U.S. NUCLEAR REGULATORY COMMISSION

OBSERVATION AUDIT REPORT 93-11

FOR THE YUCCA MOUNTAIN QUALITY ASSURANCE DIVISION

AUDIT NO. YMP-93-12

OF THE REYNOLDS ELECTRICAL & ENGINEERING CO., INC.

7/15/93

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1.0 INTRODUCTION

From June 21-25, 1993, members of the U.S. Nuclear Regulatory Commission quality assurance (QA) staff of the Division of High-Level Waste Management observed a U.S. Department of Energy, Office of Civilian Radioactive Waste Management (OCRWM), Yucca Mountain Quality Assurance Division (YMQAD) QA audit of the Reynolds Electrical & Engineering Co., Inc. (REECo) QA program in Las Vegas, Nevada and at the Nevada Test Site in Mercury, Nevada. The audit evaluated the adequacy and effectiveness of the REECo QA program in seven programmatic areas.

This report addresses the effectiveness of the YMQAD audit and the adequacy of implementation of the QA controls in the audited areas of the REECo QA program.

2.0 OBJECTIVES

The objectives of the audit by YMQAD were to determine whether the REECo QA program and its implementation meet the applicable requirements and commitments of the OCRWM Quality Assurance Requirements Document (QARD), the OCRWM Quality Assurance Program Description (QAPD), and associated implementing procedures.

The NRC staff's objective was to gain confidence that OCRWM and REECo are properly implementing their QA program requirements in accordance with the QARD, QAPD, and Title 10 of the Code of Federal Regulations (10 CFR), Part 60, Subpart G (which references 10 CFR Part 50 Appendix B).

3.0 SUMMARY AND CONCLUSIONS

The NRC staff based its evaluation of the YMQAD audit process and implementation of the REECo QA program on direct observations of the auditors; discussions with audit team and REECo personnel; and reviews of the audit plan, the audit checklists, and other pertinent documents. The NRC staff has determined that QA Audit YMP-93-12 was useful and effective. The audit was well organized and conducted in a thorough and professional manner with minimal logistic delays. Audit team members were independent of the activities that they audited. The audit team was well qualified in the QA discipline, and its assignments and checklist items were adequately described in the audit plan.

The NRC staff agrees with the YMQAD audit team's preliminary findings that the REECo QA program generally has adequate controls in place and that the overall implementation of the REECo QA program is effective. The REECo QA program was adequate in six of the seven programmatic areas audited; the procurement area was unsatisfactory; and a segment of one of the areas pertaining to shotcrete (Portland Cement concrete pneumatically projected at high velocity onto a prepared surface) was unsatisfactory. Eleven preliminary Corrective Action Requests (CARs) were issued by the YMQAD audit team; seven against the REECo QA program and four against the QA program of the Civilian Radioactive Waste Management System Management and Operating Contractor (M&O). None of the preliminary CARs identified by the YMQAD audit team are significant in terms of the overall REECo and M&O QA programs or pose a condition that may impact safety or waste isolation.

OCRWM should continue to closely monitor implementation of the REECo and M&O QA programs to ensure that the deficiencies identified during this audit are corrected in a timely manner and that future QA program implementation is effective. The NRC staff expects to participate in this monitoring as observers and may perform its own independent audits at a later date to assess the implementation of the REECo QA program.

4.0 AUDIT PARTICIPANTS

4.1 NRC

William L. Belke	Observer	
Robert D. Brient	Observer	Center for Nuclear Waste Regulatory Analyses

4.2 DOE

Amelia I. Arceo	Audit Team Leader (ATL)	YMQAD-Science Applications International Corp. (SAIC)
Donald J. Harris	Auditor	YMQAD-SAIC
Gerald Heaney	Auditor	YMQAD-SAIC
Robert Klemens	Auditor	YMQAD-SAIC
Fred H. Lofftus	Auditor	YMQAD-SAIC

4.3 State of Nevada

Susan Zimmerman	Observer

5.0 REVIEW OF THE AUDIT AND AUDITED ORGANIZATION

The YMQAD audit of REECo was conducted in accordance with OCRWM Quality Assurance Administrative Procedure (QAAP) 18.2, "Audit Program" (Revision 5 plus Interim Change Notice 1) and QAAP 16.1, "Corrective Action" (Revision 4). The NRC observation audit of this audit was based on the NRC procedure, "Conduct of Observation Audits," issued October 6, 1989.

5.1 Scope of Audit

This was designed to be a programmatic type audit; however, as the audit progressed, especially in the areas of shotcreting, rock bolts and accessories, and tunnel construction, the audit became more performance-based. Due to the nature of its findings, the audit team expanded the audit into criteria other than originally listed in the audit plan and thereby, the audit process became more meaningful. In many instances, the auditors appeared to focus on the importance of the overall effect that a discrepancy had on work products rather than its programmatic compliance effect. The audit did not include any technical areas.

The audit scope included the seven QA programmatic elements listed below:

4.0 Procurement Document Control
7.0 Control of Purchased Items and Services
8.0 Identification and Control of Items
10.0 Inspection
12.0 Control of Measuring and Test Equipment
14.0 Inspection, Test and Operating Status
15.0 Nonconformances

The audit team developed and utilized checklists based on the requirements in implementing procedures that address the REECo QA Program Plan, the DOE QARD, and applicable QAAPs.

5.2 Timing of the Audit

The NRC staff believes the timing of this audit was appropriate for YMQAD to audit the pertinent QA activities of REECo and for the NRC staff to evaluate the YMQAD audit process and implementation of the REECo QA program. This audit was scheduled in conformance with YMQAD's practice of auditing each applicable QA programmatic element at least annually.

5.3 Examination of QA Programmatic Elements

The auditors observed were well prepared and knowledgeable of the QA program requirements. They used their checklists effectively and pursued issues beyond the checklists when appropriate. They solicited comments and questions from the NRC observers in an appropriate manner. The NRC staff observed the audit team's evaluation of QA Programmatic Elements 4.0, 7.0, 8.0, 10.0, 12.0 and 14.0. Only those portions of the elements observed by the NRC staff will be discussed and are listed below.

5.3.1 Procurement Document Control and Control of Purchased Items and Services (Programmatic Elements 4.0 and 7.0)

Limited portions of Programmatic Elements 4.0 and 7.0 involving procurement were observed. The current starter tunnel activities utilize conventional mining practices and materials. While these are quality-affecting activities, commercial grade items (rock bolts, shotcrete, etc.) are specified in the starter tunnel design. The auditor identified problems in the treatment of procurement of these commercial grade items. Commercial grade items, as described in Section 10 of Supplement 7S-1 of ASME NQA-1-1989, may be purchased from qualified suppliers (those with QA programs meeting applicable QA criteria), or from unqualified suppliers provided that the purchaser conduct the necessary evaluations to determine that performance requirements are met. REECo purchased items from unqualified suppliers and receipt inspections were limited to visual inspection for damage and verification that documentation was received. Acceptance appeared to be based on the supplier's documentation. No performance verification under an acceptable (supplier or

REECo) QA program was performed. In addition the M&O, as Architect/Engineer specifying the items to be purchased, has not identified the requirements that REECo should verify upon receipt.

The NRC staff believes the concern for commercial grade procurement uncovered by the audit team should receive expeditious corrective action by the YMQAD and its participants to avoid similar problems encountered in procurement of commercial grade items for nuclear reactors, e.g., counterfeit parts, non-qualified or non-dedicated parts being used in a safety-related application. The NRC staff suggested that a project-wide procedure be developed and implemented in a timely manner to ensure commercial grade items will be procured in an acceptable manner and be suitable for application.

The auditor was thorough in his evaluations and convened a meeting with REECo, M&O, YMQAD, and audit observers to fully discuss commercial grade procurement and possible corrective actions. CARs were initiated to both REECo and the M&O for their respective responsibilities in this function. The audit of this programmatic element was effective and the NRC staff agrees with the audit team finding that program implementation for this area is unsatisfactory.

5.3.2 Identification and Control of Items (Programmatic Element 8.0)

The auditor assigned to audit this programmatic element also reviewed the implementation of technical control procedures associated with water use, lithium-bromide tracers (in water), and drainage. The observed portion of this audit included the review of logs and other documentation associated with construction activities. Procedure TC-581-SP-0012, "Monthly Inspection of North Exploratory Shaft Facility Portal Pad Drainage Channel," had not been implemented because the drainage channel had not been completed. The audit of this programmatic element was effective, and implementation of this criterion and the procedures being used appeared adequate.

5.3.3 Inspection, and Inspection, Test, and Operating Status (Programmatic Elements 10.0 and 14.0)

The audit of these two programmatic elements was mainly conducted at the Nevada Test Site, Mercury, Nevada. The areas audited included the inspection and testing work activities associated with the starter tunnel such as shotcrete and rock bolts and accessories.

The auditor reviewed training, qualification, and certification of inspection and test personnel; inspection and test results and records; and compliance with procedures and specifications. Procedures and specifications were also verified to assure they were adequate to accomplish a particular activity.

At the beginning of each audit activity, the auditor, for the benefit of the auditee and observer, briefly explained what was being audited and what documentation or resources would be needed to accomplish the audit. During the audit, if minor discrepancies surfaced, or if the discrepancies were isolated and had no effect on safety, they were reported to the auditee with a

request to correct them at the earliest time frame. The auditee and auditor were completely open and candid in their discussions on the items and activities audited. The NRC staff was also invited to provide input at any time during the audit of these two criteria. At the conclusion of the audit of each area, the auditor summarized what had been audited and any positive or negative findings to ensure the auditee understood the findings. Auditee personnel were given ample opportunity to take remedial corrective action on any negative finding.

The starter tunnel was visited to verify the placement of shotcrete and rock bolts, rock bolt status (pulltest pass/fail), shotcrete mix process, purchase order identification, heat codes, shotcrete mix batch numbers, and associated documentation. During this portion of the audit, the NRC staff noted that the specifications for Shotcrete (03361) and Rock Bolts and Accessories (02165) contained numerous Field Change Requests (FCRs) that, from an audit observer perspective, appeared to be difficult to follow. For example, the Shotcrete specification contained 22 pages of handwritten FCRs dating back to December 5, 1992. The majority of these handwritten FCRs were in the form of undated, uninitialed, multilined crossouts leaving much to be interpreted by the document user in implementing the document requirements. The specification for Rock Bolts and Accessories contained 12 FCRs numbering 13 pages, also dating back to December 5, 1992. Most of the FCRs in this specification were initialed and dated as required by the QARD commitment to Supplement 17S-1 in ASME-NQA-1-1989. However, many of the FCRs were illegible or unreadable and, again, difficult to follow from a document user standpoint. Several of the REECo personnel commented, when asked, that these documents were not totally "user friendly" and that clarification would assist them in following these specifications in a more constructive manner.

The NRC staff requested a meeting to obtain information on this issue. The meeting was attended by the OCRWM QA Manager, REECo personnel, the State of Nevada audit observer, the ATL, and others. The OCRWM QA Manager indicated that a CAR had been written on this issue and the corrective action was to limit the number of FCRs to five after which the document would be reissued and incorporate all changes. This would provide some assistance in limiting the amount of FCRs; however, this was not the principle concern of the NRC staff. The NRC staff's concern was that the numerous pages of handwritten, uninitialed, sometimes illegible, hard to follow FCRs are not conducive to accurate procedure development and implementation. The OCRWM QA Manager further explained that the M&O was assigned responsibility at the beginning of this year to control future revisions to design documents and that measures were in process which should alleviate the NRC staff's concerns. The NRC staff recognized that this process would involve a reasonable time period to fully implement it and indicated it would observe the progress of this process during its observation of future audits.

The audit of Programmatic Elements 10.0 and 14.0 was extremely thorough and effective in identifying a number of deficiencies that may be attributed to start-up activities. Seven preliminary CARs were issued and are listed as Items a-g in Section 5.9 of this report. The NRC staff agrees with the audit team that QA program implementation under this program element is satisfactory

except for starter tunnel survey activities of quality-affecting items which were performed in accordance with procedures that are not part of the REECo Yucca Mountain QA program. This area is considered to be unsatisfactory.

5.3.4 Control of Measuring and Test Equipment (Programmatic Element 12.0)

The auditor for Programmatic Element 12.0 also reviewed implementation of procedures covering drilling and blasting and rock bolt testing. The observed portion of this audit involved REECo Physical Standards and Calibration facility in Mercury, Nevada, on the Nevada Test Site. This facility is not dedicated exclusively to Yucca Mountain activities but is one of the REECo organizations providing support to the REECo Yucca Mountain group.

The applicable checklist items covered calibration procedures and calibration controls for standards. Considerable progress seems to have been made in addressing deficiencies identified in a previous audit. The calibration staff appeared to be familiar with Yucca Mountain QA requirements. The audit of this area was effective and implementation of the QA program and procedures was adequate.

5.3.5 Conclusions

The audit of the REECo QA program evaluated the adequacy of implementing procedures and the effectiveness of implementation of the QA program. The auditors used appropriate checklists, interviewed REECo and M&O personnel, and reviewed appropriate documentation. The audit was effective and the NRC staff agrees with the audit team that REECo is adequately implementing its QA program in the programmatic elements audited other than the aforementioned areas listed as unsatisfactory. The audit team appropriately identified a number of cases of implementation deficiencies. These deficiencies do not indicate serious programmatic deficiencies but reflect the start-up of the REECo construction activities and the unanticipated problem areas. The audit team indicated that a special surveillance may be initiated in the area of procurement to assure corrective action is effective for the procurement of commercial grade items.

5.4 Conduct Of Audit

The audit was performed in a professional manner. The audit team was generally well prepared and, overall, demonstrated a sound knowledge of the REECo QA program. In general, the audit team personnel were persistent in their interviews, challenged responses when necessary, and performed an acceptable audit. Daily caucuses were held between auditors and observers, and daily audit status meetings were held between REECo management and the ATL (with an NRC observer present) to discuss the preliminary findings. Responsible REECo personnel were receptive to the audit team findings in the interest of improving the REECo QA program. REECo personnel were also very cooperative with the audit team and observers in being candid and timely in their responses to requests from the auditors.

5.5 Qualification Of Auditors

The qualifications of the ATL and auditors were reviewed by the NRC observers during the course of the audit and found to be acceptable. Each auditor and the ATL met the requirements of YMPO QMP-02-02, "Qualification of Quality Assurance Program Audit Personnel."

5.6 Audit Team Preparation

The auditors were prepared in the areas they were assigned to audit and were generally knowledgeable of the applicable procedures. The audit plan for this audit included the audit scope, the audit schedule, a list of audit team personnel, a list of the activities to be audited, and audit checklist references.

5.7 Audit Team Independence

The audit team members did not have prior responsibility for performing the activities they audited. Members of the team had sufficient independence to carry out their assigned functions in a correct manner without adverse pressure or influence.

5.8 Summary of NRC Staff Findings

5.8.1 Observations

The NRC staff did not identify any observations relating to deficiencies in either the audit process or the REECo QA program.

5.8.2 Weaknesses

- The procurement of commercial grade items needs to be standardized among all Yucca Mountain Site Characterization Project participants (See Section 5.3.1)

- The FCR process is not "user friendly" (See Section 5.3.3).

5.8.3 Good Practices

- The performance-based approach to auditing appears to be well suited for effective and efficient audits of construction activities, particularly when auditing the implementation of procedures that address a number of QA program criteria associated with the activity.

5.9 Summary of YMQAD Audit Findings

As a result of this audit, the audit team concluded that the REECo QA procedures are adequate and that REECo's QA program implementation in the areas audited is adequate except where corrective action is required as discussed in Sections 5.3.1 and 5.3.3 above. Seven preliminary CARs were

issued against the REECo QA program and four preliminary CARs were issued against the M&O Contractor's QA program. A summary of the eleven preliminary CARs is presented below:

a. Alignment of tunnel was performed by REECo without a QA procedure on surveying. The Survey Guideline Manual was also classified as non-QA (REECo).

b. No reference to a calibrated instrument for temperature reading on shotcrete documentation (REECo).

c. Shotcrete specification did not require a Nonconformance Report to be initiated for failed test results (M&O).

d. Shotcrete construction placement log has incorrect batch numbers, crossouts not initialed or dated, incorrect serial numbers, and drawing numbers not listed (REECo).

e. Shotcrete specification was inadequate for controlling the placement of additional shotcrete over nonconforming shotcrete when shotcrete compressive tests failed (REECo).

f. Shotcrete preconstruction mix design testing not traceable to the fibercrete material that was tested (REECo).

g. Test results for fibercrete mix design submitted by REECo and accepted by the M&O; however, test results were not traceable to indicate that the material tested was fibercrete (M&O).

h. Rock bolt bearing plates inside the starter tunnel are not being painted red to indicate a failed pull test and green to indicate a passed pull test, and the procedural requirements regarding the status indicators were not verified by appropriate personnel (REECo).

i. Specifications are unclear on definition of commercial grade for quality affecting procurements, receiving inspection, and testing. No requirements to have a program in place to dedicate commercial grade procurements for use in a quality-affecting application. Specifications also do not require verifying the validity of the supplier's certifications (M&O).

j. Supplier evaluations to qualify suppliers were not performed for procurement of commercial grade materials. Testing was not performed to verify the validity of test reports furnished by unqualified suppliers (REECo).

k. Nonconformance Reports dispositioned "use-as-is" without technical justification for acceptability (M&O).