotopes must be addressed to the attention of the RSO.</p> <p><u>Ordering and Receiving Procedures</u> must be followed when obtaining radioactive material.</p>

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WVO Loose Isotope Radiation Safety Program, Continued

Security and Storage	Radioactive materials must be secured from unauthorized access or removal.
Locations of Use	Loose isotopes may only be used in laboratories authorized by the Radiation Safety Committee. Authorized laboratories will have a written <u>Laboratory Approval</u> that describes locations of use and other specific requirements. Please contact RSO for additional information.
ALARA Program/Policy	It is the policy of The Dow Chemical Company to maintain all radiation exposure to personnel ALARA (As Low As is Reasonably Achievable). Details of ALARA requirements can be found on Page 2 of the Radiation Program
Radiation Exposure	Requirements concerning surveys of radiation fields in loose isotope laboratories are contained in the <u>Laboratory Approval</u> for each laboratory.
Fetal Protection and Exposure of Minors	<p>Employees under 18 years of age are not allowed to work with loose radioactive materials.</p> <p>Employees working with radioactive materials that are pregnant should contact the RSO and declare their pregnancy. Once an employee has declared their pregnancy, their exposures will be less than 10% of the permissible dose. Contact the RSO for additional information regarding prenatal radiation protection.</p>
Dosimetry	Employees working with radioactive materials or radiation producing machines will utilize dosimetry to measure their exposure dosage. Contact the RSO to receive appropriate training and dosimeter(s).
Contamination	<p>Periodic wipe testing is performed to assure that loose isotopes are contained in their proper locations.</p> <p>Wipe testing frequency for a specific laboratory can be found in the <u>Laboratory Approval</u> for that laboratory.</p>
Monitoring	To assure that radiation survey instruments used for monitoring at this facility are accurate, annual inspection and calibration is performed. The Site RSO and/or Industrial Hygiene will handle the calibration and inspection program

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WVO Loose Isotope Radiation Safety Program, Continued

Transfer	The site RSO must be notified before any internal or external transfers of radioactive sources. This includes transfer of ownership of the sources and returns to the supplier.
Shipping	The site RSO must be notified before the shipping of any radioactive materials.
Disposal	<p>Loose isotopes may only be disposed of according to <u>long-lived</u> and short-lived (ensure link) Waste Procedures contained in the "Radioactive Material Loose Isotope Procedures" Manual.</p> <p>The Site RSO must be notified before disposal of any radioactive materials.</p>
Audits	The site RSO or Industrial Hygiene Expertise Center audits loose Isotope Laboratories at least annually. Auditing frequency for a specific laboratory can be found in the <u>Laboratory Approval</u> for that laboratory.
Records	Documentation of requirements of this program must be kept and maintained according to the site record retention policy.

WVO Sealed Source Radiation Safety Program

Introduction	A written Sealed Source Radiation Safety Program is necessary to provide guidance on the safe use of sealed sources of radiation.
Inventory	<p>A current, accurate inventory of sealed radioactive sources must be available. Radioactive sources that are exempted from government regulations do not need to be included in the inventory. However, <i>Generally Licensed</i> sources must be included.</p> <p>Sources in WVO are primarily used for analytical research. Contact the site RSO prior to procurement. The site RSO maintains a current list of all sources.</p>
Responsibility	<p>The Radiation Safety Officer (RSO) for this site is Michael Boyd. He is responsible for the oversight of the Site Sealed Source Radiation Safety Program.</p> <p>The Owner of a sealed source is responsible for ensuring compliance with the requirements of this program. The owner is required to notify the site RSO prior to procurement. The owner is also responsible for ensuring that the radioactive material is safely secured.</p>
Emergency Procedures	<p>In case of emergency, activate an emergency alarm and call the site RSO.</p> <p>Be prepared to relay information about the source involved, the isotope, its activity and location.</p>
ALARA Program/Policy	<p>It is the policy of The Dow Chemical Company to maintain all radiation exposure to personnel ALARA (As Low As Reasonably Achievable).</p> <p>ALARA program details can be found on Page 2 WVO Radiation Safety Program.</p>
Training	<p>Personnel that work with, or are exposed to radiation from sealed sources, must be trained in the hazards of radiation and procedures on how to work with/ around such sources safely. The level and frequency of this training must be commensurate with the hazard.</p> <p>Personnel that work in the general area of radioactive sources must receive initial and annual Radiation Awareness Training at the appropriate level. Contact the site RSO for information about this training.</p>

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WVO Sealed Source Radiation Safety Program, Continued

Training (continued)	Personnel that work in the immediate area of radioactive sources and/or directly with the sources (e.g. operating shutters, working with detectors) must receive annual Radiation Safety Training. Contact the site RSO for information about this training.
Procurement	The Site RSO must approve all orders of Radioactive sources, including generally licensed sources, prior to ordering. This is necessary to ensure compliance with the WVO's Nuclear Regulatory Commission (NRC) License and NRC regulations regarding radioactive sources. Follow the <u>WVO Ordering and Receiving Procedures</u> .
Receiving	All Sealed Radioactive Sources for WVO must be received at Building 300 for South Charleston Plant activities or Building 725 for Technical Center activities. The site RSO must be notified ASAP of the receipt of a radioactive source. Sources being shipped to the Institute site must be coordinated with the site RSO's for WVO Operations and Bayer at the Institute location.
Security and Storage	<p>Radioactive sources must be secured from unauthorized removal or access.</p> <p>Fixed gauges may be secured by bolting or otherwise securely attaching them to the desired location.</p> <p>If fixed gauges are removed from their permanent location for any reason, they must be kept under constant surveillance, locked in a room or cabinet, or chained to an immovable object. All sources must be removed by authorized personnel and the RSO notified.</p> <p>Portable gauges must be under constant surveillance or locked up (in a room or vehicle) at all times.</p>
Lockout/Tagout	<p>Sealed sources must be secured according to the Site's Red Tag 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.</p> <p>Written Radioactive Red Tag procedures may be obtained by clicking <u>here</u>. Contact the site RSO if you need additional information concerning Lockout/Tagout of radioactive sources.</p>
Transportation	Transportation of radioactive materials between sites will be performed in accordance with DOT 49 CFR.

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WVO Sealed Source Radiation Safety Program, Continued

Locations of Use	<p>Sealed sources may only be used at authorized and documented locations with West Virginia Operations. This includes portable gauges, unless the gauge is specifically approved in the Site's License for use at temporary job sites. Contact the site RSO for additional information.</p> <p>The site RSO must authorize any source brought onto Union Carbide or Dow premises within WVO.</p>
Visual Inspections	<p>A visual inspection and inventory must be performed every six months (not to exceed 7 months) to assure compliance with regulations of the following items:</p> <ul style="list-style-type: none">• The source is in its approved location.• 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.• The source is securely mounted. <p>This inspection is typically performed by the site RSO, Industrial Hygiene, or EH&S organization. The RSO should be contacted if any problems with the above items are observed between annual inspections.</p>
Contamination	<p>Periodic wipe testing is performed to assure that radioactive material is contained by the source container.</p> <p>Wipe testing will be performed by the site RSO, Industrial Hygiene or the EH&S organization. Those performing wipe tests will be knowledgeable and trained in the hazards and procedures for the tasks.</p> <p>In general, wipe testing is performed with the following frequency.</p> <ul style="list-style-type: none">• All sealed sources will be wipe tested semi-annually (every six months, not to exceed 7 months). <p>Sources containing only a radioactive gas such as Hydrogen-3 or Krypton-85 do not require wipe testing.</p> <p>Sources in storage will be wipe tested at least every 10 years and prior to removal from storage.</p>
Radiation Exposure	<p>Initial and periodic surveys of the radiation fields around the sources are performed to assure that radiation exposure is within established limits. These surveys will document that no one in the vicinity of a source will receive a dose greater than 100 mR/year.</p> <p>These surveys are performed every six months (not to exceed 7 months) by the site RSO, Industrial Hygiene, or EH&S Delivery.</p>

WVO Sealed Source Radiation Safety Program, Continued

Shutter Operation	<p>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.</p> <p>These operability checks are performed semi-annually by the site RSO or his delegate.</p>
Monitoring	<p>To assure that radiation survey instruments used for monitoring at this facility are accurate, semi-annual inspection and calibration is performed. The calibration and inspection program is conducted by persons licensed by the NRC to perform these tasks.</p>
Source Removal	<p>Radiation sources must not be relocated, removed or serviced without the approval of the RSO.</p>
Transfer	<p>The site RSO must be notified before any internal or external transfers of radioactive sources. This includes transfer of ownership of the sources and returns to the manufacturer.</p>
Shipping	<p>The site RSO must be notified before shipping of any radioactive source. This includes Generally Licensed sources.</p>
Disposal	<p>Sealed sources may only be disposed of through transfer to an authorized recipient.</p> <p>The RSO or his/her delegate must be notified before disposal of any radioactive source. This includes Generally Licensed sources.</p>

WVO Ordering and Shipping/Receiving Radioactive Material

Introduction	This procedure describes the steps involved in ordering radioactive materials. These steps must be followed to ensure compliance with U.S. Nuclear Regulatory Commission (NRC) regulations.
Step 1: Approval	<p>Written approval must be received from the Radiation Safety Officer, RSO, or the Alternate RSO before radioactive material can be ordered, shipped, or received.</p> <p>Complete the "Isotope Request/Approval Form". This form must be completed to document this approval. Be sure to include the signature of the isotope owner.</p> <p>Note: Approval for ordering radioactive material may be an NRC License Condition. The RSO must ensure that all license conditions are met and that no isotope limits are exceeded before radioactive materials are ordered.</p> <p>The vendor may require a copy of our U.S. NRC License and/or a written statement from the RSO before they will ship material. If so, contact the RSO.</p>
Step 2: Contact Manufacturer	Contact vendor to identify study specific details (formulation, label position, quantity, etc.) and confirm that the vendor can supply the required material in a timely manner. If ordering from a catalog, identifying this information from the catalog is sufficient.
Step 3: Ordering	<p>Provide the following information to purchasing:</p> <ul style="list-style-type: none">• A copy of the approved "Isotope Request/Approval Form"• Date the material is needed• Submit requisition to purchasing with approval form• Information about the vendor (name, phone number, previous contacts, etc.) and the materials to be ordered (name, radioactivity amount, catalog number, other specific information). A copy of the vendor's catalog page is very helpful when ordering and can be used for future orders of the same material.

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WVO Ordering and Shipping/Receiving Radioactive Material, Continued

Step 3: Ordering (continued)

Purchasing will contact the vendor to place the order and provide the necessary shipping address (as follows), labeling requirements, Dow NRC license (if necessary), and arrange for purchase/shipment.

Technical Center Shipments:

Union Carbide Corporation
A subsidiary of The Dow Chemical Company
3200 Kanawha Turnpike
S. Charleston, WV 25303
Receiving Dept.: Building 725
ATTN: RSO – Michael Boyd

South Charleston Plant Shipments:

Union Carbide
A subsidiary of The Dow Chemical Company
437 MacCorkle Avenue
S. Charleston, WV 25303
Receiving Dept.: Building 300
ATTN: RSO – Michael Boyd

The package **must** be delivered to these addresses, depending on the location of use, to assure compliance with U.S. NRC regulations on receiving radioactive material.

Step 4: Receiving

The radioactive material will be received at Building 725 or Building 300 by Receiving personnel. They will secure the package and restrict access to only those who will perform wipe test and individuals procuring material.

They will immediately notify the site RSO or designee.

The RSO or designee will wipe test and visually inspect the outside of the radioactive materials package. If the package is received damaged or wipe testing indicates the presence of contamination, the RSO will be notified immediately and the source will be isolated until emergency response personnel and the RSO determine an appropriate action plan relative to the degree of hazard.

The package will be transported to its location of intended use.

Then they will open the package, perform the appropriate wipe testing and log the material into the inventory system.

If a contamination is found, the material will be isolated and decontamination procedures will be initiated.

The user will then be notified that their material is available for use.

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WVO Ordering and Shipping/Receiving Radioactive Material, Continued

Step 5: Complete Inventory Forms

U.S. NRC regulations require an accurate inventory of radioactive materials to be kept at all time.

Complete an "Unsealed Radioactive Material Transaction Form", and send to the RSO. Make a copy of the packing list and send to the RSO.

Shipping Radioactive Materials

Any radioactive material shipped or transferred from WVO must be authorized by the site RSO.

All materials must be shipped in compliance with U.S. NRC, DOT, and State regulations.

Radiation Isolation & Verification Procedure

Introduction

This procedure is used to provide a method of verifying that the shutter on a radioactive source is in the closed position. This verification is required for the following activities involving Radioactive gauges:

- Vessel entry or vessel opening (opening a flange on a vessel)
- Line opening within 4 ft. of a radioactive device installed on that line
- Working on a detector on a line mounted density gauge
- Working within 4 ft. or 1.2 meters of a nuclear gauge for more than 30 minutes
- Radioactive sealed source removal

Who is responsible

The following table lists the job roles and their duties:

Role	Responsibilities
Sealed Source Owner:	Notify RSO or qualified person in advance, of the need to verify shutter orientation for a lockout of a radioactive sealed source. All efforts should be made to perform this function on the day shift.
RSO or RSO's designee:	Verify that the radioactive source's shutter is in the closed position, and that radiation is no longer entering the vessel or pipe prior to building personnel applying the red tag.
After hours and weekends: Emergency Services & Security	Verify that the radioactive source's shutter is in the closed position, and that radiation is no longer entering the vessel or pipe prior to building personnel applying the red tag.

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Radiation Isolation & Verification Procedure, Continued

Hazards/Warnings Following is list of hazards with associated precautions that should be taken before beginning this procedure. (Consider the areas of safety, toxicity, exposure, and environmental hazards.)

Hazard	Precaution
Explosion hazard while performing survey	Use equipment with appropriate electrical classification. Use Safe Work Permit and survey area for flammables.

Safety Equipment The table below lists the safety equipment required to perform this procedure.

Safety Equipment	Location
Standard safety equipment as required for the area. No special safety equipment is required to perform this procedure.	Unit specific
Follow safe works permit requirements.	See safe work permit issuer

Lockout/Tagout requirement This procedure Does Not fulfill the Lockout/Tagout requirements. This is only a part of the Lockout/Tagout program. It is the responsibility of building personnel to ensure compliance.

- This procedure Must be performed and the radioactive device's Must be locked out prior to vessel or line entry.
- The red tag will be placed by building personnel or equipment owner. The responsibility of the RSO is to certify the shutter is operable and is in the locked position.

Waste disposal Wastes are not typically generated during this process. Consult with the RSO prior to initiating work if radioactive waste will be generated.

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Radiation Isolation & Verification Procedure, Continued

Shutdown/Trip/ Startup consideration	<p>This procedure <u>may</u> affect operating procedure.</p> <p>It is the responsibility of facility personnel to ensure that all shutdown circuits are bypassed or placed in a "static" condition prior to closing the shutter. Radiation derived level or density indications will change significantly when its radiation source is closed.</p>
RSO Special tools	<p>Following is a list of special tools you will need to perform this procedure:</p> <ul style="list-style-type: none">• A radiation survey meter that has a calibration date within 6 months of the date of use.• A lock that will fit the shutter locking holes on the source holder being certified closed.
Definitions	<p>RSO – Radiation Safety Officer.</p> <p>Source – The radioactive element, which emits ionizing radiation, generally "Gamma" radiation (X-Ray) in level and density applications at Dow.</p> <p>Nuclear – Used interchangeably with "radioactive".</p> <p>Source holder – The device that houses the source and directs the radiation through the vessel or pipe. There are no "electronics" associated with the source of 5mr at 1 foot. Source holders must have an appropriate radioactive material label attached.</p> <p>Shutter – A mechanical device, which is part of the source holder and is used to "block" the source's radiation from exiting the source holder.</p> <p>Detector – The portion of a nuclear gauge (either level or density) which receives radiation and converts it into usable information. This device is generally mounted on the opposite side of the pipe or vessel, and does not contain radioactive material.</p>
References	<p>"Lockout/Tagout Verification Form".</p> <p>Consult GEMTS documentation to determine other controls and shutdowns associated with this measurement.</p>

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Radiation Isolation & Verification Procedure, Continued

Procedure

Follow the steps below:

- To verify that the radioactive source's shutter is in the closed position.
- To verify that radiation is being prevented from penetrating the pipe or vessel.
- To lock the shutter in it's closed position.
- Document operation on Lockout/Tagout Verification Form.
- To prepare and send the record of this operation to the RSO.

Step	Action
1	Ensure that the survey meter is appropriate for the radiation emitted and the calibration date on the survey meter is within six months of the date of use.
2	Place the survey meter in the battery test position to ensure proper battery voltage. Change batteries if necessary.
3	Ensure that the source holder shutter is in the open position.
4	Place the survey meter (or probe) in such a position that the meter will read a portion of the radiation field coming from the front of the source (not the field surrounding the source holder). This position is generally toward the detector from the front of the source holder. Meter must indicate the presence of radiation.
5	Adjust (if present) the survey meters scale selector such that the reading is between 20% and 50% of scale if possible.
6	Close the shutter and observe that the indicated radiation field strength on the survey meter has dropped to near zero (<5%) without changing scales on the survey meter. <i>Note: If this change is reading cannot be obtained, reposition the survey meter and try again.</i> If the change still cannot be obtained, stop and call the Radiation Safety Officer or his/her delegate.
7	Verify the shutter is locked in the closed position such that it cannot be operated without removing the lock. Building personnel will place red tag.
8	Fill out the " <u>Lockout/Tagout Verification Form</u> " and send it to the Radiation Safety Officer (RSO) and leave one copy for the building the gauge was locked out for.

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Radiation Isolation & Verification Procedure, Continued

Lockout/Tagout Verification Form

This form must be filled out prior to vessel entry, line entry or detector maintenance by a qualified person that has been trained and certified by the Radiation Safety Officer (RSO) or his/her delegate to verify that the particular source's shutter is in the closed position.

Please fill out the following table for each vessel entry, line entry or any maintenance to a radioactive gauge detector requiring a radioactive source shutter to be **verified closed and locked**. Sign and date the form and send to the Radiation Safety Officer. Please note the following:

- All sources on the vessel or all sources on the line within 4 feet of the line entry point must be verified closed and locked in the closed position.
- Some line entries will require closing more than 1 source.
- The survey meter **must** be at the same location for the **open** and **closed** shutter readings for a given source.
- The survey meter must have a calibration date within 6 months of the date of use.

Vessel or Line name/description: _____

Survey Meter Manufacturer: _____ Cal. Date: _____
Model #: _____ Serial #: _____

Source Number	Source's ID #	Shutter Open mr/hr reading	Shutter Closed mr/hr reading	<input checked="" type="checkbox"/> Shutter Locked Closed
1				
2				
3				
4				

Verifier's Name (Please print): _____

Verifier's Signature: _____ Date: _____

WVO Radiation Producing Machine (RPM) Program

Introduction	A written Radiation Safety Program for Radiation Producing Machines (RPMs) is necessary to provide guidance on the safe use of machines that produce ionizing radiation and ensuring compliance with local regulations.
Inventory	<p>A current, accurate inventory of radiation producing machines (RPMs) must be available.</p> <p>RPMs include but are not limited to: X-ray diffraction analytical machines, X-ray fluorescence analytical machines, diagnostic X-ray machines, electron microscopes and Sedigraphs.</p> <p>Radiation Producing Machines within WVO are primarily used for analytical research. A current list of all RPMs is maintained by the site RSO.</p>
Responsibility	<p>The site RSO is responsible for the oversight of the Site RPM Radiation Safety Program.</p> <p>The person who is responsible for the RPM is considered the RPM Owner. The RPM Owner is responsible for ensuring compliance with the requirements of this program in this facility.</p> <p>Operation of a medical diagnostic x-ray system shall not be permitted without a current diagnostic x-ray certificate issued by the West Virginia Bureau for Public Health, as per WV 64 CSR 23.</p>
Emergency Procedures	<p>In case of an emergency, activate emergency alarm.</p> <p>Be prepared to relay information about the RPM involved its type and location.</p> <p>Written RPM Emergency Procedures for this facility are posted on the near each RPM.</p>

WVO Radiation Safety Program
Union Carbide, a subsidiary of The Dow
Chemical Company

ALARA
Program/Policy

It is the policy of The Dow Chemical Company to maintain all radiation exposure to personnel ALARA (As Low As Is Reasonably Achievable). A COPY OF THE WRITTEN ALARA PROGRAM FOR THIS FACILITY CAN

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WVO Radiation Producing Machine (RPM) Program, Continued

Training	<p>Personnel that work with, or are exposed to radiation from RPMs, must receive training on the hazards of radiation and procedures on how to work with/around such sources safely. The level and frequency of this training must be commensurate with the degree of hazard.</p> <p>Personnel that work with RPMs must receive training prior to working with the RPM and anytime the work changes significantly. Contact the RSO for training.</p>
Procurement	<p>All Radiation Producing Machines (RPMs), <u>must</u> be approved by the site RSO prior to ordering. This is necessary to ensure compliance with the regulations regarding RPMs.</p>
Lockout/Tagout	<p>Radiation producing machines (RPMs) must be secured according to the Site's Lockout/Tagout procedure/requirements before personnel may work in an area that has that potential for exposure to the radiation beam of a RPM.</p> <p>Written Radioactive Lockout/Tagout procedures may be accessed by clicking here. Contact the site RSO if you need additional information concerning Lockout/Tagout of RPMs.</p>
Visual Inspections	<p>A visual inspection must be performed annually to assure compliance with regulations of the following items:</p> <ul style="list-style-type: none">• The Radiation Producing Machine (RPMs) is in its approved location.• Appropriate warning signs are present and in good condition.• Appropriate warning and information labels (attached to the RPM) are present and in good condition.• The physical condition of the RPM is good. <p>The RPMs shielding is appropriate and in good condition.</p> <p>This inspection is typically performed by the site RSO, Industrial Hygiene, or EH&S Delivery. The RSO should be contacted if any problems with the above items are observed between annual inspections.</p>

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WVO Radiation Producing Machine (RPM) Program, Continued

Radiation Exposure	<p>Periodic surveys of the radiation fields around radiation producing machines are performed to assure that radiation exposure is within established limits.</p> <p>These surveys are performed annually by the site RSO or their designee.</p> <p>A survey will be performed following any maintenance requiring the disassembly or removal of a local component in the system or any time a visual inspection of the local components in the system reveals an abnormal condition. If an authorized vendor performs work on the machine and performs a field survey on the instrument, the results of the survey must be sent to the site RSO.</p> <p>It is recommended that personnel using RPMs wear film badges to ensure they are not being inadvertently overexposed.</p>
Shutter Operation	<p>Many Radiation Producing Machines include shutters or interlocks that prevent exposure to the radiation beam of the equipment. These shutters and interlocks are important safety equipment. Therefore, they must be tested for operability periodically.</p> <p>It is the responsibility of the machines owner or operator to perform these tests.</p> <p>No person shall bypass a safety device unless such person has obtained the approval of the site RSO. Such approval shall be for a specified period of time. When a safety device has been bypassed, a readily discernible sign bearing the words "SAFETY DEVICE NOT WORKING", or words having a similar intent, shall be placed on the radiation source housing.</p> <p>Radiation dosimetry must be worn by personnel using RPM's with the safety devices bypassed.</p>
Monitoring	<p>To assure that radiation survey instruments used for monitoring at this facility are accurate, annual inspection and calibration is performed. The calibration and inspection program is handled by the site RSO or Industrial Hygiene.</p> <p>Employees will be monitored for exposure to radiation from RPMs.</p>
RPM Removal	<p>Radiation producing machines must not be relocated, removed or serviced without the approval of the RSO.</p>
Transfer	<p>The site RSO <u>must</u> be notified before any internal or external transfers of radiation producing machines. This includes transfer of ownership of the machines and returns to the manufacturer.</p>
Disposal	<p>The site RSO must be notified before disposal of any RPM. (Verify state requirements).</p>
Records	<p>Documentation of the requirements of this program must be kept and maintained according to the site record retention policy.</p>

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WVO Radiation Producing Machine (RPM) Program, Continued

**Template
Document
Revision History**

Below are at least the last three revisions of this document but includes all revisions within the last 6 months.

Date	By	Description
3/24/00	Janet Grappin	Original Document
2/21/02	Jim Weldy	Updated

**Document
Revision History
for Facility Copy**

Below are at least the last three revisions of this document but includes all revisions within the last 6 months.

Date	By	Description
10/4/02	Michael Boyd	Modified for WVO
3/6/03	Michael Boyd	Updated and modified as per Jim Weldy
7/13/03	Michael Boyd	Compiled program elements into one document
8/8/03	Michael Boyd	Modifications made based on comments provided by: Jeff Blatt, WVO Responsible Care Leader Manhar Patel, WVO EHS Delivery Leader, CIH Jim Weldy, Dow Radiation and IH Specialist Tom Bloss, IH Delivery Technician
8/15/03	Michael Boyd	Modifications made based on comments provided by Mike Green, Union Carbide RSO