



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
SAM NUNN ATLANTA FEDERAL CENTER  
61 FORSYTH STREET, SW, SUITE 23T85  
ATLANTA, GEORGIA 30303-8931

July 29, 2008

Mr. David Stinson  
President and Chief Operating Officer  
Shaw AREVA MOX Services  
Savannah River Site  
P.O. Box 7097  
Aiken, SC 29804-7097

SUBJECT: MIXED OXIDE (MOX) FUEL FABRICATION FACILITY- NRC INSPECTION  
REPORT 70-3098/2008-002 AND NOTICE OF VIOLATION

Dear Mr. Stinson:

During the period of April 1 through June 30, 2008, the US Nuclear Regulatory Commission (NRC) completed inspections of construction activities related to the construction of the proposed Mixed Oxide Fuel Fabrication Facility (MFFF). The purpose of the inspections was to determine whether activities authorized by the construction authorization were conducted safely and in accordance with NRC requirements. The enclosed inspection report documents the inspection results. At the conclusion of the inspections, the findings were discussed with those members of your staff identified in the enclosed report.

The inspections examined activities conducted under your construction authorization as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your authorization. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, the NRC has determined that a violation of NRC requirements occurred. The violation was evaluated in accordance with the NRC Enforcement Policy. The current Enforcement Policy is available on the NRC's Web site at [www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html](http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html). The violation is cited in the enclosed Notice of Violation (Notice) and is being cited in the Notice because it was identified by the NRC. The circumstances surrounding the violation are described in detail in the subject inspection report.

Except as noted in the following paragraph, you are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. For your consideration, NRC Information Notice 96-28, "SUGGESTED GUIDANCE RELATING TO DEVELOPMENT AND IMPLEMENTATION OF CORRECTIVE ACTION," is available on the NRC's Web site. The NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

The NRC has concluded that information regarding the reason for Example 1 of the enclosed Notice of Violation, the corrective actions taken and planned to be taken to correct the violation and prevent recurrence, and the date when full compliance will be achieved, is already

adequately addressed on the docket in Inspection Report No. 70-3098/2008-002, therefore no response to this letter is required.

In addition, we received your reply to our Notice of Violation 70-3098/2008-001-02 and 70-3098/2008-001-03 in a letter dated June 26, 2008. The reply met the requirements of 10 CFR 2.201 and your corrective actions will be reviewed during a future inspection.

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

To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Should you have any questions concerning this letter, please contact us.

Sincerely,

**/RA/**

Deborah A. Seymour, Chief  
Construction Projects Branch 1  
Division of Construction Projects

Docket No. 70-3098  
Construction Authorization No. CAMOX-001

Enclosure: 1. Notice of Violation  
2. NRC Inspection Report 70-3098/2008-001 w/attachment

cc w/encl: (See page 3)

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Deborah A. Seymour, Chief  
Construction Projects Branch 1  
Division of Construction Projects

Docket No. 70-3098  
Construction Authorization No. CAMOX-001

Enclosure: 1. Notice of Violation  
2. NRC Inspection Report 70-3098/2008-001 w/attachment

cc w/encl: (See page 3)

PUBLICLY AVAILABLE       NON-PUBLICLY AVAILABLE       SENSITIVE       NON-SENSITIVE

ADAMS:  Yes      ACCESSION NUMBER: ML082120091       SUNSI REVIEW COMPLETE

OFFICE	RII:DCP	RII:DCP	RII:DCI	RII:DCI	RII:DCI	HQ:NMSS	
SIGNATURE	Via Phone WBG	Via Email MS	Via Email LC	Via Email JB	Via Email MSL	Via Email PB	
NAME	WGloersen	MShannon	LCain	JBartleman	MLesser	PBell	
DATE	7/29/08	7/29/08	7/29/08	7/29/08	7/29/08	7/29/08	
E-MAIL COPY?	YES      NO	YES      NO	YES      NO	YES      NO	YES      NO	YES      NO	YES      NO

D. Stinson

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cc w/encl:

Mr. Garrett Smith, NNSA/HQ  
NA-261/ Forrestal  
1000 Independence Ave., SW  
Washington, DC 20585

A.J. Eggenberger, Chairman  
Defense Nuclear Facilities Safety Board  
625 Indian Ave., NW  
Suite 700  
Washington, DC 20004

Mr. Joseph Olencz, NNSA/HQ  
1000 Independence Ave., SW  
Washington, DC 20585

Mr. Henry Porter, Assistant Director  
Division of Radioactive Waste  
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Diane Curran  
Harmon, Curran, Spielberg  
& Eisenberg LLP  
1726 M St., NW  
Suite 600  
Washington, DC 20036

Letter to D. Stinson from Deborah A. Seymour dated July 29, 2008

SUBJECT: MIXED OXIDE FUEL FABRICATION FACILITY – NRC INSPECTION REPORT  
70-3098/2008-002 AND NOTICE OF VIOLATION

Distribution w/encl:

M. Kotzalas, NMSS

D. Tiktinsky, NMSS

D. Jackson, NMSS

A. Gody, RII

D. Seymour, RII

M. Lesser, RII

K. O'Donohue, RII

M. Shannon, RII

W. Gloersen, RII

PUBLIC

## NOTICE OF VIOLATION

Shaw AREVA MOX Services  
Aiken, South Carolina

Docket No. 70-3098  
Construction Authorization No. CAMOX-001

During NRC inspection activities conducted between April 1 through June 30, 2008, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Condition 3.A of NRC Construction Authorization No. CAMOX-001 (Revision 2, dated June 12, 2008) authorizes, in part, the applicant to construct a plutonium processing and mixed oxide fuel fabrication plant, known as the Mixed Oxide Fuel Fabrication Facility (MFFF) located at the Department of Energy's Savannah River Site, in accordance with the statements, representations, and conditions of the MOX Project Quality Assurance Plan (MPQAP) dated March 26, 2002 and supplements thereto.

Contrary to the above, on and before June 19, 2008, the applicant failed to implement certain MPQAP and requirements, as enumerated in the following examples:

1. MPQAP, Revision 5, Section 5.1, requires quality-affecting activities to be prescribed by and performed in accordance with documented, approved QA procedures and other approved implementing documents (drawings, specifications, etc.) appropriate to the MOX Project work scope. Requirement 5.2.2 under this section requires implementing documents to provide a sequential description of work to be performed, and quantitative or qualitative acceptance criteria sufficient for determining activities were satisfactorily accomplished.

The applicant failed to provide an approved QA procedure or other approved implementing document which prescribed a sequential description of work to be performed, and quantitative or qualitative acceptance criteria sufficient for determining activities were satisfactorily accomplished during the installation and inspection of exothermic weld splices of ground cables.

2. MPQAP, Revision 5, Section 2.2.6, requires indoctrination, training, and qualification of personnel performing activities affecting quality. Requirement H. 2 requires training procedures to identify technical objectives and requirements of the applicable codes and standards.

MOX Services Project Procedure PP3-27, "Quality Control Personnel Certification," Section 3.2.4, states inspection personnel shall perform inspection activities only in their areas of certification. Sections 3.4 and 3.6 state areas of certification, including certifications for special applications, will be documented on the qualification summary form, or Certificate of Qualification. Appendix D designates "Cadwelding" as a certification area for Special Processes. Section 3.1 defines Inspector Training Records as documents containing training objectives, course outlines, reading assignments, tests, and examinations and/or capability demonstrations.

The applicant failed to document evaluations of inspector training for "Cadweld" ground cable splices on the respective Certificates of Qualification, and did not provide a written inspector training record that identified the technical objectives, course outline, or requirements of the applicable codes and standards.

3. MPQAP, Revision 5, Section 17.2.4.C, Record Repositories, requires in part that records shall be stored in either temporary or permanent containers or facilities. According to the MPQAP, temporary storage is defined as a facility or container with a fire rating of at least one (1) hour. The temporary storage container or facility shall bear an underwriters' laboratories label (UL) or equivalent, certifying one (1) hour fire protection, or be certified by a person competent in the technical field of fire protection.

The applicant failed to store QA records in temporary storage container or facility bearing an underwriters' laboratories label (UL) or equivalent, certifying one (1) hour fire protection, or be certified by a person competent in the technical field of fire protection in the Management Administrative Complex, Construction Administrative Complex and Equipment Engineering Complex buildings. Specifically, QA records, including receipt inspection reports, surveillances of Quality Level -1 items relied on for safety (IROFS), and design drawings, were not stored in fire rated containers prior to transmittal to the permanent record repository.

4. MPQAP, Revision 5, Section 16, Corrective Action, requires in part, that conditions adverse to quality be promptly identified.
  - a. On June 3, 2008, the applicant failed to identify a condition adverse to quality in that during the BMP-F111 basemat concrete placement, the previously placed concrete had lost its plasticity prior to making the next concrete placement, thus creating a cold joint.
  - b. On June 19, 2008, the applicant failed to identify during BMP-F112 basemat construction joint inspection activities that foreign material had been left in the construction joint and that there was voiding behind the stay forms.

This is a Severity Level IV violation (Supplement II)

Pursuant to the provisions of 10 CFR 2.201, Shaw AREVA MOX Services is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, Region II, and a copy to the NRC Resident Inspector at the Mixed Oxide Fuel Fabrication Facility construction project, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include: (1) the reason for the violation, or, if contested, the basis for disputing the violation, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previously docketed

correspondence if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an Order or Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other actions as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

In addition, the NRC has concluded that information regarding the reason for Example 1 of the violation, the corrective actions taken and planned to correct the violation and prevent recurrence and the date when full compliance was achieved is already adequately addressed on the docket in this letter and as documented in NRC Inspection Report No. 70-3098/2008-002. However, you are required to submit a written statement or explanation pursuant to 10 CFR 2.201 if the description therein does not accurately reflect your corrective actions or your position. In that case, or if you choose to respond, clearly mark your response as a "Reply to a Notice of Violation," and send it to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555 with a copy to the Resident Inspector and the Regional Administrator, Region II, within 30 days of the date of the letter transmitting this Notice.

If you contest this enforcement action, you should also provide a copy of your response to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room (PDR), or from the NRC's document system (ADAMS), which is accessible from the NRC web site at <http://www.nrc.fob/reading-rm/adams.html>, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld, and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CRR 19.11, you may be required to post this Notice within two working days.

Dated at Atlanta, Georgia this 29th day of July 2008.



**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket No.: 70-3098

Construction  
Authorization No.: CAMOX-001

Report No.: 70-3098/2008-002

Applicant: Shaw AREVA MOX Services

Location: Savannah River Site  
Aiken, South Carolina

Inspection Dates: April 1- June 30, 2008

Inspectors: M. Shannon, Senior Resident Inspector, Construction Projects Branch 1.  
(CPB1), Division of Construction Projects (DCP), Region II (RII),  
MOX FFF  
W. Gloersen, Senior Project Inspector, CPB1, DCP, RII  
J. Bartleman, Senior Construction Inspector, Construction Inspection  
Branch 2 (CIB2), Division of Construction Inspection (DCI), RII  
M. Cain, Senior Construction Inspector, CIB2, DCI, RII

Accompanying  
Personnel: C. Abbott, Construction Inspector Trainee,  
P. Bell, Senior Quality Assurance Engineer, Nuclear Materials Safety and  
Safeguards  
T. Gody, Deputy Director, DCP, RII  
C. Jones, Senior Construction Inspector Trainee, RII  
M. Lesser, Chief, Construction Inspection Branch 1, DCI, RII  
Carlos Cubero-Ponce, Student Engineer Trainee, RII

Approved: Deborah A. Seymour, Chief, CPB1, DCP

## **EXECUTIVE SUMMARY**

Shaw AREVA MOX Services  
Mixed Oxide Fuel Fabrication Facility (MFFF)  
NRC Inspection Report No. 70-3098/2008-002

These routine inspections included activities conducted by specialists from the Region II and Nuclear Material Safety and Safeguards (NMSS) offices during May 5-8 and June 9-12, and by the senior resident inspector from April 1-June 30, 2008. These inspections involved the observation and evaluation of the applicant's programs for facility construction of principle structures, systems, and components (PSSCs) which included quality assurance (QA) activities related to program development and implementation; problem identification, resolution, and corrective actions; inspection, test control, and control of measuring and test equipment; structural concrete activities; and geotechnical foundation activities.

On May 21, D. Seymour, M. Shannon, and W. Gloersen participated in a public management meeting in Aiken, SC. The meeting was organized by NMSS and the purpose of the meeting was to discuss the status of license review activities with respect to the license application to possess and use radioactive material at the MFFF and the construction inspection program. On June 12, M. Lesser, Branch Chief, Division of Construction Inspection, observed QA inspection activities and the exit meeting of a RII quality assurance inspection team. In addition, on June 24 and 25, T. Gody, Deputy Division Director of Construction Projects, visited the construction site to observe ongoing construction activities and discuss matters of mutual interest with MOX Services senior management.

The inspections identified the following aspects of the applicant's programs as outlined below:

### **Resident Inspection Program for On-Site Construction Activities (Inspection Procedure (IP) 88130)**

Construction activities related to principle structures, systems, and components (PSSCs) included: installations of reinforcing steel, embedded plates, embedded piping, and ground cables; heavy lifts of equipment and supplies; verification of equipment placements by surveys; welding; non-destructive testing (NDT); receipt of materials; and concrete placements. These construction activities were performed in a safe and quality related manner and in accordance with procedures and work packages. No items of concern were identified (Section 2).

### **Geotechnical/Foundation Activities (IP 88131)**

The controlled low strength material (CLSM) placement and testing activities observed were controlled in accordance with technical and quality requirements. The use of CLSM was an effective method for backfilling the areas around and under the MOX facility. No items of concern were identified (Section 3).

### **Structural Concrete Activities (IP 88132)**

Piping and plates that were observed were properly installed, cleanliness was more than adequate, and observed concrete placement activities were in accordance with procedures. No items of concern were identified (Section 4.(a)).

The control of concrete quality as measured by the standard deviation and assessed according to American Concrete Institute (ACI) rating criteria was classified as excellent. The specified design strength requirement was satisfied. No items of concern were identified (Section 4.(b)).

**Quality Assurance: Program Development and Implementation (IP 88106)**

Implementation of the QA program pertaining to the organizational structure, functional responsibilities, delegation of authority and interfaces for managing and assessing work was properly established and adequate. Design verification documentation, including sources of design inputs that support final design, were being maintained and were adequately controlled in accordance with the MOX Project Quality Assurance Plan (MPQAP) (Section 5.b).

**Quality Assurance: Design and Documentation Control (IP 88107)**

MOX Services implemented design and documentation control in accordance with its procedural requirements. However, the temporary storage of QA records was not performed according to approved QA procedures. The failure to implement requirements for the temporary storage of QA records was identified as an example of a violation of the MPQAP and Construction Authorization, CAMOX-001, Condition 3A (Section 6).

**Quality Assurance: Control of Materials, Equipment, and Services (IP 88108)**

MOX Services implemented control of materials, equipment, and services in accordance with the MPQAP and procedural requirements. (Section 7).

**Quality Assurance: Inspection, Test Control, and Control of Measuring and Test Equipment (IP 88109)**

MOX Services implemented inspection and testing of mechanical and civil installations in accordance with its procedural requirements. However, installation of weld splices for electrical ground cables was not performed in accordance with approved quality assurance procedures; and training and certification of personnel conducting acceptance inspections of the weld splices was not documented in accordance with approved quality assurance procedures. The failure to implement requirements for procedures and training was identified as two examples of a violation of the MPQAP and Construction Authorization, CAMOX-001, Condition 3A. (Section 8.(a)).

Equipment and instruments used to perform onsite concrete slump and air entrainment testing were properly calibrated. Concrete specimens were properly prepared and stored under proper temperature conditions in the QORE field storage boxes. No items of concern were identified. (Section 8 (b)).

The concrete plant chemical addition system was properly calibrated. No items of concern were identified. (Section 8.(c)).

**Quality Assurance: Problem identification, Resolution and Corrective Action (IP 88110)**

Procedures for problem identification and resolution addressed applicable requirements. One instance was identified where a condition report (CR) was not issued for an adverse condition

associated with a previously identified NRC violation. However, most of the required program elements were addressed in separate documents prepared by the applicant, and a CR would have been developed to address an NRC violation, thus the actual consequences of the failure were minor (Section 9.(a))

An example of a violation was identified for the failure to identify a condition adverse to quality in that there was a loss of plasticity of the concrete in placement BMP-111 on June 3, 2008 (Section 9.(b)).

An additional example of a violation was identified for the failure to identify conditions adverse to quality in that foreign material and voiding were found in the construction joints for basemat BMP-F112 after the construction joints were signed off as acceptable on June 19, 2008. (Section 9.(c)).

Attachment:

Persons Contacted

Inspection Procedures

List of Items Opened, Closed, and Discussed

List of Acronyms Used

List of Documents Reviewed

## **REPORT DETAILS**

### **1. Summary of Facility Status**

During the period, the applicant continued construction activities of principle structures, systems, and components (PSSCs) related to building construction up to ground level (Release 1). The applicant completed seven additional basemats (now at 20 of 28) needed to bring building construction up to ground level. The applicant also continued Release 2 activities and multiple walls of the fuel manufacturing building (BMF), receiving and shipping building and aqueous polishing building. At the end of the inspection period, the applicant had placed approximately 26,000 cubic yards of concrete, finished the lower level basemats for the receiving building, finished the basemats of the aqueous polishing building, completed 10 of 16 basemats in the manufacturing building, and placed approximately 33,000 cubic yards of flowable concrete in place of engineered fill.

### **2. Resident Inspection Program for On-Site Construction Activities (Inspection Procedure (IP) 88130)**

#### **a. Scope and Observations**

During the inspection period, the inspectors observed the following activities: (1) installation of structural reinforcing steel in the Mixed Oxide (MOX) fuel fabrication building, aqueous polishing building, and shipping and receiving building; (2) installation of embedded piping and embedded support plates in all three buildings; (3) placements of concrete in basemats for the BMF; (4) operation of the concrete batch plants; (5) receipt of cement, fly ash, sand and gravel; (6) concrete testing in the field (slump, air entrainment, and temperature) ; (7) welding and non-destructive testing (NDT) of piping to be embedded; (8) installation of building grounding cables in various basemats and walls; and (9) surveys (proper positioning/location) of embedded piping and embedded plates. In addition, the inspectors verified the following activities: (1) cleanliness of areas prior to concrete placement, and maintenance of cleanliness during the concrete placements; and (2) adequate consolidation of concrete during placement (vibration of concrete) in various basemats and walls.

The inspectors observed routine lifts conducted to position reinforcing steel, embedded piping, embedded plates; installation and removal of concrete retaining walls; and movement of equipment such as generators, pumps, temporary lighting, and toolboxes. The lifts were conducted in accordance with the applicant's procedures.

The inspectors reviewed the applicable sections of the applicant's Quality Assurance (QA) program and verified that the installations of the structural reinforcing steel, embedded plates, embedded piping, and electrical grounding of the MOX structures were in accordance with the program. Specifically, the inspectors verified that installations were in accordance with applicable field drawings and met the general construction notes detailed on the drawings: (1) MOX Fuel Fabrication Facility, Concrete and Reinforcing General Notes, DCS01-01352, Revision 9 (Sheet 1 of 2); and

(2) MOX Fuel Fabrication Facility, Concrete and Reinforcing General Notes and Tolerance Details, DCS-01352, Revision 6 (Sheet 2 of 2).

The inspectors routinely attended the applicant's construction plan-of-the-day meetings in order to maintain current knowledge of construction activities. The inspectors also routinely held discussions with MOX Services civil engineers, field engineers and quality control/assurance personnel, US Concrete personnel, Titan steel workers, and Baker Construction personnel in order to maintain current knowledge of construction activities and to maintain current knowledge of any problems and concerns.

The inspectors routinely reviewed the work packages maintained at each work site to verify construction personnel obtained proper authorizations to start work and maintained the packages up-to-date as tasks were completed.

The inspectors routinely verified that adequate staffing was available for construction activities, changing weather conditions were taken into account for planned construction activities, and construction activities were carried out in a safe manner. The inspector also observed proper communication in the work areas, observed that the work force was attentive, workers adhered to procedures in effect, observed proper communication between supervisors and workers, noted adequate cleanliness of the construction areas, and noted that hazardous materials were properly stored and/or properly controlled when in the field.

The inspectors routinely reviewed various corrective action documents. The review included non-conformance reports (NCRs), condition reports (CRs), root causes and supplier deficiency reports (SDRs). The inspectors also reviewed the closure of selected NCRs and CRs. The inspector concluded that the applicant was appropriately identifying conditions adverse to quality in their corrective action systems. The applicant identified these items during routine daily activities, special inspections, audits, and self assessments. The applicant routinely evaluated the significance of the adverse conditions, was completing corrective actions in a timely manner and properly evaluated adverse conditions for applicable reporting requirements. The inspectors noted that the applicant entered issues, identified during self assessments, into the corrective action system.

b. Conclusions

Construction activities related to PSSCs included: installations of reinforcing steel, embedded plates, embedded piping, and ground cables; heavy lifts of equipment and supplies; verification of equipment placements by surveys; welding; non-destructive testing; receipt of materials; and concrete placements. These construction activities were performed in a safe and quality related manner and in accordance with procedures and work packages. No items of concern were identified.

3. **Geotechnical/Foundation Activities (IP 88131)**

a. Scope and Observations

The inspection focused on the applicant's use of controlled low strength material (CLSM) in lieu of compacted engineered fill.

During the inspection period, the inspectors observed various placements of CLSM. Approximately 13,500 yards of CLSM was placed during this inspection period. The inspectors verified proper preparation of embankments prior to addition of CLSM. The inspectors verified CLSM strength test results and noted that the CLSM material strength remained within specification limits. Discussions with survey crews indicated that there were no settlement problems.

b. Conclusions

The CLSM placement and testing activities observed were controlled in accordance with technical and quality requirements. The use of CLSM was an effective method for backfilling the areas around and under the MOX facility. No items of concern were identified.

4. **Structural Concrete Activities (IP 88132)**

a. Concrete Placement Activities

(1). Scope and Observations

The inspectors evaluated the adequacy of the ongoing Quality Level (QL) -1 concrete placement activities that were associated with building structures that are considered to be PSSCs. The inspection focused on reinforcing steel installation, pre-placement preparation, materials testing, and placement procedures utilized.

The inspectors observed formwork cleanliness and alignment, reinforcing steel installation, and in-process testing of concrete (slump, air content, density, and temperature) related to both placements. The applicant's QA staff was observed conducting testing and surveillance of concrete activities as required by the QA program.

The inspectors observed various activities prior to and during each major concrete placement. Prior to each placement, the inspectors randomly checked for proper placement of reinforcing steel, including proper lap splices, supports, and bar quantity. The inspectors randomly checked for proper embed plate placement by observing ongoing surveys, and verified embed plate support structures were in place; verified cleanliness of the placement area; observed placement of embedded piping, installation of piping supports, mounting of piping to supports, and installation of galvanic sleeve between piping and supports. The inspectors also observed the installation of the grounding system for the reinforcing steel including embedded grounding posts for future equipment installation. The inspectors also noted minimal movement of wall dowels (reinforcing steel) during the placement activities. During the placements, the inspectors observed proper lift heights and observed MOX Services field engineers and Quality Control (QC) personnel performing inspections of the reinforcing steel, embed plates, embed piping, cleanliness prior to placements, and detailed observations of all placements.

During the concrete placements, inspectors observed operations at the batch plant and at the point of placement. Concrete placement and testing activities were in accordance with procedural requirements. Minor difficulties observed during the placements were independently identified by on-going QC inspections and corrected by the applicant.

The inspectors observed that concrete samples were collected at the prescribed frequency and noted that the slump and air content met the acceptance criteria or were appropriately dispositioned with NCRs, and that the concrete test cylinders were collected and temporarily stored per procedure prior to being transported to the off-site materials laboratory for curing and later testing. Batch plant operators correctly implemented procedural requirements and were in constant communication with the concrete placement crews.

The following list is a summary of the observed concrete placement activities:

- April 2, 2008, Aqueous Polishing Building (BAP) W-1, BAP Exterior Wall, 65 cubic yards, verified by field drawings BAP-WR 01 and BAP-WR02.
- April 7, 2008, MOX Process Building (BMP) F109, BMP Basemat, 1060 cubic yards, verified by field drawings BMP-RF103, BMP-RF103A, BMP-RF103B, and BMF-01776.
- April 9, 2008, BMP W-104, BMP Exterior Wall, 210 cubic yards, verified by field drawing BMP-WR 01.
- April 14, 2008, BMP-F-112A, BMP Pipe Encasement, 25 cubic yards.
- April 15, 2008, BMP F-110, BMP Basemat, 1130 cubic yards, verified by field drawings BMP-RF104, BMP-RF104A, BMP-RF104B, and BMF-01776.
- April 16, 2008, Shipping and Receiving Building (BSR)-W2-R-A, BSR Exterior Wall, 155 cubic yards, verified by drawing BSR-WR01.
- April 17, 2008, BMP-W-106A, BMP Interior Wall, 90 cubic yards, verified by field drawings BMP-WR04, BMP-WR08 and BMP-WR09. .
- April 28, 2008, BAP W3, BAP Exterior Wall, 100 cubic yards, verified by field drawing BMP-WR01
- April 30, 2008, BAP W2 1<sup>st</sup> lift, BAP Exterior Wall, 250 cubic yards, verified by field drawings BAP-WR02 and BAP-WR03. Placement not observed by SRI/NRC.
- May 5, 2008, BMP W-105A, BMP Exterior Wall, 190 cubic yards, verified by field drawing BMP-WR01. Placement not observed by SRI/NRC.
- May 6, 2008, BSR W-1 West Half, BSR Exterior Wall, 125 cubic yards, verified by field drawing BSR WR01. Placement not observed by SRI/NRC.
- May 13, 2008, BAP W-2 2<sup>nd</sup> lift, BSR Exterior Wall, 120 cubic yards, verified by field drawings BAP-WR02 and BAP WR03. Placement not observed by SRI/NRC.
- May 28, 2008, BSR W-3B 2<sup>nd</sup> lift, BSR Exterior Wall, 125 cubic yards, verified by field drawing BSR-WR02.



- May 29, 2008, BMP W-110A, BMP Exterior Wall, 160 cubic yards, verified by field drawing BMP-WR02.
- June 3, 2008, BMP F111, BMP Basemat, 1620 cubic yards, verified by field drawings BMP-111, BMP-111A, BMP-111B, and BMF-01776.
- June 10, 2008, BAP W4A, BAP Exterior Wall, 240 cubic yards, verified by field drawings BAP-WR01 and BAP-WR04.
- June 11, 2008, BMP W-103A, BMP Exterior Wall, 240 cubic yards, verified by field drawing BMP-WR01.
- June 19, 2008, BAP W-4B, BAP Exterior Wall, 240 cubic yards, verified by field drawings BAP-WR-01 and BAP-WR04.
- June 25, 2008, BMP F-112, BMP Basemat 1310 cubic yards, verified by field drawings BMP-111, BMP-111A, BMP111B, and BMF-01776.
- June 30, 2008, BMP W-103B, BMP Exterior Wall, 130 cubic yards, verified by field drawing BMP-WR01.

No items of concern were identified.

(2). Conclusions

Piping and plates that were observed were properly installed, cleanliness was more than adequate, and observed concrete placement activities were in accordance with procedures. No items of concern were identified.

b. Concrete Testing

(1). Scope and Observations

The inspectors observed concrete cylinder compression test results for the most recent 28-day old concrete placement. The 28-day compressive strength exceeded the design requirement for all the test results reviewed. The design requirement for the concrete mix reviewed was 4000 pounds per square inch based on the 56-day compressive strength. The analysis of concrete strength variation over time, conducted in accordance with American Concrete Institute (ACI) Report 214R, Evaluation of Strength Test Results of Concrete, was also reviewed. The review, performed by US Concrete, noted a variation in the production of the cement which accounted for the observed variation in the seven day and 28-day strength test results.

(2). Conclusions

The control of concrete quality as measured by the standard deviation and assessed according to ACI rating criteria was excellent. The specified design strength requirement was satisfied. No items of concern were identified.

5. **Quality Assurance: Program Development and Implementation (IP 88106)**

a. **Scope and Observations**

The inspectors reviewed selected elements of the applicant's functional organization and criteria of the QA programmatic structure. The elements were reviewed to ensure that the QA program was implemented in accordance with the MOX Project Quality Assurance Plan (MPQAP). Elements selected for inspection included the organizational structure, classification of structures, systems, and components, training, and management assessments.

The roles, responsibilities, and programmatic interfaces of the various functional areas of the project were defined in the QA program and project implementing procedures. In addition to verifying the roles and responsibilities, the lines of authority, delegation of authority, functional responsibilities, and interfaces for managing, performing and execution of work were properly defined, established and functioning.

The inspectors reviewed the process used to indoctrinate, train, and qualify personnel who perform quality affecting activities in accordance with MOX Project Procedure (PP) PP1-3, Project Training. The training activities described in this procedure provided clear guidance for the development and implementation of the training program which was applied to MOX employees and its subcontractors. The inspectors reviewed and evaluated training records for scaffolding training, and confined space entry for those individuals authorized to climb scaffolding and enter confined spaces. In addition, the inspectors verified that the licensee had properly maintained files pertaining to specific training and periodically reevaluated records and individual training needs in accordance with the requirements of the procedure.

The licensee's audit and assessment program was evaluated for its effectiveness in implementing the requirements of the MPQAP. Management assessments were performed and documented by the QA organization. The inspectors reviewed Management Assessment Report No. FY07-M-QA-016. No items of concern were identified.

The inspectors reviewed MOX engineering Project Procedures PP1-1, Quality Assurance Grading, PP9-1, SSC Quality Levels & Marking Design Documents, PP9-3, Design Control, PP9-9, Engineering Specifications, and Specification DCS01-ZMJ-DS-SPE-M-19113-3, Glovebox Shell Fabrication and Test Requirements. These procedures and specification provided specific instructions and requirements that described the technical basis required to assure that certain structures, systems, and components (SSCs) associated with the gloveboxes were properly characterized. No items of concern associated with classification of SSCs in this application were identified.

The inspectors also reviewed the specification for KCB GB 1000 Separating Hoppers Glovebox. The specification was based on American National Standards Institute (ANSI)/American Institute of Steel Construction (AISC) ANSI/AISC N-690-1994, Specification for Design, Fabrication, and Erection of Steel Safety Related Structures for Nuclear Facilities. The inspectors reviewed the calculations that demonstrated the structural integrity of the glovebox. The components, which included the glove box shell, frames, welded connections and fasteners, windows, and piping support, were

appropriately classified as QL-1, items relied on for safety (IROFS) and appropriately designated as Seismic Class 1 (SC-1). The inspectors reviewed the following calculations:

- Output reaction loads to anchorage embedment plates
- Maximum seismic displacements, accelerations and stress
- Maximum reaction and seismic accelerations for vendor qualified equipment
- Forces and moments on casting filters

The inspectors also reviewed the consistency between the floor response spectra and materials used to fabricate the parts. The inspectors reviewed the following calculations:

- Seismic displacement for BAP floors at five feet and ten inches and the horizontal and vertical displacement values
- Load drop calculation DCS01-ZMJ-DS-M-CAL-60101, Glovebox Floor Plate Impact Analysis, which was used to qualify glovebox floors within minimum thickness of four millimeters to maintain confinement under impact loads with kinetic energies of up to 500 joules

The inspectors verified selective implementation of the appropriate quality assurance controls used during facility design. At the time of this inspection, specific instructions to personnel regarding quality level designations were established in design, construction procurement and operational requirement documents and procedural controls. The inspectors reviewed PP9-17, System Description Documents, and PP9-16, Basis of Design Documents. The inspectors reviewed selected system description documentation pertaining to criticality analyses, seismic stress calculations and analyses, equipment sizing calculations, engineering evaluations of equipment qualifications, fire protection, and glove box shell fabrication. The inspectors verified that inspection and test requirements were maintained and adequately controlled in accordance with the MPQAP. The inspectors noted that SSCs were defined in combination with IROFS and contained those components necessary to meet the system's design requirements. The inspectors also noted that the facility's design information was not final.

b. Conclusions

Implementation of the QA program pertaining to the organizational structure, functional responsibilities, delegation of authority, and interfaces for managing and assessing work, was properly established and adequate. Design verification documentation, including sources of design inputs that supported final design, were maintained and were adequately controlled in accordance with the MPQAP.

**6. Quality Assurance: Design and Documentation Control (IP 88107)**

a. Scope and Observations

In the area of design control, the inspectors reviewed a total of six engineering change requests (ECRs), six design calculations, and one manufacturing design package, to determine if the design control program was adequately defined and included effective

procedures that identified design input controls, processes, analyses, verifications, change controls, and interface controls; translated quality standards into design documents; and controlled deviations from standards. The inspectors also determined that applicable design bases and other requirements necessary to assure adequate quality were included or referenced in the applicant's procurement documents for procurement of Quality Level 1 (QL-1) and QL-2 material, equipment and services.

The inspectors reviewed the applicant's thresholds for generating CRs, deficiency action requests (DARs), surveillance reports (SRs), and NCRs, and found the thresholds to be consistent with the applicant's procedural guidance. The inspectors verified that the applicant properly reported defects and 10 CFR Part 21 issues. The inspectors also reviewed implementation of MOX Services Project Procedure, PP 3-4 Revision 5, Records Management, to verify that the applicant was in compliance with Section 17 of the approved MPQAP. The inspectors also verified that proper document control of QA records was in compliance with the aforementioned procedures by conducting interviews and observations.

Section 17 of the MPQAP, Quality Assurance Records, specifies the requirements and methods for proper storage of QA records. Subsection 17.2.4.c, Record Repositories, specifically requires that records be stored in either permanent or temporary containers or facilities. Section 17 further clarifies that 'temporary storage' must be in a facility or container with a fire rating of at least one hour, bear an underwriters' laboratories label (UL) or equivalent, certifying one hour fire protection, or be certified by a person competent in the technical field of fire protection. PP 3-4, Records Management, Revision 5, includes the same requirements for storage of QA records. The QA record storage facilities and containers were inspected to evaluate the applicant's compliance with the MPQAP.

The inspectors observed several examples of QA record storage that were not in compliance with the MPQAP, and PP 3-4, in the Management Administrative Complex (MAC), Construction Administrative Complex (CAC), and Equipment Engineering Complex (EEC) buildings. More specifically, QA records, including receipt inspection reports, surveillances of QL-1 IROFS, and design drawings, were not stored in fire rated containers prior to transmittal to the permanent record repository. QA records were stored in desks and cabinets, which were not fire rated, for varying periods. The failure to store QA records in an appropriate temporary storage container is identified as one example of a violation of the Construction Authorization, Condition 3.A and MPQAP Section 17.2.4.c. (VIO 70-3098/2008-02-01: Failure to Implement MPQAP Requirements for the Storage of QA Records). As a result, the applicant generated CR - 20080234. Immediate corrective actions were taken to ensure that QA records were temporarily stored in one-hour fire rated containers and planned corrective actions included an extent of condition review for all MOX Project facility buildings.

b. Conclusions

MOX Services implemented design and documentation control in accordance with procedural requirements. However, the temporary storage of QA records was not performed according to approved quality assurance procedures. The failure to implement requirements for the storage of QA records was identified as an example of a violation of the MPQAP and Construction Authorization, CAMOX-001, Condition 3A.

7. **Quality Assurance: Control of Materials, Equipment, and Services (IP 88108)**

a. **Scope and Observations**

The inspectors reviewed one internal audit plan of procurement activities and processes, one internal QA audit report of procurement activities and processes, four QC receiving inspection reports, several site procedures, two inspection reports covering the supplier evaluation summary, a QA audit report for Weldstar, three purchase orders for process unit electrical cables, homogenizers and annular tanks, and four design/procurement specifications.

The inspectors determined that the procurement of QL-1 and QL-2 materials, equipment and services conformed with specified technical and QA requirements, and were in accordance with the MPQAP. The inspectors reviewed the QA program and associated QA procedures to verify that the applicant established the necessary requirements to control special processes, and that necessary controls were established for QL-1 and QL-2 items that did not conform to specified requirements to prevent inadvertent installation or use. The inspectors reviewed selected portions of the applicant's commercial-grade item dedication program and found that it was implemented to provide the necessary assurance of quality.

b. **Conclusions**

MOX Services implemented control of materials, equipment, and services in accordance with the MPQAP and procedural requirements.

8. **Quality Assurance: Inspection, Test Control, and Control of Measuring and Test Equipment (IP 88109)**

a. **Inspection, Test Control, and Control of Measuring and Test Equipment (M&TE)**

(1). **Scope and Observations**

The inspectors conducted a vertical slice of program implementation by directly observing in-progress inspection and test activities, interviewing responsible staff, reviewing applicable documents and records, and inspecting support facilities.

Observed activities included a concrete pour of wall section W103-A in the BMP. The inspectors observed that the applicant's quality inspector implemented planned checklists to verify installation of concrete forms and rebar, placement of embedded plates, and installation of ground system components. Hold points were formally identified by the quality inspector in work package WP 07-10888-C-1935-BMP-W103-C, and were implemented by work crews. Calibrated torque wrench serial number (S/N) Q-12468 was verified to have a current calibration date (next calibration was due on October 29, 2008). Follow up review at the calibration services facility verified the associated calibration standard had a proper accuracy ratio and was traceable to national standards.

The inspectors observed the applicant's work crews conduct hydrostatic leak testing of two fire water piping spools to be embedded in the south exterior wall of the BAP. Test requirements, methods, and acceptance criteria were outlined in procedure BPP-118, Installation of Embedded Piping, and documented in work package 07-10888-C-1609-BAP-W4-M. Test boundaries were defined in engineering-approved isometric drawings. The applicant's quality inspector monitored activities according to a preplanned checklist. A subsequent review of applicable records confirmed the quality inspector was trained and certified for Level II inspection of pressure testing and piping. Calibrated pressure gauges M-ASH-10 and M-ASH-11, and calibrated temperature meter P-1629, were verified to have current calibration dates and were found traceable to national standards.

The inspectors observed the applicant's work crews install and inspect four exothermic weld splices (i.e. CADWELD® splices) of ground cable junctions in Level 1 of the BSR. The inspectors observed that the electrical craft workers performed the welds using specialty tools and weld material, and implemented sequential work steps defined in an informally controlled vendor-supplied document. Completion of work was documented in work package 08-10888-C-1609-BSR-F101A-E. The applicant's quality inspector monitored the activities according to a preplanned checklist and applied acceptance criteria defined in the vendor-supplied literature. The applicant's inspector exhibited appropriate attention to detail in verifying conformance to the engineering layout drawing and accomplishment of prerequisite tasks. The applicant's inspector rejected two of the weld splices due to failure to meet vendor-recommended criteria.

However, the inspectors noted the procedure steps and acceptance criteria necessary to install the exothermic weld splices were not specified in an approved QA procedure; nor was the vendor guide approved and controlled as a quality-related document. To address this finding, the applicant staff issued CR 2008-0236 to incorporate the procedure steps and acceptance criteria in procedure BPP-103, Ground Grid System Installation. The failure to provide an approved procedure for the installation and inspection of welds for the QL-1 ground system cables is identified as an example of a violation of the MPQAP and Construction Authorization, Condition 3.A and MPQAP Section 5.1. (VIO 70-3098/2008-02-01: Failure to Implement MPQAP Requirements for an Approved Procedure for Installation and Inspection of Weld Splices).

In addition, inspector review of certificates of qualification for the individuals performing acceptance inspections of weld splices disclosed the certificates did not show the applicant's inspectors were certified to perform the activity. In contrast, procedure PP3-27, Section 3.4, states, "... areas of certification will be documented on the qualification summary forms." Appendix D identifies "Cadwelding" as an area requiring certification. Section 3.2.4 states, "... inspection personnel shall perform inspection activities only in their areas of certification." Interviews with cognizant management indicated "Cadweld" splicing of ground cables was addressed in inspector training module ITR 225, Raceway Installation, Supports and Embedments. In contrast, inspector review of the training document disclosed none of the 30 training objectives addressed weld splicing of ground cables. Also, the document did not identify the codes or standards applicable to installation and inspection of weld splices. This was not consistent with procedure PP3-27, Section 3.1, which indicates Inspector Training Record documents will contain training objectives and course outlines and will meet the requirements of NQA-1. NQA-1

and MPQAP Section 2.2.6 require training procedures to identify technical objectives and requirements of the applicable codes and standards.

The applicant's staff subsequently produced documentation showing quality inspectors had received training on the topic of "CADWELD Electrical Connections" on October 16, 2007. The documentation consisted of a class attendance sheet and test score sheets for the respective attendees. However, the inspectors found the training document did not contain training objectives or a course outline, and did not identify the technical objectives and requirements of the applicable codes and standards. Also, the evaluation of inspector capabilities from the training was not documented on the inspectors' Certificates of Qualification. The applicant subsequently issued CR 2008-0233 to implement a new inspector certification-training module, ITR 204, Grounding & Bonding, to address this finding. The failure to properly document training and certification of quality inspection personnel is identified as an example of a violation of the Construction Authorization, Condition 3.A and MPQAP Section 2.2.6. (VIO 70-3098/2008-02-01: Failure to Implement MPQAP Requirements for the Training and Certification of Electrical Inspectors for Inspection of Exothermic Weld Splices).

Calibration M&TE was provided by an offsite supplier under services contract WTA 040. The inspectors toured the calibration services facility, reviewed applicable records, and interviewed calibration services personnel. Calibration standards were verified to be traceable to national standards, had appropriate accuracy transfer ratios, and were stored and handled in a manner to prevent degradation of instrument accuracy. Out of tolerance and uncalibrated devices were controlled to preclude inadvertent use. Training records demonstrated calibration personnel were trained and qualified for calibrations being performed. Based upon inspections performed and review of procedure PP3-15, Control of Measuring and Test Equipment, inspectors identified no concerns with control of M&TE.

The inspectors found the offsite calibration facility appropriately notified the applicant when defective or out-of-tolerance M&TE were found.

(2). Conclusions

The applicant's program for inspection, test control, and control of M&TE was established in accordance with the appropriate requirements. Implementation of activities met requirements for the civil and mechanical jobs observed during this inspection. However, the applicant did not meet program requirements by failing to properly document the training and certification of electrical inspectors for inspection of exothermic weld splices and by failing to provide an approved procedure for installation and inspection of the weld splices. These are considered two examples of a violation of the MPQAP and Construction Authorization, Condition 3A.

b. Concrete Testing

(1). Scope and Observations

As part of the evaluation to assess the applicant's test control and control of M&TE, the inspectors observed slump testing, air entrainment testing, and monitoring of concrete temperature as various concrete placements occurred. The testing was performed by a

geotechnical engineering and construction materials testing laboratory (QORE) personnel, and observed by MOX Services QC personnel.

The inspectors observed QORE personnel preparing concrete specimens. The specimens were prepared and stored in accordance with the American Society for Testing and Materials (ASTM) C 31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.

The inspectors routinely reviewed the Concrete Statistical Summary maintained by US Concrete for MOX concrete testing. This summary included all testing to date.

(2). Conclusions

Equipment and instruments used to perform onsite concrete slump and air entrainment testing were properly calibrated. Concrete specimens were properly prepared and stored under proper temperature conditions in the QORE field storage boxes. No items of concern were identified.

c. Concrete Production Plant

(1). Scope and Observations

The inspectors observed appropriate and current calibration stickers on the concrete chemical addition systems. In addition, the inspectors inspected the on-site concrete production facility. The inspectors reviewed the concrete supplier's National Ready Made Concrete Association (NRMCA) QC manual plant certification for truck numbers 101, 102, 103, 104, and 105, and determined that the documentation was in order.

(2). Conclusions

The concrete plant chemical addition system was properly calibrated. No items of concern were identified.

**9. Problem Identification, Resolution and Corrective Action (IP 88110)**

a. Program Review

(1). Scope and Observations

The inspectors reviewed applicable sections of the applicant's QA program and implementing procedures for condition reporting and control of nonconforming items. The inspectors verified that procedures provided methods to identify, evaluate, and report conditions adverse to quality. The procedures also provided a method to ensure proper closure of corrective actions, and to ensure actions were implemented in a timely manner. No items of concern were identified.

The inspectors reviewed selected CRs issued July 2007 through May 2008. The configuration of the corrective action program was substantially changed in July 2007 to enhance program features and improve use by facility employees.



The inspectors found the CRs properly documented conditions adverse to quality. In most cases, the conditions were appropriately characterized and evaluated for significance. Review of records, interviews with responsible program staff, and direct observation of a meeting of the management review committee verified determinations were made by appropriate individuals.

The inspectors examined the status of NCR QC-08-0203S, issued in response to an April 2008 NRC inspection finding (VIO 70-3098/2008-01-03). The violation identified QL-1 reinforcing bars that were fabricated with nonconforming bend radii. As identified in Inspection Report 70-3098/2008-001, the NCR was supplemented by various reviews performed by the applicant to determine the extent of condition, impact of the defect, and bases for acceptability of the installed reinforcing steel. However, NRC inspectors also noted that neither a root cause nor actions to prevent recurrence were identified.

The follow up review disclosed the applicant had not taken action to initiate a CR for the adverse condition pertaining to reinforcing steel noted above. In contrast, procedure PP3-6, Corrective Action Process, prescribes the use of CRs to provide evaluations of root cause and development of corrective actions to address the cause. The existing NCR provided some narrowly focused corrective actions appropriate for controlling the nonconforming materials; however, actions were not correlated to an evaluated cause. After discussion of this discrepancy, the applicant indicated that a CR would be initiated. The applicant indicated that a CR would be necessary to address NRC violation VIO 70-3098/2008-01-03, and the same CR would identify root cause and develop actions to prevent recurrence. The inspectors determined the initial failure to implement required program elements would have been remediated when a CR was prepared to address the violation; thus, the actual consequences of the failure were minor.

(2). Conclusions

Procedures for problem identification and resolution addressed applicable requirements. One instance was identified where a CR was not issued for an adverse condition associated with a previously identified NRC violation. However, most of the required program elements were addressed in separate documents prepared by the applicant, and a CR would have been developed to address an NRC violation, thus the actual consequences of the failure were minor.

b. Failure to Identify Conditions Adverse to Quality (Loss of Plasticity of Concrete)

(1). Scope and Observations

The inspectors observed the placement of basemat BMP-111 on June 11, 2008. This placement was under scrutiny due to previous difficulties in rapid set up of the concrete mix; in addition, this was the first day where summer temperatures were in excess of 95 degrees Fahrenheit with intensive sunlight. During the placement, the inspector noted that the placement of concrete was limited due to high pump pressures. The inspector also observed that one of the pumping trucks ruptured a seal and had to be repaired. Following this delay in placement, the inspector noted that a section of the previously placed concrete had set up to the point that plasticity of the concrete was lost. ACI-349, Section 5.10.2, requires that "Concreting shall be carried out at such a rate that concrete is at all times plastic." This requirement ensures that planes of weakness are

not created due to cold joints in the placement. The inspector noted that the applicant had opportunities to identify the condition prior to the complete loss of plasticity. The inspector notified the QC inspectors, who were assigned to oversee the placement of the discrepant condition. MOX civil engineering personnel immediately evaluated the condition and authorized continuation of the placement over the non-plastic concrete. NCR-CE-08-0322 was initiated to capture this problem. The failure to identify the loss of plasticity of the concrete in placement BMP-111 was considered to be a violation of the requirements of the MPQAP, Section 16, Corrective Action, and is identified as an example of Violation (VIO) 70-3098/2008-02-01: Failure to Identify Conditions Adverse to Quality. This issue was captured in the applicant's corrective action program as NCR-CE-08-0322.

One of the corrective actions following this adverse condition was the modification of the concrete mix to add more water. The water to cement ratio was maintained. The addition of more water to the mix increased the concrete set up time, which allowed greater flexibility in placing the finish on the basemat for placement BMP-112.

(2). Conclusions

An example of a violation was identified for the failure to identify a condition adverse to quality in that there was a loss of plasticity of the concrete in placement BMP-111 performed on June 3, 2008.

b. Failure to Identify Conditions Adverse to Quality (Construction Joints)

(1). Scope and Observations

During this inspection period, civil engineering was assigned the responsibility for inspecting and approving the basemat construction joints. This responsibility was previously assigned to the QC function. This reassignment was made to minimize delays in the placement schedule, especially since the QC inspection activities normally occurred late in the concrete placement process. On June 19, 2008, MOX field engineering and MOX design engineering personnel performed a walkdown of the construction joints associated with basemat placement BMP-F112. Following the walkdown the BMP-F112 construction joints were signed off as acceptable. On June 23, 2008, the NRC inspectors performed a walkdown of the BMP-F112 construction joints. The inspectors noted that wood was stuck in the construction joint, and there were small voids behind the stayforms in the construction joint that had not been repaired. The applicant considered both of these conditions to be conditions adverse to quality. The inspectors informed the applicant's QC representatives of the issues who then initiated CR-2008-0255 to capture the issues. The failure to adequately identify the deficient conditions or to document exceptions was considered to be a violation of the requirements of the MPQAP, Section 16, Corrective Action, and is identified as an example of violation VIO 70-3098/2008-02-01: Failure to Identify Conditions Adverse to Quality. This issue was captured in the applicant's corrective action program as CR-2008-0255. The construction joints were repaired prior to concrete placement.

(2). Conclusions

An example of a violation was identified for the failure to identify conditions adverse to quality, in that foreign material and voiding were found in the construction joints for basemat BMP-F112, after the construction joints were signed off as acceptable on June 19, 2008.

**10. Exit Interviews**

The inspection scope and results were summarized throughout this reporting period by specialist inspectors and on July 7, 2008 by the Senior Resident Inspector, and during a telephone exits on July 24 and 28, 2008, with those persons indicated in the attachment. During the teleconferences, the applicant took exception to the issues associated with the example of a violation for failure to implement MPQAP and procedure requirements for documenting the training and certification of QC inspectors for inspecting IROFS exothermic weld splices of ground cables, and for inadequate storage of QA records. Although proprietary documents and processes may have been reviewed during this inspection, the proprietary nature of these documents or processes was deleted from this report.

1. **PARTIAL LIST OF PERSONS CONTACTED**

Applicant Personnel

J. Adair, Civil - Mechanical Engineering Manager  
I. Alderman, Equipment Procurement Manager  
B. Bezanson, Lead Auditor  
J. Bourachot, Manager Manufacturing Design Group (MDG)  
R. Bumford, Information Technology Manager  
C. Cash, QC Inspector  
D. Chamberlain, MDG Methods and Procedures Manager  
M. Clayton, Administrative Assistant  
J. Creech, MDG Technical Requirements Engineering Manager  
W. Crisler, QC Manager  
D. Daubert, QC Inspector  
J. Devine, Mechanical Supt.  
W. Elliott, Engineering Vice-President  
S. Harding, QC Inspector  
D. Gwyn, Regulatory Affairs Manager  
J. Henard, Construction Engineer  
D. Jensen, Infrastructure Procurement Manager  
R. Justice, Quality Assurance (QA) Programs Engineer  
D. Kehoe, QA Engineer  
H. Lawrence, Construction Supervisor  
D. Leach, Deputy Director, Mixed Oxide Fuel Fabrication Facility Project  
F. Maranda, Construction Procurement Manager  
J. Miller, Construction Materials Manager  
B. Parks, Procurement Engineering Group Manager  
A. Peeler, QC Inspector  
R. Posey, Field Engineer  
R. Sauce, Field Engineer  
G. Shell, QA Manager  
D. Stinson, President and Chief Operating Officer  
J. Vaughn, Civil Engineer  
J. White, Quality Assurance Lead Auditor  
R. Whitley, Supply Quality Manager  
K. Williams, Senior Subcontractor Administrator  
L. Wood, Document Control Manager

Other individuals contacted included supervisors, engineers, and inspection, measurement, and testing technicians.

Supplier Personnel

C. Long, First Line Manager, WSRC Field Services

National Nuclear Security Administration

K. Chacey, Assistant Deputy Administrator  
S. Glenn, Project Engineer  
C. Ramsey, MOX Site Project Manager  
G. Smith, Project Manager

## 2. INSPECTION PROCEDURES (IPs) USED

IP 88106	Quality Assurance: Program Development and Implementation
IP 88107	Quality Assurance: Design and Documentation Control
IP 88108	Quality Assurance: Control of Materials, Equipment, and Services
IP 88109	Quality Assurance: Inspection, Test Control, and Control of Measuring and Test Equipment
IP 88110	Quality Assurance: Problem Identification, Resolution and Corrective Action
IP 88130	Resident Inspection Program for On-Site Construction Activities
IP 88131	Geotechnical/Foundation Activities
IP 88132	Structural Concrete Activities

## 3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

<u>Item</u>	<u>Status</u>	<u>Description</u>
70-3098/2008-02-01	Open	VIO: Four Examples of Failure to Implement MPQAP requirements: (1) Inadequate Storage of QA Records; (2) Inadequate QA Procedure for Installing IROFS Exothermic Weld Splices of Ground Cables; (3) Failure to Implement MPQAP and Procedure Requirements for Documenting the Training and Certification of QC Inspectors for Inspecting IROFS Exothermic Weld Splices of Ground Cables; and (4) Failure to Identify Conditions Adverse to Quality (two examples).

## 4. LIST OF ACRONYMS USED

ACI	American Concrete Institute
ADAMS	Agency-Wide Document Access and Management System
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BAP	Aqueous Polishing Building
BMF	Fuel Manufacturing Building
BMP	Manufacturing Building
BSR	Receiving Building
CAC	Construction Administrative Complex
CAR	Construction Authorization Request
CFR	Code of Federal Regulations

CLSM	Controlled Low Strength Material
CR	Condition Report
DAR	Deficiency Action Request
ECR	Engineering Change Request
EEC	Equipment Engineering Complex
IP	Inspection Procedure
IROFS	Item Relied on for Safety
MAC	Management Administrative Complex
M&TE	Measuring and Test Equipment
MOX	Mixed Oxide
MFFF	MOX Fuel Fabrication Facility
MPQAP	MOX Project Quality Assurance Plan
NCR	Nonconformance Report
NDE	Nondestructive Examination
NDT	Nondestructive Testing
NMSS	Nuclear Materials Safety and Safeguards
NRMCA	National Ready Made Concrete Association
PO	Purchase Order
PSSCs	Principle Structures, Systems, and Components
PT	Liquid Dye Penetrant Examination
QA	Quality Assurance
QC	Quality Control
QL	Quality Level
QORE	Geotechnical Engineering and Construction Materials Testing Laboratory
RT	Radiographic Examination
SC-1	Seismic Category
SSC	System, Structure, Component
SDR	Supplier Deficiency Report
SR	Surveillance Report
UL	Underwriters' laboratories label
UT	Ultrasonic Examination
VIO	Violation

## 5. **LIST OF DOCUMENTS REVIEWED**

### **Specifications & Procedures**

PP 1-3, Project Training, Revision 9  
 PP 3-4, Records Management, Revision 5  
 PP3-5, Control of Nonconforming Items, Revision 3 (Including Interim Change PP3-5R3-CN01)  
 PP 3-6, Corrective Action Process, Revision 10  
 PP 3-8, Qualification and Certification of Auditors, Revision 5  
 PP 3-15, Control of Measuring and Test Equipment, Revision 0  
 PP 3-27, Quality Control Personnel Certification, Revision 2  
 PP 3-12, Supplier Evaluation, Revision 8  
 PP 3-28, QC Receiving Inspection, Revision 1  
 PP 9-3, Design Control, Revision 14

PP 9-6, Calculations, Revision 8  
 PP 9-7, Drawings, Revision 11  
 PP 9-8, Technical Documents, Revision 8  
 PP 9-18, Commercial Grade Item Evaluations, Revision 1  
 PP 9-24, Turnover Package to Assembly Test Group, Revision 1  
 PP 10-5, Vendor/Subcontractor Prequalification, Revision 3  
 PP 10-13, Offer/Proposal Evaluation and Award Recommendation, Revision 2  
 PP 10-29, MOX Subcontractor Purchase of Permanent Plant Material, Revision 0  
 (Including Interim Change Notice #PP10-29R0 ICN01)  
 BPP-118, Installation of Embedded Piping, Revision 2  
 BPP-103, Ground Grid System Installation, Revision 2  
 Shaw Areva Mox Services, Construction Specification DCS01-BKA-DS-SPE-B-09330-3,  
 Section 03301, Placing Concrete and Reinforcing Steel for Quality Level 1a, 2, 3 and 4,  
 6/4/07  
 Baker Concrete Construction, Inc., Specification BPP-110, Concrete Placement,  
 10/11/07.

### **Drawings and Specifications**

DCS01-FPW-DS-PLI-T-5700102, Sh. 1, Piping Isometric, Fire Protection - Water, Revision  
 3 DCS01-FPW-DS-PLI-T-5700502, Sh. 1, Piping Isometric, Fire Protection - Water,  
 Revision 3 DCS01-EEJ-DS-SPE-E-25210-2, Section 16170 – Grounding and Bonding,  
 Revision 2 DCS01-ZMJ-DS-SPE-M-19101, Design Standard  
 DC S01-ZMJ-DS-SPE-M-19102, Design Standard Document published by ERICO, Inc.,  
 Installers and Inspectors Guide for CADWELD® Electrical Connections  
 Shaw AREVA MOX Services No. 01353, Revision 3, BAP, BMP & BSR Areas Concrete  
 and Reinforcing Typical Details.

### **Nonconformance Reports**

NCR QC-08-0203S, Nonconforming Bend Radii for Reinforcing Steel

Nonconformance Report QC-08-0322, June 3, 2008.

QC-08-0266, Embedded Plates was received and installed in the MFFF without  
 Commercial Grade Dedication Package by the Supplier making the acceptability of  
 these embedded items as QL-1 material indeterminate

QC-08-0267, Embedded Piping was received and installed in the MFFF without  
 Commercial Grade Dedication Package by the Supplier making the acceptability of the  
 piping items as QL-1 material indeterminate

QC-08-0268 Reinforcing Steel was received and installed in the MFFF without  
 Commercial Grade Dedication Package by the Supplier making the acceptability of the  
 steel as QL-1 material indeterminate

**Corrective Action Program Documents (Condition Reports)**

CR 2007-0027CR 2007-0058  
CR 2007-0099  
CR 2007-0117  
CR 2008-0029  
CR 2008-0160  
CR 2008-0161  
CR 2008-0198  
CR 2008-0213  
CR 2008-0215  
CR 2008-0216  
CR 2008-0217  
CR 2008-0218  
CR 2008-0220  
CR 2008-0234  
CR 2008-0255

**Deficiency Action Request**

DAR-07-025  
DAR-07-026  
DAR-07-027  
DAR-07-028  
DAR-07-029  
DAR-07-030  
DAR-07-031  
DAR-07-032  
DAR-07-036  
DAR-07-040  
DAR-07-041  
DAR-07-044  
DAR-07-068

**QC Receiving Inspection Reports (RIR)**

QC-RIR-07-115, for Welding Electrodes & Welding Filler Material from WeldStar Co.  
QC-RIR-07-146, for Welding Electrodes & Welding Filler Material from WeldStar Co.  
QC-RIR-08-096, for Embedded Plates from Specialty Maintenance & Construction, Inc.  
QC-RIR-08-145, on Reinforcing Steel for Concrete from Energy & Process

**Purchase Orders (POs)**

Solicitation #10888-R-0024 of Subcontract #10888-B-1072 for Process Unit Electrical Cable  
Solicitation #10888-R-0020 of Subcontract #10888-S-1482 for Homogenizers  
Solicitation #10888-R-CP43-01 of Subcontract #10888-S-1412 for Annular Tanks



**Procurement Specifications**

DCS01-EEJ-DS-CCT-E-40560, Revision 2, for Process Unit Electrical Cable  
DCS01-ZMJ-DS-CCT-M-40510, Revision 0, for Homogenizers  
DCS01-KKJ-DS-SPE-L-16264-3, Revision 3, for Annular Tanks  
DCS01-BKA-DS-CGD-M-65829-0, on Commercial Grade Item Evaluation for Steel Plates

**Inspection Reports**

WEL-07-VE38, Supplier Evaluation Summary Report for WeldStar Co.  
WEL-07-VE47, QA Audit Report for WeldStar Co.

**Internal QA Audit Reports**

DCS-07-A08, Internal QA Audit Report on Procurement Activities, including DCS-07-A08 Procurement Audit Plan

**Records and other Documents**

Inspection Plan C 112-08-043, Revision 2, Reinforcing Steel, dated 06/11/2008  
Inspection Plan C 102-08-036, Revision 2, Concrete Pre-Placement, dated 06/11/2008  
Inspection Plan C 103-08-036, Revision 2, Concrete Placement Inspection, dated 06/11/2008  
Inspection Plan M 333-08-021, Fire Protection System Hydrostatic Testing, Revision 1  
  
Work Package 07-10888-C-1935-BMP-W103-C  
Work Package 07-10888-C-1609-BAP-W4-M  
Work Package 08-10888-C-1609-BSR-F101A-E  
Work Task Authorization WTA 040, Equipment Calibration Services and Rebar Testing, Revision 0  
MOX Project Quality Assurance Plan, Revision 5