U.S. NUCLEAR REGULATORY COMMISSION REGION I

Docket No.:	03029462
License No.:	45-23645-01NA
Report No.:	03029462/2011005
Licensee:	Department of the Navy
Address:	Radiological Controls and Health (N455) Energy and Environmental Readiness Division Office of the Chief of Naval Operations 2000 Navy Pentagon (2D253) Washington, DC 20350-2000
Location Inspected:	Space and Naval Warfare Systems Center, San Diego, California
Permit No.	NRMP 04-66001-E1NP
Inspection Dates:	January 18 through June 2, 2011
Inspectors:	Gerald A. Schlapper, Ph.D., CHP, Health Physicist Region IV
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	/RA/
Approved By:	Judith Joustra, Chief Decommissioning Branch Division of Nuclear Materials Safety Region I

EXECUTIVE SUMMARY

Department of the Navy NRC Inspection Report No. 03029462/2011005

This announced reactive inspection was conducted at the Space and Naval Warfare Systems Center (SPAWARS), located in San Diego, California. The Navy Master Material License (MML) No. 45-23645-01NA issued SPAWARS Permit No. 04-66001-E1NP, which authorized SPAWARS to use byproduct and special nuclear material for research and development activities. The inspection was requested by NRC Region I on January 11, 2011, to evaluate a contamination event identified during a routine December 2010 inspection by the Radiological Affairs Support Office (RASO), and the adequacy of the Navy's response to the event. The NRC inspection consisted of a site tour, interviews with personnel, and a review of the permittee's radioactive materials program, as it related to the contamination event and follow-up effort. The review of additional records and additional discussions with Navy personnel continued until the final exit meeting on June 2, 2001.

The NRC inspectors identified the following two violations:

- RASO granted SPAWARS authorization to possess special nuclear material greater than the critical mass limits which is contrary to the limits specified in the Letter of Understanding (LOU) dated March 24, 1987, which is identified in License Condition 18 of Navy MML No. 45-23645-01NA. Specifically, between March 1, 2010 and January 19, 2011, the Navy issued Permit No. 04-66001-E1NP which authorized a total possession limit of special nuclear material that exceeded the quantity specified in the LOU. The quantity was sufficient to form a critical mass as defined in 10 CFR 150.11(a).
- 2. 10 CFR 20.1501 requires, in part, that each licensee make or cause to be made surveys that are reasonable under the circumstances to evaluate the magnitude and extent of radiation levels, concentrations or quantities of radioactive materials, and the potential radiological hazards that could be present. The licensee did not make surveys to assure compliance with 10 CFR 20.1301, which limits dose to individual members of the public. Specifically, on December 17, 2010, the licensee removed a laboratory countertop/sink from a laboratory that had been used radioactive material and transported it to another facility in San Diego without first performing a radiological survey. Removable contamination was subsequently identified as radium-226 and thorium-232 contamination (i.e., 29,192 disintegrations per minute beta/gamma and 11,478 disintegrations per minute alpha contamination).

REPORT DETAILS

Organization and Scope of Program

a. Inspection Scope

The inspection included a review of the permittee's activities and organizational structure. The NRC inspectors observed ongoing activities, interviewed personnel, and reviewed associated records to verify that permitted activities were conducted in accordance with NRC regulations and provisions of the Department of the Navy MML No. 45-23645-01NA.

b. Observations and Findings

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Naval Radioactive Materials Permit (NRMP) No. 04-66001-E1NP, Amendment No. 19, for Space and Naval Warfare Systems Center (SPAWARS) was authorized as a research and development Type A Broad Scope permit with additional specific authorizations for special nuclear materials (SNM). The Broad Scope permittee utilized an Ionizing Radiation Control Committee (IRCC) that met quarterly. The IRCC had authorized six use applications and there were a total of fourteen authorized users at the time of the inspection. The permittee possessed 147 radioactive sources. Forty-four of the 147 sources required leak testing at six-month intervals in accordance with Navy's Radiation Safety Manual RAD-010. Building 563, Building B3111, and certain areas within Building 111 were authorized for use with radioactive materials by the IRCC. Since 2008, the authorized users were required to perform daily area surveys of each location where radioactive material was used.

The NRC inspectors reviewed the permit conditions and determined the permittee had been authorized to possess a quantity of special nuclear material (SNM) above the amount allowed by 10 CFR 150.11. 10 CFR 150.11 requires, in part, that SNM does not exceed quantities sufficient to form a critical mass, as defined in this paragraph of the regulation. This means uranium enriched in the isotope U-235 in guantities not exceeding 350 grams of contained U-235; uranium-233 in guantities not exceeding 200 grams, and plutonium in quantities not exceeding 200 grams; or any combination of them shall not exceed unity. The Department of the Navy's Master Materials License "Letter of Understanding (LOU)," listed under License Condition 18.B. states, in part, that the Naval Radiation Safety Committee will not issue any permit authorizing a total possession limit of special nuclear material equal to or in excess of critical quantities (as determined by the procedures specified in 10 CFR 150.11(a)). Only the Office of Federal and State Materials and Environmental Management Programs (FSME) is authorized to license special nuclear materials in quantities that exceed critical mass limits. The NRC inspectors identified that the SPAWARS Naval Radioactive Materials Permit No. 04-66001-E1NP, Amendment No. 19, dated March 1, 2010, authorized 228.2 grams of plutonium which exceeded the maximum quantity of 200 grams of plutonium at any one location. The inventory record provided to the NRC inspectors on site showed an activity in excess of 200 grams of plutonium. RASO had authorized the command via several line items on their permit to exceed the 200 grams for plutonium. Based on the records of inventory and receipt reports, RASO demonstrated that the command never actually possessed that amount. As soon as the NRC identified this matter, RASO immediately amended the permit to lower the quantity to the actual amount on hand; which is less than 200 grams of plutonium. However, issuing a permit for the

authorization of special nuclear material in critical mass quantities is an apparent violation.

c. <u>Conclusions</u>

The NRC inspectors identified that RASO granted SPAWARS (Permit No. 04-66001-E1NP) authorization of special nuclear material greater than the critical mass limits as specified in the Letter of Understanding dated March 24, 1987, which is identified in License Condition 18 of Navy MML No. 45-23645-01NA. Contrary to the above, between March 1, 2010 and January 19, 2011, the Navy issued Permit No. 04-66001-E1NP which authorized a total possession limit of special nuclear material that exceeded the quantity specified in the LOU that was sufficient to form a critical mass as defined in 10 CFR 150.11(a).

No other violations or safety concerns were identified.

II Chronology of Event

a. <u>Inspection Scope</u>

The NRC inspectors reviewed the Navy's response to the contamination event to verify that permitted activities were conducted in accordance with NRC regulations and provisions of Department of the Navy MML No. 45-23645-01NA. The NRC inspectors interviewed Navy and contractor personnel and reviewed associated records relating to the contamination event.

b. Observations and Findings

RASO Actions

RASO personnel conducted a routine inspection of SPAWARS from December 7-10, 2010. On December 9, 2010, the RASO Radiation Protection Managers (RPM) identified a March 2010 source leak test result that was greater than 0.005 microcuries for an Iron-55 (Fe-55) sealed source. The RPMs determined this had not been reported to RASO as required by their permit condition 18.f. The RPMs determined the Fe-55 sealed source had been removed from an X-ray fluorescence analyzer device by the previous RSO and placed in storage as authorized by the IRCC. They further determined the permittee RSO at the time swiped the exposed end of the Fe-55 source as part of the leak test procedure. The subsequent results indicated 0.07 uCi, which exceeded the 0.005 uCi limit in the permit condition. The RPMs determined the RSO at the time subsequently re-categorized the source as unsealed and determined that the swipe result did not need to be reported to RASO. There was no analysis performed to determine if the source of the contamination was actually from the Fe-55. The RPMs determined the source had been stored in the same cabinet that was later determined to be contaminated with naturally occurring material (i.e., Th-232). The RPMs determined the RSO at the time applied a conformal coating (epoxy) to the metal tip of the Fe-55 source (serial number 52459) and placed it in a sealed plastic container in the event it was actually leaking. A report was made to the inventory file and the circumstances were briefed during the IRCC meeting on April 29, 2010, with no further discussion or actions taken by the permittee.

During the December 2010 RASO inspection, the RPMs determined, the RSO at the time and IRCC determined the source had been inappropriately categorized as a sealed source and therefore was not reported to RASO in March 2010. In December 2010, the RPMs initiated a more detailed review based on the permittee's survey results which indicated contamination levels higher than one would expect from a Fe-55 source. On December 10, 2010, RASO recommended to the Executive Secretary of the Naval Radiation Safety Committee a rating of unsatisfactory and all permit activities at SPAWARS ceased as the command's radioactive material usage was shutdown. The RPMs took control of the facility by turning off the ventilation system and taking the keys into their custody. The RPMs determined the permittee failed to report the leaking source to RASO and cited them for this violation. RASO later determined the sealed source was not leaking, but had been contaminated with thorium, an alpha emitter. On December 13, 2010, RASO notified the NRC regarding the unsatisfactory rating.

The RASO inspectors determined, and NRC inspectors concurred, the permittee did not perform surveys in a manner that was reasonable to evaluate the extent of potential contamination, guantities of radioactive materials, and any potential radiological hazards. More specifically, the instrumentation used by the permittee was not sufficient to evaluate guantities of licensed radionuclides that were used at the facility. Even though it was known that there had been use of unsealed alpha emitters in Building 111, primarily Ra-226 and Th-232 (which could have been obtained with either a specific or a general license in the 1990's), the permittee did not utilize an alpha probe during any routine or follow-up contamination survey, nor did they have access to an alpha probe detector to conduct the routine surveys. This is an apparent violation of 10 CFR 20.1501, which requires, in part, that each licensee make or cause to be made surveys that may be necessary to evaluate the magnitude and extent of radiation levels, concentrations or quantities of radioactive materials, and the potential radiological hazards that could be present. RASO cited the failure to perform required contamination surveys in their January 14, 2011, letter to the Command. This citation was limited to the Fe-55 source.

As a result of the inadequate surveys performed by the permittee in March 2010, the RPMs conducted their own surveys in the radioactive material use areas in Building 111 in December 2010. While conducting these surveys, the RPMs identified a room with two fume hoods, one of which was authorized for radioactive material usage. The RPMs further determined the entrance to the room and hoods were not properly marked to indicate the use of radioactive materials. The RPMs performed a survey of the countertops and hoods and identified contamination on the lip of a hood.

On December 16, 2010, Aleut World Solutions (AWS), a decontamination and decommissioning service provider (NRC License No. 50-29273-01), was contracted by RASO to conduct radiation characterization surveys at SPAWARS. Under RASO oversight, AWS commenced characterization surveys of other potentially affected areas throughout the facility where radioactive material, both sealed and unsealed forms, may have been used.

The RPMs determined through interviews with AWS personnel that the countertop/sinks had been removed from Building 111 on December 17, 2010, and transported in the back of a Navy truck across town on public roads to the Naval Warfare Systems Command, Old Town Campus (OTC), in San Diego. The RPMs located the two

countertop/sinks in a storage area at OTC and AWS conducted radiological surveys for the presence of fixed and removable contamination. One countertop/sink had no detectable activity when surveyed; however, wipe surveys of the second countertop/sink indicated the presence of removable contamination. The wipe survey for removable contamination identified radium-226 and thorium-232 contamination (i.e., 29,192 disintegrations per minute beta/gamma and 11,478 disintegrations per minute alpha contamination). The Navy wrapped the contaminated sink in poly, taped and stored the countertop/sink in a locked cage and eventually disposed of it as low-level radioactive waste. No detectable contamination was found in the area where the two countertop/sinks had been initially stored at the OTC. A later survey performed by AWS personnel of the truck bed indicated the presence of contamination at a location on the truck bed liner. RASO reviewed the AWS survey results which indicated a location on the truck bed liner had 61 disintegrations per minute (dpm) alpha and 5,552 dpm beta/gamma contamination. The liner was removed from the truck and placed in storage by the licensee.

NRC Actions

The inspectors reviewed the details regarding the leaking sealed source. After discussing the issue with RASO personnel and the former executive secretary, the NRC inspectors determined the source had been contaminated with thorium and not Fe-55, as previously thought, and cited by RASO in their January 14, 2011 letter.

During the facility tour of Building 111, RASO showed the NRC inspectors the contaminated truck bed liner. AWS personnel informed the NRC inspectors that the truck bed liner had been removed from the Navy's pickup truck that transported the contaminated sink as mentioned above. The contamination was isolated and not uniformly spread across the liner, the RPMs and NRC inspectors concluded the truck bed liner was contaminated as a result of the shipment of the countertop/sink. The failure to survey the countertop/sink prior to removing it from the laboratory is an apparent violation of 10 CFR 20.1501.

The inspectors reviewed the jurisdiction for the transportation of the countertop/sink across public highways to the Naval Warfare Systems Command, OTC, San Diego. The shipment was made from SPAWARS to OTC, through a Navy contractor. The countertop/sink was considered under the control of the Navy during transport on public highways. Although the transportation activity remained under the control of the Navy and the jurisdiction of the NRC, the Navy made courtesy notifications to the State of California on December 19, 2010.

Although the command was shutdown, the NRC inspectors verified that adequate equipment was available for AWS to conduct required surveys. In addition, the inspectors spot checked instruments and noted that all instrumentation was calibrated and operational.

As of March 17, 2011, RASO had terminated Permit No. 04-66001-E1NP.

c. <u>Conclusions</u>

The NRC inspectors identified one apparent violation.

10 CFR 20.1501 requires, in part, that each licensee make or cause to be made surveys that are reasonable under the circumstances to evaluate the extent of radiation levels, concentrations or quantities of radioactive materials, and the potential radiological hazards that could be present. Survey as defined in 10 CFR 20.1003, means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation.

Contrary to the above, the licensee did not make a survey to assure compliance with 10 CFR 20.1301, which limits dose to individual members of the public. Specifically, on December 17, 2010, the licensee removed a laboratory countertop/sink from a laboratory that had used radioactive material and transported it to another facility in San Diego without first performing a radiological survey of the countertop/sink. A subsequent wipe survey for removable contamination identified radium-226 and thorium-232 contamination (i.e., 29,192 disintegrations per minute beta/gamma and 11,478 disintegrations per minute alpha contamination).

No other violations or safety concerns were identified.

III Exit Meeting

The inspectors presented the preliminary inspection findings to the Commanding Officer and other members of his staff on January 20, 2011 at the conclusion of the inspection. The inspection findings were also presented at the quarterly NRSC meeting held on May 10, 2011. A final exit meeting was conducted with Navy MML personnel at the N45 offices in the Pentagon on June 2, 2011.

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Space and Naval Warfare Systems Center (SPAWARS) *CAPT Joe Beel, Commanding Officer CAPT Sandra T. Buckles, Executive Office Gary Douglass, Manager, Safety and Environmental Rebecca Garoutte, Assistant Radiation Safety Officer Carmela A. Keeney, Technical Director Richard Kroeger, Ph.D., Authorized User Gary Mastny, IRCC Chair John Moore, Radiation Safety Officer +LT Terry Miles, Officer in Charge, NMCPHC

Naval Radiation Safety Committee (NRSC)

+RADM Philip Cullom NRSC Chairman
*+#CAPT Donna Davis-Urgo, Executive Secretary
*+#CAPT Luis Benevides, NAVSEA, NRSC member (#by phone)
#David Farrand, Deputy Director Radiological Controls, NAVSEA
+#Lino Fragoso, Ph.D., Deputy Special Assistant for Radiological Controls
+CDR Chad Mitchell, BUMED, NRSC member
+LT Joe Sorcic, USMC, NRSC member

Radiological Affairs Support Office (RASO) *+#CDR Greg Kahles, Officer in Charge Randy Erickson, Radiation Protection Manager

- * Individual(s) present at preliminary exit meeting on January 20, 2011
- + Individual(s) present during the NRSC meeting on May 10, 2011
- # Individual(s) present at exit meeting on June 2, 2011

INSPECTION PROCEDURE USED

IP 87126, Industrial/Academic/Research Program

ACRONYMS

- AWS Aleut World Services
- CFR Code of Federal Regulations
- DOT Department of Transportation
- DPM Disintegrations per minute
- FSME Office of Federal and State Materials and Environmental Management Programs
- IRCC Ionizing Radiation Control Committee
- MML Master Materials License
- NRMP Naval Radioactive Materials Permit
- SPAWARS Space and Naval Warfare Systems Center
- SNM Special Nuclear Material

Naval Radiation Safety Committee
Old Town Campus
Radiological Affairs Support Office
Radiation Protection Manager
Surface Contaminated Object