

**AUDIT
REPORT**

**FACILITY MAINTENANCE AT THE
IDAHO NATIONAL ENGINEERING AND
ENVIRONMENTAL LABORATORY**



MARCH 2001

U.S. DEPARTMENT OF ENERGY
OFFICE OF INSPECTOR GENERAL
OFFICE OF AUDIT SERVICES

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MEMORANDUM FOR THE MANAGER, IDAHO OPERATIONS OFFICE

FROM: Lawrence R. Ackerly, Regional Manager (Signed)
Western Regional Audit Office
Office of Inspector General

SUBJECT: INFORMATION: Audit Report on "Facility Maintenance at the
Idaho National Engineering and Environmental Laboratory"

BACKGROUND

The average age of facilities at the Idaho National Engineering and Environmental Laboratory is 27 years and some of the facilities are more than 50 years old. Even though the facilities are aging, the Department of Energy's (DOE) Idaho Operations Office (Idaho) goal is to maintain its facilities in a safe and reliable state and to maximize their useful life. To achieve its goal, Idaho spent an estimated \$72 million on a combination of preventive and corrective maintenance in Fiscal Year 1999. The objective of our audit was to determine whether Idaho maintained facilities in a safe and economical manner.

RESULTS OF AUDIT

Idaho has not maintained its facilities in a safe and economical manner. Serious facility-related problems occurred because management did not develop a site maintenance plan, include performance goals or standards in the Bechtel BWXT Idaho, LLC contract, and devise a computerized maintenance management system that contained complete and reliable data. As a result, Idaho's facility maintenance program threatens mission accomplishment, personal safety, and it is uneconomical. We recommended that the Manager of the Idaho Operations Office take several steps to improve controls over the maintenance program.

MANAGEMENT REACTION

Management concurred with the finding and recommendations in the draft report. Management identified specific corrective actions to address each recommendation identified in the draft report and noted that DOE Idaho was already in the process of making improvements to maintenance management at the time of the audit.

FACILITY MAINTENANCE AT THE IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY

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Overview

INTRODUCTION AND OBJECTIVE

The Department of Energy's (DOE) Idaho Operations Office (Idaho) owns more than 500 buildings at the Idaho National Engineering and Environmental Laboratory (INEEL). Some of the facilities are new while others are more than 50 years old. Collectively, the average age of these facilities is 27 years. Idaho along with its contractor, Bechtel BWXT Idaho, LLC (Bechtel) estimated that \$72 million was spent in Fiscal Year (FY) 1999 on a combination of preventive and corrective maintenance at the INEEL. The goal of Idaho's facility maintenance program is to keep facilities in a safe and reliable state that maximizes their useful life.

The objective of our audit was to determine whether Idaho maintained facilities in a safe and economical manner.

CONCLUSIONS AND OBSERVATIONS

Idaho has not maintained its facilities in a safe and economical manner. Facility-related problems occurred because management did not ensure that a site maintenance plan was developed, performance goals or standards were included in the Bechtel contract, and a computerized maintenance management system contained complete and reliable data. As a result, Idaho's facility maintenance program threatens mission accomplishment, personnel safety, and it is uneconomical.

During our audit, management took several steps to correct these deficiencies. However, the audit identified a material internal control weakness that management should consider when preparing its yearend assurance memorandum on internal controls.

Signed
Office of Inspector General

Facilities Not Maintained In A Safe Or Economical Manner

Facility Operations Affected By Untimely Maintenance

Idaho did not maintain its facilities in a safe and economical manner. Facility problems were often related to untimely completion of maintenance work orders. A sample of recent work orders for preventive maintenance revealed that 51 percent were not completed by the requested due date. This included preventive maintenance needed on more than 150 fire protection and life safety systems such as fire alarms, fire pumps, and water supply control valves. It also included preventive maintenance related to emergency lighting, a monorail, and an overhead bridge crane. We identified examples of problems related to Idaho's facility maintenance program that may have been avoided if a more organized preventive maintenance program had been in place. For example:

- On July 12, 1999, two of four generators failed to provide back-up power when the largest operating area at the INEEL lost power. A site emergency was declared that led to the shut down and/or evacuation of high-level radioactive liquid waste processing facilities, spent nuclear-fuel storage facilities, laboratories, and deep-well water pumps. An internal report on the incident attributed the generator failures to inadequate preventive maintenance.
- On November 6, 1999, a leaky valve in the primary coolant system caused an unscheduled shut down of the Advanced Test Reactor (ATR). The ATR lost 55 hours of operation. An internal report concluded that a lack of preventive maintenance contributed to the problem. A nearly identical failure occurred in 1996.
- On January 24, 2000, an over-pressurization condition in a furnace caused an explosion that led to an exhaust stack falling to the floor. Although no one was injured, this was the second failure of this furnace. A report on the incident cited improper maintenance as the problem. Incident reports identified other furnace problems, all related to inadequate maintenance.
- On August 5, 1999, the Test Reactor Area potable water supply was contaminated after the area's chlorination system failed. A report linked the problem to maintenance that was neglected.

We further noted that, as of April 2000, the backlog of preventive maintenance was approximately 31,000 hours.

Likewise, 96 percent of the work orders for corrective maintenance were not completed by the requested due date. For instance, two work orders to repair an air compressor and a raw water pump were completed three months late. In June 1999, the corrective maintenance backlog was estimated at 139,000 hours. By April 2000, the backlog had increased to an estimated 311,000 hours.

Goal Of Maintenance Program

According to DOE Order 4330.4B, the primary role of a facility maintenance program is to preserve Government property and ensure the safe, reliable, and economical operation of facilities. The Order requires the contractor, in coordination with the appropriate operations office to develop a site maintenance plan that provides a clear understanding of the contractor's maintenance program. Idaho Notice 430.1A reiterated the requirement for the contractor to develop, implement, and document a cost-effective and efficient maintenance program through a site maintenance plan. The plan should include controls to ensure timely maintenance, conduct facility assessment surveys, track maintenance budgets, and measure performance effectiveness.

The Bechtel contract requires operational excellence in facility maintenance. It also requires the contractor to balance the goal of decreasing costs with long-term reinvestment planning in the area of facility maintenance. To achieve this, the contractor implemented a computerized maintenance management system that provides data on facility maintenance operations.

Finally, a September 1999 General Accounting Office (GAO) report identified best practices for the Department of Defense's facility maintenance program. This guidance was available for use at the INEEL as a model for facility maintenance. The GAO recommended prioritization of budget resources based on physical condition and relevance of facilities to the mission; a single, engineering-based system for assessing facility conditions; a single, property-maintenance budget that is controlled by a central office with the power to shift resources to facilities in the greatest need; and restriction of repair and maintenance funds to repair and maintenance activities.

Management Control Weaknesses

The problems cited in this report occurred because of weaknesses in Idaho's facility maintenance program. Specifically, Idaho did not ensure that a comprehensive site maintenance plan was developed and implemented, establish performance goals or standards for facility maintenance in the Bechtel contract, and maintain a computerized maintenance management system with complete and reliable data.

Site Maintenance Plan

Idaho did not ensure that Bechtel developed and implemented a comprehensive site maintenance plan. Such a plan would provide the controls needed to define and implement Idaho's facility maintenance program. Without a plan, Bechtel did not have sufficient oversight over its maintenance program. For instance, facility assessment surveys were used to determine specific maintenance needs of facilities. However, these surveys were performed differently throughout INEEL. In fact, some facilities were not assessed at all.

In addition, maintenance budgets were decentralized and expenditures were not always restricted to maintenance activities. Some maintenance funds, in fact, were used for non-maintenance purposes. For instance, we found that \$362,700 was transferred out of the Irradiated Fuel Storage Facility maintenance budget so that it could be used for spent fuel-transfer activities. Accordingly, Bechtel had to postpone maintenance activities at this facility such as evaluating and repairing the facility's breathing air system and installing the lighting system in the spent nuclear-fuel storage area.

Further, both Idaho and Bechtel officials were aware of a GAO report that identified "Best Practices" for facility maintenance. However, officials did not attempt to establish and implement its suggested best practices.

Performance Measurement

Idaho did not incorporate any performance goals or standards concerning facility maintenance into the Bechtel contract. The contract required the contractor to balance the goal of decreasing costs with long-term reinvestment planning in the area of facility maintenance. However, the contract did not contain performance goals or standards to measure facility maintenance operations. Furthermore, Idaho did not attach any fee to the activity of facility maintenance in the Bechtel contract. Although Bechtel spent an estimated \$72 million on maintenance operations in FY 1999, the success of those expenditures was difficult to measure without established goals or standards.

Maintenance Data Incomplete and Unreliable

The data on the contractor's computerized maintenance management system was incomplete and unreliable. Thus, management could not make informed decisions based on this data. This system was designed

to manage the maintenance work control process, as well as track performance data. However, the system could neither produce a comprehensive list of maintenance needs nor produce reliable actual cost data per maintenance work order. In addition, non-maintenance work was erroneously classified as maintenance on the computer system. For example, hazardous waste shipments and calibrations were classified as preventive maintenance, instead of shipments and calibrations, respectively. This skewed management reports that track preventive maintenance performance.

Inadequate Maintenance Program Threatens Safety, Mission Accomplishment, And Costs More Than Necessary

An ineffective maintenance program threatens mission accomplishment and personnel safety. In September of 1998, the Office of Oversight, Environment, Safety and Health reported that reactive maintenance practices result in potential degradation of safety and operability of aging facilities. Based on the facility-related problems that have occurred, INEEL's facility maintenance program has become reactive rather than proactive.

A reactive maintenance program may cost Idaho more money than necessary. For example, it cost an estimated \$392,000 when the ATR was shut down because preventive maintenance was not performed. According to a National Academy of Sciences National Research Council paper, it cost significantly more to perform corrective maintenance than preventive maintenance. Based on industry estimates, for every dollar spent on preventive maintenance, as much as eight dollars may be saved in the future. However, it is generally difficult to relate a lack of maintenance to specific dollar costs.

RECOMMENDATIONS

We recommend that the Manager, Idaho Operations Office:

1. Develop and implement a comprehensive site maintenance plan that incorporates Departmental and GAO facility maintenance best practices. As a minimum, the plan should include procedures and controls to:
 - a. Complete maintenance activities in a timely manner;
 - b. Manage the backlog at acceptable levels; and,
 - c. Centralize maintenance budgets to ensure consistency of use and prioritization of resources to the most critical maintenance needs.
2. Develop and incorporate performance goals and standards into the Bechtel contract to measure facility maintenance operations.

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3. Direct the contractor to correct the deficiencies in its computerized maintenance management system.

MANAGEMENT COMMENTS

Management concurred with the finding and recommendations. Further, management noted that prior to the audit it was in the process of completing corrective actions resulting from a serious maintenance accident in 1998. As a consequence of that accident, many maintenance activities had been delayed until Idaho was assured that effective processes consistent with Integrated Safety Management were in effect. Thus, Idaho was already in the process of redirecting itself toward improvements and efficiencies in maintenance management at the time of the audit.

Recommendation 1: Management concurred and stated that on August 18, 2000, Idaho issued a completely revised maintenance management Order (ID O 433.A). This Order institutes requirements for the establishment of a single maintenance management program at the INEEL and reinforces the requirements for site maintenance planning as a means of ensuring management control and accountability. The Order has been incorporated into the Bechtel contract for implementation. An implementation plan has been developed, schedules are in effect, and performance is monitored biweekly by Idaho and the contractor. Implementation of the maintenance management program (including maintenance planning) is a fee-bearing performance activity for FY 2001. The implementation plan includes GAO best practices mentioned in the Office of Inspector General (OIG) draft report, including the establishment of a single maintenance program office, centralization and control of maintenance personnel resources, and allocation of resources based upon strategic importance and mission needs. Because the INEEL is a multi-program laboratory funded by many programs, implementation of a centralized maintenance budget may not be feasible under existing fiscal regulatory constraints.

Recommendation 2: Management stated that revised maintenance standards have been incorporated into the Bechtel contract. Also, on October 9, 2000, Idaho issued a Performance Evaluation Measurement Plan (PEMP) to Bechtel, covering the administration of the award-fee provisions of the contract regarding performance incentives and allocation of total available fee. The PEMP includes fee-bearing performance goals and measures pertaining to the INEEL Maintenance Management Program. Further, it requires the contractor to develop, institutionalize, and implement the INEEL Maintenance Management Program, including the establishment of performance measures,

implementation of documentation and training, and implementing a means for assessing maintenance backlogs. The PEMP also requires the contractor to achieve a site-wide mean time to repair priority 3 work orders of sixty days, with no adverse impact to priority 1 and 2 work orders. Finally, the PEMP requires the contractor to achieve specified completion rates of required preventive maintenance for all of the INEEL.

Recommendation 3: Management stated that in the FY 2001 Program Execution Guidance document issued on October 18, 2000, Idaho has directed the contractor to improve its computerized maintenance management system. Furthermore, the system application previously selected for maintenance management (Passport) was also selected by the INEEL to serve as the main platform for our business applications. The software is currently being upgraded, resulting in more reliable maintenance cost information.

AUDITOR COMMENTS

Management's comments were responsive to the recommendations.

Appendix 1

SCOPE

The audit was performed from April 2000 to January 2001, at DOE Idaho and Bechtel offices in Idaho Falls, Idaho, and at the INEEL and covered the period February 1998 through May 2000.

METHODOLOGY

To accomplish the audit objective, we:

- Collected and reviewed a random attribute sample of 86 work orders out of an identified population of 4,787 found on the computerized maintenance management system. The sample size provided a 95 percent confidence level with 5 percent precision and 6 percent error rate. The sample was limited to corrective and preventive maintenance for the INEEL's four major site areas;
- Collected and validated additional work orders on a judgmental basis that pertained to the audit;
- Reviewed applicable Federal and DOE regulations;
- Reviewed prior OIG, GAO, and DOE Headquarters reviews;
- Reviewed and validated selected facility maintenance data;
- Reviewed the *Government Performance and Results Act of 1993* and determined whether performance measures were established; and,
- Interviewed Idaho and Bechtel personnel.

The audit was performed in accordance with generally accepted Government auditing standards for performance audits and included tests of internal controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. Specifically, we tested controls with respect to Idaho's implementation of the facility maintenance program at the INEEL. Additionally, we assessed the *Government Performance and Results Act of 1993* and determined that there were no specific performance goals or standards for facility maintenance in the Bechtel contract. Because our review was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our audit. Since our statistical sample of work orders revealed material weaknesses with the data on the computerized maintenance management system, we relied on computer-processed data to the least extent practicable to accomplish our audit objective. We discussed audit results with management on February 12, 2001.

Appendix 2

RELATED OFFICE OF INSPECTOR GENERAL, GENERAL ACCOUNTING OFFICE, AND DOE REPORTS

This report concerned DOE's management of facility maintenance programs at the INEEL. Prior OIG, GAO, and DOE reports related to this area are listed below.

- *Management of the Nuclear Weapons Production Infrastructure*, DOE/IG-0484, September 2000. DOE needed to fully link workload, production capacity, and budget information to facility requirements for nuclear weapons production. Current and future Stockpile Stewardship Plan goals stand at risk because of inadequate infrastructure maintenance.
- *Military Infrastructure: Real Property Management Needs Improvement*, GAO/NSIAD-99-100, September 1999. The Department of Defense lacked a comprehensive maintenance strategy that caused the various military services to develop different prioritization ratings and prevented maintenance funds from being used in the most critical areas or being obtained to reduce the existing repair backlog.
- *Federal Buildings: Billions are Needed for Repairs and Alterations*, GAO/GGD-00-98, March 2000. The General Services Administration requires billions of dollars to satisfy Federal building repair needs due to a repair revolving fund that does not generate enough revenue, incomplete and unreliable repair data, and lack of a strategic approach to meeting repair requirements.
- *Oversight Analysis: Maintenance*, Office of Oversight Environment, Safety and Health, September 1998. DOE's low priority on maintenance potentially degraded the safety and operability of DOE facilities through lack of funding for preventive maintenance, increasing demands for resources from aging facilities, and management's acceptance of maintenance work-arounds.

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