



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION I  
631 PARK AVENUE  
KING OF PRUSSIA, PENNSYLVANIA 19406

Docket No. 70-687

APR 18 1980

Union Carbide Corporation  
ATTN: Mr. James J. McGovern  
Production Manager, Radiochemicals  
P.O. Box 324  
Tuxedo, New York 10987

Gentlemen:

Subject: Inspection No. 70-687/80-02

This refers to the inspection conducted by Mr. W. W. Kinney of this office on January 29 - February 1, 1980, of activities authorized by NRC License SNM-639 and to the discussions of our findings held by Mr. W. W. Kinney with yourself and members of your staff at the conclusion of the inspection.

Areas examined during this inspection are described in the Office of Inspection and Enforcement Inspection Report which is enclosed with this letter. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspector.

Within the scope of this inspection, no items of noncompliance were observed.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and the enclosed inspection report will be placed in the NRC's Public Document Room. If this report contains any information that you (or your contractor) believe to be proprietary, it is necessary that you make a written application within 20 days to this office to withhold such information from public disclosure. Any such application must be accompanied by an affidavit executed by the owner of the information, which identifies the document or part sought to be withheld, and which contains a statement of reasons which addresses with specificity the items which will be considered by the Commission as listed in subparagraph (b) (4) of Section 2.790. The information sought to be withheld shall be incorporated as far as possible into a separate part of the affidavit. If we do not hear from you in this regard within the specified period, the report will be placed in the Public Document Room.

APR 13 1980

No reply to this letter is required; however, should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

*for*   
George H. Smith, Chief  
Fuel Facility and Materials Safety  
Branch

Enclosure:

Office of Inspection and Enforcement  
Inspection Report No. 70-687/80-02

cc (w/encl):

M. H. Voth, Manager Nuclear Operations  
W. G. Ruzicka, Reactor Project Engineer  
C. Konnerth, Health Physicist  
R. Bollinger, Vice President, Medical Products Division

bcc (w/encl):

IE Mail & Files (For Appropriate Distribution)  
Central Files  
Public Document Room (PDR)  
Nuclear Safety Information Center (NSIC)  
Technical Information Center (TIC)  
REG:I Reading Room  
State of New York  
IE Headquarters, FFMSI (Attn: A. Grella)  
DOT office local to the facility  
NRC Office of State Programs (Attn: G. W. Kerr) (3 cys)  
NMSS, Division of FCMS (Attn: D. A. Nussbaumer)  
NMSS, Division of WM (Attn: R. Browning)  
State of New York, Department of Labor, Division of Safety & Health

U. S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT

REGION I

APR 21 1980  
REGION I HAS NOT OBTAINED INSPECTION  
PERMITS BY MANAGEMENT DATE 10-27-2005

Report No. 70-687/80-02

Docket No. 70-687

License No. SNM-639 Priority 1 Category UR

Licensee: Union Carbide Corporation

P.O. Box 324

Tuxedo, New York 10987

Facility Name: Sterling Forest Research Center (Hot Laboratories)

Inspection At: Tuxedo, New York

Inspection Conducted: January 29 - February 1, 1980

Inspectors: W. W. Kinney  
W. W. Kinney, Project Inspector

4/16/80  
date

J. J. Kottan  
J. J. Kottan, Radiation Specialist

4/16/80  
date

\_\_\_\_\_

\_\_\_\_\_ date

Approved by: H. W. Crocker  
H. W. Crocker, Chief, Fuel Facilities  
Projects Section, FF&MS Branch

4/17/80  
date

Inspection Summary:

Inspection on January 29-February 1, 1980 (Report No. 70-687/80-02)

Areas Inspected: Routine, unannounced inspection by a region-based inspector on the licensee's program for the packaging of low-level radioactive waste for transport and burial. The inspection involved 32 inspector-hours onsite by two region-based inspectors.

Results: No items of noncompliance or deviations were identified.

## DETAILS

### 1. Persons Contacted

- \*J. J. McGovern, Business Manager, Radiochemical Products
- \*M. H. Voth, Manager, Nuclear Operations
- H. C. Hart, Facilities Engineer
- \*L. Thelin, Supervisor, Health Physics

\*Denotes those present at the exit interview.

### 2. Scope of Inspection

Part of this inspection on the packaging of low-level radioactive waste for transport and burial concerned the areas of concern listed in a letter from Heyward G. Shealy, Chief, Bureau of Radiological Health of the State of South Carolina to G. Wayne Kerr of the NRC Office of State Programs. Mr. Louis S. Cabasino of the State of New York Department of Labor participated in this part of the inspection. The rest of the inspection concerned inspection of the licensee's actions in response to IE Bulletin 79-19.

### 3. State of South Carolina Concerns

#### a. Radioactive Content in Waste Shipments

Union Carbide Corporation produces medical radioisotopes by irradiating highly enriched uranium targets for a short period of time. The irradiated material is chemically processed to separate the molybdenum-99 from the other fission products and the uranium. The material other than the molybdenum is packaged for burial. The licensee has characterized the distribution of the fission products produced by the irradiation process which is performed repeatedly. The licensee measures the gamma radiation from a drum containing the waste fission products, and calculates the amounts of the various fission products in the waste from the gamma radiation measurement. The licensee keeps records on the amount of uranium in each component and process stream. The amount of uranium in the waste is calculated by use of these records.

#### b. Transuranic Element Content of Waste

The licensee considers the plutonium-239 produced from the  $n, \gamma$  conversion of uranium-238 to be the only significant transuranic in the waste sent to the Barnwell burial site. The licensee calculates the amount of plutonium-239 present in waste from the amount of uranium-238

initially present in material which was irradiated and processed to produce the waste and the neutron flux and irradiation time for the material in the reactor. The licensee has determined from these calculations that the concentration of the plutonium in the aluminum cylinders used to incapsulate the liquid wastes solidified with concrete is within the 10 nanocurie per gram limit. Two of the aluminum cylinders containing 15 pounds of solidified waste are placed in 55 gallon drums which typically weigh 275 pounds.

The inspectors suggested that the licensee investigate the possibility of obtaining laboratory analyses of the plutonium content of the liquid waste containing the plutonium. The licensee indicated they would attempt to get actual analyses of the plutonium content of the waste.

c. Solidification Process Used on Liquid Waste

The liquid waste destined for burial at the Barnwell facility is the liquid containing the uranium and fission products discussed in the foregoing section. The liquid waste is mixed with cement inside a 5 inch diameter aluminum container approximately 12 inches high. According to the licensee, they had bench tested the procedure and demonstrated that there was no free standing liquid using the cement to liquid ratio defined in their procedure. The welded aluminum container has an aluminum pipe nipple welded on the top for introduction of the cement and liquid into the container. An iron pipe cap is used to seal the container closed. As indicated previously, this container is placed inside a 55 gallon drum.

d. Radioactive Gases

The licensee performed an experiment to determine the origin of the airborne radioactive material which was detected when sampling the air close to the waste drums. The licensee found that the radioactive iodine was contaminating the outside surfaces of the waste drums while the drums were in the hot cells. The licensee also found that washing the drums with a sodium hydroxide wash prior to removal from the hot cell was an effective way of removing the contamination. The licensee also started to wash the inside of the B3-1 casks prior to loading the waste drums inside the cask.

e. Description of Waste Type and Form

The types of waste are the solidified liquids, described previously, and dry waste. The dry waste is glass ware, glass filters, tubing, vycor crucibles, aluminum and stainless steel target capsules, resins, absorbent media, and syringes.

The licensee places the compressible dry waste inside gallon containers. The containers are then crushed to approximately two-thirds the original volume.

The chemical constituents are compounds containing uranium, silicon, carbon, aluminum, iron, chromium, molybdenum, technetium, and mixed fission products. Organic compounds are also present.

f. Review of Process

The process producing the waste was reviewed. This process review is reflected in the information previously discussed.

The packaging of waste in B3-1 casks for shipment to the Barnwell burial facility was observed. This is discussed in detail in section 8.a. of this report.

4. Copies of Licenses, Regulations, and Requirements

The licensee has a current set of DOT and NRC regulations for the packaging and transport of low-level radioactive waste material.

The licensee had a copy of Washington State License No. WN-1019-2 and the pertinent amendments for the Nuclear Engineering Company (NECO) burial site at Richland, Washington. The licensee also had a letter from NECO dated January 18, 1980, which concerned Amendments 10 and 11 of the Washington State license and gave specific information on conditions of the license. The licensee did not have a copy of the new NRC license issued to NECO for the Richland burial site. They indicated they were expecting a copy from NECO in the near future. The licensee also had a copy of an executive order by the governor of Washington relating to transport of commercial low-level waste.

The licensee had a copy of Nevada State License No. 13-11-00043-02 and its four amendments for the NECO burial site at Beatty, Nevada. The licensee also had a copy of an executive order by the governor of Nevada relating to transport of commercial low-level radioactive waste.

The licensee had a copy of Amendment No. 18 of NRC Materials License No. 46-13536-01 to Chem-Nuclear Systems, Inc., which amended the license in its entirety on August 28, 1979. The licensee also had a copy of Amendment No. 19 to the license. The licensee also had a copy of Amendment No. 26 to Chem-Nuclear Systems, Inc. South Carolina Radioactive Material License No. 097, which amended the license in its entirety. The license had copies of the Barnwell Disposal Site Criteria.

## 5. Operating Procedures

The licensee has three procedures for packaging of low-level radioactive waste and loading of the waste on vehicles for transport to the burial grounds. These are:

- SP-01 B3-1 Cask Loading and Shipping, dated September 30, 1976 (currently rewritten and being approved);
- SP-02 Radioactive Waste Disposal Procedures (currently in last stages for approval); and
- Health Physics Low Level Waste Shipping Procedures.

The last two procedures were prepared as a result of the review the licensee made as a result of Statement No. 4 of IE Bulletin 79-19.

Procedure SP-01, B3-1 Cask Loading and Shipping, addresses the inspection of the gasket on the lid of the cask and replacement of gasket if necessary. Inspection and cleaning of the interior of the cask is called for. After the waste drum is in the cask, the lid in place, the lid hold-down bolts are coated with an anti-sieze compound and torqued to 50 foot-pounds. The tie downs for holding the cask on the transport vehicle are inspected for damage, wear or corrosion. The cask is tied down in accordance with a sketch provided in the procedure. The procedure has places for the operator to sign that the work has been completed.

Procedure SP-02, Radioactive Waste Disposal Procedure, provides the instructions for (1) assuring that only that waste allowed for burial at the NECO burial sites in Richland, Washington, and Beatty, Nevada, are packaged for burial; and (2) packaging the waste properly for transport and burial. The procedure addresses the packaging of the following radioactive waste.

- Liquid Scintillation Vials
- Radioactive Biological Waste - other than Tc99m
- Non-Radioactive and Tc99m Contaminated Waste (to be disposed of as non-radioactive waste)
- Dry Solid Radioactive Waste
- Radioactive Organic Liquids (Procedure applicable to Washington Burial Site Only)
- Aqueous Radioactive Liquids

The Health Physics Low Level Waste Shipping Procedures address completing the data sheets, performing the required radiation measurements, labeling the packages, and surveying the transport vehicles after loading.

None of the procedures address the DOT requirements for packages with surface radiation levels above 200 mR/hr or 10 mR/hr at 3 feet. Also the procedures do not address the exclusive use vehicle requirements which must be met if packaging of low specific activity radioactive material is done in accordance with 49 CFR 173.392(b) and (c) rather than in accordance with 49 CFR 173.392(a).

The licensee is preparing a procedure covering the solidification of aqueous liquid radioactive waste. However, it was not available for review at the time of the inspection.

#### 6. Training

The licensee was preparing a training manual for use by personnel involved in the packaging of waste for transport and disposal. All personnel involved in the waste packaging will be required to be trained according to the licensee. As conceived, the personnel will mainly be "self-taught". The licensee has provided some classroom lectures on waste handling for personnel. The licensee does not plan to employ methods such as testing, close supervision, and/or periodic auditing to assure that employees have sufficient familiarity with procedures and packaging requirements.

#### 7. Audits

The licensee uses the Nuclear Safeguards Committee to perform the auditing of the transfer, packaging, and transport of low-level radioactive wastes. An audit of transfer, packaging, and transport of low-level radioactive waste was performed on October 3, 1979, by the Manager of Health, Safety and Environmental Affairs. This audit identified the need for written procedures for waste disposal.

The licensee did not formally establish and implement an audit program of activities associated with the transfer packaging and transport of low-level radioactive wastes.

The above mentioned audit was the management type audit which was conducted within 60 days after IE Bulletin 70-19 was issued.

#### 8. Examination of Packages

##### a. B3-1 Casks

The inspector observed the activities involved in the preparation of B3-1 casks for loading, the loading of the casks, placement of the casks on the flat bed trailer, and surveying the transport vehicle.

The inspector inspected the condition of the two B3-1 casks which were to be loaded. The casks belonged to NECO. The sealing gaskets were present and appeared to have been in service for a long time. The insides of the casks had been painted at one time. Much of the paint was either worn off or chipped off. The gasket sealing surface on each cask was rounded and dented from being hit during the loading and unloading of drums in the cask and the placing of the lid in place. The inspector placed a piece of paper on the sealing surface of the cask, and the licensee placed the lid on the cask. Examination of the paper showed that the gasket was making contact with the sealing surface. However, the general condition of the casks indicate the need for renovation of the casks by the owners of the casks.

The inspector noted that one of the casks did not have the model number marked on it as required by 10 CFR 71.53(c). The licensee contacted NECO concerning this. NECO sent a letter to the licensee certifying that the cask had been fabricated in accordance with the design approved by the AEC (NRC). NECO asked Union Carbide to mark the container with its model number, MOD. NO. B3-1. Union Carbide stamped the model number on the cask identification plate using 1/2 inch dies.

One of the casks had ice in it. The licensee used alcohol to speed the melting of the ice. The water-alcohol solution was mopped from the cask. The mop rags soaked in alcohol and water were not placed in a metal container as required by the licensee's general safety rules.

The licensee washed the interior of the casks with a sodium hydroxide wash solution. The inspector noted that the man wore only plastic protective gloves while using the caustic solution. The licensee's general safety rules require that rubber aprons, gloves, and a full face shield are to be used when working with acid and caustic.

The licensee washed off the outside of an 55 gallon drum of waste using the manipulator while the drum was in the hot cell.

The licensee then evacuated the area where the casks were located, and opened the door to the cell. A new 55 gallon waste drum was placed on the pad of the door with a 1 1/2 ton crane. The cleaned waste drum was hooked onto the crane. The drum was removed from the door pad by the crane and moved to the gamma counting position. The gamma levels from the drum were recorded by Health Physics. The drum was placed in the cask. The lid, which was hooked on a 10 ton crane, was placed on the cask. The door to the cell was closed.

An operator wearing a lab coat, shoe covers, and a half-mask went to the cask area and changed the hook from the lid of the loaded cask to the lid of the other empty cask; and removed the plastic cover from

the top of the empty cask. When the man come back from performing the job, he removed his shoe covers and lab coat at a doorway and disposed of the clothing properly. The inspector noted that no contamination survey was made of the individual before or after removal of the protective clothing.

The outside of another drum was cleaned while the drum was in the cell. The door of the cell was again opened and the process described before was repeated and the drum of waste was loaded into the second cask.

Health Physics started an air sampler in the area where the cell door was opened and the waste was placed into the casks. After the results from the air sample showed the airborne radioactivity within limits, personnel went in and marked off the zone where contamination may have fallen from the open door.

The lids of the casks were lifted about 1 foot and air samples were taken of the air between the lid and cask body. The lids were replaced on the casks. The bolts, which had been lubricated, were tightened using a 2 foot handle wrench. The outside of the casks were sprayed with a decontaminant. The outside of the casks were smear surveyed.

The casks were labeled with a Radioactive-Yellow III labels. The curies and transport indexes for each cask were listed on the labels.

The casks were placed on the trailers and were securely tied down to the trailer. The trailer was placarded with radioactive labels.

The licensee took radiation readings of the trailer and the cab of the vehicle.

The licensee finished filling out the shipping papers. The Tri-State Motor Transit Company driver signed the papers appropriately.

b. 55 Gallon Drum

The licensee opened a drum of waste at Building 4 at the request of the inspector. The licensee had filled out the PACKAGE CERTIFICATION form for the drum. The waste came from Lab C-7 of Building 4. The waste was dry solid waste. The drum had been surveyed by health physics. The drum lid had a good sealing gasket. The drum contained lab coats, empty boxes, and empty bottles. There was no evidence of any liquid in the waste.

9. Exit Interview

The inspector met with licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on February 1, 1980. The scope of the inspection was presented, and the following items were discussed.

The inspector mentioned that the licensee should have actual analyses of plutonium content in the Raw Fission Waste if at all possible. The licensee indicated they would attempt to obtain actual analyses of the plutonium content in this waste stream.

The condition of the NECO B3-1 casks was discussed. The licensee indicated they would use these casks as sparingly as possible.

The failure of the operators to place the water-alcohol rags, which resulted from the removal of ice from the casks, in a metal container was pointed out. The failure of the operator to wear prescribed safety equipment while using the caustic solution to wash the interior of the cask was pointed out. And the failure of the operator to perform a personal survey after removing his protective clothing during the cask loading operation was pointed out. The licensee indicated they would investigate these matters and take appropriate action.