

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

REGION V

Report No. 70-734/80-10

Docket No. 70-734 License No. SNM-696 Safeguards Group 1

Licensee: General Atomic Company
P. O. Box 81608
San Diego, California 92138

Facility Name: Torrey Pines Mesa and Sorrento Valley Sites

Inspection at: San Diego, California

Inspection conducted: September 15-19, 1980

Inspectors: W. J. Cooley, Fuel Facilities Inspector 11/25/80
Date Signed

Approved by: R. D. Thomas, Chief, Materials Radiological Protection Section 12/1/80
Date Signed

Approved by: H. E. Book, Chief, Fuel Facility and Materials Safety Branch 12/1/80
Date Signed

Summary:

Inspection on September 15-19, 1980 (Report No. 70-734/80-10)

Areas Inspected: Review of liquid waste evaporation ponds and submerged radioactive liquid waste retention tanks in terms of possible leakage and environmental monitoring; organization; facility changes and modifications; internal audit and review; safety committee activity; operations review; criticality safety; fire prevention/protection procedures; and radioactive waste management. The inspection involved 25 inspector-hours onsite by one NRC inspector.

Results: No items of noncompliance or deviations were found in the subject areas inspected.

DETAILS

1. Persons Contacted

*H. N. Wellhouser, Director, Nuclear Material Control Division
*F. O. Bold, Manager, Health Physics Services
*W. R. Mowry, Licensing Administrator
*D. C. Pound, Manager, Nuclear Safety Control
K. C. Duffy, Manager, Nuclear Materials Management
E. L. Spencer, Environmental Specialist
R. L. McDermott, Supervisor, Nuclear Material Processing Center

*Denotes those attending the exit interview.

2. Liquid Waste Retention Tanks and Evaporation Ponds at Torrey Pines Mesa

The licensee maintains a number of retention tanks which are submerged and four evaporation ponds which are mounted at ground surface at the Torrey Pines Mesa site. The retention tanks may be identified by the laboratories and buildings they serve as follows: L307 and L540 (two concrete 1,000 gallon tanks serving laboratory facilities); Building E (one 1,000 gallon concrete tank); Building EA-1 (one 1,000 gallon plastic tank mounted in a concrete vault); and four evaporation ponds (approximately 18,000 gallon capacity each and mounted on the ground surface).

Additionally, two 1,000 gallon steel tanks mounted in a concrete vault serve the fuel manufacturing department at the Sorrento Valley Site.

Tanks L307 and L540 are no longer in use. Those tanks in addition to tanks EA-1 and E, when in use, are pumped to a portable tank which is discharged to the evaporation ponds. The two steel tanks servicing the Fuels Manufacturing Department contain liquid waste which has been filtered and sampled before delivery to the tanks and sampled again in the tanks before discharge to the San Diego City Sanitary Sewer System.

Tanks EA-1 and the two steel tanks servicing the Fuel Manufacturing Department can be and are inspected visually for leaks periodically by inspecting for liquids in their concrete vaults. No similar monitoring can be done for tanks L307, L540, and E. The four evaporation ponds can be and are inspected for leaks in their bases infrequently at times when they are cleaned out. The evaporation ponds are also equipped with four sumps (one servicing each of the four ponds) which are designed to capture liquids which may be leaking from the base of the ponds. Those sumps are inspected periodically and are sampled when water appears. The ponds, when

originally constructed, were sloped to the north at the rate of one inch per six feet and were provided with a six gauge Visqueen plastic sheet to help direct any leaks toward those sumps. At the time of this inspection, three of the sumps monitoring the ponds had water in them which was sampled and analyzed for activity. The results of those samples are presented in Section 6 below in this report. Those evaporation ponds have shown cracks in their concrete sides which have been repaired by caulking.

No wells to ground water have been used to monitor the evaporation ponds or the several submerged tanks listed above and located at the Torrey Pines Mesa Site. A licensee representative stated that according to the State of California, Department of Water Resources, in their June, 1967 publication, "Ground Water Occurrence and Quality, San Diego Region," the nearest ground water from the Mesa Site would be located in the Sorrento Valley at a depth of approximately 300 feet from the Mesa elevation. That ground water is considered marginal or inferior for irrigation purposes. Salt water intrusion closer to the coast further decreases the utility of the ground water. The licensee summarized by saying the arid nature of the local climate, the flow characteristics of the local ground water, the chemical nature of the local ground water, and the local geology all make any significant contamination of local ground water very unlikely.

The licensee includes monitoring of surface water, soil, and vegetation activity at the base of Torrey Pines Mesa and in the Sorrento Valley as part of his environmental surveillance program. No unusual activity has been detected in those samples which were obtained at 200-300 feet below the surface of Torrey Pines Mesa.

3. Organization

Management of the Radioactive Waste Processing Facility was assumed by the Nuclear Materials Control Division since the last inspection. That processing facility includes all waste handling operations at the Torrey Pines Mesa including evaporation, solidification, volume reduction, incineration (no longer conducted), and preparation of waste containers for shipment. Personnel of the Radioactive Waste Processing Facility were not changed as a result of the organizational change.

4. Facility Changes and Modifications

The licensee has dismantled and packaged for licensed land burial all parts of his radioactive waste incinerator.

The licensee has begun a review of radioactive waste handling aimed at controlling radioactive waste disposal costs. The review will characterize the wastes as to their source, quantities, radioactive contents, and chemical composition. Current procedures and waste handling operations will be evaluated. Commercially available waste handling equipment will be evaluated. The final report on the review and recommendations is scheduled by December 1, 1980.

Preliminary consideration is being given to relocation of the waste processing facility (waste yard at Torrey Pines Mesa) to the linear accelerator area, and the elimination of the evaporation ponds as a method of volume reduction of waste.

5. Internal Audit and Review

This inspection included a review of the licensee's criticality control audits performed and reported from January 1980 through the approximate date of this inspection. During that time 13 reviews were made by the Nuclear Safety Department. Six of those reviews were addressed to fissile material storage facilities; four were addressed to activities in fuel manufacturing areas; two were addressed to waste processing operations; and one was addressed to hot cell activities.

Additionally, reviews addressed to the safety of activities were made by the Criticality and Radiation Safety Committee. The CRSC reviews are addressed not only to the waste processing, fuel manufacturing, fuel storage, and development operations, but also to the functions of the departments within the Nuclear Materials Control Division.

The reviews listed above revealed good nuclear safety control in the areas reviewed. Several recommendations were made for improvements in the Sorrento Valley fuel manufacturing areas as a result of reviews conducted in March, May, and August. Those recommendations had been reported to manufacturing area management and corrective action taken. One matter which persisted through the March and May reviews was the mislocation of fissile material transfer carts which had been corrected by the August review of that facility.

The licensee also reviews his ALARA program as part of the semi-annual audit conducted by the Criticality and Radiation Safety Committee. That review has been conducted for approximately two years. An ALARA review report dated August 26, 1980 noted the whole body annual doses for the year 1979 and that 78% of the radiation workers had either no measurable dose or a trivial one. It identified the source of higher exposures (1 to 3 rem) as having been received by 2% of the workers and also identified the source

of those exposures. It explored the possibility of reducing those higher annual doses. It noted the major improvement in the reduction of airborne radioactive material at the Sorrento Valley Fuel Manufacturing Facility and indicated a favorable review of the licensee's environmental survey program which indicates control of radioactive effluents to levels very much below the maximum permissible concentrations for noncontrolled areas.

6. Operations Review

This inspection included visits to the waste processing facility and to the fuel storage facility located in an annex to the Triga fabrication building.

At the waste processing facility it was observed that the incinerator had been completely dismantled and its parts completely packaged for shipment to a land burial site. Opportunity was also taken to inspect the evaporation ponds where above ground cracking of the pond concrete walls was observed. Those cracks had been repaired using caulking compound and no evidence of leaks was apparent. The four sumps adjacent to the ponds (mentioned above in this report) were inspected for liquid content. No liquids in the sumps could be seen by the inspector although liquid samples were obtained by the licensee prior to and during this inspection for analysis. The source of that liquid might be minor leaks at the base of the evaporation ponds or might be accumulations of water used for general cleanup purposes around the outside of the ponds. The results of that analytical work was furnished by the licensee to Region V and indicated alpha activities ranging from approximately $1 - 5 \times 10^{-9}$ uCi/cc and beta activities ranging from approximately $2 - 4 \times 10^{-6}$ uCi/cc. The content of the ponds are generally U-235, natural thorium, cesium-137, and mixed fission products. Corresponding maximum permissible concentrations for release to the environment (10 CFR Part 20, Appendix B, Table 2, Column 2) are U-235 - 3×10^{-5} uCi/cc; natural thorium - 2×10^{-6} uCi/cc; cesium-137 - 2×10^{-5} uCi/cc; and mixed fission products (SR-90) - 3×10^{-7} uCi/cc.

During the visit to the fissile material storage annex at the Triga fabrication building opportunity was taken to observe the loading of scrap U-235 fuel sticks into a DOT 17H drum in preparation for shipment to the DOE at Oak Ridge, Tennessee. The shipment was intended to be made by DOE using DOE vehicles and escorts with the material packaging being provided by the licensee. It was observed that a 16" x 16" x 16" cardboard box was first placed (empty) into the otherwise empty 17H drum. That provided a snug-fitting base for a second 16" x 16" x 16" cardboard box placed on top of it and ultimately filled with less than 350 grams of contained U-235. The U-235 was in the form of scrap fuel sticks from the HTGR fuel

manufacturing program and was placed in double plastic bags which in turn were placed in one quart paint containers with pressure-fitting lids. The one quart containers were then placed in an additional plastic bag. Those containers were then placed in the upper 16" x 16" x 16" cardboard box. The upper cardboard box protruded above the lip of the 17H container so that its closure flaps along with approximately 2 inches of its body were folded over its contents and acted as dunnage. A gasketed lid along with a lid ring provided with a 5/8 inch bolt was then used to seal the drum. The 5/8 inch bolt had been drilled to provide for a keyless type padlock as a security seal on each drum.

Justification for use of that shipping container and packaging arrangements was cited by the licensee as DOT Regulation Section 173.396, Fissile Radioactive Material (b)(3). The licensee determined from DOT Section 173.396(b)(7) that 72 containers of that type each loaded with 350 grams of U-235 or less could be placed in a single fissile class III shipment. The container was deemed by the licensee to meet the requirements of Specification 7A as it appears in Section 173.375, Radioactive Material in Normal Form (a)(1). The licensee recorded his rationalization for the use of this container for the contemplated shipment and had received oral approval from both DOT authorities and DOE authorities.

7. Criticality Safety

The licensee is proceeding to meet the 10 CFR 73 security upgrading requirements at the Sorrento Valley fuel fabrication plant. General considerations including cost of upgrading lead to plans for reducing the size of fissile materials storage facilities. To meet that contingency consideration was being given to the use of neutron thermalizing and capturing materials to reduce the effectiveness of concrete walls as reflectors. At the time of this inspection the licensee was searching for experimental data of that nature which might be used in connection with calculations he had made and planned to make.

8. Environmental Surveillance Program

The licensee conducts an environmental surveillance program in which he collects soil, vegetation, and surface water samples for radioanalysis. A collection of those samples occurs once each year approximately in the month of April. The analytical work is performed by an independent laboratory.

This inspection included a review of the annual environmental surveillance reports for the years 1978, 1979, and 1980. The most

recent environmental program (1979 and 1980) includes 30 soil, 26 vegetation, and 10 surface water samples. Analysis of the samples is for gross alpha and gross beta activity and includes a gamma scan to determine the isotopes contributing to that activity. The results obtained indicate no particular trends.

The results of this licensee's environmental surveillance program were compared with a similar program conducted by an NRC licensee in the Los Angeles area. Substantial agreement between the two was observed in soil, vegetation, and surface water samples.

Positive environmental program results were identified as resulting from atmospheric weapons testing. The licensee experiences temporary increases in environmental radioactivity by a factor of 3-5 due to that testing.

9. Fire Prevention/Protection Program

The licensee conducts an accident prevention program. An accident prevention program manual has been published, approved by management, and distributed to all supervisors. That manual is oriented toward industrial safety. Its Section 3 consists of a series of practices and procedures designed to prevent accidents including fires. This inspection included a review of those procedures associated with fire prevention.

Procedure No. 2 of the safety manual is devoted to flammable liquids. It gives the specific characteristics of those liquids and a list of the general requirements for their safe handling and storage. It presents a listing of available safety containers for flammable liquids and a summation of the do's and don'ts of handling and storing them.

Procedure No. 5 is again addressed to solvents, in general, and including flammable solvents primarily from the point of view of fire protection, toxic vapors, personal protective equipment, and storage.

Procedure No. 8 is addressed to fire prevention both in terms of the requirements of fuel, heat, and oxygen and of the specifics of obtaining cutting and welding permits and employee fire extinguisher training.

Procedure No. 9 is addressed to the handling and use of portable fire extinguishers, the maintenance of extinguishers, and the fire extinguisher training given employees.

Procedure No. 23 is again addressed to cutting and from the point of view of ventilation. That procedure reiterates the requirement of a General Atomic Company cutting and welding permit.

Procedure No. 28 incorporates into the manual the licensee's policy and procedure No. 71 which is addressed to hazardous work and

experiment authorization. It states the company's policy and procedures with respect to hazardous work, presents the procedure for the review of that type of work, and specifically mentions the use of flammable or toxic chemicals as an example.

Procedure No. 37 presents the do's and don'ts in the use of coffee-makers, hot plates and similar devices.

The Accident Prevention Manual is maintained current by personnel of the Safety Department.

10. Licensee Event Followup

The licensee reported the explosion of a container of uranium carbide-thorium carbide powder to NRC, Region V on August 11, 1980. A preliminary notification of that event (PNO-V-80-64) was issued on August 11, 1980. An update of that preliminary notification (PNO-V-80-64A) was issued on August 22, 1980. This inspection included a review of that licensee event which included confirmation of air sample and urinalysis data. The inspection also included a review of subsequently acquired lung count data for U-235 and a review of the licensee's investigation of the incident. The substance of preliminary notification PNO-V-80-64A is repeated here for the record having been found to be correct in its details as a result of this inspection review.

The licensee reported the explosion of an aluminum container of UC-ThC on 8/11/80 at 10:30 a.m., PDT. The explosion occurred at 2:00 p.m. on 8/9/80. The aluminum container was believed to be inerted. The explosion was caused by loss of inerting gas, or by reaction with impurities, or a combination of both.³ The aluminum container was cylindrical, valve-topped and 150 in.³ in volume. It has a wall thickness of 34 mils.

The contents of the container were approximately 800 grams of UC-ThC of which 200 grams were U-235. The contents of the container had been screened and the particle size range was from 106 to less than 1 micron.

An employee was holding the container at the time of the explosion and received a cut wrist. The cut was washed and found not to be contaminated.

Four employees were in the vicinity at the time. Nasal wipes of those persons indicated 94, 96, 103, and 855 disintegrations per minute, a qualitative indication that some internal deposition may have occurred. Eight additional nose wipes of other employees who were in the building but not in the vicinity of the explosion

indicated less than 18 disintegrations per minute and, therefore, no qualitative indication of internal exposure. All employees in the facility at the time of the explosion have submitted urine samples. The urine samples submitted by the four employees in the immediate vicinity were processed on a rush basis. Those samples were analyzed for U-235 and natural thorium. The results of those samples for employees in ascending order of nasal wipe results were:

<u>Nose wipe d/m</u>	<u>U-235 as % MPLB</u>	<u>U-235 d/m/24 hours</u>	<u>Nat Th (mg)</u>
94	4.8%	4.2	0
96	4.0%	4.0	0
103	4.0%	3.5	0
855	15.7%	12.1	0

In vivo lung counts of three of the four individuals involved in the event all indicated no detectable U-235 deposited in the lungs. Those in vivo counts were made by an independent laboratory on October 27, 1980.

Lung counts for thorium on those four employees indicated no thorium lung deposition.

The maximum airborne concentration was measured at a sampling station five feet from the explosion and indicated 1.8×10^{-8} uCi/cc accounting for both U-235 and thorium. Similar samples at six feet and twenty feet indicated 3×10^{-9} uCi/cc and 3×10^{-10} uCi/cc respectively. Those samples included the explosion and about seven hours of collection time prior to the explosion.

The four employees in the vicinity of the explosion evacuated immediately. The longer exposure time to airborne activity was estimated as two minutes and was incurred by the person indicating the nasal wipe of 855 integrations per minute. No respiratory protection equipment was being worn at the time.

Region V's evaluation indicates that no exposures to airborne activity in excess of 10 CFR 20 limits occurred. That is confirmed by the licensee's urinalysis and lung count results.

Contamination levels in the vicinity of the explosion (dry scrap recovery area) ranged from 1,000 to 50,000 dpm/100 cm². The best estimate of lost SNM was 69 grams which was reported to Region V Safeguards Branch on 8/13/80 by telephone. Damage to property was less than \$2000. Decontamination operations required about 48 hours but did not require downtime of scrap recovery facilities.

With regard to the licensee event this inspection included a review of the health physics technician's report to the Manager, Health Physics Services regarding the event. That report agreed in all details with the preliminary notification data, the latter having been furnished by the licensee telephone calls to Region V. This inspection also included a review of the licensee's report of his investigation of the event which was dated August 15, 1980. That investigation concluded that the most probable cause of the event was a combination of critical amounts of water with the fine carbide powder. That conclusion was reached on the basis of a gas analysis on the argon input line to the glovebox which indicated 87 ppm moisture due to a substantial leak in the glovebox vacuum system.

The investigating committee recommendations included replacing and modifying the glovebox vacuum system.

11. Radiation Protection

This inspection included a review of Health Physics Services reports of airborne radioactivity and surface contamination levels to Fuel Manufacturing Department management. Those reports reviewed covered the first and second quarters of 1980. The data was presented as the average percent of maximum permissible concentrations for each of 18 identified areas in the Sorrento Valley fuel manufacturing building. Those averages were presented for each of three operating shifts. The average removable surface contamination level data was presented in units of activity per unit area for each of 37 areas of the Sorrento Valley building including both controlled and noncontrolled areas.

All average airborne activity concentrations remained less than 10% of the maximum permissible concentration for each of the first two quarters of 1980. No single air sample exceeded 5.5 times the maximum permissible concentration.

12. Management Interview

The scope and results of the inspection were discussed with licensee representatives on September 19, 1980. Those individuals were informed that no items of noncompliance with NRC rules and regulations or conditions of the licensee were observed within the scope of the inspection.