



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION III  
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Docket No. 50-264

Dow Chemical Company  
ATTN: Dr. R. R. Langner, Chairman  
Radiation Safety Committee  
Building 1803  
Midland, Michigan 48640

Gentlemen:

This refers to the safeguards inspection of your TRIGA reactor facility conducted on November 16 and 17, 1978, by Mr. J. P. Patterson of this office and to the discussion of our findings with Dr. G. Kochanny and Mr. K. Kelly of your staff at the conclusion of the inspection. Your activities pursuant to Title 10, Code of Federal Regulations, Part 70, "Special Nuclear Material" as they pertain to License No. R-108 were the subject of this inspection.

The enclosed copy of our inspection report identifies areas examined during the inspection. Within these areas, the inspection consisted of a selective examination of procedures and representative records, observations, and interviews with personnel.

No items of noncompliance with NRC requirements were identified during the course of this inspection.

Areas examined during the inspection concern a subject matter which is exempt from disclosure according to Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations. Consequently, our report of this inspection will not be placed in the Public Document Room.

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Dow Chemical Company

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We will gladly discuss any questions you have concerning this inspection.

Sincerely,

J. A. Hind, Chief  
Safeguards Branch

Enclosure: IE Inspection  
Report No. 50-264/78-04  
(Part 2.790(d) Information)

cc w/encl:  
Central Files  
Reproduction Unit NRC 20b

cc w/o encl:  
PDR  
Local PDE

ATTACHMENT CONTAINS  
100-264/78-04 INFORMATION

OFFICER	RILL <i>[Signature]</i>	RILL <i>[Signature]</i>	RILL <i>[Signature]</i>	RILL <i>[Signature]</i>		
SURNAME	Patterson/blk	Donabue	Hind	BROWN		
DATE	12/23/78					

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

REGION III

Report No. 50-264/78-04

Docket No. 50-264

License No. R-108

Licensee: Dow Chemical Company  
Building 1803  
Midland, Michigan 48640

Facility Name: TRIGA Reactor, Building 1602

Inspection At: Reactor Site, Midland, Michigan

Inspection Conducted: November 16 and 17, 1978

Inspectors: *G. P. Patterson*  
G. P. Patterson

Approved By: *J. F. Donahue*  
J. A. Hind, Chief  
Safeguards Branch

11/17/78

12/27/78

Inspection Summary

Inspection conducted on November 16 and 17, 1978 (Report No. 50-264/78-04)  
Areas Inspected: Special nuclear material control and accountability including facility organization and operation; measurement and controls; inventory; shipping and receiving; storage and internal controls and records and reports. The inspection involved 12 inspector-hours onsite by one NRC inspector.

Results: No items of noncompliance with NRC requirements were identified during the course of this inspection.

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## DETAILS

### 1. Persons Contacted

\*Dr. Gerald Kochanny, Laboratory Director  
\*Kerry Kelly, Assistant Reactor Supervisor  
Samuel Norwood, Health Physicist

\*Denotes those who attended the exit interview:

### Facility Organization and Operation

In the letter to the licensee from Region III Safeguards Branch following the previous inspection of March 3-4, 1976, Report No. 50-264/76-02, a statement was made that the licensee agreed to initiate some material control and accountability procedures for special nuclear material (SNM) held under License No. R-108. Also it was noted that this facility's authorized possession of SNM is less than one effective kilogram making it exempt from issuing written material control and accounting procedures as required by 10 CFR Part 70.51(c). Since then the licensee has issued safeguards procedures relating to material control and accounting of SNM under License No. R-108

These procedures were written as an appendix to Chapter 3 of the Administrative Procedures for TRIGA Reactor Operations. These were reviewed by the inspector and found to be satisfactory for this type of operation. One incorrect statement was made under Paragraph 9 regarding the reporting of a receipt or shipment off-site. A copy of this transfer, an NRC-741 form, shall be sent to the Department of Energy, P. O. Box E, Oak Ridge, Tennessee 37830, not to the Region III NRC office address. The licensee agreed to make this change.

The safeguarding and maintenance of all SNM assigned to this reactor is the responsibility of the Reactor Supervisor and in his absence to the Reactor Operations Committee. Except for SNM in sealed sources which require special procedures authorized by the Radiation Safety Committee, all SNM shall be stored, transferred between, and used in the reactor pool, storage wells in the floor of the reactor room, or one of the two radiation caves equipped with masterslave manipulators in Building 1602. These internal transfers shall be carried out only with the authorization of Health Physics and in the presence of the Reactor Supervisor. A signed record of any such transfer shall be filed with Health Physics and the Radiation Safety Committee.

The Reactor Supervisor is responsible for computation of uranium depletion. Current safeguards procedures state that burnup amounts will be adjusted every two years based on calculations made from operating periods and power levels recorded in the Reactor Log Book. Any loss or theft of SNM shall be reported by the Reactor Supervisor to both the Reactor Operations Committee and the Radiation Safety Committee and appropriate action taken as required by 10 CFR Part 70.52. A physical inventory is taken annually in conjunction with the yearly checkout of the TRIGA reactor and recorded in the Reactor Log Book. These conditions are all listed in the safeguards procedures.

Semi-annual Material Status Reports and Nuclear Material Transaction Reports (NRC-741) are issued by the Radiation Safety Committee staff. The licensee has confined his use and possession of SNM under License R-108 to the location and purposes authorized by license as required by 10 CFR Part 70.41. This operating license was renewed on November 21, 1977, with the issuance of Amendment No. 3 by the NRC's Division of Operating Reactor. This amendment renewed License No. R-108 until December 20, 1986.

X. Measurement and Controls

Usage of the 100 kilowatt TRIGA Mark I research reactor has been determined by the Reactor Supervisor from current operating data to be an average of \_\_\_\_\_ hours equivalent full power per week. By \_\_\_\_\_ the licensee's method of calculating burnup, this amounts to \_\_\_\_\_ grams total uranium and \_\_\_\_\_ gram U-235 over a two year period. Up to the previous inspection of March, 1976 no burnup had been reported by the licensee. The licensee, as a result of that inspection, issued a revised Material Status Report for the period ending December 31, 1975, reporting 7 grams U and 6 grams U-235 for the first 8.5 years of the reactor's operation.

The licensee reported \_\_\_\_\_ grams U and \_\_\_\_\_ grams U-235 on the NRC-742 ending March 31, 1978. For the most recent NRC-742 reporting period ending September 30, 1978, another 0.4 gram U and 0.3 gram U-235 was reported. At this rate \_\_\_\_\_ grams total U would be accumulated in two years (4 reporting periods).

The inspector calculated burnup for both the two year period and the most recent six month period ending September 30, 1978. His results were within 0.1 to 0.2 gram of the licensee's values. Again, as in the previous inspection, it was pointed out to the licensee that the NRC-742 report should be kept in whole gram units. The burnup amounts could be kept "in-house" until 1.0 gram accrues and report it then, keeping smaller amounts off the report until they reach a whole number. The Laboratory Director stated that he would bring this to the attention of the Reactor Supervisor when he returns to work from a current business trip.

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This research reactor operates only during normal work day shifts and for periods of time less than one hour. Its main use is for irradiating chemical samples for neutron activation analyses. All samples put in the reactor are representative of the licensee's chemical manufacturing and processing business.

4. Shipping and Receiving

There have been no shipments or receipts during the inspection period. The recently issued safeguards procedures stipulate that transfer of SNM shall require approval of the Radiation Safety Committee as well as the Reactor Supervisor.

5. Storage and Internal Control

All fuel elements and the two fission counters are stored in the

Locations of the fuel elements are listed on metal tags hung on a large core diagram mounted on a status board on one wall of the reactor room. There have been no transfers to different core locations since the previous inspection. When the annual inventory is taken, reactor procedures do require temporary transfer of two fuel elements to the storage rack until all the fuel elements have been verified by serial number. Then these two elements are returned to their original core position. These transfers and any checkouts of fuel are documented in the Reactor Log Book.

6. Inventory

This 100 KW TRIGA reactor has 91 positions in the core, only which contain fuel elements. The remainder positions are for graphite elements, control rods, a transfer tube and one location, F-17, which contains the Am/Be neutron source. These TRIGA fuel elements are made up of 91% Zr, 1% H, and 8% U by weight, cladding being either aluminum or stainless steel. The initial enrichment was 19.88% U-235. Since the fuel already had some exposure when the fuel was received from General Atomic in 1967, the current enrichment is slightly less than that.

For inventory verification - reactor core positions out of were randomly selected by the inspector. Fuel elements from these positions were withdrawn and raised to near the top of the pool. There under a spotlight, the fuel element was maneuvered to enable the serial number to be read. All serial numbers were compared with the location in the pool from a large status board mounted on the rear wall of the reactor room. All fuel elements were

properly identified by location and serial number. Location of the two fission counters in the pool was also pointed out to the inspector. These locations were confirmed by entries in the Reactor Log Book made for the annual fuel checkout when all fuel elements are raised from the core and identified by the serial number. Documentation that annual physical inventories are being taken was confirmed by the inspector by audit of the reactor log book. Reactor log book No. 26 noted an inventory was taken on February 2, 1977. Reactor Log Book No. 28 also had entries on February 13, 1978, that confirmed all 76 fuel elements were verified by serial number.

The only other SNM at this facility consisted of encapsulated Pu-238 sources held under License No. SNM-1451. This license was recently renewed and has a present expiration date of January 31, 1980. A total of 180 millicuries (mc.) were inventoried consisting of two 30 mc. sources and one item containing four separate, 30 mc. sources mounted in one metal holding device. These four sources in one mounting were formerly in a Texas Nuclear Corporation, custom made thickness gauge device. All these sources are assigned to responsible staff personnel as authorized and controlled by Radiation Safety Committee.

#### 7. Records and Reports

The records review included the period from the previous inspection date, March 4, 1976 until the present inspection. In that time span there has been no activity except for the inclusion of burnup data on two Material Status Reports (NRC-742). The revision to the NRC-742 form for the period ending December 31, 1975 requested during the previous inspection has been made by the licensee. This included an entry of grams U and grams U-235 for the cumulative burnup since the reactor became operational in July, 1967. Subsequent burnup data has been reported as described previously in Paragraph 3 of the report details.

The Radiation Safety Officer has been signing the NRC-742 forms beginning with the March, 1978 report. Formerly the Manager of Business and Government Statistics had been signing them as the authorized representative.

The inventory amounts reported on the NRC-742 form as of September 30, 1978, were verified by the inspector as being accurate. No transactions have occurred since that date to change these amounts. Exhibit A reflects the activity for License R-108 for the period of inspection.

There has been no change in the authorized limit of SNM of 3.4 kg. U-235 for license R-108 with the issuance of Amendment No. 3 to the facility license which extended the operating license to December 20, 1986.

The licensee's authorized limits and holdings as of March 5, 1974 by docket and license are as follows:

<u>Docket</u>	<u>License</u>	<u>Authorized Limit</u>	<u>Possession 3/17/78</u>
50-264	R-108	3.4 kg. U-235	
70-1487	SNM-1451	270 mc. Pu-238	

There was no apparent loss or theft of SNM that requires reporting as required by 10 CFR Part 70.52.

The licensee's records system provide sufficient information to comply with the record requirements of 10 CFR Part 70.

#### 8. Exit Interview

The licensee's representatives were briefed on the areas inspected as described in the preceding paragraphs. They were informed that no items of noncompliance were identified by the inspector as a result of this inspection.

The safeguards procedures written as a result of the previous inspection were considered satisfactory for this research reactor authorized to possess less than one effective kilogram of SNM. The inspector reminded those present of the error in Paragraph 9 of the procedures which stated that any receipt or transfer out should be reported to the Region III office. This will be changed and NRC-741 transfer forms issued will be sent to the Department of Energy at the address listed under 10 CFR Part 70.54.

Other minor suggestions relating to the safeguards accountability procedures include adding the words "annual physical inventory" on the Approval Sheet for Special Experiments, a required written procedure needed to perform the annual checkout of the reactor fuel elements. Also, to Paragraph 7 of these safeguards procedures relating to report of a loss of any SNM, the 10 CFR 70 reference should be more specific as 10 CFR 70.52. This would make the code reference more readily available for compliance if the occasion should arise. Again, the inspector emphasized the reporting of burnup on Line 73 of the Material Status Report should be in whole numbers rather than to 0.1 gram as still being done by the licensee. Current instructions for completing the NRC-742 state that reporting shall be to the nearest gram (Ref. Pages 3 and 4 of



blue-colored instruction booklet). The Health Physicist, acting in absence of the Radiation Safety Officer, has a copy of this instruction booklet. He was also informed of reporting in whole gram units, although the Reactor supervisor supplies the data, to be used on the Material Status Report.

The laboratory Director indicated he would notify the Reactor Supervisor of the suggested changes brought out at this exit interview. The Reactor Supervisor was not onsite during the inspection and therefore unavailable.

Attachment:  
Exhibit A

DOW CHEMICAL COMPANY - RIS-YFX

Material Balance Statement - Privately Owned Enriched Uranium  
For Period 3/5/76 - 11/17/78

0-27, 0-28

	<u>Number of Fuel Elements</u>	<u>Grams Enriched Uranium</u>	
		<u>U</u>	<u>U-235</u>
Beginning Inventory 3/5/76			
Receipts			
Total to Account For			
Shipments			
Depletion			
Ending Inventory			
Total Accounted for			

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