

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

Region I

Report No. 70-687/79-02

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 Laboratory)

Inspection at: Tuxedo, New York

Inspection conducted: May 14-16, 1979

Inspectors: J. E. Plumlee, for  
J. Roth, Fuel Facilities Inspector

8/6/79  
date signed

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

8/6/79  
date signed

Inspection Summary:

Inspection on May 14-16, 1979 (Report No. 70-687/79-02)

Areas Inspected: Routine unannounced inspection by a region based inspector of the licensed program including: scope of operations; organization; facility changes and modifications; safety committees; training; maintenance; review of operations; nuclear criticality safety; routine use of packagings; and licensee action on previously identified enforcement items. The inspection was conducted during regular working hours and involved 18 inspector hours on-site by one NRC region based inspector.

Results: Of the 10 areas inspected, no apparent items of noncompliance were identified in 8 areas; 4 apparent items of noncompliance were identified in 2 areas (Deficiency - Failure to maintain the array of 17-H drums in the waste storage hot cells as authorized by Amendment #2(79-02-01) para 5a; Infraction - Failure to survey for alpha contamination as required by 10CFR 20.201(b) (79-02-02) para. 5c; Deficiency - Failure to maintain a running inventory log of U-235 in various locations as required by L.C. 15 (79-02-03), para. 5d; Deficiency - Failure to post Caution Radioactive Materials signs on the QC Laboratory and a U-235 containing storage drawer in the QC Laboratory (79-02-04) para. 5e).

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DETAILS

1. Persons Contacted

\*C.J. Konnerth, Manager, Health Safety and Environmental Affairs

\*L. Thelin, Health Physicist

J.J. McGovern, Business Manager, Radiochemical Products

\*M.H. Voth, Manager, Nuclear Operations

\*Denotes those present at the exit interview.

The inspector also interviewed other licensee employees during the course of this inspection. They included MBA custodians, health physics technicians, hot cell operators, various operations supervisors and general office personnel.

2. Scope of Operations

The licensee operates a pool type reactor with MTR type fuel elements at a maximum thermal power output of five megawatts. The reactor is used to produce radioactive isotopes mainly for use by pharmaceutical houses. The isotopes are produced by irradiation of U-235 in target tubes, separated by chemical techniques in a hot cell network located on site and loaded onto columns for shipment. The spent uranium is packaged for shipment to a licensed burial ground.

3. Licensee Action on Previously Identified Enforcement Items

(Closed) Infraction (687/78-02-01) Failure to post the notice required by 10CFR 21.6. The inspector verified that the licensee had installed an additional bulletin board in the central hallway on the main floor of the hot lab building. The inspector also verified that the notice required by 10CFR 21.6 including Section 206 of the Energy Reorganization Act and other postings required by 10CFR Part 19 were positioned on the available bulletin boards so that each notice was conspicuous and could be easily read by employees entering or leaving the Reactor/Hot Lab building. Corrective actions have been completed on this item of noncompliance.

(Closed) Deviation (687/78-02-02) Failure to evaluate the use of unsafe geometry containers for nuclear criticality safety. NRC-NMSS with the concurrence of Union Carbide Corporation Incorporated License Condition 17 into SNM 639 in Amendment 3 dated

March 26, 1979, Condition 17 states that "the licensee shall empty and clean the unsafe geometry container in the waste storage laboratory after each batch of not more than 350 grams of U-235 have been processed through the plating laboratory and shall maintain records showing that the container has been emptied after each 350 gram batch is processed". The inspector verified through an examination of licensee records that the unsafe geometry container located in the waste storage laboratory had been emptied as required since the issue of Amendment #3. The corrective actions on this item of noncompliance have been completed.

(Closed) Infraction (687/78-02-03) Failure to post a radiation area with signs and use of improper signs in a high radiation area. The inspector verified that the waste storage building had been posted with new Caution - Radioactive Area signs and that a new high radiation area on top of the hot cells was properly posted and entry was properly controlled. Corrective actions have been completed on this item of noncompliance.

(Closed) Infraction (687/78-02-04) Failure to maintain the quantity of SNM at or below license limits in hot cell No. 5. The facility license was modified to increase the allowable contents of cell No. 5 by Amendment No. 2 dated October 30, 1978. The inspector verified that hot cell No. 5 was properly posted with a higher limit for the quantity of SNM and that the actual contents of the hot cell was below the newly posted limit. Corrective actions have been completed on this item of noncompliance.

(Open) Infraction (687/78-02-05) Failure to conduct a nuclear safety audit of the hot laboratory facilities each 12 months. The Nuclear Safeguards Committee had not established a schedule for audits of the facility as of the date of this inspection (70-687/79-02). Discussions with licensee representatives indicated that the audit schedule should be formally established by June 30, 1979.

#### 4. Organization

The following is the current organization of the UCC - Sterling Forest Laboratory Reactor and Hot Cell Operation effective May 1, 1979.

R.E. Bollinger, Vice President/General Manager, Nuclear Products  
C.J. Konnerth, Manager, Health, Safety and Environmental Affairs  
L. Thelin, Supervisor, Health Physics

J.J. McGovern, Business Manager, Radiochemicals  
K.D. George, Senior Scientist  
J.C. Perhauch, Business Analyst  
F.J. Morse, Process Engineer  
E.P. O'Gull, Manager, Materials  
W.W. Leinheiser, Supervisor, Quality Control  
M.H. Voth, Manager, Nuclear Operations  
D.D. Grogan, Supervisor, Hot Laboratory  
J.W. Paradiso, Supervisor, Reactor  
H.C. Hart, Facilities Engineer.

5. Review of Operations

The inspector examined all areas of the hot laboratory facility to observe operations and activities in progress, to inspect the nuclear safety aspects of the facility and to check the general state of cleanliness, housekeeping and adherence to fire protection rules within the various facilities.

a. Hot Cell Storage of Waste Solutions

The inspector observed that waste solutions containing high enriched uranium was being stored in 55 gal. (17H) containers in hot cells 1 and 5. It was also noted that the storage array being used for the 17H containers was not as depicted in drawing 10134B attached to and described in an amendment application dated May 3, 1978 which was incorporated into the facility license by Amendment #2 dated October 30, 1978. The array in Cell 5 consisted of 7-17-H containers instead of the authorized 5 containers and the array in Cell 1 consisted of 13 17H containers with 4 of the containers stacked on top of 9 containers. In neither case was the 2000 gram cell limit exceeded. Failure to maintain the arrangement of drums as authorized by Amendment #2 was identified as an item of noncompliance (79-02-01).

b. Nuclear Safety Postings

The inspector noted that the licensee had neglected to remove nuclear safety limit signs which had been posted at the entrances to the operating side of the hot cells when other signs had been posted on each individual hot cell. These obsolete signs indicated that the maximum quantity of U-235 allowed in each hot cell was 650 grams. Each of the hot cells was properly posted in that cells 1 and 5 were posted for

2000 grams U-235 and cells 2, 3, and 4 were posted for 650 grams U-235.

c. Alpha Contamination Control

The inspector observed an operator leave a controlled contamination area (the waste solution storage laboratory) after removing contamination control equipment (shoe covers, laboratory coat and rubber gloves) and then start to enter an uncontrolled (clean) area without surveying for alpha contamination. Discussions with licensee representatives indicated that there are no established procedural requirements to survey for contamination when leaving potentially contaminated areas since each individual is required to use a hand - foot counter prior to leaving the building. During subsequent discussions with licensee representatives by telecon on May 18, 1979 it was determined that the hand - foot counter would not detect alpha contamination. Failure to survey for alpha contamination was identified as an item of noncompliance contrary to 10 CFR 20.201(b) "Surveys". (79-02-02)

d. Running Inventory Records

The inspector noted that the licensee was not maintaining running U-235 inventory records to assure the U-235 mass limits were not exceeded as required by License Condition 15 for the welding laboratory, the solution make-up laboratory, the plating laboratory, the waste solution storage laboratory and for each of the five hot cells. It was noted that the licensee had posted a single number on a blackboard in each location which indicated the area SNM contents. Failure to maintain running U-235 inventory records was identified as an item of noncompliance. (79-02-03)

e. Labeling

The inspector observed that the Quality Control Laboratory and the storage drawer in the Quality Control Laboratory which contained U-235 bearing target tubes and solutions bearing radioactive materials was not marked with labels bearing the words "Caution - Radioactive Materials". This was contrary to 10 CFR 20.203e(1) and was identified as an item of noncompliance which was corrected prior to the end of the inspection. (79-02-04)

6. Nuclear Criticality Safety Gamma Radiation Monitors

The inspector verified that all facility area radiation and criticality monitors appeared to be operating properly. Each monitor was provided with a remote readout meter located on a control panel which was in the hot cell operating area. All monitors except for those located in the hot cells, the two criticality monitors and the one located in the filter room were set to alarm between 5 and 10 mr/hr. Only that monitor located in the hot cell operating area was set to alarm at 5 mr/hr. The monitor located in the filter room and the criticality monitor was set to alarm at 18-20 mr/hr. It was noted that attached to the control panel was an internal procedure "Daily Instrument - Monitors Checklist" undated which stated that the criticality monitors were to be set at 10 mr/hr and all other monitors were to be set at 5 mr/hr. The fact that this internal procedure was not being adhered to was discussed at the exit interview. There did not appear to be any safety related problems associated with this failure to follow internal procedures.

7. Nuclear Safeguards Committee

The Inspector examined the records of two meetings of the Nuclear Safeguards Committee held between November 16, 1978 and March 20, 1979. In each case review actions and recommendations made by the committee were adequately documented. Included in these records were supporting documents used by the committee to develop the recommendations made. In addition, the implementation of these recommendations was adequately documented in the committee minutes. Committee actions discussed during these meetings relative to SNM-639 included, a review of the proposed procedure for recovery of U-235 from fission product solutions, preparation of a list of all required facility audits and establishment of an audit committee, and, review of deficiencies noted in the Model B-3 shipping containers.

8. Facility Changes and Modifications

During examination of the facility, the inspector observed that the construction work to expand the facility shipping-receiving area had been completed. This modification expanded the spent target material packaging area and included monorail system to transport the load casks from cells 1 or 5 and/or the packaging area to the transporting vehicle.

9. Training

As reported in inspection report (70-687/78-02) the licensee had started a program to retrain all persons working with radioactive material in the topics discussed in the site health physics guide entitled "Understanding Radiation" which had been assembled by members of the facility Health Physics Department. This guide covers basic areas of radiation protection including, health physics criteria; effects of radiation on man; handling of SNM; industrial safety; emergency procedures; contamination control procedures; warning signs; and protective equipment. Each person retrained was to be tested to determine proficiency with a score of 70 on the test being a passing grade. As of the date of this inspection (70-687/79-02) 148 of 168 eligible personnel had satisfactorily completed the retraining program. Licensee representatives indicated that it was expected that the remaining 20 individuals will have completed the retraining program by June 30, 1979.

10. Special Nuclear Material at the Sterling Forest Research Center

The inspector examined licensee records and MBA logs and determined that the quantity of SNM located at the site was within the license limits established for License No. SNM-639.

11. Maintenance

a. General

The inspector determined that a facility instrument technician repairs all safety related equipment and the Health Physics Department technicians calibrate all safety related instruments.

All facility enclosed ventilation systems are equipped with manometers; the hot cell ventilation systems are checked daily and fume hoods in the facility are checked weekly. Absolute filters are changed at a  $\Delta P$  of about 2-2½ inches H<sub>2</sub>O. Ventilation system fans are checked weekly by operations personnel.

b. Preventative Maintenance

The Facility Engineering Group performs preventative maintenance on facility ventilation systems monthly. Instruments are calibrated once each year on a 12 month cycle and fume hood face velocities are determined once every six months. Hot cell ventilation systems are fully checked daily, cell negative

pressure is determined and recorded once each operating shift and the  $\Delta P$  on the main filter banks is recorded once each week.

c. Charcoal Filter Train

A new charcoal filter train was installed in the facility and started up during March 1978. This filter train services the single facility stack which receives air effluent from both the reactor and the hot cell ventilation systems. The individual systems are equipped with grab samplers which are analyzed for Iodine weekly and the main stack is equipped with a continuous stack monitor which, according to licensee representatives, has been indicating less than 1% of 10 CFR20 Appendix B requirements since installation of the new charcoal filter train in March 1978. The facility ventilation systems are also equipped with an automatic CO<sub>2</sub> discharge system in case of fire in the system. The CO<sub>2</sub> discharge system is not checked by activation, however, the system sensors are interconnected to set off an alarm if they fail for any reason.

12. Routine Use of Shipping Packages

This facility is currently an authorized user of the Model B-3 Shipping Cask (Certificate of Compliance 6058) and the Model GE-1600 Shipping Cask (Certificate of Compliance 9044).

a. Model B-3 Shipping Cask

On March 12, 1979 Union Carbide informed the NRC-NMSS that the Model B-3 casks had been removed from service because of an identified manufacturing defect. It was determined at that time that the casks in their possession had not been fabricated with the required stainless steel heat shield installed. In addition it was subsequently determined and reported on March 22, 1979 that the cask lifting lugs had been fabricated out of stainless steel rather than the required Cor-ten steel. As of this inspection it was observed that one of the casks (Part No. D35136-1-02) had been modified as required and that the other cask (Part No. D35136-1-03) was in the process of being modified as required. It was also determined that the cask safety analysis had been modified to reflect the current as-built condition of the casks and that Certificate of Compliance 6058 Revision 4 had been issued to the licensee

on April 27, 1979 which references a letter concerning the modifications from Battelle Columbus Laboratories dated April 12, 1979.

It was noted that the licensee possessed all of the documents required by 10 CFR Part 71.

b. Model GE-1600 Shipping Cask

The inspector determined through discussions with licensee representatives that because of the nonconformance of the Model B-3 casks identified as discussed in paragraph a above, the licensee requested to become an authorized user of the Model GE-1600 cask. As part of this request, the licensee requested an amendment to Certificate of Compliance 9044 which described the material being shipped from the facility. Certificate of Compliance 9044 Revision 4 was issued by NRC-NMSS on April 2, 1979 and the licensee became a registered user of this cask on the same date. The inspector determined that the licensee possessed all of the documents concerning this cask as required by 10 CFR Part 71.

c. Shipment of Waste Materials in the Model GE-1600 Cask

The inspector observed the transfer of a 17H container out of Hot Cell No. 5 into a Model GE-1600 shipping cask. It was noted that the container being shipped contained only trace quantities of U-235. Personnel followed an internal checklist which details the steps to be followed from the time the shipping cask arrives at the shipping dock until the vehicle leaves the site. The steps involved included contamination check of the cask shield and trailer; radiation level readings on the cask; security and personnel checks prior to opening the hot cell door (doors closed and locked, personnel evacuation from potentially affected areas, placement of warning lights or chains in affected open passageways, radiation alarm checks, etc.); radiation level readings on the 17H container; loading of the 17H container into the cask; remote closing of the cask; air sampling in the affected area; contamination surveys of the affected area (clean up if necessary); unsecuring of the facility; radiation readings on the cask and trailer; and a check of the ventilation system on the secured hot cell.

The inspector noted that the preparation of this cask for shipment went uneventfully except for the inadvertent contamination of a portion of the area in the vicinity of the open cask and open Hot Cell door. This contamination was cleaned up prior to returning the area to normal use. Licensee determined dose rates and removable contamination on the cask as it was placed on the transporting vehicle were within Department of Transportation (DOT) regulations as follows:

	<u>DOT Limit</u>	<u>GE-1600 Cask with Overpack</u>
Dose Rate package surface mr/hr	1000	2
Dose rate at vehicle surface mr/hr	200	<1
Dose rate at six feet from vehicle mr/hr	10	<1
Dose rate in vehicle cab mr/hr	2	<1
Removable contamination dpm/100 cm <sub>2</sub>	22000	< 1850

13. Proposed Waste Recovery Process

In order to reduce the quantity of high enriched uranium sent to burial as waste material, the licensee has started development of a recovery process which will allow this material to be sent to the DOE Savannah River Facility for waste processing. The process being developed is proprietary. However, it involves the precipitation of undesirable anions, separation of the desirable uranium bearing solution, heating to dryness and conversion of the uranium to the oxide form. The uranium solution will be transferred to a 3 inch diameter aluminum vessel which will be used as the reaction vessel during the drying and oxide conversion steps. This vessel will then be sealed, stored and shipped to the Savannah River Facility.

14. Exit Interview

The inspector met with licensee representatives (denoted in paragraph 1) at the conclusion of the inspection at 3:00 p.m. on May 16, 1979. The inspector summarized the scope and findings of the inspection.