

Evaluation **R**eport



ARMY NATIONAL GUARD AND U.S. ARMY RESERVE COMMAND
SMALL ARMS INDOOR FIRING RANGES

Report Number 98-170

June 30, 1998

Office of the Inspector General
Department of Defense

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Acronyms

ARNG	Army National Guard
EPA	Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
USARC	U.S. Army Reserve Command



INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
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June 30, 1998

MEMORANDUM FOR AUDITOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: Evaluation Report on Army National Guard and U.S. Army Reserve
Command Small Arms Indoor Firing Ranges (Report No. 98-170)

We are providing this report for review and comment. This is the first of two reports on indoor small arms ranges and was developed in response to a request by the Director of Facilities, Deputy Assistant Secretary of Defense for Reserve Affairs (Materiel and Facilities). We considered management comments on a draft of this report in preparing the final report.

The Assistant Chief of Staff for Installation Management, Department of the Army, concurred with all findings as written, but did not comment on the specific recommendations. DoD Directive 7650.3 requires that all recommendations be resolved promptly. Therefore, we request the Assistant Chief of Staff for Installation Management to comment on all recommendations by July 31, 1998. Comments must describe actions taken or planned in response to recommendations and provide the completion dates of the actions.

We appreciate the courtesies extended to the evaluation staff. Questions on the evaluation should be directed to Mr. John C. Speedy at (703) 604-8978 (DSN 664-8978), or Ms. Lorretta F. Swanson at (703) 604-8971 (DSN 664-8971). See Appendix E for the report distribution list. The evaluation team members are listed inside the back cover.

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Report No. 98-170
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June 30, 1998

Army National Guard and U.S. Army Reserve Command Small Arms Indoor Firing Ranges

Executive Summary

Introduction. This report responds to a request by the Director of Facilities, Deputy Assistant Secretary of Defense for Reserve Affairs (Materiel and Facilities). Army National Guard (ARNG) and U.S. Army Reserve Command (USARC) small arms range inventories include a combined total of 1,519 indoor ranges. The ARNG and USARC built indoor ranges to support Department of the Army training strategies for attaining marksmanship goals in support of operational readiness objectives. The Director of Facilities reported indications that the number of small arms ranges may be excessive. He stated that management changes may be needed based on current training requirements and other issues such as increased costs, potential health risks of exposure to range-generated lead levels, and recent improvements in alternative small arms training devices and simulators.

This report is the first of two reports on indoor small arms ranges. The second report will provide the results of an evaluation of new indoor range construction and range rehabilitation projects.

Evaluation Objectives. Our objective was to evaluate the accuracy and reliability of indoor firing range inventory data, indoor range use, potential health risks of range-generated lead, and indoor range fiscal requirements. We also reviewed the adequacy of the management control program as it applies to those issues.

Evaluation Results. The ARNG and the USARC need to improve management of their inventories of indoor small arms ranges.

- o The Army, ARNG, and USARC did not have accurate and complete data on the number, location, safety status, and disposition of all ARNG and USARC small arms indoor firing ranges. As a result, senior managers in ARNG and USARC may be hindered from making informed decisions, making best use of resources, and managing indoor ranges safely (Finding A).

- o Some ARNG and USARC units have used indoor ranges that safety officials and industrial hygienists designated as unsafe because of lead contamination. ARNG and USARC range-use policy prohibits using unsafe ranges for any purpose. The lack of good data on indoor ranges made it impossible to determine how often unauthorized use of unsafe ranges may have unnecessarily exposed Federal and State personnel and their families to hazardous levels of lead-dust. (Finding B).

- o Hazardous levels of lead-contaminated dust have migrated from 12 indoor ranges to other areas of readiness centers. As a result, persons using readiness centers have an increased potential of both occupational and casual exposure to high lead concentrations (Finding C).

o Unsafe ARNG and USARC indoor ranges represent an undefined and unfunded fiscal requirement for rehabilitation or for decontaminating unsafe ranges for closure or conversion. An estimated 982 (65 percent) of 1,519 ARNG and USARC small arms indoor firing ranges are unsafe and unusable (Finding D).

See Appendix A for the details of the review of the management control program.

Summary of Recommendations. We recommend the development and maintenance of accurate and reliable inventory and status data on every indoor range and that real property managers annually verify the accuracy of indoor range data in the Army Integrated Facility System-Management and Installation Status Report databases. Also, we recommend increased command emphasis to field units in communicating the potential dangers and individual responsibilities and liabilities associated with unauthorized use of unsafe indoor ranges. We recommend increased management oversight in enforcing policy prohibiting the use of unsafe ranges and in assuring that unsafe ranges are not used. Further, we recommend completion of safety inspections for all indoor ranges to include surveys for lead contamination. We recommend completion and issuance of the draft revision of Department of the Army Regulation 385-63, "Range Safety," and Pamphlet 385-63, "Range Safety," as soon as possible. Range safety policy should include Army standards for testing, cleaning, and decontaminating indoor ranges. Further, we recommend developing and issuing guidance that requires safety managers and industrial hygienists to conduct lead-contamination surveys in areas outside of the immediate range area, and where necessary, abate lead hazards.

To support senior management decisions on range disposition, we recommend conducting risk assessments of unsafe ranges. We also recommend the development of estimates of the fiscal requirements for managing unsafe indoor range rehabilitation and permanent closure, conversion, sealing as necessary, and a plan of action with milestones for reducing the number of unsafe ranges. In addition, we recommend initiating action to identify or develop low-cost technologies and methodologies for decontaminating ranges.

Management Comments. The Assistant Chief of Staff for Installation Management provided a coordinated Army response that concurred with the findings as written. See Part I for a discussion of management comments and Part III for the complete text of the management comments.

Evaluation Response. The Assistant Chief of Staff for Installation Management did not specifically address the report recommendations. We request the Assistant Chief of Staff for Installation Management to comment on all recommendations by July 31, 1998.

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Part I - Evaluation Results

Evaluation Background

This evaluation responds to a request from the Director of Facilities, Office of the Deputy Assistant Secretary of Defense for Reserve Affairs (Materiel and Facilities), that we evaluate the small arms range program. The Director reported several indications that the large infrastructure of small arms firing ranges may be excessive to actual training needs. If so, continued funding of the operations and maintenance of some ranges may not be an efficient use of limited Reserve Component training funds. Both outdoor and indoor small arms ranges support required small arms training. However, this report deals only with indoor small arms firing ranges.

As the first of two reports on indoor small arms ranges, this report provides an evaluation of the accuracy and reliability of indoor range inventory data, indoor range use, potential health risks of range-generated lead, and indoor range fiscal requirements. The second report will evaluate new indoor range construction and range rehabilitation projects.

The Federal Government provides all funds for U.S. Army Reserve Command (USARC) indoor range construction, operations, and maintenance. However, individual States and the Federal Government share in funding Army National Guard (ARNG) range construction in armories, with Federal Operations and Maintenance funds used only for training related to the Federal mission.

The ARNG and USARC use small arms range infrastructures as part of the Army training strategy for achieving marksmanship goals and standards that support operational readiness. ARNG and USARC units use indoor ranges for small arms marksmanship training when outdoor ranges are too far away or when they are unavailable.

Approximately 1,519 indoor ranges are in the combined inventories of the ARNG and USARC. Officials in the Office of the Chief of Safety and Occupational Health Division, ARNG, estimate a small arms indoor range inventory of 1,125 ranges. Officials in the Office of the Deputy Chief of Staff, Engineers, USARC, report an indoor small arms range inventory of approximately 394 ranges. In the past, ARNG and USARC units used indoor ranges extensively. However, the following three factors are now driving changes in marksmanship training:

- reductions in force structure and associated training,
- new technology improvements in small arms simulators and alternative training devices, and

-
- growing concern for and awareness of the safety and health risks associated with exposure to the hazardous lead-dust levels generated at many live-fire ranges.

The implications of these factors are having an impact on both the ARNG and USARC indoor range infrastructures. For example, some units are not using indoor ranges for live-fire training because the ranges are not equipped to meet occupational health and safety standards. According to current estimates by ARNG safety officials, 215 of the approximately 1,125 ARNG indoor ranges are assumed to be "safe" for live-fire training. USARC Headquarters personnel believe that 119 of the approximately 394 Reserve indoor ranges are safe for live-fire training.

Evaluation Objectives

Our objective was to evaluate the accuracy and reliability of indoor range inventory data, indoor range use, potential health risks of range-generated lead, and indoor range fiscal requirements. The report also addresses the management control program as it applies to those issues.

See Appendix A for a discussion of the evaluation scope and methodology and the management control program.

Finding A. Accuracy of Indoor Range Inventory Data

The Army, ARNG, and USARC did not have accurate and complete data on the number, location, safety status, and disposition of all ARNG and USARC small arms indoor firing ranges. ARNG and USARC management controls did not ensure that National Guard State Area Commands and Reserve Regional Support Commands provided the data in accordance with the requirements of DoD Instruction 4165.14, Army Regulation 405-45, and other guidance. As a result, senior managers in ARNG and USARC may be hindered from making informed decisions, making best use of resources, and managing indoor ranges safely.

Requirements for Range Inventory Data

The Army created the Army Integrated Facility System-Management database to comply with the provisions of DoD Instruction 4165.14, "Inventory of Military Real Property," December 21, 1966, and Army Regulation 405-45, "Inventory of Army Military Real Property," March 18, 1977. The latter regulation and Office of the Assistant Chief of Staff for Installation Management, Plans and Operations Division Memorandum, "Interim Policy and Procedure Changes to Army Regulation 405-45, 'Inventory of Army Military Real Property,'" April 15, 1997, require that the commanders of major Army commands "ensure the accuracy, completeness and timeliness of real property information," on federally owned property. As a result, ARNG and USARC are required to report real property information on federally owned facilities for inclusion in the Army Integrated Facility System-Management database.

The Army regulation and policy memorandum also require ARNG and USARC to identify all federally owned facilities and to report all functions performed at those facilities that occupy at least 1,000 square feet of contiguous space within a multipurpose building that is located on Federal property. Any functional use that takes less than 1,000 square feet of space must also be reported separately if the installation or headquarters considers it to be important to real property management. (The standard ARNG or USARC indoor range occupies more than 1,000 square feet.) The reporting requirement is also stated in Army Regulation 415-28, "Real Property Category Codes," October 10, 1996.

The National Guard State Area Commands are also required to identify and report State-owned facilities to the Chief, National Guard Bureau. Information on State-owned real property is not included in the Army Integrated Facility System-Management database. The National Guard Bureau has a separate real property maintenance information management system, called the Desktop Resource for Real Property system, for both federally owned and State-owned property.

Finding A. Accuracy of Indoor Range Inventory Data

Headquarters, Department of the Army, Assistant Chief of Staff for Installation Management, DAIM-FDF-Memorandum (1-1q), December 4, 1995, established Army policy for the Installation Status Report Program. The Army Installation Status Report database provides commanders of installations and major Army commands, including ARNG and USARC, with key elements of the status of facilities at an installation. Information on the status of real property facilities, including the status of indoor ranges for both federally owned and State-owned facilities, are supposed to be included in the Installation Status Report.

Adequacy of Range Inventory Data

Officials in the Office of the Army Assistant Chief of Staff, Installation Management, as well as officials in the ARNG and USARC, did not have accurate and complete data on ARNG and USARC indoor small arms ranges. Safety, industrial hygiene, and occupational health managers do not have sufficient information to know the location and safety status of all indoor ranges. We requested data from the Director of Facilities, ARNG, and the Office of the Chief, USARC, on their respective Reserve Component's small arms ranges. The ARNG responded to the request for indoor range data by stating that, "The ARNG did not maintain data on indoor ranges." The USARC responded with a list of indoor ranges, but it said that the list represented only an approximate inventory and could not be certified as accurate and complete. Personnel in both the ARNG and USARC were helpful in collecting the data needed for the evaluation.

Much of the data that were requested on federally owned ranges should have been available from the Army Integrated Facility System-Management database. Information on the status of both federally owned and State owned ranges should have been available through the Army Installation Status Report database. However, the databases did not contain accurate or complete data on ARNG and USARC indoor ranges. ARNG and USARC management controls did not ensure that National Guard State Area Commands and Reserve Regional Support Commands provided the data in accordance with the requirements of DoD Instruction 4165.14, Army Regulation 405-45, and other guidance.

ARNG Range Inventory Data. ARNG management controls did not require the National Guard State Area Commands to provide accurate and complete information on all indoor firing ranges. In January 1998, the Army Integrated Facilities System-Management database contained only four entries for federally owned ARNG range facilities. The ARNG estimates that it has approximately 1,125 ARNG indoor ranges, many of which are State owned. ARNG officials did not report how many of the 1,125 indoor ranges were federally owned or how many ranges should have been in the database.

A query of the Army Installation Status Report database showed that it contained status information on only 36 of an estimated 1,125 indoor ranges and that 21 of the 36 ranges reportedly had passed current safety inspections. ARNG officials acknowledged that they did not require the maintenance and reporting of indoor range status.

Finding A. Accuracy of Indoor Range Inventory Data

Desktop Resource for Real Property. The ARNG uses the Desktop Resource for Real Property system for collecting and maintaining source data on real property inventory. The ARNG extracts inventory data on federally owned facilities from the ARNG Desktop Resource for Real Property system and forwards the data to the Army. The Army enters those records in the Army Integrated Facility System-Management database, which is a property management system and database.

The ARNG also uses the Desktop Resource for Real Property system to collect and provide data on State-owned and federally owned real property for entry in the Army Installation Status Report database. The property system provides information for internal ARNG management as well.

When ARNG officials queried the Desktop Resource for Real Property system during the evaluation, they found that it contained data on only 56 of an estimated 1,125 ARNG indoor ranges. In addition, it contained data from only 10 of the 50 states, 3 territories, and the District of Columbia, which are covered by the system. Of the 56 ranges, the State of Maryland reported 30 ranges. None of the 17 ranges in Puerto Rico that were listed in the Army Installation Status Report appeared in the ARNG Desktop Resource for Real Property database.

Range Data Impacts Funding. The ARNG forwards requests for inventory and status data on indoor ranges to each National Guard State Area Command and relies on each state to respond in a timely and accurate manner. The ARNG does not regularly compile, maintain, or verify data on indoor range inventories and status. ARNG used that process to respond to a data request from the Deputy Assistant Secretary of Defense (Guard and Reserve Materiel and Facilities) (now the Deputy Assistant Secretary of Defense for Reserve Affairs [Materiel and Facilities]) in 1987 and from the Inspector General, DoD, in 1997. Information received each time was incomplete and unverifiable. The lack of accurate and reliable ARNG indoor range inventory data is an ongoing problem in the DoD resourcing cycle, dating back to at least 1985.

In 1985, the ARNG began requesting funds to upgrade indoor ranges. Budget requests submitted in FY 1985 included \$120 million for range upgrades. Again, in FY 1986, the ARNG requested \$80 million for range upgrades. However, the Army Construction Requirement Review Committee rejected both requests because ARNG supporting data did not identify the number or location of the indoor ranges planned for upgrade. During July and November 1986, the ARNG requested that the National Guard State Area Commands provide data on the number of closed ranges and the cost to upgrade them.

In June 1987, the Deputy Assistant Secretary of Defense for Reserve Affairs (Materiel and Facilities), in conjunction with the Deputy Assistant Secretary of Defense for Reserve Affairs (Readiness Training), requested range inventory and related data to use in reviewing policy on indoor small arms ranges. They also requested that each Reserve Component provide staff briefings on indoor and outdoor range requirements. Staff briefings included information on range

Finding A. Accuracy of Indoor Range Inventory Data

justification and type; the quality of training; range availability; Occupational Safety and Health Administration (OSHA) problems; safety issues; and cost data.

In response to the request, the ARNG reported that, as of July 20, 1987, it had identified 1,600 ARNG indoor ranges. The National Guard Bureau, Operations, Training, and Readiness Directorate, Resource Management Division, reported that approximately 1,100 ranges were either closed or restricted to limited use because they could not fully comply with OSHA and other safety standards or because they were no longer needed.

ARNG officials interviewed during the evaluation did not maintain a current indoor range inventory. They did not have data to verify the accuracy or the source of the 1,600 ranges reported in 1987, but stated that they did not believe that they still had 1,600 indoor ranges.

Range Data from Regional Hygiene Offices. The Chief, Industrial Hygiene Branch, ARNG Safety and Occupational Health Division, initiated the collection of new data on ARNG indoor ranges specifically for this evaluation. On October 2, 1997, he provided a list of indoor ranges that was based on information received through the three regional industrial hygiene offices. Although the indoor range list did not contain all data that we requested, it did contain the location and status of approximately 1,125 indoor ranges in 50 of the 54 States and Territories that have ARNG facilities. According to the status data, 867 (77 percent) of the indoor ranges on the list were reportedly in an inactive or closed status.

The Chief, Industrial Hygiene Branch, stated that all ranges on the inventory list that were designated as inactive or closed could be assumed "unsafe" for live-fire training. The Chief stated that the ranges are classified as unsafe or restricted to limited use by ARNG industrial hygienists as the result of visits conducted in cooperation with State safety officials. Ranges are classified as unsafe primarily because they cannot be operated in compliance with Army, OSHA, and National Institute of Occupational Safety and Health safety standards, especially with those standards concerning exposure to lead contaminants generated by live fire. See Appendix B for a detailed discussion of specific lead standards.

ARNG officials did not have sufficient information to explain the difference in total range numbers between those reported in 1987 (1,600) and those reported in 1997 (1,125). They stated that many indoor ranges are not currently being used for live firing, and that the closure of ranges in State-owned readiness centers is a State function that is not reported to ARNG Headquarters staff.

Officials in the ARNG Installations Division stated that the Desktop Resource for Real Property database should have accurate information on all ARNG

*Memorandum from the Deputy Assistant Secretary of Defense (Guard and Reserve Materiel and Facilities), now the Deputy Assistant Secretary of Defense for Reserve Affairs (Materiel and Facilities), for the Assistant Secretary of the Army (Installations and Logistics) and the Assistant Secretary of the Navy (Supply and Logistics); Subject: "Reserve Facilities," June 8, 1987.

Finding A. Accuracy of Indoor Range Inventory Data

indoor ranges. Further, the database could be used to collect and report accurate indoor range information for inclusion in the Army Integrated Facility System-Management and Installation Status Report databases. Range information could also include the safety status and condition of indoor ranges.

USARC Range Inventory Data. USARC management controls did not ensure that the 10 Reserve Regional Support Commands provided accurate and complete data on all indoor firing ranges. In January 1998, a query of the Integrated Facilities System-Management database showed that the database contained only 11 of the estimated 394 indoor ranges in the USARC indoor range inventory. A similar query of the Army Installation Status Report database showed it contained only 8 of the estimated 394 USARC indoor ranges. The Army databases should have contained information on all USARC indoor ranges.

Regional Support Command Range Data. The USARC relies on its 10 Reserve Regional Support Commands to provide accurate and complete inventory data for entry in the Army Integrated Facilities System-Management and the Installation Status Report. Each of the Reserve Regional Support Commands reportedly has a stand-alone computer system for recording the required information on Real Property facilities. The data are downloaded from the Reserve systems and sent via computer diskette to the Army Center for Public Works for entry into the Army databases. The data are sent directly to the Center without first going to the Headquarters, USARC, for review or verification. However, the USARC does have access to the data for review after they are entered in the Army real property and installation status systems.

In trying to validate the USARC inventory list provided in August 1997, we identified discrepancies in the numbers of Reserve ranges reported since 1987. In 1987, USARC responded to a request from the Deputy Assistant Secretary of Defense for Reserve Affairs (Materiel and Facilities) for information on indoor ranges. The response reported 390 indoor ranges in USARC readiness centers. According to the report, 74 ranges had been permanently closed, leaving 316 ranges that were apparently still in operation.

In response to our July 1997 request, USARC officials provided an inventory list containing 394 indoor ranges, with 160 of those ranges noted as converted to alternative uses. The inventory list also noted an additional 115 ranges as unsafe, bringing the estimated total of unsafe and converted ranges to 275, or 70 percent of 394 indoor ranges. A review of the inventory list showed that several of the ranges listed as active were actually closed. One range, shown on the inventory list as converted to other uses, had been transferred to the local government, and ranges listed as unsafe actually had been converted to other uses. USARC personnel stated that the inventory data represented only approximate information.

Range Management New to USARC. USARC officials stated that the command assumed management responsibility for its indoor firing ranges and other facilities in 1995. Before 1995, the Army Installation real property managers had responsibility for the accuracy of inventory data for USARC ranges located on, or supported by, their respective installations. For most locations, USARC real property managers received no DoD Form 1354,

Finding A. Accuracy of Indoor Range Inventory Data

"Transfer and Acceptance of Military Real Property," or other evidence of a physical inventory, at the time of transfer in 1995. USARC officials issued a standard operating procedure on real property in 1997 and reported that they understood the need for developing accurate inventory data. USARC officials have started a comprehensive effort to conduct physical inventories and to collect and validate inventory data, which they estimate will take 1 to 2 years to complete. The managers also need to verify the accuracy and completeness of the data each year.

Effect of Present Range Inventory Data Reporting

The ARNG and the USARC have developed comprehensive range inventory and status data on a situational basis, and not as part of the current Army real property management systems. As a result, senior managers in ARNG and USARC may be hindered from making informed decisions, making best use of resources, and managing indoor ranges safely. Training managers, facility engineers, and other ARNG and USARC managers should have current, accurate, and complete information on their indoor range infrastructure when making funding decisions for new construction or rehabilitation.

Recommendations for Corrective Action

A. We recommend that the Director, Army National Guard, and the Chief, U.S. Army Reserve Command, require:

1. All National Guard State Area Commands and all Army Reserve Regional Support Commands to collect and report accurate inventory and status data in accordance with Army Regulation 405-45, "Inventory of Army Military Real Property," March 18, 1977, and Headquarters, Department of the Army, Assistant Chief of Staff for Installation Management, DAIM-FDF-Memorandum (1-1q), "Installation Status Report Program," December 4, 1995, to include the location, safety status, and disposition of every indoor range.
2. The Army National Guard and the U.S. Army Reserve Command real property managers to annually review indoor range inventory and status data collected by the National Guard State Area Commands and the Reserve Regional Support Commands.
3. The Army National Guard and the U.S. Army Reserve Command real property managers to annually verify that the Army Integrated Facility System-Management and the Installation Status Report databases contain accurate and complete indoor range data.

Finding A. Accuracy of Indoor Range Inventory Data

Management Comments

The Assistant Chief of Staff for Installation Management, Department of the Army, concurred with the finding as written. He noted that State-owned National Guard facilities are not subject to Federal and U.S. Army reporting requirements and are not included in the Army's Real Property inventory.

Evaluation Response

The comments from the Assistant Chief of Staff for Installation Management, Department of the Army, did not specifically address the recommendations. We revised Recommendation A.1. to reference the Army Installation Status Report Program, which requires the collection and reporting of data on all Army National Guard facilities, regardless of whether they are Federal or State-owned. In response to the final report, we request that the Assistant Chief of Staff for Installation Management provide comments on the recommendations.

Finding B. Unauthorized Range Use

Some ARNG and USARC units have used indoor ranges that safety officials and industrial hygienists designated as unsafe because of lead contamination. ARNG and USARC range-use policy prohibits using unsafe ranges for any purpose. Reasons for noncompliance with range-use policy include insufficient management oversight, local need for storage and training space, and inadequate range safety guidance. The lack of good data on the indoor ranges made it impossible to determine how often unauthorized use of unsafe ranges may have unnecessarily exposed Federal and State personnel and their families to hazardous levels of lead-dust.

Indoor Range Safety Standards and Status

Health and Safety Regulations. DoD Instruction 6055.5, "Industrial Hygiene and Occupational Health," January 10, 1989, (change 1, May 6, 1996) states that it is DoD policy to provide employee a healthful work environment, free from recognized chemical, physical, or biological hazards that are likely to cause illness or death. Consistent, meaningful DoD occupational health and safety and environmental surveillance programs are designed to ensure that controls adequately protect the health of DoD personnel. With certain exceptions, DoD organizations must comply with safety and health regulations administered by the Occupational Safety and Health Administration (OSHA). With certain exceptions, they must also comply with all environmental regulations that the Environmental Protection Agency (EPA) and State and local environmental regulators administer.

Airborne lead contamination, occurring as a by-product of indoor live firing, is a major concern in maintaining and decontaminating indoor ranges and in determining whether an indoor range is safe. See Appendix B for a detailed discussion of lead hazards and standards.

Range Safety Status and Use Determined by Inspections. Federal industrial hygiene officials and State and Territorial safety officials and occupational health nurses schedule periodic inspections to identify and correct range safety and health problems. Safety and industrial hygiene officials determine the safety status of an indoor range by inspections, and they classify indoor ranges as safe for use, safe for limited use, or unsafe, based primarily on the results of air and wipe sampling data collected during inspections.

Safe Ranges. Ranges are considered safe if they have passed a current safety inspection. Safe ranges meet established safety standards such as adequate ventilation systems, bullet stops, minimum firing lane width, and designated baffling. In addition, safe ranges meet standards for periodic cleaning based on hours of use.

Ranges Restricted to Limited Use. Ranges that do meet prescribed standards are restricted to limited use or are closed. ARNG and USARC units

Finding B. Unauthorized Range Use

can use the ranges only under conditions in which they can control personnel exposure limits for intermittent lead. For example, a safe range must have airflow from behind the firing line toward the bullet trap. If the average airflow at the firing line is not at least 50 feet per minute, personnel using the range have a greater risk of exposure to lead dust. By limiting firing times, range personnel can control exposure to lead-dust.

Unsafe Ranges. Unsafe ranges are those that do not meet minimum occupational safety and health or administrative standards. USARC, ARNG, and State safety offices have recommended that many indoor ranges be closed because hazardous amounts of airborne lead and lead particles are present on range equipment and other surfaces in the ranges, and because of inadequate ventilation systems and other health and safety problems. When a range is classified as unsafe, it should be closed to prevent personnel being exposed to potential lead hazards and to contain and limit lead contamination on clothing and items that are transported to workers' homes. As a result, unsafe ranges cannot be used for any purpose until they have been decontaminated.

Safety of Ranges Used

Some ARNG and USARC personnel have used unsafe ranges in violation of ARNG and USARC policy and regulations. They use some ranges for storage, and they permanently converted some to other uses such as storage and office space before testing them for lead contamination and decontaminating them. Using unsafe indoor ranges risks the unnecessary exposure of some State and Federal personnel and their families to hazardous levels of lead in a form easily inhaled or ingested. Using unsafe ranges may also expose members of the local community to lead hazards during authorized social events, even when ranges have been inactive for years.

Use of Unsafe ARNG Ranges. The ARNG Chief, Industrial Hygiene Branch, compiled an inventory of small arms indoor firing ranges from information that State safety officials reported in the fall of 1997. Although all States did not report, the inventory listed 1,125 indoor ranges and included a description of each range as closed, inactive, restricted to limited use, under construction, abated, never used, and unknown. The ARNG Chief considered all ranges described as closed or inactive to be unsafe. On that basis, 867 ranges, or 77 percent of the approximately 1,125 indoor ranges, are unsafe.

On August 21, 1992, an ARNG industrial hygienist issued an information paper on the "Conversion of Indoor Firing Ranges to Other Uses," warning about the dangers and risk of lead exposure and intoxication. The paper provided guidance for converting lead-contaminated indoor ranges to other uses. It warned as follows:

The potential for lead intoxication at indoor firing ranges is well-documented. Currently, many lead-contaminated indoor firing ranges are actively being used as storage areas for local community food drives, equipment, office supplies, or as maintenance activities. Allowing instances such as these to occur invites potential future

Finding B. Unauthorized Range Use

liability as each time an individual enters a lead-contaminated range, the air stream produced causes the lead-dust to become airborne and redistributed on the individual's clothing or shoes. The lead-dust can then be tracked from the range to the adjacent offices and break rooms and eventually be ingested or inhaled through contact with food, drink, or smoking. This is alarming because of the number of inactive indoor firing ranges in the Army National Guard. Individuals may be unknowingly taking home lead-dust on their clothes and equipment and exposing their family members. . . .

During the evaluation, safety, environment, and contracting personnel reported specific instances in which ARNG and USARC personnel used unsafe ranges for storage, offices, classrooms, and exercise rooms. For example, an inspection report that ARNG, Industrial Hygiene Office, Region North, filed on the Ruhl Armory in Towson, Maryland, on June 15, 1994, cited the range as unsafe for firing. ARNG inspectors found lockers and exercise equipment stored in the range area that needed cleaning and removal.

In 1995, ARNG personnel told inspectors that they locked the Ruhl Armory range door to prevent people from entering. Nonetheless, the inspector found indications of recent range use. Exercise equipment, tables, and lockers remained stored in the range. While inspectors were on-site, two people used the exercise equipment stored in the range. The lockers looked as if ARNG personnel were using them to store personal belongings. Inspectors also found freshly painted walls and evidence of recent firing.

Wipe samples taken in the area during the 1995 inspection showed evidence of residual contamination. Very high lead concentrations remained on surfaces throughout the range, including the exercise equipment and the lockers. Lead concentration levels ranged from 28 micrograms per square foot to 48,800 micrograms per square foot. National Guard Pamphlet 385-16 states that lead levels above 200 micrograms are a potential health hazard.

During the course of the evaluation, ARNG took steps to address unsafe range use and improper conversion. On October 14, 1997, the ARNG Chief, Industrial Hygiene Branch, issued a letter for all State, Territorial, and District of Columbia safety managers. He wrote, "Many indoor firing ranges converted to offices, classrooms, physical fitness areas, and other uses have not been properly decontaminated." The Chief stressed the need for reevaluating lead hazards in converted ranges. He also recommended that State, Territorial, and District of Columbia safety managers develop procedures to guide future range conversions, to protect workers and their families from lead poisoning, and to minimize the liability of senior ARNG personnel.

While ARNG personnel acknowledge some unsafe range use, they could not provide conclusive data on how often it occurs or how many unsafe ranges are involved. Because no surveillance program for casual or unauthorized users of indoor ranges exists, we could not determine whether unauthorized use is affecting the health and safety of exposed personnel and their families.

Use of Unsafe USARC Ranges. USARC officials report that they have not completed a survey of indoor ranges. Before 1995, Army installations

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accounted for Army Reserve real property, including indoor ranges. The Army began transferring real property accountability to the USARC in 1995 and completed the transfer in 1997. However, the Army did not provide all the documents on indoor ranges. USARC officials said that Army installation real property managers did not provide records on all range safety inspections to the Reserve Regional Support Commands. As a result, it will take from 1 to 2 years to conduct baseline safety inspections and to confirm the status of all indoor ranges.

The USARC reported that, based on assessments and safety inspections that the Army conducted before 1995, approximately 115 ranges, or 29 percent of approximately 394 Reserve ranges, are inactive and unsafe. USARC officials believe that some Reserve personnel use unsafe ranges, and that some Reserve personnel convert unsafe ranges without first abating the lead hazards. However, they could not provide accurate data to support an assessment of the extent of the problem. The USARC is trying to identify those ranges and to decontaminate them as funding becomes available. USARC recognizes the value of range space and wants to decontaminate the space so that it can be put to other uses, such as for small arms simulator training rooms.

The USARC reported 160 converted ranges. Reserve units convert ranges for many other uses such as for chapels, assembly halls, classified work areas, supply rooms, administrative purposes, offices, storage areas, and, in one case, a mess hall. In trying to assess unsafe range use, we reviewed 11 contracts for closing indoor ranges managed by the 99th Reserve Regional Support Command. Additionally, we reviewed data on specific ranges.

Lead Contamination Survey Report Reviewed. A Lead Contamination Survey Report contains summaries of the results of lead investigations conducted at 11 USARC ranges to determine the degree of lead contamination. Lead investigations were conducted at ranges that were scheduled for conversion to other uses. They were also done to identify procedures necessary to clean the ranges to make the space usable.

Lead contamination investigations completed on 11 ranges in 1997 show reservists using 6 of the 11 ranges as supply rooms or offices without first decontaminating them. For example, the Norfolk U.S. Army Reserve Center, Norfolk, Virginia, had been shut down and abandoned. At the time of the survey, inspectors could not determine when the range became inactive. Further, inspectors found reservists using the range to store supplies such as clothing, bedrolls, cots, and other similar items. At the time of the lead investigation, inspectors found at least 90 percent of the furniture already removed. Wipe sample results showed residual lead concentrations ranging from 40 to 14,000 micrograms per square foot. Inspectors could not determine whether the furniture had been cleaned and decontaminated before it was removed.

The indoor firing range in the 1st Lt. Jimmie T. Monteith U.S. Army Reserve Center, Richmond, Virginia, operated from 1968 through 1970. After 1970, the range became a supply room. In 1995, inspectors found that the end of the range room containing the firing line was already renovated. The renovation included retiling the floor, repaneling walls, and installing a drop ceiling. The

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renovation did not include the rest of the range. The Center did not provide records on the removal and disposal of the bullet deflector panel and an exhaust fan, which occurred sometime after 1970.

The results of bulk samples taken by the inspectors in 1995 revealed lead-containing bulk material (sand) present in concentrations greater than the EPA criterion of 5,000 milligrams per kilogram. Concentrations higher than 5,000 milligrams per kilogram constitute a lead hazard. Three samples of the sand and debris in the bullet trap contained total lead concentrations of 92,000, 150,000, and 49,000 milligrams per kilogram. Wipe samples taken from range surfaces also showed lead-dust or debris greater than 200 micrograms per square foot, which is the standard established for initiating decontamination and abatement actions.

At the Prince George's County U.S. Army Reserve Center, Riverdale, Maryland, industrial hygienists conducting a lead investigation found reservists using the former firing range as a storage facility. In operation from the 1950s to the late 1980s, the range underwent lead and asbestos abatement in 1989. In 1995, wipe sample results showed lead concentrations ranging from fewer than 40 micrograms per square foot to 82,000 micrograms per square foot.

The indoor firing range in the Major General Albert C. Lieber U.S. Army Reserve Center, Alexandria, Virginia, was inactive for 10 to 15 years before its conversion to an office and a supply room. Contractor personnel found reservists using the range space for a supply room. Reserve Center personnel converted the range without first abating and cleaning it. Contractor personnel found "bullet slugs" still in the sandpit. In 1995, the results of surface lead-wipe samples ranged from fewer than 40 to 110,000 micrograms per square foot.

At the Southern Maryland Memorial U.S. Army Reserve Center, Camp Springs, Maryland, reservists closed the indoor firing range and turned it into a print shop in 1980. At the time of the lead investigation, industrial hygienists found the 12th Psychological Operations Command using the range as office space. The most recent renovation of the space occurred just 2 months before the 1995 lead investigation. Two personnel worked in the area on a daily basis.

Personnel working for the 12th Psychological Operations Command informed inspectors that, on the weekend of April 22, 1995, reservists filled their backpacks with sand from the bullet trap, in preparation for a hike. The same personnel reported that, "Not only did this action fill the room with dust (enough dust that two workers had to leave the room), but the soldiers also tracked the sand onto the floor of the office and possibly into the hallway." Inspectors reported, "This action may explain the high results of lead residue prevalent throughout the office and range." The results of wipe samples showed lead concentrations ranging from 52 to 420,000 micrograms per square foot in the range and adjacent areas. Tests of the remaining sand and debris showed lead concentrations of 90,000 milligrams per kilogram, 28,000 milligrams per kilogram, and 25,000 milligrams per kilogram.

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Reservists also converted the indoor range in the Maus-Warfield U.S. Army Reserve Center, Rockville, Maryland, before decontaminating it. They converted it to a library, which reservists use only on weekends. Inspectors reported that the range appeared to have been abated at one time because they found the bullet trap and the bullet deflector panel cleaned and painted. In 1995, inspectors reported that eight out of nine wipe samples taken in the range showed lead-dust concentrations above the 200 micrograms per square foot. A wipe sample taken from the floor of the storage room next to the range showed lead concentrations as high as 13,000 micrograms per square foot. In the range area, wipe sample results ranged from as low as 92 micrograms to as high as 3,200 micrograms per square foot for a sample taken from the floor of the sandpit.

Range Conversion Documents Reviewed. We attempted to review data on eight specific ranges that USARC reported had been converted to other uses. We reviewed ranges converted to a mess hall, a classroom, a supply room, an exercise room, and a chapel. We requested documents showing that each range was cleaned before it was converted, showing to what standard it was cleaned, and certifying that lead hazards had been cleaned to established standards. Although the documentation was limited, it showed that reservists used some of the ranges for other purposes before properly cleaning them.

The General Andrew Pickens U.S. Army Reserve Center, Clemson, South Carolina, 81st Reserve Regional Support Command, reportedly converted its range to a mess hall. Because of the danger of lead ingestion, we wanted to confirm range decontamination before conversion. In responding to our inquiry, Center personnel corrected the original usage report, stating that they had converted the range to an assembly hall, not a mess hall.

On March 3, 1997, contractor personnel inspected the range before performing abatement activities and found evidence that Center personnel were using the range for a snack area as well as an assembly hall. They found "a water fountain, vending machine, and a soda machine located in the area to be abated." During cleaning, those items remained in the area. The contractor covered those items with a polyethylene sheeting during the final clean up.

The contractor also found contaminated soil and hazardous lead waste in the range area that had to be treated and disposed of in accordance with environmental regulations. In addition, the contractor reported, "The assembly hall abated contained no features commonly associated with a typical firing range, that is, deflector panels, firing position stands, etc." We could not determine whether those items had been removed previously or had never been a part of the range equipment. Workers completed final closure and waste removal on March 10, 1997.

In 1960, closure of the indoor range in the Henry A. Goss U.S. Army Reserve Center, Grand Rapids, Michigan, 88th Reserve Regional Support Command, led to its being used as a storage and supply room. According to the 88th Reserve Regional Support Command, the range area had never been cleaned, nor had any formal request been submitted to close or convert the range.

The USARC reported that documents on range activities at the Tucson U.S. Army Reserve Center, Tucson, Arizona, 63rd Reserve Regional Support Command, were "no longer available." The USARC provided no cleaning and decontamination certifications or safety inspection reports. The only document on the indoor range was a letter written by the Chief, Environmental Division, for the Army Intelligence Center and Fort Huachuca, Arizona. The Chief wrote the letter to support a retirement physical and stated that the Tucson U.S. Reserve Center had closed its indoor range. The range was closed in the early 1970s and converted to administrative space in 1993.

The Chief reported that, "At one time [before it closed], the Center contained a firing range. Contents of lead in the air during the operation of the firing range are unknown. The range was converted to offices and it is our understanding that the area was thoroughly cleaned of any remaining dust prior to use." The Chief received the information from "knowledge of personnel that visited the center in recent years and from surveys completed." However, the USARC did not provide copies of surveys or documentation of abatement activity. As a result, we could not verify whether the range had been cleaned and decontaminated to standard before the Reserve personnel converted it to offices.

The Sverdrup U.S. Army Reserve Center, St. Louis, Missouri, 89th Reserve Regional Support Command, and the Eldorado Army Reserve Center, Eldorado, Arkansas, 90th Reserve Regional Support Command, provided documents showing that they cleaned and abated their indoor ranges before converting them to other uses. The Finkbeiner U.S. Army Reserve Center, Little Rock, Arkansas, 90th Reserve Regional Support Command, reported the date of its range closure as unknown. Center personnel reported converting the range to office space 20 years ago. However, they did not abate the range until December 1996. At the time of the abatement, workers found that all debris from the sandpit and bullet traps had been removed. The air exhaust unit had also been removed. Documentation to show who removed the equipment or the lead-contaminated media, or where it went, was unavailable.

Although USARC reported the Darden U.S. Army Reserve Center, Guyman, Oklahoma, 90th Reserve Regional Support Command, indoor range as "vacant," the entire facility had actually been transferred "as is" to the city of Guyman, Oklahoma. The Guyman police department now uses the range for police training.

Reasons for Using Unsafe Ranges

ARNG and USARC did not have a common explanation for how the policy and procedures governing unsafe range use broke down on a particular range. Senior managers recognize that lead-contaminated ranges are being used for other purposes, and that the subsequent exposure of personnel to lead

contamination warrants senior management's attention. Programs are in place to enforce the no-use policy for unsafe ranges, but the programs are not fully effective.

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Management Oversight. Commanders and safety managers should be able to use safety inspection reports as management tools to determine whether indoor range safety programs are effective. The inspection process is supposed to include a full range of inspections by OSHA, EPA, State safety officers, ARNG safety officers, and USARC safety officers. Each part of the process has problems. For example, OSHA has Federal compliance offices with inspection responsibilities. Since 1980, OSHA standards have been applicable to Federal facilities. In addition, the EPA or State and local government environmental agencies can conduct environmental compliance inspections of indoor ranges. "Military unique" facilities are a specific exception. While indoor range operations are not considered "military unique," OSHA and EPA usually do not inspect military indoor firing ranges unless someone makes a complaint.

Safety Personnel. In addition, the USARC and ARNG safety managers and industrial hygienists cited a lack of personnel and other resources needed to comply with all inspection requirements. All indoor ranges in each of the 50 States, 3 Territories, and the District of Columbia are supposed to undergo periodic safety inspections, usually annually or biennially. A safety inspection includes a test of the ventilation system to ensure the system meets minimum operating standards. A safety inspection could also include testing firing lines, taking air lead samples while personnel are firing, and taking wipe samples to ensure that the range has been cleaned properly. A detailed inspection should be done for all ranges not considered safe, to identify all deficiencies.

ARNG and USARC safety managers reported that they do not routinely inspect unsafe ranges. ARNG industrial hygienists report that they only reinspect unsafe ranges when specially requested or when a rehabilitated range is being reopened.

Annual Inspections. The ARNG Chief, Industrial Hygiene Branch, reported that annual inspections depend on whether ARNG industrial hygienists have time to do them. Six ARNG industrial hygienists and three technicians work in three regional offices. The staff of 9 people is responsible for inspecting all indoor ranges in all 54 geographic areas. They work with National Guard State Area Command safety managers and occupational health nurses in conducting safety inspections.

USARC officials gave a similar response, stating that USARC did not have the personnel to conduct safety inspections at all ranges. The 10 Army Reserve Regional Support Commands each have one safety officer who is responsible for all ranges in the region. USARC safety managers have not yet completed safety inspections for all unsafe ranges. As a result, USARC designated indoor ranges as unsafe based on old Army inspection reports and professional judgment, pending completion of inspections. The USARC safety officer reported that he is developing a safety inspection plan for the future.

Overall supervision and oversight of the ARNG and USARC safety programs are inadequate to ensure that Reserve personnel do not use unsafe ranges. The State Adjutants General are responsible for ensuring that unsafe ranges are not used. However, the Chief, National Guard Bureau, is responsible for the overall supervision of the ARNG indoor firing range safety and occupational

Finding B. Unauthorized Range Use

health program and for coordinating with other Headquarters, Department of the Army, staff agencies, and the State Adjutants General on related matters. That responsibility is vested in the Director, Army National Guard.

Since 1995, USARC has been responsible for indoor range safety programs for USARC-owned ranges. The USARC has a more aggressive program for closing unsafe indoor ranges and for ensuring that they are properly cleaned and decontaminated. However, the potential for hazardous lead exposure and contamination, as shown in our examples, indicates a need for a timely and complete assessment of unsafe ranges and increased oversight.

Command Emphasis. Increased command emphasis of safety policies and management oversight can preclude unauthorized range use. Reliance on commanders to detect and correct most unauthorized-use problems will help to ensure better use of inspection resources to the best advantage.

Alternatives to Indoor Ranges. Army training doctrine states that the preferred weapons qualification method is a full-scale, standard record fire outdoor range. An indoor small arms range can be used as an alternative qualification course only when units do not have ready access to standard record fire ranges. Therefore, indoor small arms ranges are used primarily for weapons familiarization and weapons qualification practice. Today, familiarization firing is no longer authorized for training. In addition, some training exercises authorized for indoor ranges can be accomplished by alternative methods. The Firearms Training Simulation systems that are already installed in some armories and the Engagement Skills Trainers that the Army plans to field in the near future can also be used for prequalification training and practice. Many units are now using nearby or regional outdoor ranges for all weapons training and qualification. If the use of outdoor ranges continues and the use of new training technologies is optimized, the requirements for indoor ranges and their inspection could be permanently reduced.

Storage and Training Space Shortages. There is a space shortage at an unknown number of reserve centers and armories where indoor ranges are inactive because of health and safety problems. The ARNG and National Guard State Area Commands have sought funding for a storage building construction project, originally estimated at 1,400 storage buildings, at a cost of \$65 million. The overall storage space shortage in 1987 was estimated at 723,000 square feet. Indoor ranges can represent between 1,020 and 2,400 square feet of ARNG and USARC training space in a building. Examples show that unsafe ranges were converted for use as storage space, classrooms, office space, classified work areas, and simulator training rooms.

Range Safety Guidance. The Army is responsible for providing overall guidance and supervision of range safety programs. A pending revision of Army Regulation 385-63, retitled "Range Safety," and a new Army Pamphlet 385-63, "Range Safety," were in revision for 7 years and were not published. Also, the draft of the U.S. Army Center for Health Promotion and Preventive Medicine Technical Guide Number 206, "Indoor Firing Ranges," was not completed. As a result, some of the primary range safety policy and guidance documents of the Army are either outdated or are not yet in effect.

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Headquarters, Department of the Army, issued a supplement to Army Regulation 385-63, "Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat," November 15, 1983, through Letter 385-91-1, March 26, 1991, to provide safety guidance for operating and maintaining Army indoor firing ranges. The Army extended that policy on March 26, 1993, through Headquarters, Department of the Army, Letter 385-93-2, but the policy and letter expired on March 26, 1995.

On May 30, 1995, USARC issued a memorandum for USARC commanders to continue to abide by the Army policy in Letter 385-93-2 "until either new policy is issued or until Army Regulation 385-63 is revised." The ARNG is relying on guidance in National Guard Regulation 385-15, "Safety Policy, Responsibilities, and Procedures for Inspection/Evaluation and Use of ARNG Indoor Ranges," March 30, 1990, which is also being revised. The ARNG also has several related range safety policy and procedure guidance documents that are still in the draft stage.

Personnel Exposure to Lead Hazards

ARNG and USARC personnel, their families, and the general public were unnecessarily exposed to hazardous lead levels. ARNG and USARC safety managers and industrial hygienists reported that the use or conversion of unsafe ranges before they are decontaminated or rehabilitated endangers users and increases potential liabilities of senior staff.

The use of contaminated facilities exposes reservists, ARNG personnel, civilian workers, and the general public to a wide variety of symptoms and disabilities that can be attributed to chronic lead exposure. It also exposes family members when personnel transport lead home on contaminated clothing or work gear. That danger is especially important in the potential for childhood exposure. According to an October 14, 1997, memorandum, issued to state safety managers by the Chief, Industrial Hygiene Branch, National Guard Bureau, "There have been cases where some ARNG personnel have allowed their children to play in (lead-contaminated) sand from indoor firing range bullet traps."

Recommendations for Corrective Action

B.1. We recommend that the Director, Army National Guard, and the Chief, U.S. Army Reserve Command:

- a. Increase command emphasis to field units in communicating the potential dangers and individual responsibilities and liabilities associated with unauthorized use of unsafe indoor ranges.
- b. Increase management oversight in enforcing policy prohibiting the use of unsafe ranges and assuring that unsafe ranges are not used.

Finding B. Unauthorized Range Use

c. Direct safety and industrial hygiene personnel from the Army National Guard, the National Guard State Area Commands, the U.S. Army Reserve Command, and the Reserve Regional Support Commands to conduct safety inspections at all indoor ranges to confirm their status and to identify safety deficiencies. Safety inspections should include surveys for lead contamination and lead hazards.

B.2. We recommend that the Deputy Director of Army Safety complete and issue the revision of Department of the Army Regulation 385-63, "Range Safety," and Army Pamphlet 385-63, "Range Safety." Range safety policy should include Army standards for testing, cleaning, and decontaminating indoor ranges.

Management Comments

The Assistant Chief of Staff for Installation Management, Department of the Army, concurred with the finding. He noted that both the National Guard Bureau and the U.S. Army Reserve Command have published guidance pertaining to the converted use of indoor ranges, specifically addressing the potential for lead contamination.

Evaluation Response

The comments from the Assistant Chief of Staff for Installation Management, Department of the Army, did not address the recommendations. We request that the Assistant Chief of Staff for Installation Management provide coordinated comments on recommendations in response to the final report.

Finding C. Lead-Dust Migration Outside Ranges

Hazardous levels of lead-contaminated dust have migrated from 12 indoor ranges to other areas of readiness centers. Hazardous levels of lead-contaminated dust can exist outside ranges because current range safety policy does not require testing for or abating lead-contaminated dust and debris in areas outside of the immediate range area. As a result, persons using readiness centers have an increased risk of both occupational and casual exposure to high lead concentrations.

Policy Requirements and Guidelines

OSHA Technical Manual, Directive (Training and Education) 1.15, Section 1, Chapter 2, "Sampling for Surface Contamination," September 22, 1995, states, "Accumulated toxic materials can become suspended in air and may contribute to airborne exposures (for example, asbestos, lead, or beryllium)." Airborne exposures increase the likelihood of human exposure to toxic materials such as lead. DoD Instruction 6055.5 states that it is DoD policy to provide each employee with a healthful work environment that is free from recognized chemical, physical, or biological hazards.

The DoD Directive 1025.1, "DoD Civilian Rifle and Pistol Marksmanship Training Program," January 31, 1984, encourages extending the privilege of using Reserve Component small-arms ranges to local police, civic organizations, local shooting clubs, schools, and colleges. Also, ARNG and local readiness center range-use policy sometimes allows readiness centers to be used for community, civic, and sporting events, some of which may include children and pregnant women. OSHA lead standards, Title 29, Code of Federal Regulations, Chapter 17, Part 1910.1025, "Lead," July 1, 1995, specifically address lead-dust concentrations such as those found inside indoor ranges.

ARNG regional industrial hygienists stated that no Armywide guidance addresses the migration of lead in airborne dust from indoor ranges to other areas in a readiness center. Only the unpublished Technical Guide Number 206, "Indoor Firing Ranges," being drafted by the U.S. Army Center for Health Promotion and Preventive Medicine, suggests that lead concentration levels can exist outside a range. The industrial hygienists interviewed did not know of any requirement for posting warnings or placing restrictions on the use of areas or items outside a range known to be contaminated with high lead concentrations.

The only regulatory reference indicating a need to consider the health and safety of persons using other areas in a readiness center is National Guard Regulation 385-15, "Policy, Responsibilities, and Procedures for Inspection/Evaluation and Use of Army National Guard Indoor Firing Ranges," March 30, 1990, and a draft revision dated April 28, 1997. The regulation states that "Ranges are unsafe if air from the ranges enters adjacent rooms or buildings."

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The draft revision states that older indoor firing ranges may not meet the current standards for protecting the health and safety of shooters. In addition, two questions in the Range Inspection Checklist in the draft revision relate to possible lead migration into other areas.

The first question calls for inspection of pipes, conduits, and walls to determine whether they are "sealed to prevent leakage of lead-dust from the range into other areas." The other question asks whether the entrance door to the range has been weather-stripped, presumably to prevent leakage of lead-contaminated air out of the range. The industrial hygienist who wrote the draft stated that such leakage of lead dust was most likely to occur when range ventilation systems did not generate an adequate airflow velocity to create a measurable negative air pressure in relation to areas outside the range.

Lead Exposure in Areas Outside Ranges

Several factors indicated that lead had migrated to areas outside the indoor ranges. For example, safety officials designated a range and two other rooms in an ARNG readiness center in Schenectady, New York, as "unsafe" because of inadequate ventilation. They closed all three rooms to prevent their use and to limit personnel exposure to potentially toxic lead concentrations.

An ARNG regional industrial hygienist and a New York State safety specialist reported that they found high lead-dust concentrations outside the range and in areas not closed to use. Contamination as high as 6,642 micrograms per square foot was on surfaces in a room containing nuclear, biological, and chemical defense masks and in a room containing communications equipment. The highest concentration of contaminated dust, 12,839 micrograms per square foot, was on a ventilation grill near the dining facility. A lead-dust concentration above 200 micrograms per square foot establishes a potential lead hazard.

During a followup visit 6 months later, the ventilation grill was still contaminated with lead concentration levels of 3,632 micrograms per square foot. The case study in Appendix D also describes an example of a lead concentration level of 3,558 micrograms per square foot in an area outside a range that was decontaminated and converted to a store room for medical equipment and supplies.

A review of the ARNG indoor-range rehabilitation project files, described in Finding D in this report, also indicates a problem with lead migration outside the immediate range area. Some of the range rehabilitation funding requests include installing new metal doors "to prevent leakage of lead-contaminated air out of the range as well as for added range security."

In addition, analysis of the contract files for the 11 inactive range decontamination and demolition projects in the 99th Reserve Regional Support Command, referenced in Finding B, revealed that lead dust had migrated to areas outside the range in all 11 projects. At one project location, wipe sample results showed contaminated lead dust exceeding 3 million micrograms per square foot. Outside the range, contaminated lead dust, in concentrations

Finding C. Lead-Dust Migration Outside Ranges

greater than 200 micrograms per square foot, had migrated from the range to the kitchen and a clothing-issue room. In two other ranges, lead-dust concentrations exceeded 1 million micrograms per square foot. Inspectors found lead-dust levels as high as 160,000 micrograms per square foot on floors, furniture, and air ducts in storerooms, assembly halls, hallways, and the tops of staircases near the two ranges.

The 99th Reserve Regional Support Command paid the contractor an additional amount ranging from \$13,500 to \$38,350 to decontaminate or dispose of items stored outside the indoor ranges. Contaminated items included furniture, uniforms, sleeping bags, duffel bags, documents, boxes, and other items stored in areas adjacent to five of the USARC ranges.

Policy Guidance

Range safety programs do not include policy and guidance addressing the migration of lead contamination to areas outside the indoor ranges. ARNG safety managers and industrial hygienists are not required to regularly sample surfaces outside the range to determine the levels of lead contamination. The industrial hygienists contacted stated that they relied on their own professional judgment and initiative to determine whether wipe sample testing was appropriate for areas outside of the ranges. However, none of the examples of funding requests for ARNG range rehabilitation projects, described in Finding B, includes an amount for testing or decontaminating areas or items outside the ranges that were remodeled to comply with current health and safety standards. The industrial hygienists contacted agreed that additional guidance should be published on the potential for lead-dust migration to other areas in readiness centers and on the hazards to military and civilian persons who use readiness centers with ranges classified as unsafe.

Effects of Lead-Dust Migration

ARNG or USARC personnel and civilians using areas of a readiness center that have an unsafe indoor range may be at risk of unknowingly getting lead dust on their hands or clothing. They may also cause lead-dust concentrations to become airborne in the normal course of their activities and may inhale or ingest the lead dust.

Recommendations for Corrective Action

C.1. We recommend that the Director, Army National Guard, and the Chief, U.S. Army Reserve Command, issue guidance requiring lead-contamination surveys to identify lead migration outside the immediate range area during range inspections and, where necessary, abate lead hazards.

Finding C. Lead-Dust Migration Outside Ranges

C.2. We recommend that the Deputy Director of Army Safety include a requirement in range safety policy and procedures for regular inspections, tests, and abatement of hazardous levels of lead-contaminated dust and debris in areas outside of the immediate indoor range.

Management Comments

The Assistant Chief of Staff for Installation Management, Department of the Army, concurred with the finding.

Evaluation Response

The comments from the Assistant Chief of Staff for Installation Management, Department of the Army, did not specifically address the recommendations. Therefore, we request the Assistant Chief of Staff for Installation Management to provide comments on the recommendations.

Finding D. Unfunded Requirements

Unsafe ARNG and USARC indoor ranges represent an undefined and unfunded fiscal requirement for rehabilitation or for decontaminating unsafe ranges for closure or conversion. Most unsafe ranges have not been rehabilitated, closed, or converted because ARNG and USARC did not determine or program funding requirements. As a result, an estimated 982 (65 percent) of 1,519 ARNG and USARC small arms indoor firing ranges are unsafe and unusable.

Funding for Rehabilitation, Conversion, and Closure

ARNG and USARC officials report the following three acceptable dispositions for unsafe indoor ranges:

- rehabilitate unsafe ranges for continued use for small arms training;
- clean and decontaminate unsafe ranges so they can be closed and the space converted to other functional uses, or
- lock, post warnings, and "walk away."

Whatever the disposition, unsafe ranges must be decontaminated before they can be safely rehabilitated and reused, closed, or converted to other functional uses such as storage areas, classrooms, or simulator rooms. However, when an unsafe range is not rehabilitated, closed, or converted, current range safety policy does not require that it be tested for contamination, cleaned, or decontaminated. In such cases, some ARNG and DoD officials suggest that they can lock, post warnings, and "walk away" from many unsafe ranges until resources are available for further action. Unsafe ranges reportedly can remain inactive indefinitely. Some ranges reviewed were inactive for 5, 10, or 15 years. As discussed in Finding B, the risk of unauthorized use and subsequent hazardous exposure of personnel continues over time.

Although the individual National Guard State Area Commands may use training or operations and maintenance funds to do minor range rehabilitation projects, major rehabilitation projects have been federally funded. In addition, the costs incurred for lead cleanup for range rehabilitation projects, either as part of an Army Indoor Range Rehabilitation project or overall armory rehabilitation or addition, are completely reimbursable by the Federal Government. Range cleanup, decontamination, and conversion costs for USARC unsafe ranges and for federally owned ARNG unsafe ranges are federally funded. When approved, USARC policy says that permanent closure and conversion costs are supportable with Federal environmental funds and Real Property Maintenance funds.

National Guard State Area Commands are responsible for funding lead cleanup and decontamination for range conversions at State-owned facilities. They must also fund all costs associated with the conversion, such as shelves and lighting

Finding D. Unfunded Requirements

for a storage area. Responsibility for funding permanent closure at State-owned ARNG facilities has not been fully determined. Part of the Federal-versus-State debate over funding responsibility includes determining when the range was contaminated and whether the contamination occurred as part of State or Federal activities.

Unsafe indoor firing ranges that are needed to meet a valid mission requirement must be rehabilitated to be used safely. Operations and Maintenance funds can be used for minor range rehabilitation and construction projects. However, major project costs for State-owned facilities are done either on a shared cost basis or are federally funded. According to National Guard Regulation 385-15, funding requests for upgrading existing ranges are considered on an individual basis.

Range Rehabilitation. Returning unsafe ranges to functional training use has not been a funding priority. As discussed in Finding A, ARNG identified a need for Federal funding to rehabilitate as many as 1,100 indoor ranges in 1985. In FY 1989 through 1995, ARNG funded 65 indoor range rehabilitation projects at a total cost of \$7.9 million. The ARNG terminated the Armory Indoor Range Rehabilitation Project at the end of FY 1995 because of decreases in Army Military Construction funding. According to the Chief of Installations, National Guard Bureau, "Range rehabilitation is an extremely low priority item when compared to other needs." As a result, only a few ARNG unsafe ranges are rehabilitated each year.

Range rehabilitation projects usually include correcting environmental conditions and removing hazardous lead-particle contamination. The OSHA, EPA, and, sometimes, local and State agencies require removal of lead particulate and residue caused by range operations before construction or renovation. Regulations focus primarily on the collection and disposal of contaminated soil used in the firing lanes near the bullet trap and on cleaning and disposing of lead-dust found on floors, walls, furniture, and ancillary equipment. Decontamination ensures that the indoor firing range is as free of lead as possible before construction begins.

Rehabilitation projects may include the installation of ventilation systems, air exhaust systems, and adequate bullet traps and acoustical treatments. In some cases, ranges must undergo design changes as well. Rehabilitation projects are carried out only for ranges that are still needed to meet a valid, continuing small-arms training mission because alternative, nearby ranges are not available.

Closure or Conversion. Funding for decontaminating ranges to be converted to other uses is also limited and is determined on a case-by-case basis for USARC and federally owned ARNG facilities. Lead cleanup for range conversion at State-owned facilities, regardless of the project type, is fully funded by the State. While indoor ranges can simply be closed, conversion to other functional uses is sometimes a better alternative. Closing a lead-contaminated range requires that the range undergo specific cleaning and abatement measures to ensure that it is as free of lead-dust and contaminated soil as possible before alternative use.

Finding D. Unfunded Requirements

Lock and Walk Away. Officials at ARNG, USARC, and the Office of the Assistant Secretary of Defense (Reserve Affairs) state that they have no impetus to fund the rehabilitation, conversion, or closure of all unsafe indoor ranges, and they believe that they can leave unsafe ranges inactive, indefinitely, and at no cost. The safety records and the funding history of unsafe ranges show that the practice exists. Officials stated that unsafe ranges pose no health or safety risks because no one uses them. Further, they assert, unsafe indoor ranges present no environmental problems because lead-contaminated dust, debris, and sand are not considered hazardous waste until an intent is expressed to dispose of them.

Unfunded Requirements for Unsafe Ranges

Unsafe ARNG and USARC indoor ranges represent an undefined and unfunded fiscal requirement for rehabilitation or for cleaning and decontamination for closure or conversion. Most unsafe ranges have not been rehabilitated, closed, or converted because ARNG and USARC did not determine or program funding requirements, based on current costs. The costs can be reasonably estimated only after a decision has been made to rehabilitate, close, or convert the ranges, either collectively or on a range-by-range basis. Numerous possibilities exist to address the issue, including rehabilitating all ranges, closing them all, closing all ranges and converting the space for other functional uses, and various combinations of those actions that have implications for programming and budgeting Federal funds. DoD programming and budgeting actions in the Planning, Programming, and Budgeting System need ARNG and USARC plans addressing the proper and affordable course of action to decontaminate or close the current inventory of unsafe ranges.

The following discussion shows the wide range of costs encountered by managers in the past and the large increase in costs for more recent projects. Given the number of unsafe ranges and the wide range of costs, unsafe ranges clearly represent a significant unfunded requirement.

Funding Requirements for Range Rehabilitation. The average cost of the 65 ARNG rehabilitation projects funded from FYs 1989 through 1995 was \$121,000. Costs varied from just under \$11,000 to as much as \$400,000.

The most recently funded range rehabilitation project was for the indoor range at Sea Girt, New Jersey. The Sea Girt project, funded in FY 1995, was chosen by the National Guard Bureau as a test of the operational capability of a wet-type bullet trap to significantly reduce the amount of lead pollution resulting from small arms training. The cost of the range rehabilitation project contract was \$397,506 in federal funds and \$63,812 in State funds for installation of the new oil cascade backstop and other new equipment. The ARNG spent another \$46,255 cleaning the range and disposing of the hazardous waste in compliance with the requirements of the Resource Conservation and Recovery Act. According to ARNG officials, the total cost of approximately \$508,000 for the Sea Girt project is more typical of range rehabilitation projects today than the average cost of

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\$121,00 for the last 65 rehabilitation projects because of the cost of new technology and the rapid rise in costs that are directly related to hazardous lead-dust and debris disposal.

At the time of this evaluation, USARC officials had no plans to rehabilitate unsafe indoor ranges. Instead, USARC officials claimed that the command was proposing to "get out of the indoor range business." They cited escalating safety and environmental costs and the availability of alternative training methods and devices as reasons for no longer needing indoor ranges to meet the USARC small-arms training mission.

However, if unsafe ranges were to be rehabilitated, the costs could be estimated from the costs of the 65 ARNG rehabilitation projects. Those costs would probably range between \$121,000 and \$508,000 per indoor range.

Funding Requirements for Cleanup and Abatement. To safely close or convert an indoor range, it must be properly cleaned and abated. Abatement means any measure or set of measures designed to permanently eliminate a lead hazard. National Guard Pamphlet 385-16, "Guidelines for Converting Indoor Firing Ranges to Other Uses," January 31, 1994, prescribes ARNG policy, responsibilities, and procedures for converting lead-contaminated ranges. The pamphlet also contains guidance for National Guard State Area Commands wanting to convert an indoor firing range to another functional use, such as storage or other office space.

Converting an indoor range to other uses includes the cost of cleaning (for example, High Efficiency Particulate Air vacuuming and removing and cleaning equipment and furnishings); the cost of decontaminating (for example, removing and disposing of contaminated soil and lead-dust); and the cost of converting (for example, storage shelves, reconfiguring rooms, and similar items). The cost of cleaning and abating an unsafe range varies considerably and is really based on the level of contamination and whether lead waste can be managed in-place or whether it must be loaded into containers and disposed of as hazardous material. Costs also vary depending on whether cleaning and abatement services are done by Reserve or Guard employees or by a contractor.

Actual cleaning and abatement projects reviewed showed a wide range of costs from as little as \$3,500 and up to \$120,000. For example, Appendix D contains a case study of a cleanup and abatement project at an unsafe range in the National Guard readiness center in Cottage Grove, Minnesota, that cost only \$3,500. Costs for this project included cleanup and lead abatement that were done completely by ARNG employees. The project did not require hazardous waste disposal off-site. The ARNG industrial hygienist who classified the range as unsafe stated that low-cost, in-house range abatement and conversion projects could be successful if an industrial hygienist provided on-site training and oversight of the work.

Of the 65 range rehabilitation projects, only two projects were examples of actual cleanup and abatement costs. First, the range rehabilitation project file for the Kewanee, Illinois, readiness center included a cost of \$81,000 for range cleanup, disposal of lead-contaminated sand from the bullet trap, and asbestos abatement. The data did not indicate whether costs included pre- and post-

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construction wipe sampling. Second, the Sea Girt, New Jersey, range rehabilitation project included an additional \$46,255 spent for range cleanup and abatement.

In 1996, the ARNG Hazardous Waste Manager reportedly funded 40 lead decontamination projects in 8 States. From 1994 through 1996, costs varied from \$3,500 to \$120,000 per project for lead-sand disposal, which he estimated averaged about \$60,000 per project. However, he said that his estimates included only the cost of disposing of lead-contaminated sand after it had been containerized; it did not include other cleaning and abatement costs.

USARC cleanup and abatement projects had significant cost variations. USARC-ENS-C (140) policy memorandum, "USARC Policy With Regards to Indoor Firing Ranges," April 27, 1993, provides guidance for converting indoor ranges, and it states that a command can request conversion of an indoor range when it finds that the range is no longer needed to meet a mission requirement or when the range is unsuitable for use based on environmental documentation. When approved, a command can convert an unsafe range to office space, supply rooms, classrooms, or a classified work area.

Although USARC does not have a policy establishing standards for decontaminating indoor ranges, the USARC Environmental Division developed a generic statement of work that detailed standards and procedures for range closure and conversion to be used for contracting abatement services. The statement of work establishes clearance standards for specified surfaces. USARC officials stated that cleanup and decontamination costs average approximately \$50,000 to \$60,000 per range, including the cost of hazardous waste disposal.

However, recent USARC projects showed the average cost to be higher. A review of 1995 contracts awarded to decontaminate 11 indoor ranges for the 99th Reserve Regional Support Command showed that the cost for the 11 ranges averaged \$117,000, which included approximately \$81,000 in contracted decontamination costs and \$36,000 in Government overhead costs. Total costs of contracting for cleaning and abatement services at all 982 USARC and ARNG indoor ranges for permanent closure would be substantial. Costs to convert to other uses would be in addition to the cost of lead abatement and decontamination.

Lock, Post, or Seal. The option of locking or sealing, posting, and walking away from unsafe ranges appears to represent the lowest cost, short-term solution for unsafe ranges at a time when funding is limited. The option presumes that ARNG and USARC personnel will not use unsafe range space and that the space is not needed for other training needs. This option ignores the hazards of toxic lead that may have migrated out of the range. The approach does not prevent or minimize costs, however; it simply pushes costs into the future when costs are most likely to be higher. The costs of decontamination have risen in the last few years, and much of that increase resulted from the costs of hazardous waste disposal. Changes in regulatory requirements could also cause costs to rise. In addition, an armory may eventually become the property of the community and the ARNG must abate all known hazards before giving it to the community. Allowing a lead hazard to

exist only leaves the ARNG and the USARC open to future liabilities in the event a contaminated area is entered, contaminated items are removed, and other areas of the building are contaminated. The Army should initiate action to develop and identify low-cost procedures and technologies that will effectively abate contaminated areas to permanently eliminate lead hazards.

ARNG and USARC Range Safety

Many ARNG indoor firing ranges are of pre-World War II vintage and are not designed or equipped to meet current OSHA and Army safety standards. Similarly, USARC built many of its indoor ranges between 1940 and 1966, and a number of those ranges do not meet current safety requirements. Even some of the newer and more standardized ranges lack the equipment and engineering controls that they need to comply with current Federal and State regulatory requirements.

Collectively, ARNG and USARC safety officials state that 982 (65 percent) of an estimated 1,519 indoor ranges are currently unsafe and unusable until they are decontaminated. Indoor ranges reportedly remain unsafe, sometimes for years, because they have not been permanently closed, converted to other uses, or rehabilitated for continued use for small arms training. As discussed in Finding B, the risks of unauthorized use and hazardous personnel exposures continue over time. Until cleanup occurs, training and storage space is not available for use. Constrained resources, inadequate problem identification, and lack of reasonable requirements definition continue to complicate the resolution of the issues.

Recommendations for Corrective Action

D. We recommend that the Director, Army National Guard, and the Chief, U.S. Army Reserve Command:

1. Direct completion of current risk assessments on all unsafe indoor ranges.
 - a. Base the risk assessments, in part, on the results of the lead contamination surveys recommended in Finding B.
 - b. Use resulting data to estimate total funding requirements based on current costs to rehabilitate, decontaminate and close, or convert all unsafe indoor ranges, or any combination of those actions required.
2. Develop an overall cost-effective plan of action and milestones for reducing and effectively controlling the number of unsafe indoor ranges.
3. Initiate action to develop or identify low-cost technologies and methodologies for decontaminating ranges.

Finding D. Unfunded Requirements

4. In coordination with the Assistant Chief of Staff for Installation Management, Department of the Army, enter the status of each range, determined as a result of Recommendation D.1. actions, into the Installation Status Report.

Management Comments

The Assistant Chief of Staff for Installation Management, Department of the Army, concurred with the finding.

Evaluation Response

The comments from the Assistant Chief of Staff for Installation Management, Department of the Army, did not respond to the recommendations. In response to the final report, we request the Assistant Chief of Staff for Installation Management to provide comments on the recommendations.

Part II - Additional Information

Appendix A. Evaluation Process

Scope and Methodology

Work Performed. We reviewed a list of 1,519 ARNG and USARC small-arms indoor range inventory data gathered and provided in response to our July 2, 1997, request; range safety survey reports that National Guard Bureau industrial specialists and contractors prepared from 1994 through 1997; range rehabilitation and modernization program budget submissions and authorizations from FYs 1989 through 1995; and range rehabilitation project data, as well as range rehabilitation and decontamination contract documents prepared from 1994 through 1997. We visited 21 indoor ranges in Tennessee, Texas, Georgia, and New Jersey. We also reviewed environmental laws; EPA lead and other hazardous waste regulations; occupational safety and health laws; OSHA regulations; and DoD, Army, and ARNG range safety and property management directives, regulations, policies, and procedures. Our analysis included a review of reports and surveys on indoor firing range management issues dating from 1980 to the present.

Limitations to Evaluation Scope. Because of the large number of indoor ranges believed to be in the ARNG and USARC inventory, as compared with the Reserve Components of the Air Force, the Marine Corps, and the Navy, this report addresses range issues in only the ARNG and USARC. We focused on determining whether ARNG and USARC were developing and managing inventory data for small-arms indoor ranges and whether they were adequately assuring the safety and health of ARNG and USARC employees and private citizens working in and around those ranges in accordance with applicable laws, regulations, and other published guidance. We also assessed the adequacy of published guidance.

DoD-wide Corporate Level Government Performance and Results Act Goals. In response to the Government Performance and Results Act, the Department of Defense has established 6 DoD-wide corporate level performance objectives and 14 goals for meeting these objectives. This report pertains to achievement of the following objective and goal:

Objective: Maintain highly ready joint forces to perform the full spectrum of military activities. **Goal:** Maintain high military personnel and unit readiness. (DoD-5.1)

DoD Functional Area Reform Goals. Most major DoD functional areas have also established performance improvement reform objectives and goals. This report pertains to achievement of the following functional area objectives and goals:

- **Environment Functional Area. Objective:** Reduce, in a cost-effective manner, risks to human health and the environment attributable to contamination resulting from past DoD activities.

Goal: Identify, evaluate, and, where appropriate, remediate contamination resulting from past DoD activities. (ENV-1.1)

Goal: Ensure immediate action to remove imminent threats to human health and the environment. (ENV-1.2)

Goal: Comply with statutes, regulations, Executive Orders, and other legal requirements governing cleanup of contamination. (ENV-1.3)

- **Environment Functional Area. Objective:** Implement pollution prevention programs throughout the DoD.

Goal: By the end of 1999, reduce disposal of hazardous waste 50 percent from the 1992 baseline (amount of hazardous waste disposal will be measured and reported in pounds). (ENV-3.2)

General Accounting Office High Risk Area. The General Accounting Office has identified several high risk areas in the DoD. This report provides coverage of the Defense Infrastructure Management high risk area.

Use of Computer-Processed Data. We relied on computer-processed data to evaluate the accuracy of the number of ARNG and USARC indoor ranges in the ARNG Desktop Resource for Real Property database and the Department of the Army Integrated Facility System-Management and Installation Status Report databases. We compared the contents of the inventory lists provided with the contents of the listings generated from the National Guard Bureau's Desktop Resource for Real Property and the Army Integrated Facility System-Management and Installation Status Report databases. The computer-processed data from those databases did not provide managers with current, accurate, and complete information on the number, location, status, and disposition of ARNG and USARC indoor ranges.

Evaluation Type, Dates, and Standards. We performed this evaluation from June through December 1997 in accordance with standards issued and implemented by the Inspector General, DoD. Accordingly, we included tests of management controls considered necessary.

Contacts During the Evaluation. We visited or contacted individuals and organizations within DoD and EPA, OSHA, and the National Institute of Occupational Safety and Health. Interviews with personnel at Firearms Training Systems, Inc., Atlanta, Georgia, and the Army Marksmanship Unit provided the team with insight on the capabilities of marksmanship training simulators and other devices used to accomplish tasks in small arms training strategies. Further details are available on request.

Summary of Prior Coverage. No prior audits or reviews have been done on indoor ranges within the last 5 years.

Management Control Program Review

DoD Directive 5010.38, "Management Control (MC) Program," August 26, 1996, requires DoD organizations to implement a comprehensive system of management controls that provide reasonable assurance that programs are operating as intended and to evaluate the adequacy of those controls.

Scope of Review of the Management Control Program. We reviewed the adequacy of management controls to ensure that senior managers know the number, location, status, and disposition of their small-arms, live-fire indoor range infrastructures. Working from data on the status of ranges, we assessed the extent to which management has been able to lay out programmatic and budgetary responses to EPA and OSHA requirements as well as management practices to protect personnel from the health consequences of ranges deemed unsafe by EPA and OSHA criteria. We collected information on management controls and procedures to determine their effectiveness in identifying resource requirements created by noncompliance with EPA and OSHA regulations.

Adequacy of Management Controls. We identified material management control weaknesses for the Army National Guard and Army Reserve as defined by DoD Directive 5010.38. Management controls were either not used, not in place, or inadequate to ensure the efficient and safe use of indoor small arms ranges. Shortcomings exist in controls over the collection of basic information on the number, location, status, and disposition of each indoor range as well as in dealing with the consequences of lead contamination. All recommendations in the report, if implemented, will improve the ARNG and USARC management controls of those weaknesses. A copy of this report will be provided to the senior official responsible for management controls in ARNG and USARC.

Adequacy of Management's Self-Evaluation. ARNG and USARC officials did not identify management of small-arms live-fire indoor range infrastructure as an assessable unit and, therefore, did not identify or report the material management control weaknesses identified by the evaluation.

Appendix B. Lead Hazards and Standards

DoD personnel and others who use unsafe indoor ranges may be exposed to unhealthy levels of lead. Children can also be exposed to lead when parents bring contaminated items home. The human body can absorb lead by inhalation and ingestion.

When lead is scattered in the air as a dust, fume, or mist, the metal is easily inhaled and absorbed through the lungs and upper respiratory tract. Inhalation of airborne lead is generally the most important source of occupational lead absorption. Indoor firing range personnel and construction workers can absorb lead through the digestive system if lead gets in their mouths and is swallowed. Using lead-contaminated food, cigarettes, chewing tobacco, equipment, clothing, and make-up, or handling such lead-contaminated items, provide major pathways for the ingestion of lead.

Most absorbed lead is deposited in the bones (90 percent) and may be released over time. Lead has a 30-year half life in humans. Exposure to lead results in decreased libido, impotence, and sterility in men and decreased fertility and abnormal menstrual and ovarian cycles in women. The course of pregnancy is adversely affected by exposure to lead. Conclusive evidence exists of miscarriage and stillbirth in women who were exposed to lead or whose husbands were exposed. Children born of parents either of whom were exposed to lead are more likely to have birth defects, mental retardation, or behavioral disorders, or to die during the first year of childhood.

Because of the severity of the hazard and the potential for airborne lead contamination, active indoor firing ranges must be periodically cleaned to remove lead dust, lead fragments, and contaminated soil. Active indoor firing ranges also must meet OSHA and National Institute of Occupational Safety and Health standards for air quality and for ensuring range personnel health and safety. Those standards require medical surveillance of all permanent range personnel so that blood levels do not exceed established permissible exposure levels.

OSHA, EPA, and Department of Housing and Urban Development Lead Safety Standards and Criteria. Lead-related regulations come from three main bodies. The OSHA, the National Institute of Occupational Safety and Health, the EPA, and the Department of Housing and Urban Development. OSHA focuses mainly on worker safety, while EPA regulates ecological and environmental conditions. The Department of Housing and Urban Development focuses primarily on federally owned and funded housing. In many instances, regulations from the organizations overlap.

Airborne Lead Exposure Levels. When lead is absorbed into the body in certain doses, it is a toxic substance. The 29 Code of Federal Regulations Part 1910.1025 specify OSHA standards for all occupational exposure to lead, and they establish a Permissible Exposure Level for airborne concentrations of lead. The objective of the lead standard is to prevent absorption of harmful quantities of lead. All employers must ensure that no employee is exposed to lead

Appendix B. Lead Hazards and Standards

concentrations greater than 50 micrograms per cubic meter of air, which is the highest level of lead in air to which any employee may be permissibly exposed over an 8-hour work day. An 8-hour exposure standard permits short exposures above the Permissible Exposure Level as long as the exposure does not exceed 50 micrograms of lead per cubic meter of air.

If lead is present in the workplace in any quantity, the employer is required to make an initial determination of whether the action level is exceeded for any employee. The 29 Code of Federal Regulations Part 1910.1025 standard also establishes an action level of 30 micrograms per cubic meter of air, time weighted average, based on an 8-hour work day. The action level initiates several requirements, such as exposure monitoring, medical surveillance, and training and education. Employers are responsible for developing controls to meet the compliance standards for employees exposed to lead concentrations above the permissible exposure level for less than 30 days per year. Employers are also required to implement engineering controls, such as ventilation systems and work-practice controls, to reduce airborne lead exposures to below permissible levels.

The OSHA lead standard, 29 Code of Federal Regulations Part 1910.1025, does not specifically address indoor firing ranges. The National Institute for Occupational Safety and Health developed exposure standards guidance based primarily on the Action Level of the OSHA lead standard. The Action Level is 30 micrograms per cubic meter and the Permissible Exposure Level is 50 micrograms per cubic meter. When exposure to lead is not controlled below the permissible level by other means, employers must provide and require the use of respirators during exposure times. These two standards are based on a time-weighted average to account for variations in the length of the normal 8-hour work period. Many indoor ranges received "unsafe" classifications because airborne lead concentrations exceeded the Action Level for airborne lead.

Surface Lead Exposure Levels. EPA rules that identify lead-based paint hazards, including lead-contaminated dust and lead-contaminated soils, are in 40 Code of Federal Regulations Part 745.220 through 745.237. A lead-based paint hazard is any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, or lead-contaminated paint that has deteriorated or is present on surfaces, which would result in adverse human health effects. The rules establish dust concentration levels measured by wipe samples (dust lead loading), which are dependent on both the amounts of collectable dust on a surface and concentrations of lead in the dust. High values for either of these factors could produce high lead levels in wipe-sample results.

"EPA Guidance On Identification of Lead-Based Paint Hazards," September 11, 1995, specifies surface clearance criteria for lead of below 100 micrograms per square foot for uncarpeted floor surfaces. Abatement actions must be taken when the results of wipe sampling show a surface lead level at or above 100 micrograms per square foot for uncarpeted floor surfaces. The standard was 200 micrograms per square foot for floor surfaces, but because technology now allows for more effective cleaning, the standard is more stringent. EPA did not develop clearance standards to identify adult lead-hazard levels, developing instead standards to identify children's lead-poisoning hazards.

In the absence of National Institute of Occupational Safety and Health standards, the EPA clearance criteria are used to interpret wipe sampling and to identify lead-based hazards and lead exposure sources. They are also used to determine the need for control actions. The criteria were established to protect children and pregnant women. At the time of this evaluation, surface lead concentrations above 200 micrograms per square foot on any range surface were considered a potential health hazard by ARNG and USARC safety officials and industrial hygienists.

Hazardous Waste Disposal. The EPA also regulates all areas of environmental protection, including disposal of hazardous waste. Many Federal environmental statutes establish a Federal-State regulatory program in which the State can enact and enforce environmental laws as long as the laws meet or exceed Federal standards. When an indoor range is scheduled for rehabilitation, closure, or conversion, and the lead residue is going to be disposed of, the lead dust and debris must be handled, transported, and disposed of in accordance with environmental regulations.

Appendix C. Range Safety Standards

Department of the Army Safety Standards. Department of the Army regulations for operating and maintaining indoor firing ranges pertain to both ARNG and USARC. Headquarters, Department of the Army, issued a supplement to Army Regulation 385-63, "Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat," November 15, 1983, through Letter 385-91-1, March 26, 1991, to provide safety guidance for operating and maintaining Army indoor firing ranges. The Army extended the policy on March 26, 1993 (Army Letter, 385-93-2), but it expired on March 26, 1995. A pending revision of Army Regulation 385-63, retitled "Range Safety," and a new Army Pamphlet 385-63, "Range Safety," are supposed to supersede Army Letter 385-93-2, but both documents are still in draft. The draft documents state that the primary concern in range safety is airborne lead contamination occurring as by-products of indoor firing. The draft documents do not address specific levels of surface lead concentrations.

ARNG Indoor Range Safety Standards. In 1983, the Army Environmental Hygiene Agency conducted industrial hygiene studies in 22 States. The studies showed unsafe ARNG workplace conditions, such as no ventilation systems in the armories.

In 1983, the National Guard Bureau issued guidance to the National Guard State Area Commands prohibiting the use of indoor ranges for any purpose other than firing. In 1984, the National Guard Bureau issued additional guidance for inspecting and evaluating the condition of indoor ranges.¹ In 1987, the National Guard Bureau began staffing the environmental and industrial hygiene program.

The ARNG safety and industrial hygiene program consists of an industrial hygiene supervisor, six industrial hygiene professionals, and three technicians located in three regional offices. That small group conducts safety inspections for ARNG facilities in all 50 States, 3 Territories, and the District of Columbia. In addition, State safety managers and occupational health nurses perform range inspections, maintain copies of inspections, classify ranges, and ensure medical surveillance of firing range personnel. National Guard Bureau guidance requires that State personnel perform an initial inspection to determine the status of each range.

ARNG safety policy is contained in National Guard Regulation 385-15, "Safety Policy, Responsibilities, and Procedures for Inspection or Evaluation and Use of Army National Guard Indoor Firing Ranges," March 30, 1990. The regulation is being revised; the most current draft is dated April 28, 1997. National Guard Pamphlet 385-16, "Guidelines for Converting Indoor Firing Ranges to Other Uses," January 31, 1994, provides responsibilities and guidelines for converting indoor ranges to other functional uses. The ARNG also has several draft policy documents and technical guides such as Draft National Guard Pamphlet 385-14, "Evaluation and Maintenance of Indoor Firing Ranges," dated March 4, 1997, and Draft U.S. Army Center for Health Promotion and Preventive Medicine

¹ National Guard Regulation 385-15, "Safety Policy, Responsibilities, and Procedures for Inspection or Evaluation and Use of Army National Guard Indoor Firing Ranges," March 30, 1984, superseded by the March 30, 1990 revision, and in the revised draft, April 28, 1997

Technical Guide No. 206, "Indoor Firing Ranges," October 1996, which will provide additional indoor-range-use guidance if it is published.

USARC Indoor Range Safety Standards. USARC policy on range safety and use is contained in a series of policy memorandums. Policy extends the provisions of expired Headquarters, Department of the Army, Letter 385-93-2, until new Army policy is published.² Letter 385-93-2 establishes guidance for the safe operation and maintenance of indoor ranges. In particular, it addresses permissible levels of airborne lead concentrations. Indoor firing ranges must comply with OSHA standards, including medical surveillance of range personnel. Letter 385-93-2 also sets requirements for sampling, ventilation, housekeeping (cleanup), and inspections.

Inspections must be performed on all indoor ranges to ensure compliance with current health and safety standards.³ According to USARC memorandum Armed Forces Reserve Command-Environment and Safety-Compliance (140), "USARC Policy with Regards to Indoor Firing Ranges," April 27, 1993, indoor firing ranges that are not needed to meet a mission requirement can be converted to other uses. However, Reserve personnel cannot convert an unsafe range to other uses until it is clean and decontaminated.

² Armed Forces Reserve Command-Safety memorandum (385), "Inspection and Evaluation of U.S. Army Reserve Command Indoor Firing Ranges," May 30, 1995.

³ Armed Forces Reserve Command-Safety memorandum (385), "Policy, Responsibilities, and Procedures for Inspection, Use, and Maintenance of U.S. Army Reserve Command Indoor Firing Ranges," April 4, 1994.

Appendix D. Case Study of Range Conversion

The following case study illustrates:

- an example of a low-cost range decontamination and conversion project performed by National Guard State Area Command employees, and
- the need for such projects to be closely coordinated with safety and industrial hygiene officials.

In August 1996, a private industrial hygiene contractor received a complaint from an employee of the Minnesota National Guard, Cottage Grove, Minnesota, and forwarded it to the OSHA office in Minneapolis, Minnesota. The complainant alleged that a lead health hazard existed at the Cottage Grove Armory. The complainant's concerns involved the possible lead exposure of employees working in an inactive, decontaminated indoor firing range.

According to case records, ARNG personnel used the range for active firing until 1991. An ARNG industrial hygienist classified the range "unsafe" primarily because of an inadequate air ventilation system that allowed for a positive air pressure inside the range. A safe range has negative air pressure inside the range.

The range reportedly remained dormant until 1994, when the ARNG reportedly decontaminated it and converted it to a storage area for medical equipment and supplies. The complainant alleged that the ARNG required supply employees and part-time help employees to sort and move supplies from the area. Allegedly, the storage area still contained lead filings and dust that posed a risk of lead exposure when the dust and debris were disturbed.

The complaint went to the U.S. Department of Labor, OSHA, Minneapolis, Minnesota, because the facility had more Federal employees than State employees. Citing "some question of Federal OSHA jurisdiction," OSHA referred the complaint to the Office of the Adjutant General, Minnesota National Guard. OSHA instructed the ARNG to post a copy of the complaint at the Cottage Grove Armory so that it would be readily accessible for review by any Federal civilian employee at the Cottage Grove facility. In addition, OSHA instructed ARNG to investigate the allegation and report the documented results to the OSHA by September 10, 1996. OSHA also instructed ARNG to make any necessary corrections or modifications. Further, OSHA advised ARNG that "... if the anonymous complainant is a Federal technician, or if there is a Federal technician working at the Cottage Grove site, and that individual is exposed to the alleged health hazard, then he or she is covered by Part 1960 of Title 29, Code of Federal Regulations, 'Basic Program Elements for Federal Employees Occupational Safety and Health Programs and Related Matters,' October 21, 1980."

In responding to OSHA, the Minnesota ARNG State safety officer produced documentation that training center staff had decontaminated the range in 1994 for an estimated cost of \$1,000. (State employees, trained in OSHA safety

Appendix D. Case Study of Range Conversion

procedures, reportedly performed the range decontamination work.) The safety officer also forwarded the results of wipe samples, taken before and after range decontamination, to the OSHA office in Minneapolis. Documents show that decontamination actions significantly reduced lead concentrations in the range area in 1994. However, wipe samples taken afterward still showed lead levels on some surfaces above the safety level, establishing a potential for lead hazards. Results of wipe samples showed the highest level of lead concentration in a room outside the entrance of the range at 3,558 micrograms per square foot. Personnel did not take wipe samples from surfaces in other areas of the training center to determine how far lead-contaminated dust had migrated outside the indoor range area. Also, safety personnel provided no documentation that the lead-contaminated room outside the range entrance was decontaminated and painted.

In keeping with ARNG policy, the Minnesota ARNG safety officer recommended several actions to complete the range conversion and abatement. He recommended painting the entire range and sealing the floor to encapsulate the remaining lead. The backstop reportedly could not be decontaminated because of the heavy concentrations of lead and the entrapment of lead in the oil applied to the backstop surface. The safety manager recommended constructing a wall in front of the backstop as the lowest cost alternative.

Training center staff did not implement either recommendation for completing conversion of the range in 1994. After the 1996 complaint and later OSHA involvement, the staff constructed the wall, as the State safety officer had originally recommended.

ARNG employees encapsulated potential, residual lead dust by building a wall in front of the backstop area, spray painting the acoustical panels in the ceiling and walls, and sealing the range floors with a commercial floor sealant. The wall cost approximately \$500. The cost of applying the paint and sealant was approximately \$1,250 for both materials and labor. The final cost of the project was approximately \$3,500, which included \$1,000 for the initial High Efficiency Particulate Air vacuuming and scrubbing in 1994 and approximately \$2,500 for the encapsulation work completed in 1996.

The converted range is currently being used as a storage area and does not appear on the list of indoor ranges provided by the ARNG Chief, Industrial Hygiene, which is discussed in Finding A. Overall, the results of the range conversion actions suggest that low-cost processes for converting other ranges may be available.

Appendix E. Report Distribution

Office of the Secretary of Defense

Under Secretary of Defense (Comptroller)
Deputy Chief Financial Officer
Deputy Comptroller (Program/Budget)
Assistant Secretary of Defense (Public Affairs)
Assistant Secretary of Defense (Health Affairs)
Deputy Under Secretary of Defense (Environmental Security)
Deputy Assistant Secretary of Defense for Reserve Affairs (Materiel and Facilities)
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Department of the Army

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Chairman and ranking minority member of each of the following congressional committees and subcommittees:

Senate Committee on Appropriations
Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
House Committee on Appropriations
House Subcommittee on National Security, Committee on Appropriations
House Committee on Government Reform and Oversight
House Subcommittee on Government Management, Information, and Technology,
Committee on Government Reform and Oversight
House Subcommittee on National Security, International Affairs, and Criminal
Justice, Committee on Government Reform and Oversight
House Committee on National Security

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Part III - Management Comments

Assistant Chief of Staff for Installation Management, Department of the Army, Comments



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT
600 ARMY PENTAGON
WASHINGTON DC 20310-0800



DAIM-MD

11 JUN 1998

MEMORANDUM THRU DIRECTOR OF THE ARMY STAFF *8/96/98*

ACTING ASSISTANT SECRETARY OF THE ARMY
(INSTALLATIONS, LOGISTICS AND ENVIRONMENT)

FOR DEPARTMENT OF DEFENSE INSPECTOR GENERAL (AUDITING) *4/18/98*

SUBJECT: Evaluation Report on Army National Guard and U.S. Army Reserve
Command Small Arms Indoor Firing Ranges (Project No. 70R-5044)

1. Reference draft DODIG Evaluation Report, subject as above (Encl 1).
2. The Assistant Chief of Staff for Installation Management has reviewed the reference report and has coordinated this response with appropriate Army Staff and Major Commands. Comments concerning each recommendation are provided below:
 - a. Finding A, Accuracy of Indoor Range Inventory Data. Concur with the finding as written. It should be noted that state owned National Guard facilities are not subject to federal and U.S. Army reporting requirements and are not included in the Army's Real Property Inventory.
 - b. Finding B, Unauthorized Range Use. Concur with the finding as written. Both the National Guard Bureau and the United States Army Reserve Command have published guidance pertaining to the converted use of indoor ranges, specifically addressing the potential for lead contamination.
 - c. Finding C, Lead-Dust Migration Outside Ranges. Concur with the finding as written.
 - d. Finding D, Unfunded Requirements. Concur with the finding as written.

Assistant Chief of Staff for Installation Management, Department of the Army, Comments

DAIM-MD

SUBJECT: Evaluation Report on Army National Guard and U.S. Army Reserve
Command Small Arms Indoor Firing Ranges (Project No. 70R-5044)

3. The above responses have been coordinated with Mr. Birney, SAILE; LTC Hladky, AFRC-ENP; Ms. Patterson, DAAR-EN; Ms. Condon, NGB-ARC-M; Mr. Gibson, DACS-SF and Mr. Marroquin, DAIM-ED-F. The ACSIM point of contact for this action is Mr. Randy Klug, DAIM-MD, (703) 693-4583.

encl
as


DAVID A. WHALEY
Major General, GS
Assistant Chief of Staff
for Installation Management

Evaluation Team Members

The Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, DoD, produced this report.

Thomas F. Gimble
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INTERNET DOCUMENT INFORMATION FORM

A . Report Title: Army National Guard and U.S. Army Reserve Command
Small Arms Indoor Firing Ranges

B. DATE Report Downloaded From the Internet: 09/15/99

**C. Report's Point of Contact: (Name, Organization, Address, Office
Symbol, & Ph #):** OAIG-AUD (ATTN: AFTS Audit Suggestions)
Inspector General, Department of Defense
400 Army Navy Drive (Room 801)
Arlington, VA 22202-2884

D. Currently Applicable Classification Level: Unclassified

E. Distribution Statement A: Approved for Public Release

F. The foregoing information was compiled and provided by:
DTIC-OCA, Initials: __VM__ **Preparation Date** 09/15/99

The foregoing information should exactly correspond to the Title, Report Number, and the Date on the accompanying report document. If there are mismatches, or other questions, contact the above OCA Representative for resolution.