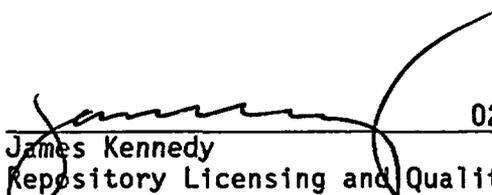


U. S. NUCLEAR REGULATORY COMMISSION
OBSERVATION AUDIT REPORT
FOR THE
YUCCA MOUNTAIN PROJECT OFFICE
AUDIT NO. S89-2
FENIX & SCISSON


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NRC OBSERVATION AUDIT REPORT
OF THE DOE/YMPO AUDIT OF FENIX & SCISSON (#S89-2)

Summary

From November 7, 1988 through November 14, 1988 the Nuclear Regulatory Commission (NRC) staff participated as observers of the Department of Energy/Yucca Mountain Project Office (DOE/YMPO) audit (#S89-2) of Fenix & Scisson (F&S). The purpose of this observation was to evaluate the effectiveness of the YMPO audit and to determine whether DOE and its contractor are properly reviewing and implementing their quality assurance (QA) programs. The NRC staff based their conclusions on direct observations of the auditors, discussions with the audit team, and review of the pertinent audit information (e.g., the audit plan and checklist). To a lesser degree, this observation audit evaluated the adequacy of the F&S QA program.

The staff has concluded that the overall audit of F&S was marginally acceptable and effective. In the early stages of the audit the staff was concerned with the ineffectiveness of the lead technical specialist due to the lack of audit training and audit experience even though he was well experienced and qualified in the field of design engineering. Also the staff noted that in the early stages of the audit there appeared to be insufficient technical specialists to carry out the technical portion of the audit. The audit team was responsive in correcting these concerns in a timely manner which resulted in a more productive and effective audit. A highly qualified technical auditor was assigned to the audit team and the lead technical specialist was given additional audit training. In addition the staff believes that the audit would have been more effective if the lead auditor had not been assigned lead auditor for the preparation, staffing, training and coordination of the audit teams for both Holmes and Narver and F&S which were conducted back to back.

In regard to the F&S QA program and design controls, the staff believes that although there were some weaknesses in the QA design control practices the staff did find that the number of qualified design engineers in each discipline and design management controls had increased significantly and that the overall design process had improved since the last audit. The design engineers appeared to be highly qualified and experienced in the required fields of design. The staff is, however, particularly interested in DOE's evaluation and resolution of the audit team finding regarding the use of commercial grade software programs in the exploratory shaft facility (ESF) Title I design activities without formal QA program controls (i.e., verification and configuration management controls) and how this may impact on the acceptability of Title I designs at F&S and other DOE/YMPO contractors.

1.0 Introduction

From November 7, 1988 through November 14, 1988, the Nuclear Regulatory Commission (NRC) staff participated as observers in the Department of Energy/Yucca Mountain Project Office (DOE/YMPO) quality assurance (QA) audit of Fenix & Scisson (F&S). F&S is the exploratory shaft facility (ESF) architect-engineer for drilling and mining for the Yucca Mountain Project Office (YMPO). Other responsibilities include the surveillance and inspection of drilling and mining, and subsurface facilities construction and testing.

The DOE/YMPO audit (#S89-2) was conducted at the F&S offices in Las Vegas, Nevada and the Nevada Test Site. The objective of the audit was to: (1) supplement the previous audit of F&S (#88-01); (2) to determine the effectiveness of the F&S QA program in meeting the requirements of the NNWSI NVO-196-17, Revision 5 QA program; and (3) to verify implementation of this QA program as it relates to the design of the ESF. The remainder of this report will address the adequacy of the DOE/YMPO audit (#S89-2). The NRC staff's evaluation of the DOE/YMPO audit team is based on direct observations of the auditors, discussions with the audit team, and review of the audit plan, checklist and background material.

2.0 Scope and Purpose of NRC Staff Participation

The purpose of the staff observation was to evaluate the effectiveness of the YMPO audit and to determine whether DOE and F&S are properly reviewing and implementing their QA programs in accordance with DOE requirements and 10 CFR Part 50, Appendix B. Observation audits enable the staff to provide recommendations to DOE on their audit program and the implementation of their contractor's QA programs. These observations of DOE/YMPO audits and the subsequent recommendations should assist DOE in meeting the NRC's QA requirements.

With respect to the technical portion of the audit, the staff observations allow it to evaluate whether DOE is reviewing ongoing activities with the depth and rigor necessary to ensure that the work is acceptable. These observation audits also allow the staff to provide DOE with guidance on where additional work may be needed in its site characterization and design work.

3.0 Audit Team Members

The DOE/YMPO audit team members, the NRC observers, and other observers are listed below.

NRC

John Peshel	Observer (NRC)
James Donnelly	Observer (NRC)
John Gilray	Observer (NRC)
Michael Gonzalez	Observer (NRC - Center for Nuclear Waste Regulatory Analysis)

DOE

Stephen Dana	Lead Auditor	SAIC, Las Vegas, Nevada
Ken Wolverton	Auditor	SAIC, Las Vegas, Nevada
William Camp	Auditor	SAIC, Las Vegas, Nevada
Fredrick Ruth	Auditor	SAIC, Las Vegas, Nevada
Albert Williams	Auditor Candidate	YMP, Las Vegas, Nevada
Alvin Langstaff	Lead Technical Specialist	SAIC, Las Vegas, Nevada
Steve Smith	Tech. Specialist	SAIC, Las Vegas, Nevada
Tom Watson	Tech. Specialist	SAIC, Las Vegas, Nevada
Catherine Hampton	Observer	YMP, Las Vegas, Nevada
Arthur Watkins	Observer	WESTON, Washington, D.C.
Robert Clark	Observer	WESTON, Washington, D.C.

STATE OF NEVADA

Susan Zimmerman	Observer
James Grubb	Observer

4.0 Staff Observations

As observers, the NRC staff evaluated the effectiveness of the audit and audit team. The audit areas that were observed and evaluated included:

- (1) scope of the audit;
- (2) timing of the audit;
- (3) technical products;
- (4) conduct of the audit;
- (5) qualification of the auditors;
- (6) audit team preparation;
- (7) conduct of meetings;
- (8) team coordination; and
- (9) audit team independence

The acceptability of each area described above is based on direct observations of the auditors, discussions with the audit team, and review of the audit plan, checklist, and background material.

4.1 Scope of Audit

The audit plan for this audit did not address the following 10 CFR Part 50, Appendix B criteria:

- 1.0 Organization
- 4.0 Procurement Document Control
- 7.0 Control of Purchased material, Equipment, and Supplies
- 8.0 Identification and Control of Samples and Items
- 9.0 Control of Processes
- 10.0 Inspection
- 11.0 Test Control
- 12.0 Control of Measuring and Test Equipment
- 13.0 Handling, Storage, and Shipping
- 14.0 Inspection, Test, and Operating Status
- 15.0 Nonconforming Materials, Parts, or Components

The justification for excluding these QA controls, as stated in the audit plan, was that the aforementioned QA controls were covered in-depth during the 88-01 audit held in February of this year. This justification is acceptable to the NRC staff since the staff observed the 88-01 audit and agreed that an in-depth review of the subject criteria was performed without significant deficiencies.

4.2 Timing of the Audit

The NRC staff believes the timing of the audit was appropriate based on the near term importance of the ESF design and as a result of previously identified concerns with the F&S QA program. Many of the F&S design activities have the potential to affect safety and/or waste isolation. Further, the deficiencies identified in audit #88-01 of F&S were of such importance to warrant this supplemental audit.

4.3 Technical Products

The audit plan included a technical evaluation of all design work packages pertaining to the F&S Title 1 design activity. These work packages are:

WBS Number/Activity

- 1.2.6.3.2 - ES-1 Collar Design
- 1.2.6.3.3 - ES-2 Collar Design
- 1.2.6.4.1 - ES-1 Shaft and Lining
- 1.2.6.4.2 - ES-1 Hoist and Headframe
- 1.2.6.5.1 - ES-2 Shaft and Lining
- 1.2.6.5.2 - ES-2 Hoist and Headframe
- 1.2.6.6.0 - Subsurface Excavation
- 1.2.6.7.1 - Utilities and Communication Systems
- 1.2.6.7.2 - Mine Plant
- 1.2.6.7.3 - ES-1 Shaft Internals and Conveyances
- 1.2.6.7.4 - ES-2 Shaft Internals and Conveyances

The technical audit team conducted a technical evaluation of the design drawings, calculations and other supporting design documents using comprehensive checklists to determine adequacy of traceability from each of these design documents to the design input requirements and to determine compliance with design technical procedures which address design methodology, design analysis, design verification, design interface controls and change controls.

The staff noted that the audit team identified a possible deficiency pertaining to the use of commercial software programs without proper verification and configuration management controls by F&S. The staff is awaiting a timely resolution of this issue since this may impact on the acceptability of certain F&S Title I design packages that used commercial grade software programs.

The NRC staff observed that the F&S engineering organization and design activities have improved since the last audit. F&S design engineers appeared to have sufficient experience in the required fields of design.

With the exception of the concern identified in 4.4, "Conduct of Audit," the technical specialists conducted an effective evaluation of F&S design activities.

4.4 Conduct of Audit

The staff believes that while the overall audit of F&S was marginally acceptable and effective, there were at the early stages of the audit a number of weaknesses in its conduct which warrant attention and corrective actions by DOE/YMPO in order to preclude their recurrence and to allow for more effective audits in the future.

In the early stages of the audit, it was apparent that the lead technical specialist was not carrying out an effective audit in the technical areas. It appeared that too much time was devoted to general discussions with F&S pertaining to F&S design practices and philosophies rather than curtailing the discussion to the checklist questions. F&S designers would often stray from the subject and introduce somewhat lengthy and irrelevant subject matter in their response to the lead technical specialist's questions. In discussing these concerns with the audit team the staff determined that the lead technical specialist had not received formal audit training to assure he was knowledgeable and capable in effectively conducting audits in the design control technical areas. It was further determined that he had never performed a previous audit, yet he was assigned the important responsibility of lead technical specialist and for overseeing and providing guidance to the other technical specialist. The staff did however, find this lead technical specialist well experienced in the field of design engineering. After bringing this concern to the audit team they were responsive in bringing in a technical specialist, proficient and capable in the techniques of auditing, and also provided additional training to the lead technical specialist in a timely manner. These corrective measures directly contributed to achieving a more productive and effective audit. If the lead auditor had not been assigned responsibility for the preparation, training, staffing and coordination of two audits (Holmes and Narver and F&S) held back to back, the staff and training of the F&S audit team may have been better.

The conduct of the QA portion of the audit was acceptable. QA auditors used comprehensive checklists and branched out with persistent questions and evaluations.

Deficiencies in QA program implementation were brought to the attention of the audited organization, but only those of significant importance were classified as findings or observations. SDRs were thoroughly supported with specific examples.

Conditions requiring immediate action were not identified. However, daily briefings were held with F&S management to accomplish this should it have been necessary.

The audit plan called for an appropriate mix of technical and QA programmatic activities. Prior to the exit meeting, the audit team discussed their findings and observations along with the basis for these findings with members of the audit team and observers. The QA auditors worked and interfaced closely with the technical specialist coordinating and addressing in QA and technical concerns and issues.

In conclusion the QA auditors and in the latter stages of the audit the technical auditors, conducted the audit in an acceptable and effective manner.

4.5 Qualification of the Auditors

As part of its effort to more efficiently observe the DOE audit program, the staff has conducted a review of the SAIC QA auditors who could be used on DOE/YMPO audit teams and the procedure used to qualify them. The results of this review are contained in the staff observation report covering the DOE/YMPO audit of the U.S. Geological Survey (John J. Linehan (NRC) letter to Ralph Stein (DOE) dated August 22, 1988). Based on this review, the staff concluded that the DOE/YMPO QA auditors available for audits were acceptably qualified to perform QA audits. In addition, as a result of its review of QMP-02-02, "Qualification of Quality Assurance Program Audit Personnel," the staff concluded any new auditors qualified using this procedure would also be acceptable. Since the qualifications of the auditors on the team were reviewed by the staff or were qualified using QMP-02-02, the staff finds the team qualified.

The qualifications of the technical specialists were also reviewed. As stated earlier, the education and experience of the technical specialists were appropriate for the technical area being audited. However, the appropriate level of auditing skills were lacking for the lead technical specialist. The NRC staff recommends, as stated on page II-11 section 5.1.4 of NNWSI/88-9, that training be conducted to gain the required proficiency prior to assigning staff to perform activities that affect quality (i.e., technical audits).

4.6 Audit Team Preparation

With the exception of the lead technical specialist, the QA and technical auditors were well prepared in the areas they were assigned to audit and knowledgeable in the QA Program Plan and implementing procedures. The audit plan overall was complete and included the necessary information to support the audit. This included: (1) the audit scope; (2) a list of audit personnel and observers; (3) a list of all the audit activities; (4) a copy of the notification letter; (5) copies of the H&N QAPP, procedures, past audit reports, and work breakdown structure activities; and (6) copies of the QA and technical checklists. Implementing procedures were not only audited for compliance but for QA and technical adequacy as well.

4.7 Conduct of Meetings

The overall conduct of the preaudit and postaudit conference by the audit team was acceptable. During the preaudit conference, the scope of the audit was clearly defined, requirements documents were identified, and questions or comments were encouraged. At the postaudit conference, the findings were explained well and F&S personnel were given the opportunity to respond. This is consistent with QMP-18-01 and standard auditing practice.

The internal daily audit team caucuses were conducted in a satisfactory manner giving each audit team member an opportunity to present his concerns and findings resulting from the days audit activities. Productive dialogue took place between the QA and technical members of the audit team. Each auditor described their activities and concerns for that day. This allows the other audit team members to evaluate similar concerns and determine whether potential problems were indicative of a larger problem. Similarly, such discussions allow the auditors to coordinate their efforts on similar concerns and to avoid overlap.

4.8 Audit Team Coordination

The lead auditor conducted the audit team coordination during the audit in an acceptable manner. As noted above, the daily caucus provided the opportunity to address concerns and findings and to coordinate the audit activities for the next day. These caucuses allowed team members to consider if identified concerns and findings are symptoms of larger problems and whether they existed in other areas.

4.9 Audit Team Independence

The audit team members did not have prior responsibility for performing the activities they investigated. Members of the team appeared to have sufficient independence to carry out their assigned functions in a correct manner without adverse pressure or influence from F&S personnel.

4.10 Preliminary Audit Team Findings

The DOE/YMPO audit team identified the following preliminary findings.

- No objective evidence of verifying education and experience for three Parsons-Brinkerhoff personnel.
- Method by which F&S states it will perform proficiency evaluations does not meet the F&S QAPP requirements.
- Documented evidence was not available to indicate that interdiscipline review comments had been verified.
- Assumptions requiring verification during Title II phase were not identified. Also design analysis are not, in all cases, listed in the "Assumptions Section."

- No objective evidence that F&S Basis for Design document used for Title I design was reviewed and approved by the F&S QA organization.
- Software utilized during Title I was purchased commercially and was not verified nor controlled through a configuration control program.
- Two modifications to Parsons-Brinkerhoff Purchase Order did not receive a complete QA review.
- No documented objective evidence was available describing how external review comments for Title I 50% Design Review and Title I 100% Technical Assessment Review were resolved.