

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 70-1257/84-10

Docket No. 70-1257

License No. SNM-1227

Safeguards Group 1

Licensed: Exxon Nuclear Company  
2101 Horn Rapids Road  
Richland, Washington 99352

Facility Name: Richland Facility

Inspection at: Richland, Washington

Inspection conducted: November 5-9, 1984

Inspectors: B. L. Brock  
B. L. Brock, Fuel Facilities Inspector  
P. R. Zurakowski  
P. R. Zurakowski, Radiation Specialist

12/14/84  
Date Signed

12/14/84  
Date Signed

Approved by: R. D. Thomas  
R. D. Thomas, Chief  
Nuclear Materials Safety Section

12/14/84  
Date Signed

Summary:

Inspection on November 5-9, 1984 (Report No. 70-1257/84-10)

Areas Inspected: A routine unannounced inspection was conducted of violation corrections, management organization and controls, operator training and retraining, criticality safety, operations review, maintenance and surveillance testing, radiation protection, transportation of radioactive materials, radioactive waste management, and emergency preparedness.

The inspection involved a total of 58 man-hours on-site by two NRC inspectors.

Results: No violations were identified in the ten areas inspected.

## DETAILS

### 1. Persons Contacted

\*D. G. McAlees, Plant Manager  
R. Nilson, Manager, Corporate Licensing  
\*R. H. Purcell, Manager, Safety and Security Operations  
\*C. W. Malody, Licensing and Compliance, Operating Facilities  
\*J. E. Pieper, Engineer - III, Licensing  
\*T. C. Probasco, Industrial and Nuclear Safety Engineer  
\*L. D. Gerrald, Licensing and Compliance Engineer  
\*B. E. Berst, Manager, Specialty Fuels  
\*E. L. Foster, Radiological Safety Supervisor (Acting)  
J. H. Phillips, Shift Supervisor, Chemical Area ( $U_3O_8$ )  
\*R. Felt, Manager, Process Engineering  
\*H. Thiss, Manager Purchasing  
\*G. Mulligan, Supervisor Shipping and Warehousing  
M. K. Valentine, Manager, Operations Planning and Scheduling  
T. Luzzo, Electrical Engineer, Preventative Maintenance  
K. O. Johnson, Staff Engineer  
R. Hahn, Shift Supervisor, Conversion  
R. Logsdon, General Supervisor, Ceramic Operations  
N. Brown, Shift Supervisor, Ceramic Operations  
W. Carpenter, Technician 4  
L. A. Bisping, Senior Engineer, Facilities Design and Construction  
R. A. Nunamaker, Lead Material Control Technician  
S. M. Mason, Lead Material Control Technician  
M. G. Hill, General Supervisor  
R. A. Corder, Technical Specialist,  $UO_2$  Group  
M. R. Lemos, Contaminated Waste Technician

\*Denotes those attending the exit interview.

### 2. Status of the Licensee's Corrective Actions in Response to the Notice of Violation (Inspection Report 70-1257/84-05)

The licensee's actions correcting the violations identified in the previous inspection report were completed. In the week following inspection 84-05, the licensee's internal audit program identified two additional violations. These violations were corrected by the licensee and occurred prior to the implementation of the licensee's plans to preclude recurrence. To preclude recurrence, the licensee implemented a plan wherein all audit findings are circulated to all department and section managers. Followup discussions are held with all supervisory personnel. A working group including criticality specialists and management level users has also been formed. The goal of this group is to review the criticality safety program and identify changes that would improve the program and eliminate related violations. Management is reviewing circumstances leading to violations and plans to include appropriate disciplinary action for employees not following criticality safety specifications.



### 3. Management Organization and Controls

Section 9 of license SNM-1227 incorporates Part I and the Appendices to Part I of the licensee's application as license conditions.

#### A. Organizational Structure

Section 2.4 of the license application requires certain organizational divisions of responsibility to provide a check and balance system in the important areas of plant safety.

The licensee's organizational structure remains unchanged from that observed during the previous inspection. Responsibilities are assigned to persons who meet the position qualifications established in the license application. The licensee submits significant changes of qualifications for specific positions to NRC licensing for its review and approval.

#### B. Procedure Controls

Section 3.1.1 of the license application requires that the licensee establish and maintain radiation protection standards and procedures which shall be maintained by annual reviews and updated as appropriate. These standards and procedures are also based on and in compliance with 10 CFR 20.

The licensee maintains an appropriate procedure control system. New and amended procedures are being reviewed by technical staff and management before approval.

#### C. Safety Committee

Section 2.2 of the license application requires that the licensee's Industrial Health and Safety Council convene monthly to review various aspects of the safety program.

The Council minutes since the last NRC inspection indicated radiological safety aspects of operations were continuing to improve. It was noted by the inspector however, that three fires occurred during the month of October. The licensee's investigation of the fires indicated that the two fires that occurred in the UO<sub>2</sub> Building were not controlled in accordance with the licensee's procedures. These fires occurred on consecutive shifts during the first week of October 1984. The fires were successfully extinguished. However, the failure to notify security before fighting the fire increased the risk of a more serious accident in the event the initial effort to extinguish the fire failed. The licensee instructed each supervisor to hold safety meetings and to emphasize the importance of operator fire safety training and following procedures. The success of the retraining effort was indicated when the third fire occurred (during the last week of October). The person who discovered the fire notified security first and then attempted to control the fire. Refer to Section 11 of this report for further details.

No violations were identified.

4. Operator Training and Retraining

During this inspection the training and retraining programs were examined. The commitment for such training is specified in Section 3.10 of the application to the current license. Retraining in both radiological and criticality safety is given on a yearly schedule. Training in these areas for new employees normally occurs within the first few weeks of employment. Formal written examinations are given upon completion of each course.

Training in radiological safety is normally given in July and August. However, this year because of the two month furlough, the schedule was somewhat disrupted. One training session was given just prior to the furlough and 11 sessions were given in September and October. This involved 296 people.

The furlough was a preplanned suspension of fuel fabrication activities between July 5 and September 2, 1984 where approximately 75% of the work force was given leave without pay (unless they had paid leave to take during this period). Only some limited fuel bundle fabrication and fuel handling activities were conducted during this period.

220 people received retraining in criticality safety during the months of May and June.

Management gave special training in areas where violations were identified during the last inspection. The training was given immediately after the exact nature of the violations were identified in writing. One person responsible for a violation was disciplined in writing for the oversight that caused the violation.

No violations were identified.

5. Criticality Safety

Section 3.2 of the license application requires assurance of criticality safety through both administrative and technical practices.

A. Nuclear Criticality Safety (NCS) Analysis

Section 3.2.1.1 of the license application requires criticality safety analyses of all applicable processes in accordance with Section 2.3.20, and all determinations of nuclear criticality safety be reviewed and approved by a second party reviewer in accordance with the requirements specified therein.

- (1) The NCS analysis (SC-2.1) for the raffinate tanks in the  $\text{UO}_2$  scrap recovery line was reviewed by the NRC inspector. The details of the analysis were discussed with the criticality safety specialist. The conditions and assumptions made were appropriate and the licensee's second party review was performed by the Radiological Safety Specialist. The tanks are



used for storage of dilute nitric acid solution from which uranium has been removed by solvent extraction.

- (2) The gadolinium scrap recovery process that was not operating during previous inspections was observed during this inspection. The NCS analysis reviewed by the NRC inspector in March 1984 was discussed again with the criticality safety component prior to observing the process. The inspector reviewed the approved procedure used by the operators. Appropriate tests of control instruments were included in the procedure along with required supervision sign off at a control point just before transfer of the product uranyl nitrate to a fifty-five gallon storage drum. The operator followed the procedure, tested control instruments (hydrometers) before their use, and obtained the review of the product solution specific gravity by the supervisor (and the supervisor's approval signature) before transferring the product to the 55 gallon storage drum.

#### B. Criticality Safety Audits

Section 3.13.2 of the license application requires that the Criticality Safety Engineer conduct inspections at least monthly and that the Criticality Safety Component conduct audits at least bimonthly.

The monthly inspections by the Criticality Safety Engineer were conducted as required. No criticality safety problems were identified. The bimonthly criticality safety audits were conducted by the Criticality Safety Component as required. These audits included the  $UO_2$  Building ( $UO_2$ ), Specialty Fuels (SF), Engineering Laboratory Operations (ELO), Lagoon Uranium Recovery Process (LURP),  $UF_6$  Storage Pad, and the Contaminated Material Storage Warehouse. The June 27, 1984 audit identified that in the  $UO_2$  Building two unlabeled containers were identified. Also, several container net weights of 18.000 kgs appeared to reflect arbitrary dropping of fractional parts of kgs. It was also noted that the grid positioners for mop water buckets were undersized. The container labels were corrected, a scale was provided to facilitate correcting container net weights, and mop water grids of appropriate size were ordered. The September 19-27 licensee audit did not find labeling or weighing problems but the oversize mop water bucket grids had not been received. The mop water buckets are stored in approved locations but the positioning grids are undersized causing the buckets to tilt. One new item identified during the September 19-27 audit involved the relocation of a quality control pellet inspection table. The table was not perceived by operators as equipment housing special nuclear material (SNM) and therefore an oversight of the need for a criticality safety evaluation occurred. At the conclusion of the audit the Criticality Safety Specialist made the required review, approved the new table location and revised Figure 1 of Procedure U-22, Rev. 11 to reflect the change. On October 5, 1984 the Criticality Safety Engineer provided a complete review of

all controlling criticality safety specifications to all ceramic operations personnel and their supervisors.

A second new audit item involved the identification of a failure to follow a rod downloading plan. Ten rods were found in the downloading area without the required documentation on the continuous inventory sheet. The criticality control limit had not been exceeded, but the plan prepared with the manager of the area to prevent this type of error was not followed. The operation was stopped by the licensee and a special training session was conducted. A followup operations audit by the licensee found the procedure being followed by the operators.

Internal and external audit reports are now distributed to all managers to preclude the occurrence of similar problems in other areas of the plant. This closes item 84-05-04.

#### C. Criticality Calibrations and Monitoring Systems

Section 3.12.2 of the license application requires at least annual testing of the neutron detectors in the Criticality Accident Alarm System and quarterly testing of the mechanical and electrical components of the system.

- (1) The inspector discussed the licensee's preventative maintenance (PM) program for the criticality accident alarm system with the staff engineer responsible for installation of the system and the PM department electrical engineer responsible for the system's maintenance. The licensee services and tests spare detectors and replaces operating units due for servicing and testing on a rotational schedule that replaces each unit annually. The units are self monitoring and activate a failure light on the unit when a breakdown occurs. The failure of a detector also results in an audible alarm and warning light in the central alarm station (CAS). The licensee has recently covered some criticality detectors with a metallic shield to prevent false alarms from radio-frequency induction (RFI). The loss of this visual failure light on the detector appears to be insignificant because of the audible alarm and light in the CAS.
- (2) The criticality accident alarm system is functionally tested quarterly as required. The system is designed to alarm when two detectors out of a group of three detectors trip. This two detector trip requirement reduces the frequency of false alarms with their risk of personnel injury as well as equipment damage during plant evacuation. The detectors are installed in groups of three in seven locations at the site.

#### D. SNM Containers

Section 3.2.1.1 of the license application requires that before any operation with special nuclear material is begun or changed, it is determined that the entire process will be subcritical under both



normal and credible abnormal conditions, and within the technical requirements specified in Section 3.2.2.

The containers used in processing have been specifically addressed in the applicable criticality safety specification which is posted in each work area. The inspector observed that the licensee's use of unsafe geometry containers reflected appropriate caution. Solutions containing SNM were measured (specific gravity measurement with supervisor signoff) before being transferred to an unsafe geometry container. When filled, the containers' SNM concentration is measured by chemical analysis and the uranium enrichment is measured by mass spectrometry. The inspector also observed that powder and pellet containers had tight fitting lids thus reducing the potential of liquid moderator entry.

## 2. Procedures

Section 3.2.1.1 of the license application requires in the seventh paragraph that the Plant Criticality Safety Engineer prepare a Criticality Safety Specification (CSS) based on limits established in the criticality safety analysis provided by the Criticality Safety Component. Additionally, the fifth paragraph requires that the CSS include: work location, equipment description, special nuclear material description (element, isotope, enrichment, form, density) operation involved, control limits, moderator and reflector restrictions, spacing restrictions, criticality safety procedures, date and approvals. The ninth paragraph requires that copies of current CSS's be maintained in the work or storage areas in which the respective specifications apply.

The NRC inspector observed that the licensee provides approved procedures with the required information at the work stations. The procedures in use were current and were being followed. The operators interviewed by the inspector demonstrated they understood the procedures and the need for supervisor concurrence at identified check points. Operators demonstrated their understanding of the operation of the dissolver within temperature limits, the calibration check of the hydrometer, and the need for their supervisors' double check of the specific gravity before transferring the separated uranyl nitrate solution to the 55 gallon drum.

No violations were identified.

## 6. Operations Review

Section 2.1 of the license application requires the licensee to conduct its business in a manner so as to assure that its facilities are safe from radiation and other nuclear hazards and that its operations will not be detrimental to the environs and to assure that personnel radiation exposures, both in-plant and offsite, are maintained as low as is reasonably achievable (ALARA). In providing this assurance, conditions of applicable NRC licenses shall be complied with, and full regard shall be given to applicable NRC Regulatory Guides.

A. Conduct of Operations

- (1) Operations observed were being conducted carefully and according to the procedures. Operators paid particular attention to those steps requiring supervisor approval before execution.
- (2) SNM was stored in approved containers and locations. This closes item 84-02-01. The containers marked empty that were checked were found to be empty. Air samplers were in operation throughout the plant. Hoods were marked with sash positions to maintain at least 125 linear feet per minute air flow.

B. Housekeeping

The licensee has improved general housekeeping. This closes item 84-05-02. In the  $U_3O_8$  scrap recovery line, pellets and powder are removed from beneath the conveyor (within the equipment enclosure) when material of a different enrichment is to be processed. This closes item 84-05-03.

No violations were identified.

7. Maintenance and Surveillance Testing

Section 3.1.4.2 of the license application requires that airlocks are provided between areas where necessary to insure maintenance of pressure differentials. In a license amendment dated May 11, 1984, the Line 1 Vaporization Room was exempted from the license requirement for airlocks between general and contamination controlled areas. The exemption was granted based on the licensee's proposed installation of a warning system of lights, switches and signs designed to preclude inner and outer doors of the Line 1 Vaporization Room from being open at the same time.

- A. The installation of alarm lights and warning signs to preclude the simultaneous opening of two doors (one an external door) in the line one conversion area was completed. The system was demonstrated to the NRC inspector and performed its function effectively. This closes item 84-05-01.
- B. The licensee executed a planned plant furlough of two months duration (July 5 to September 3, 1984). A task force developed a detailed operational plan for the furlough. The detailed plan was thorough and included a management matrix for normal and emergency conditions. The plan addressed the status of all services and identified and planned for special preventative maintenance (PM) projects. PM projects to be completed during the shutdown were identified and staffed. Special procedures were prepared for shutdown, PM, and startup of the plant equipment. Appropriate reviews of the procedures were made. Three small fires and a small explosion in a humidifier were encountered during the first month after the furlough and were readily extinguished (see Section 11 for details) The ventilation system changes made during the plant furlough to increase the efficiency of energy use were reviewed by



the inspector. The changes did not affect radiological safety. This closes item 84-05-05.

No violations were identified.

## 8. Radiation Protection

Pursuant to 10 CFR Part 20, the licensee is required to provide protection against radiation hazards associated with licensee activities.

- A. Exposure records associated with the licensee's quarterly thermoluminescent dosimetry (TLD) program, supplied and evaluated by U.S. Testing Company, were examined by the inspector for the second and third quarters of 1984. As noted in previous NRC reports, external exposures of personnel employed at the Richland Facility are invariably near the lower limit of detection because the material processed is low enriched uranium. The few exposures over 100 mrem were received by persons working with refueling equipment, or at power reactors doing refueling work. No exposures exceeded the licensee's action levels or NRC requirements in Part 20.

- B. Bioassay Results

Urinalyses results for the second and third quarters of 1984 were examined by the inspector. No measurement over 100 ug uranium per liter, which requires an immediate lung count, was observed. There were no results over 25 ug uranium per liter which would require a new sample to be submitted. A slight downward trend in the urine concentrations seemed to correlate with the lower air concentrations noted in paragraph D.

- C. Lung Count Results

Lung count data for the second and third quarters of 1984 were reviewed. As with the urinalyses results, there also is a downward trend that appears to be associated with lower average air concentrations as measured by continuous air samplers. The licensee's program to lower average air concentrations appears to be having a beneficial effect in both bioassay and lung count results. This progress will be followed during subsequent inspections (84-10-01).

- D. Air Concentrations

A review of a graphical analyses of air concentrations in the conversion areas and the grinder and inspection areas for the past several years indicated a general downward trend. A review of the monthly averages in these same areas for 1984 seemed to indicate that this downward trend is continuing. However, the trend in the pellet grinder area is not as obvious. This area continues to have the higher monthly averages. The licensee is planning engineering changes in associated air ducts and hoods early next year to improve the situation. No action levels or license limits were exceeded since the last inspection.

### E. Radiological Safety

Radiological safety audits are detailed, formal (in writing) "walk through the plant" reviews of radiological safety practices. They are conducted by a Senior Radiological Safety Engineer as required by Section 3.13.1 of the current license application. The inspector found that the radiological safety audits are conducted monthly as required. When possible, items identified by the auditor were promptly corrected. For example, in one case, a study was necessary in order to identify the cause of the problem. The problem identified was smearable contamination greater than 10,000 DPM found on metal pallets coming from the Lube Blend Room into the press area of Room 100. Since the licensee has not yet determined the cause of this contamination, the problem will be reviewed during the next inspection (84-10-02).

It was noted by the inspector during the tour of facilities that a face shield used to protect workers from splashes of "product" while working on equipment in the No. 2 conversion area had some "yellow fingerprints" on the plastic surface. Some of the fingerprints were on the inside of the shield near the breathing zone. During the management interview the potential problem of this uranium compound drying out and entering the breathing zone was discussed. The licensee agreed to examine the methods used to clean and distribute the face shields. The result of the licensee's examination will be reviewed during the next inspection (84-10-03).

No violations were identified.

### 9. Transportation of Radioactive Materials

The licensee's program for packaging and transportation of radioactive waste must be conducted in accordance with 10 CFR 20.311 and 71. The inspector held discussions with the Supervisor of Shipping and Warehousing concerning the transportation of waste and the maintenance of shipping containers requiring certificates of compliance.

During the past six months, shipments of low level waste have been sent to the U.S. Ecology Disposal Site near Richland, Washington via Tri State Transportation Company. A recent inspection at the disposal site by an NRC Inspector disclosed that the licensee's shipments have been arriving at the disposal site properly packaged and labeled. Discussions with the State Resident Inspector, indicated there has been no problem with leaking or contaminated packages from this licensee.

Discussions by the inspector with an Exxon Licensing Specialist disclosed that a computerized tickler file has been generated to insure that required inspections and maintenance are performed on shipping containers and casks. The licensee's QA Department uses and updates this file as needed. An examination by the inspector of ten cask records taken at random indicated that required inspections and maintenance are being performed.

No violations were identified.



## 10. Radioactive Waste Management

10 CFR Part 61 requires that all radioactive waste prepared for disposal is classified in accordance with paragraph 61.55 and meets the waste characteristics requirements in paragraph 61.56. Sewer discharges must meet the requirements of 10 CFR 20.303.

A tour of the radioactive materials storage yard was made by the inspector during this inspection. Discussions were held with the Supervisor of Shipping and Warehousing and two of his Lead Material Technicians. One of these Lead Technicians is responsible for the shipment of radioactive waste. Discussions were also held with the Technical Specialist and his Supervisor who is responsible for the packaging, compacting and evaluating of waste in the UO<sub>2</sub> Building. It was found that the people responsible for waste management were knowledgeable in applicable DOT and NRC regulations. All waste observed was packaged in accordance with these regulations.

During the tour several rows of waste drums were observed being prepared for shipment. Although the labels were not yet attached, the drums were in good physical condition and appeared to be free of rust, dents or other signs of abuse. Several of the drums were picked at random by the inspector and a records search was conducted. The inspector determined that the licensee adequately maintained these records in accordance with 10 CFR 20.311 and Part 71.

Discussions with the licensee representative for Licensing and Compliance on release of effluents to the sanitary sewer disclosed that such releases can only occur from Pond 5A, 5B, or the underground retention tanks in back of the UO<sub>2</sub> Building. Before discharge to the sewer a written analysis performed by the Chemistry Lab and signed by the Laboratory Supervisor must be submitted. After this analysis has been completed there must be another document generated which specifies the "pump out rate" into the sewer. There must be Engineering, Operations and Licensing signatures on this document. All of these documents are required by licensee internal procedures in order to insure compliance with local, state and federal regulations and guidelines. The discussions and examination of several documents indicated that this administratively controlled system is functioning properly.

No violations were identified.

## 11. Emergency Preparedness

Section 3.9 of the license application addresses the licensee's Emergency Plan (XN-NF-32) which includes a listing of procedures that have been prepared to implement the plan.

### A. Tests and Drills

The licensee conducted an announced criticality drill at 9:15 a.m. on Tuesday October 23, 1984. The drill included an evaluation of supervisors knowledge of the location of their employees whose jobs require them to move throughout the plant. The supervisors were

able to adequately account for an engineer, two maintenance personnel and an operations employee. The results indicate the supervisors knew the whereabouts of their staff. The licensee's critique concluded that the drill was effectively executed and all persons were accounted for in a timely manner.

P. Fire Protection

The licensee experienced three small fires within the first month after the furlough. Although the first two fires were readily extinguished, the operators did not notify security before fighting the fire. Security has the responsibility of immediately notifying the Richland Fire Department which would have at least one truck respond to the plant to provide support in the event the operators efforts to extinguish the fire failed. The licensee conducted additional training with emphasis on the need to notify security before fighting a fire. The third fire occurred a month later and this time security was notified before the effort to extinguish the fire was made. The fire was successfully extinguished after the notification had been made.

The first fire started in a prefilter within 60 seconds after a duct heater was turned on. The second fire was in a VAC-U-MAX transfer line used to transfer  $UO_2$  powder. The powder being transferred from the calciner to the slab hopper was apparently hot enough to melt the plastic transfer tube and burn some attached duct tape. The third fire was in the sintering furnace used for sintering  $B_4C$  pellets. The first two fires were extinguished by the employees before notifying security. The third fire was extinguished after notifying security as required by fire safety procedures. The licensee also experienced an explosion during startup of a sintering furnace. An incident review committee (IRC) was formed. The IRC concluded the cause appeared to be that the humidifier had not been purged with inert gas in preparation for the furlough. This, coupled with the inclusion of an associated heater on the furnace startup switch circuit, apparently caused the explosion. The IRC recommended that the sintering furnace startup and shutdown procedures be modified to include nitrogen purging. Additionally they recommended that the heater control be moved to a separate circuit. The licensee agreed to send a copy of the IRC report to Region V for review.

No violations were identified.

12. Management Interview

The results of the inspection were discussed with members of the licensee's staff, identified in Section 1. The topics included:

- the areas inspected
- the licensee's response to the notice of violation issued as a result of the previous inspection
- the status of open items (four closed, one remains open)



- the results of the licensee's internal audits
- the need for increased attention to face shield contamination control
- the air concentration downward trend
- the reduction in visible contamination
- the decreasing lung count levels
- the adequacy of transportation procedures and practices
- appropriate licensee response to indications of internal contamination

The licensee commented that:

- face shields would receive additional attention