

September 19, 2007

NMED No. 070502

George Jarvis, Safety Director
Department of the Army
TACOM Life Cycle Management Command
ATTN: AMSTA-CS-CZR
1 Rock Island Arsenal
Rock Island, IL 61299-7630

SUBJECT: NRC SPECIAL INSPECTION REPORT NO. 030-13027/07-01

Dear Mr. Jarvis,

This refers to the inspection conducted on August 10, 2007, at the Anniston Army Depot facility in Anniston, Alabama, with continued NRC in-office review through August 23, 2005. The NRC in-office review included receipt and review of additional information including surveys and dose calculations that were made following the event. The purpose of the inspection was to follow up on a reported event involving a fire in a radioactive waste building that ruptured several devices containing tritium gas on August 6, 2007. The enclosed report presents the results of this inspection.

This inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel.

Based on the results of this inspection, the NRC has determined that no violations of NRC requirements occurred.

G. Jarvis

-2-

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC web site at <http://www.nrc.gov/reading-rm/adams.html>.

Sincerely,

/RA/

John R. Madera, Chief
Materials Inspection Branch

Docket No. 030-13027
License No. 12-00722-06

Enclosure:
Inspection Report No. 030-13207/07-01

cc w/encl: State of Illinois
State of Alabama

DISTRIBUTION W ENCL:

Docket File
ADAMS (PARS)
M. Satorius, RIII
S. Reynolds, RIII
G. Shear, RIII
K. O'Brien, RIII

DOCUMENT NAME: G:\SEC\Work in progress\army inspection report 9-07.doc

X Publicly Available Non-Publicly Available Sensitive X Non-Sensitive

To receive a copy of this document, indicate in the concurrence box "C" = Copy without attach/encl "E" = Copy with attach/encl "N" = No copy

OFFICE	RI		RIII		RIII		RIII	
NAME	BAParker:mb via email		RGGattone by JRM for		JRMadera			
DATE	09/19/07		09/19/07		09/19/07			

OFFICIAL RECORD COPY

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No.: 030-13027

License No.: 12-00722-06

Report No.: 030-13027/2007-001 (DNMS)

Licensee: Department of the Army
TACOM Life Cycle Management Command

Facility: Anniston Army Depot
Anniston, Alabama

Inspection Dates: August 10, 2007, with continued NRC in-office
review through August 23, 2007

Preliminary Exit Meeting: August 10, 2007

Final Exit Teleconference: September 19, 2007

Inspector: Bryan A. Parker, Health Physicist
Commercial Research and Development Branch
Division of Nuclear Materials Safety, Region I

Approved by: John R. Madera, Chief
Materials Inspection Branch
Division of Nuclear Materials Safety, Region III

NMED No. 070502

Enclosure

EXECUTIVE SUMMARY

**Department of the Army
TACOM Life Cycle Management Command
NRC Inspection Report 030-13027/2007-001(DNMS)**

The inspector conducted a reactive inspection to review the circumstances surrounding an event that occurred on August 6, 2007, involving a fire that ruptured several devices containing tritium gas. No violations of NRC requirements were identified as a result of the event. The inspector determined that the root cause of the event was a chemical reaction involving oily paper towels and hydrogen peroxide that were used to decontaminate tritium on August 4, 2007.

The licensee conducted radiation surveys immediately following the fire and periodically thereafter, all of which showed very little residual tritium contamination. The licensee also conducted bioassays on all personnel involved in the event, including the firefighters, and the resulting doses were all less than 1 millirem Total Effective Dose Equivalent.

The inspector used the Radiological Assessment System for Consequence Analysis (RASCAL) program to assess a similar dose calculation performed by the licensee to determine if there were any offsite doses as a result of the event. Both calculations indicated that the doses beyond the immediate area of the building were negligible (less than 0.1 millirem Total Effective Dose Equivalent at 0-10 miles).

The licensee's corrective actions to prevent a similar event included discontinuing the: (1) use of hydrogen peroxide as a decontamination agent; and (2) storage of decontamination materials (rags, etc.) with radioactive materials. In addition, the licensee planned to provide guidance to applicable staff regarding appropriate decontamination solutions and storage of decontamination materials.

Report Details

1 Program Overview

Licensed Activities and Inspection History

The Department of the Army TACOM Life Cycle Management Command (licensee) based its licensed program in Rock Island, Illinois. The licensee is authorized to possess and use hydrogen-3 (tritium), nickel-63, and americium-241 in a variety of fire control devices on military weaponry and chemical agent detectors. In addition, the licensee is authorized to possess Promethium-147 for collection and disposal only. The licensee conducts licensed activities at a wide range of U.S. Army, National Guard, and Marine Corps installations throughout the United States and other locations under NRC jurisdiction.

The licensee was last inspected on October 11, 2005. The inspector identified a Non-Cited Violation (NCV) of NRC regulatory requirements involving failure to secure from unauthorized removal or access, or maintain control and constant surveillance of, a nickel-63 source that was housed in a portable chemical agent detector (CAD).

The licensee was previously inspected on January 18, 2005. The inspector did not identify any violations of NRC regulatory requirements

2 Event Summary

2.1 Inspection Scope

The inspector evaluated the circumstances surrounding an event involving a fire that ruptured multiple devices containing tritium gas by interviewing selected licensee staff, observing the area of the event, observing the damaged sources, and reviewing selected records.

2.2 Observations and Findings

On August 4, 2007, a pallet of fire control devices containing self-luminous tritium sources was transferred via forklift from the Defense Logistics Agency (DLA) warehouse to an Army building for processing and installation/replacement on various Army weapons. At that time, the licensed material was possessed under DLA's NRC License No. 37-30062-01, which authorizes storage at the Anniston Army Depot. When the forklift approached the pallet to lift it, the forklift tong snagged a package containing several of the devices that had inadvertently fallen down inside the pallet, crushing three of them and allowing the tritium gas to escape into the atmosphere. The forklift operator did not realize this had happened and continued on with the transfer. A subsequent bioassay of the DLA forklift operator revealed no significant intake. Upon entering the nearby Army building with the load (where the licensed material would be transferred from the DLA license to the Army license under which the later fire event occurred), an alarm sounded due to the presence of tritium gas.

Army licensee personnel responded to the alarm and notified the Army Depot Radiation Safety Officer (Depot RSO) of the event, who also responded. Army licensee personnel identified the ruptured sources and decontaminated the forklift, the pallet, and the undamaged packaged devices. They used a solution of industrial strength hydrogen peroxide (10-12 percent) as a decontamination agent. The resulting waste (soiled paper towels soaked in hydrogen peroxide) was packaged along with the three ruptured sources into a ziplock bag and sealed for transfer to the Army radioactive waste building and eventual disposal.

The Army radioactive waste building was a standard, insulated, metal building approximately 40-feet wide by 60-feet long by 20-feet high. The floor was reinforced with concrete that was several inches thick with curbing around the inside edges. The floor was sealed with an epoxy coating and there were no drains. There were two entry doors, one rollup door and one regular door, as well as two ground level wall vents and roof ridge vents to allow natural air circulation through the building. There were electrical lights, a heater, and a roof vent fan; but there were no smoke alarms or fire suppression systems in the building.

During the late afternoon on August 6, 2007, the sealed ziplock bag and its contents were transferred from the Army building to the Army radioactive waste building. The bag was placed on a worktable approximately 10 feet inside of the building door. The table had a metal frame with a wooden top and backsplash. Directly behind and below the table were four wooden storage bins, each approximately five feet by five feet by two feet deep.

At approximately 7:30 p.m. on August 6, 2007, a security officer on routine patrol noticed smoke coming out of the Army radioactive waste building and notified the fire department which responded immediately. The Depot RSO was also notified and he also responded. The firefighters opened the door to the building and, using mostly chemical extinguishers and a minimal amount of water, extinguished the fire from the doorway. The firefighters were wearing respiratory protection and only entered the building after extinguishing the majority of the fire and forcing most of the remaining smoke out with a large fan blowing into the building.

The firefighters and the Depot RSO found the worktable and one of the bins severely burned and another bin badly charred on one side. The most damaged bin was a container for collecting replaced tritium devices scheduled for tritium recovery and/or disposal. These devices were stored in cardboard boxes. At the time of the fire, there were approximately 100 devices in that bin. The less damaged bin did not contain any radioactive material at the time of the fire. Of the two undamaged bins, one was empty and the other contained some thorium-bearing devices that were undamaged by the fire.

2.3 Conclusions

The inspector determined that the licensee's early fire detection and good firefighting techniques resulted in its ability to quickly and safely extinguish the fire. The inspector did not identify any violations of NRC regulatory requirements.

3 Event Response Detail

3.1 Inspection Scope

The inspector reviewed the licensee's response to the event by interviewing selected licensee staff, observing the area of the event, observing the damaged sources, and reviewing selected records.

3.2 Observations and Findings

Once the fire was extinguished, the Assistant Fire Chief examined the scene and determined that the fire started on the worktable surface near the three damaged sources that came from the earlier contamination event under the DLA license. The Depot RSO further investigated and determined that the fire was the result of a chemical reaction between the hydrogen peroxide used as a decontamination agent and apparent oily residues (i.e., grease) that came off of the equipment, devices, and packaging as part of the cleaning.

Since the storage bag was sealed, the oxygen concentration in the bag increased as the hydrogen peroxide decomposed into water and oxygen. This caused the hydrocarbons in the oily residues to react exothermically, resulting in smoldering of the materials in the waste bag (paper, oil and plastic). After the waste bag on the table began to burn, it ignited the wooden surface and embers from the burning backsplash fell into the bin containing the tritium devices. Subsequently, the cardboard containers ignited, heating up the mostly metal and glass devices. The heat overpressurized the tritium gas inside, eventually rupturing approximately 92 of the devices, releasing the tritium to the atmosphere. The smoke carried the majority of the tritium up and out through the roof ridge vents and other small openings in the metal building, with only a very small portion contaminating the interior of the building.

The Depot RSO determined the number of ruptured sources by examining them in low-light. If a green glow was still visible, the tritium was known to still be contained in the source. If no glow was visible, then the RSO assumed that the source had ruptured and released its tritium. (NOTE: some sources were so badly charred that they may not have been ruptured but no glow was visible. The RSO made no attempts to remove charring for fear of rupturing intact sources with no glow visible.) From this, it was determined that the ruptured sources consisted of 32 aiming posts, 40 muzzle reference sensors, 10 elbow telescopes, and 10 various other devices (e.g., rifle and pistol sights, etc.), totaling a maximum total activity of approximately 804 curies of tritium. Due to charring, the labels on most of the devices could no longer be read; therefore, some of the activity levels used to estimate the maximum total activity were nominal at the time the sources were first put into use many years ago. Therefore, it is reasonable to presume that, for most of the sources, at least one half-life (12.33 years for tritium) had elapsed, leading to their replacement because of a dimming glow. After additional evaluation of the affected sources, the licensee indicated in its 30-day report dated September 5, 2007, that the total activity of tritium released was 700 curies.

The Depot RSO conducted several surveys in and around the affected area over several days following the event. Initial surveys of the area around the bin, including two areas with some residual standing water on the floor, indicated maximum removable tritium levels ranging from approximately 8,000 to 28,000 disintegrations per 100 square centimeters (dpm/100 cm²). Surveys of the firefighters' turnout gear found no tritium above background levels (approximately 20 dpm/100 cm²). On August 9, after the residual water had evaporated, the Depot RSO took additional surveys around the interior of the building along the floor and walls. Results showed tritium levels ranging from background (approximately 20 dpm/100 cm²) to 242 dpm/100 cm². On August 10, more surveys in and around the burn area and on and around some of the burned devices found tritium levels ranging from background (approximately 20 dpm/100 cm²) to 2,600 dpm/100 cm². Additional wall surveys indicated no levels above 600 dpm/100 cm². Ceiling surveys conducted on August 13 through 14 revealed no tritium levels above 1,500 dpm/100 cm². By comparison, NRC limits for releasing a decommissioned area allow residual tritium levels on building surfaces of up to 1.2E8 dpm/100 cm², 10 percent of which can be removable.

3.3 Conclusions

The licensee determined that a chemical reaction of the materials in the waste bag started a smoldering fire that spread to the bin containing the licensed devices. Since the licensee's estimate of 700 curies of tritium released was conservative, the inspector estimated the release to be between 350 and 700 curies of tritium. Essentially all of the released tritium escaped out of the building with the smoke.

4 **Dose Assessment**

4.1 Inspection Scope

The inspector performed an independent plume dose calculation using the Radiological Assessment System for Consequence Analysis (RASCAL) program, with input data supplied by the licensee that included meteorological data. In addition, the inspector toured the affected areas and interviewed selected licensee personnel.

4.2 Observations and Findings

Bioassays in the form of urinalysis were performed on 10 personnel involved in the event response, including the firefighters and the Depot RSO. Results indicated very little intake of tritium with a maximum Total Effective Dose Equivalent of 0.2 millirem.

Licensee staff performed a dose assessment for any potential doses outside the building or possibly offsite. They used a program called D2Puff, which is a Gaussian plume model that is designed for use with chemical agent dose calculations. The licensee modified it for tritium using event data including the actual meteorological data from the time of the event. These calculations showed that there was essentially no plume and very low doses immediately around the building only for a short period of time.

Input data from the event, including the same meteorological data from the time of the event that was used by the licensee in its calculations was used by the inspector to performed an independent plume dose calculation using the RASCAL program. The inspectors' calculations indicated that there was no plume associated with the tritium release and potential dose outside the restricted area around the building was less than 0.1 millirem Total Effective Dose Equivalent.

4.3 Conclusions

The licensee conducted an adequate dose assessment for the event. The event did not result in any individual exceeding NRC regulatory dose limits.

5 Root Cause and Contributing Factors

5.1 Inspection Scope

The inspector assessed the root cause and contributing factors for the fire event by interviewing selected licensee personnel and reviewing selected records.

5.2 Observations and Findings

The root cause of the event was the chemical reaction of the hydrogen peroxide with the hydrocarbons from the oily residue removed from surfaces during clean-up from an earlier tritium contamination event. If the waste bag containing the decontamination materials had been left unsealed and open, the fire may not have occurred because oxygen levels within the bag from the decomposition of the peroxide may not have risen to a sufficient level to initiate the exothermic reaction. However, good health physics practices would dictate that the waste materials from such a clean-up should be bagged and sealed to prevent further contamination and personnel exposure. Licensee personnel who conducted the clean-up were more accustomed to practicing good health physics and, since tritium contamination events are not that common, did not recall that hydrogen peroxide should not be combined with hydrocarbons, especially in a sealed environment.

Contributing factors were the unfortunate set of circumstances that led to the fire damaging the tritium devices, including the lack of smoke detection equipment within the Army radioactive waste building, the wooden surface of the worktable, the proximity of the wooden bins to the worktable, and the presence of the cardboard boxes that held the tritium devices in the bin. The absence of one or more of these factors may have eliminated or at least minimized the damage.

5.3 Conclusions

The root cause of the event was a fire started by a chemical reaction. However, the circumstances that led to the fire were not reasonably foreseeable. No violations of NRC requirements were identified.

6 Corrective Actions

6.1 Inspection Scope

The inspector interviewed selected licensee staff to identify the corrective actions taken by the licensee to prevent a similar event.

6.2 Observations and Findings

The licensee indicated that it will: (1) no longer use hydrogen peroxide as a decontamination agent; (2) no longer store any radioactive sources in the same container with decontamination waste materials; and (3) provide guidance to other Army personnel regarding appropriate decontamination solutions and storage of waste materials.

During the preliminary exit meeting, a licensee representative stated that the licensee would explore the option of installing smoke detection capability into the Army radioactive waste building. A fire suppression system was not considered a good option by the licensee due to the nature of the material stored there and other factors associated with the use of certain fire suppressants.

6.3 Conclusions

The licensee initiated adequate corrective actions to prevent a similar event and it is exploring other options to further enhance fire safety.

7 Notifications and Reports

7.1 Inspection Scope

The inspector interviewed the Depot RSO and other selected licensee staff to evaluate the licensee's notification of the event to the NRC.

7.2 Observations and Findings

Title 10 CFR 30.50(b)(4) requires that the licensee notify the NRC within 24 hours of the discovery of an unplanned fire or explosion damaging any licensed material or any device, container or equipment containing licensed material when: (1) the quantity of material involved is greater than five times the lowest annual limit of intake (ALI) specified in Appendix B of 10 CFR Part 20; and (2) the damage affects the integrity of the licensed material or its container. The licensee notified the NRC Operations Center of the event on August 7, 2007, in accordance with 10 CFR 30.50(b)(4).

Title 10 CFR 30.50(c)(2) requires the license to submit a written report to the NRC within 30 days of the initial notification required by 10 CFR 30.50(b)(4). The licensee submitted its written report on September 5, 2007, in accordance with 10 CFR 30.50(c)(2) and it included all of the required information.

7.3 Conclusions

The licensee reported the event to the NRC in accordance with Part 30 requirements.

8 **Exit Meeting**

The inspector discussed the preliminary conclusions described in this report with licensee management during an exit meeting conducted at the licensee's facility on August 10, 2007. The final conclusions described in this report were discussed with Mr. Havenner, Chief, Safety Office, Department of the Army, TACOM, Rock Island Arsenal, during a final exit teleconference conducted on September 19, 2007. The licensee did not identify any information reviewed during this inspection and selected for inclusion in this inspection report as proprietary in nature.

PARTIAL LIST OF PERSONS CONTACTED

#Jack Cline, Deputy Commander
#Ray Minter, Chief of Staff
#George Worman, Chief Counsel
#Robert Curry, Depot Radiation Safety Officer
#Sue Turton, Safety Officer
#Cynthia Blakely, Safety Specialist
#Joan Gustafson, Public Affairs Officer
Marty Carter, Assistant Fire Chief
*Thomas Gizicki, Rock Island Radiation Safety Officer
* J. Havenner, Chief, Safety Office

participated in exit meeting

* contacted by telephone