



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

May 11, 2012

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

**SUBJECT: MIXED OXIDE FUEL FABRICATION FACILITY- NRC INSPECTION REPORT
NO. 70-3098/2012-001 AND NOTICE OF VIOLATION**

Dear Mr. Trice:

During the period from January 1 through March 31, 2012, the U. S. Nuclear Regulatory Commission (NRC) completed inspections pertaining to the construction of the Mixed Oxide (MOX) Fuel Fabrication Facility. 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, three violations of NRC requirements were identified: Failure to Provide and Implement Appropriate Work Documents, Failure to Define Appropriate Critical Characteristics, and Inadequate Corrective Actions for Significant Conditions Adverse to Quality, as required by the applicable sections of the MOX Project Quality Assurance Plan (MPQAP).

The violations were evaluated in accordance with the NRC Enforcement Policy available on the NRC's Web site at www.nrc.gov. The violations are cited in the enclosed Notice of Violation (Notice) and are being cited in the Notice because they were identified by the NRC. The circumstances surrounding the violations are described in detail in the subject inspection report.

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.

In accordance with 10 Code of Federal Regulations 2.390 of NRC's "Rules of Practice," a copy of this letter and its enclosures may be accessed through the NRC's public electronic reading room, Agency-Wide. Document Access and Management System (ADAMS) on the Internet 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

Enclosures:

1. Notice of Violation
2. NRC Inspection Report 70-3098/2012-001
w/attachment: Supplemental Information

cc w/encls: (See next page)

cc w/encls:

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SIGNATURE	Via email	Via email	Via email				
NAME	W. Gloersen	M. Shannon	B. Adkins				
DATE	5/11/2012	5/11/2012	5/9/2012				
E-MAIL COPY?	YES	YES	YES				

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Letter to Kelly Trice from Deborah Seymour dated May 11, 2012.

SUBJECT: MIXED OXIDE FUEL FABRICATION FACILITY- NRC INSPECTION REPORT
NO. 70-3098/2012-001 AND NOTICE OF VIOLATION

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PUBLIC

NOTICE OF VIOLATION

Shaw AREVA MOX Services
Aiken, South Carolina

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

During Nuclear Regulatory Commission (NRC) inspection activities conducted January 1 through March 31, 2012; three violations of NRC requirements were identified. In accordance with the NRC Enforcement Policy, the violations are listed below:

- A. Condition 3.A of the 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 (MOX) 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 (MPQAP, Revision 10, Change 1, dated July 22, 2011).

MPQAP, Revision 10, Change 1, Section 5, requires that the type of document used to perform work shall be appropriate to the nature and circumstances of the work being performed.

MPQAP Section 5.1, Instructions, Procedures, and Drawings, requires that quality affecting activities are prescribed by and performed in accordance with documented, approved quality assurance (QA) procedures and other approved implementing documents (drawings, specifications, etc.) appropriate to the MOX Project work scope.

Contrary to the above, the documents used to perform quality level (QL)-1 installation activities were not appropriate to the nature and circumstances of the work being performed; and quality affecting activities were not performed in accordance with documented, approved QA procedures and other approved implementing documents (drawings, specifications, etc.) appropriate to the MOX Project work scope; as evidenced by the following examples:

1. On January 27 and 28, 2012, quality affecting activities associated with installation of fire dampers were not performed in accordance with documented and approved QA procedures and other approved implementing documents (drawings, specifications, etc.) appropriate to the MOX Project work scope. Specifically, work was not performed in accordance with instructions contained in Work Package (WP) 12-CP23-B143-MDE-T-M-001 and WP 12-CP23-B138-HAS-T-M-001.
 - a. Step 2.3 in each WP required that, "Final verifications for each damper shall be documented by the applicable personnel signing the associated Form PP 11-37B, HVAC (heating, ventilation, and air conditioning) Fire Damper Installation Checklist." The installers failed to document final verifications on Form Project Procedure (PP) 11-37B.
 - b. Step 2.3, in each WP required that, "All work shall be performed in accordance with PP 11-37 (HVAC Ductwork Field Fabrication and Installation for Nuclear Clean Air Systems)

”PP11-37, Section 4.2.1.4, required that, “All installation/verification results shall be documented in the work implementing documents.” The installers failed to document the completion of work activities, such as prerequisites, survey completion, and work performed, as the work was being performed.

2. From January 2011 to January 2012, for installation of supports documented in WPs 10-CP27-C133-ZMS-S-M-001B, 001C, 001E, 0004, and 0005, quality affecting activities were not performed in accordance with documented, approved QA procedures and other approved implementing documents (drawings, specifications, etc.) appropriate to the MOX Project work scope. Specifically, PP 11-74, Piping Support Installation, Section 5.0, required that inspections shall be documented on Form PP 11-74A, Piping Support Installation Checklist. Form PP 11-74 A required that the installer verify numerous items, including that correct drawings were used and associated engineering change requests (ECRs) for current revision levels were implemented; and that support identification matched design drawings. Form PP 11-74A was not completed (as of January 19, 2012) to document the verification of proper drawings and associated ECRs for current revision levels; to verify that the support identification matched design drawings; to verify the proper support attachment to embed plate; to verify the proper support configuration and orientation were per the design drawings; to verify support members were the correct size, type, material, grade, etc.; to verify the correct support location; to verify tolerances were met; and verify that welding was completed per the current drawing.
3. On March 6, 2012, quality affecting activities were not performed in accordance with documented, approved QA procedures and other approved implementing documents (drawings, specifications, etc.) appropriate to the MOX Project work scope, during installation of a ventilation support. WP 11-CP23-B102-HAS-S-M-004, Section 2.3, required that, “All work shall be in accordance with PP 11-38,” and “Final verifications for each individual support shall be documented, by the applicable personnel signing the associated Form PP 11-38A, HVAC Duct & Equipment Support Installation Checklist.” Final verifications for the supports were not documented by the applicable personnel. Specifically, associated PP 11-38A was not completed to document the verification for the current drawing, that the support identification matched the design drawing, for proper support attachment to the embed plate, or for proper support configuration and orientation.
4. On or before January 27, 2012, the documents contained in WP 12-CP23-B143-MDE-T-M-001, dated January 19, 2012, and WP 12-CP23-B138-HSA-T-M-001, dated January 17, 2012, used to perform installation of fire dampers, were not appropriate to the nature and circumstances of the work being performed. Specifically, Step 2.3 required that, “All work shall be in accordance with PP 11-37, HVAC Ductwork field Fabrication and Installation for Nuclear Clean Air Systems.” PP 11-37, Section 5.2.1.7 required that, “Ductwork shall be installed according to ...MOX Services’ documents and design documents.” The WPs were not appropriate to the nature and circumstances of the work because PP 11-37, (required by both WPs) referenced installation documents (MOX Services documents and design documents) that did not provide appropriate installation requirements. The WPs did not provide for a methodology for demonstrating that the installer completed WP steps for the removal of the fire damper fusible links, and the WPs did not require the installer to re-connect the operator or fusible link after it was procedurally disconnected, which would leave the fire damper in a non-operating state.

5. From January 2011 to January 2012, the documents contained in WPs 10-CP27-C133-ZMS-S-M-001B, 001C, 001E, 0004, and 0005, used to perform installation of QL-1 process piping supports, were not appropriate to the nature and circumstances of the work being performed. Specifically, Section 2.3, of the WPs required that, "All work shall be performed in accordance with PP 11-74, Piping Support Installation." PP 11-74, Section 4.6.1, required that, "All installation activities shall comply with the requirements of DCS01-ZMS-DS-SPE-M-15145 (Construction Specification-Field Fabrication and Installation of Pipe and Electrical Raceway Supports) and the applicable codes and standards referenced therein, unless otherwise approved by MOX Services Design Engineering." DCS01 listed codes and standards, including the following: Manufacturer's Standardization Society (MSS)-SP-58-2002, Pipe Hangers and Supports-Materials, Design and Manufacture; and MSS-SP-89-2003, Pipe Hangers and Supports-Fabrication and Installation Practices. The WPs were not appropriate to the nature and circumstances of the work being performed. because they referenced multiple industry standards, practices, specifications, and design documents without specifically identifying the appropriate installation requirements; and because the WPs referenced documents such as MSS-SP-58-2002 and MSS-SP-89-2003, which were intended to provide installation tolerances, and these documents were not approved for use by MOX Services Design Engineering.

This is a Severity Level IV violation (VIO) (Supplement II) (VIO 70-3098/2012-001-001).

- B. Condition 3.A of the 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 MFFF located at the Department of Energy's Savannah River Site, in accordance with the statements, representations, and conditions of the MPQAP dated March 26, 2002, and supplements thereto (MPQAP, Revision 10, Change 1, dated July 22, 2011).

MPQAP, Revision 10, Change 1, Section 7.2.8, defines critical characteristics as those important design, material, and performance characteristics of a commercial grade item that, once verified, will provide reasonable assurance that the item will perform its intended item relied on for safety (IROFS) function. Critical characteristics for commercial grade items shall be determined and approved by the manager responsible for the procurement, based on the performance requirements for the item including the intended IROFS safety function.

Contrary to the above, in 2011, MOX Services failed to adequately define the necessary critical characteristics to provide reasonable assurance that the Homogenizing and Pelletizing Unit Lodige mixer and the fluid transport system (FTS) piping components would perform its intended IROFS function as detailed in the following examples:

1. MOX Services (1) failed to identify necessary QA controls such as design and document control; control of materials, equipment and services; and special processes (welding) as critical characteristics in the commercial grade item evaluation (CGIE), (2) failed to perform a Commercial Grade Survey of Lodige to confirm their ability to control and verify these critical characteristics, (3) failed to require dimensional measurements to confirm design assumptions related to fatigue, and (4) failed to perform an independent structural calculation to confirm that the mixer shaft and Ploughshares® were inherently robust as credited in the licensing basis documents.

2. MOX Services failed to define intergranular corrosion resistance as a critical characteristic to provide reasonable assurance that the FTS piping and components would perform their intended IROFS function.

This is a Severity Level IV violation (Supplement II) (VIO 70-3098/2012-001-002).

- C. Condition 3.A of the 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 MFFF located at the Department of Energy's Savannah River Site, in accordance with the statements, representations, and conditions of the MPQAP dated March 26, 2002, and supplements thereto (MPQAP, Revision 10, Change 1, dated July 22, 2011).

MPQAP Revision 10, Change 1, Section 16, Corrective Action, states, in part, that conditions adverse to quality are promptly identified, documented, classified and corrected as soon as practical. MPQAP, Section 16.2.B.7 requires, for significant conditions adverse to quality that "responsible management shall investigate and determine the extent of the condition and document the results." MPQAP, Section 16.2.B.8 requires, in part, that responsible management shall determine the root cause and corrective action based on the investigation results.

Contrary to the above, the applicant failed to promptly identify and correct conditions adverse to quality as soon as practical, and for significant conditions adverse to quality, responsible management failed to investigate, determine the extent of condition, and determine the root cause and corrective action based on the investigation results, as evidenced by the following examples:

1. On May 25, 2011, MOX Services failed to identify and correct a condition adverse to quality in which testing to verify critical characteristics related to chemical and physical properties of mechanical splices was not performed by an approved supplier, as required by DCS01-BKA-DS-CGD-M-65831, Commercial Grade Item Evaluation for Mechanical Splices, Revision 3. Specifically, as documented in Condition Report (CR)-11-158, MOX Services completed a review of receipt inspection reports of mechanical splices to verify they contained the required documentation, but failed to identify and correct an adverse condition where chemical and physical property testing for LENTON mechanical splices was not performed by an approved supplier.
2. During 2011, MOX Services failed to implement measures to ensure that the root causes and extent of condition were properly identified and corrective actions were implemented. Specifically, Shaw AREVA MOX Services QA Program (SQAP) Report, SQAP-029, dated June 21, 2011, identified the following adverse trends stating, "The violation of WPs (missed steps and signatures) is a trend issue," and "The repetitive failure of the Condition Report Extent of Condition preparation and analysis to identify programmatic corrective action that would prevent recurrence of an identified adverse condition is a trend issue." The adverse trends were closed without correcting the WP issues pertaining to missed steps and missed signatures and without identifying effective corrective actions for the identified trends. Condition Report 10888-MOX-CR-11-341 was initiated, on June 16, 2011, and closed in October 2011, to address the violation of WPs (missed steps and missed signatures). MOX Services defined this CR as a significant condition adverse to quality. MOX Services failed to perform an appropriate investigation to determine the extent of condition of the WP deficiencies, and extent of

condition for the missed signatures, and therefore failed to take appropriate corrective actions to correct the WP deficiencies and to ensure that WP documentation was completed as required, as evidenced by continuing issues with the WPs identified by the NRC (see NOV A, above).

This is a Severity Level IV violation (VIO) (Supplement II) (VIO 70-3098/2012-001-003).

Pursuant to the provisions of 10 Code of Federal Regulations (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 violations, or, if contested, the basis for disputing the violations, (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 authorization 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.

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 CFR 19.11, you may be required to post this Notice within two working days.

Dated at Atlanta, Georgia this 11th day of May, 2012.

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 70-3098

Construction
Authorization No.: CAMOX-001

Report No.: 70-3098/2012-001

Applicant: Shaw AREVA MOX Services

Location: Savannah River Site
Aiken, South Carolina

Inspection Dates: January 1 – March 31, 2012

Inspectors: M. Shannon, Senior Resident Inspector, Construction Projects Branch 1
(CPB1), Division of Construction Projects (DCP), Region II (RII)
B. Adkins, Resident Inspector, CPB1, DCP, RII
S. Smith, Senior Construction Inspector, Construction Inspection
Branch 2 (CIB2), Division of Construction Inspection (DCI), RII
T. Ponko, Construction Inspector (trainee), CIB2, DCI, RII
C. Jones, Senior Construction Inspector, Construction Inspection
Branch 1 (CIB1), DCI, RII
C. Taylor, Senior Construction Inspector, CPB1, DCP, RII
E. Heher, Construction Inspector, CIB2, DCI, RII
C. Smith-Standberry, Construction Inspector, CIB1, DCI, RII

Accompanying
Personnel: J. Moorman, Director, DCP
D. Seymour, Branch Chief, CPB1, DCP
W. Gloersen, Senior Project Inspector, CPB1, DCP

Approved by: D. Seymour, Branch Chief, CPB1, DCP, RII

EXECUTIVE SUMMARY

Shaw AREVA MOX Services (MOX Services)
Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF)
NRC Inspection Report No. 70-3098/2012-001

The scope of the inspections encompassed a review of various MFFF activities related to Quality Level (QL)-1 construction for conformance to NRC regulations, the Construction Authorization Request (CAR), the MOX Project Quality Assurance Plan (MPQAP), and applicable industry standards. This included, as applicable, the following inspection attributes: mechanical components; pipe supports and restraints; inspection of safety function interfaces; structural concrete; control; control of materials, equipment, and services; design and document control; and problem identification, resolution, and corrective action.

The principle systems, structures and components (PSSCs) discussed in this inspection report include: PSSC-21 Fire Barriers; PSSC-023, Fluid Transport System (FTS); PSSC-50 Supply Air Systems; PSSC-09 Criticality Control; and PSSC-36 MOX Fuel Fabrication Building Structure. Non-PSSCs discussed in this inspection report included an evaluation of the adequacy of the applicant's independent oversight of commercial grade dedication (CGD) activities, including quality assurance audits of activities at the Mixed Oxide Fuel Fabrication Facility (MFFF), audits of Appendix B suppliers who perform CGD, and commercial grade surveys of non-Appendix B suppliers who control and verify critical characteristics of basic components.

Resident Inspection Program for On-Site Construction Activities (Inspection Procedure (IP) 88130), and Problem identification, Resolution, and Corrective Actions (IP 88110)

Construction activities, as noted in Section 2, were performed in a safe and quality related manner. The inspectors concluded that MOX Services had conducted proper oversight of onsite contractors. No findings of significance were identified (Section 2).

PSSC Related Inspections

PSSC-021, Fire Barriers

The inspectors observed construction activities related to PSSC-21, Fire Barriers, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation and the associated systems, structures, and components (SSCs) were fire dampers located various rooms of the BMP. Example 1 of Violation (VIO) 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents, was identified (Section 3.a).

PSSC-023, Fluid Transport System

The inspectors observed construction activities related to PSSC-23, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation and the associated SSCs were FTS pipe supports located in Room C-133 of the Aqueous Polishing Building (BAP). Example 2 of VIO 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents, was identified (Section 3.b).

PSSC-050, Supply Air System

The inspectors observed construction activities related to PSSC-50, Supply Air System, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation and the associated SSCs included supply air ventilation ductwork supports located in Room B-102 of the MOX Manufacturing Building (BMP). Example 3 of VIO 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents, was identified (Section 3.c).

PSSC-021, Fire Barriers

The inspectors observed construction activities related to PSSC-21, Fire Barriers, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was quality assurance and the associated SSCs were fire dampers located in various rooms of the BMP. Example 4 of VIO 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents, was identified (Section 3.d).

PSSC-023, Fluid Transport System

The inspectors observed construction activities related to PSSC-23, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was quality assurance and the associated SSCs were FTS pipe supports located in Room C-133 of the BAP. Example 5 of VIO 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents, was identified (Section 3.e).

PSSC-009, Criticality Control

The inspectors observed construction activities related to PSSC-09, Criticality Control, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was quality assurance interfaces and the associated SSC was the Lodige mixer contained within the Homogenizing and Pelletizing Unit (NPG/NPH) process units. Example 1 of VIO 70-3098/2012-001-002, Failure to Identify Adequate Critical Characteristics, was identified (Section 3.f).

PSSC-023, Fluid Transport System

The inspectors observed construction activities related to PSSC-23, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was control of equipment, materials, and services and the associated SSC was FTS piping and components located in various rooms of the BAP. Example 2 of VIO 70-3098/2012-001-002, Failure to Identify Adequate Critical Characteristics, was identified (Section 3.g).

PSSC-036, MOX Fuel Fabrication Building Structure

Construction activities related to PSSC-036 as described in Table 5.6-1 of the MFFF CAR were adequately performed and included installations of embedded plates and ground cables, heavy lifts of equipment and supplies, verification of equipment placements by surveys, rebar installation, placement of concrete, welding, non-destructive testing, installation of tanks, and

receipt of materials. These construction activities were performed in a safe and quality related manner and in accordance with procedures and WPs. No findings of significance were identified (Section 3.h).

Non-PSSC Related Inspections

Quality Assurance: Program Development and Implementation (Pre-licensing and Construction) (IP 88106)

No issues of significance were identified except as discussed in Section 4.b.(1)(c)1) (Section 4.a).

Quality Assurance: Control of Materials, Equipment, and Services (Pre-licensing and Construction) (IP88108)

The review of dedications of basic components identified example 1 of VIO 70-3098/2012-001-003, Failure to Identify and Correct Condition Adverse to Quality (Section 4.b).

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

Example 2 of VIO 70-3098/2012-001-003, Failure to Identify and Correct Condition Adverse to Quality, was identified for failure to complete an appropriate extent of condition investigation and to correct significant conditions adverse to quality related to work package (WP) deficiencies (Section 4.c).

Follow-up of Previously Identified Items (IP 88132)

The inspectors reviewed and evaluated MOX Services' corrective actions related to previously opened items. Based on the review of the associated documentation, the implemented corrective actions, and discussions with applicant's staff, VIO 70-3098/2010-001-02 was closed (Section 5.a).

The inspectors reviewed and evaluated MOX Services' corrective actions related to previously opened items. Based on the review of the associated documentation, the implemented corrective actions, and discussions with applicant's staff, VIO 70-3098/2009-010-02 was closed (Section 5.b).

REPORT DETAILS

1. Summary of Facility Status

During the period, the applicant continued construction activities of principle structures systems, and components (PSSCs). Construction activities continued related to Release 2, 3A and 3B activities which included multiple inside and outside walls, elevated floors, and roof of the Mixed Oxide (MOX) Process Building (BMP), Aqueous Polishing Building (BAP), and the Shipping Receiving Building (BSR). Shaw AREVA MOX Services (MOX Services) continued installation of Quality Level (QL)-1 tanks during this inspection period. The applicant continued with the application of coatings on the walls and ceilings of the BMP and BAP lower level rooms and hallways. Other construction activities included installation of process piping and supports in the BAP, installation of ventilation system ductwork and supports in the BAP and BMP, installation of cable trays (temporary supports) in the BAP and BMP, installation of conduit in the BAP and BMP, and installation of fire dampers in the BMP. The applicant continued to receive, store, assemble, and test glove boxes and process equipment at the Process Assembly Facility (PAF).

2. Routine Resident Inspection per Inspection Procedure (IP) 88110 Resident Inspection Program for On-Site Construction Activities, and IP 88110 Problem Identification, Resolution, and Corrective Action

a. Scope and Observations

The inspectors routinely attended the applicant's construction plan-of-the-day meetings and civil engineering meetings. The inspectors routinely held discussions with MOX Services design engineers, field engineers, quality control/assurance personnel, batch plant personnel, steel workers, and subcontractors (Alberici, Superior, Electric Boat, Egizzi, SM&E) construction personnel in order to maintain current knowledge of construction activities and any problems or concerns.

The inspectors routinely reviewed the status of work packages (WPs) maintained at various work sites. The inspectors monitored the status of WP completion to verify construction personnel obtained proper authorizations to start work, monitor progress and to ensure WPs were kept up-to-date as tasks were completed.

The inspectors routinely verified that changing weather conditions were taken into account for planned construction activities and construction activities were conducted in a safe manner. The inspectors also observed proper communication in the work areas, observed that the work force was attentive, workers adhered to procedures, 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); and reviewed the closure of selected NCRs and CRs. The inspectors noted that the applicant entered issues identified during self assessments into the corrective action system.

The inspectors noted that MOX Services continued to maintain cleanliness of the BMP and BAP including the posting of areas to prevent tobacco use, eating, and drinking in areas where safety-related equipment was stored or installed.

b. Conclusions

Construction activities, as noted in Section 2, were performed in a safe and quality related manner. The inspectors concluded that MOX Services had conducted proper oversight of onsite contractors. No findings of significance were identified.

3. PSSC Related Inspections

a. PSSC-21 (Fire Barriers)

(1) Installation Attribute (IP 88136 Mechanical Components)

(a) Scope and Observations

The inspectors selected two fire dampers in the BMP as an inspection sample for verification of PSSC-21, Fire Barriers. On January 27 and 28, 2012, the applicant installed the first two fire dampers in the ventilation system. On January 30, the inspectors performed a detailed review of the WPs associated with the two installations. This review included WP 12-CP23-B143-MDE-T-M-001 for fire damper MDEDMPF0143B and WP 12-CP23-B138-HSA-T-M-001 for fire damper HSADMPF0138B. Based on their review, the inspectors concluded that the applicant failed to adequately document completion of work activities. Specifically, the applicant failed to sign off work steps at the time the steps were completed in the field. The inspectors identified the following deficiencies with the fire damper WPs: (1) prerequisites were not signed off as complete, (2) the required survey was not signed off as complete, (3) the WP Work Performed Sheet was not completed to document the work activities, and (4) the heating, ventilation, and air conditioning (HVAC) Fire Damper Installation Checklist was not signed off as complete. Specific to the HVAC Fire Damper Installation Checklist, the applicant failed to document completion of work steps to verify that (1) the proper drawings were used to install the dampers, (2) the damper ID number matched the design drawings, (3) the fusible link was properly installed and (4) the fire damper location matched the design drawings.

The MOX Project Quality Assurance Plan (MPQAP), Section 5, Instructions, Procedures, and Drawings, requires quality-affecting activities be prescribed by and performed in accordance with documented, approved quality assurance (QA) procedures and other approved implementing documents (drawings, specifications, etc.) appropriate to the MOX Project work scope.

Contrary to the above, on January 27 and 28, 2012, quality affecting work activities associated with the installation of fire dampers were not accomplished in accordance with the instructions contained in WP 12-CP23-B143-MDE-T-M-001 and WP 12-CP23-B138-HAS-T-M-001. The installers failed to document the completion of work activities, such as prerequisites, survey completion, work performed, and installation checklists, as they were performed. The failure to perform quality-affecting activities in accordance with approved QA procedures and implementing documents was considered to be a violation (VIO) of NRC requirements and is identified as the first example of VIO 70-

3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents. This issue was entered into the MOX Services' corrective action program as CR 11-665.

The violation was considered to be more than minor because one damper was installed using a temporary frame and the other damper was installed with temporary stainless steel bolts and this information was not documented on the work performed sheet at completion of the work. Therefore, these issues represented a failure to implement procedural requirements related to installation of QL-1 equipment which could render the quality of construction indeterminate.

(b) Conclusion

The inspectors observed construction activities related to PSSC-21, Fire Barriers, as described in Table 5.6-1 of the Mixed Oxide Fuel Fabrication Facility (MFFF) Construction Authorization Request (CAR). The inspection attribute observed was installation and the associated systems, structures, and components (SSCs) were fire dampers located various rooms of the BMP. Example 1 of VIO 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents, was identified.

b. PSSC-23 (Fluid Transport Systems (FTS))

(1) Installation Attribute (IP 88143 Pipe Supports and Restraints)

(a) Scope and Observations

The inspectors continued to perform routine observations of field installation of supports, piping, ductwork and electrical conduit. The inspectors observed that selected field installations were in accordance with WP installation drawings and welding was in accordance with the WP weld data sheets. The inspectors noted that approximately 2500 supports have been installed; however, only 66 supports were turned over for QC inspection.

During the previous inspection period (September 1-December 31, 2011), the inspectors identified that various WPs, primarily for installation of structural supports, were not being updated as the work steps were completed. Specifically, this observation pertained to the generic Installation Checklist contained in every WP. This included process piping supports, electrical supports, ventilation supports, ventilation ductwork installation and fire system supports. These checklists were intended to document the verification of items such as: proper drawings and engineering change requests (ECRs), identification of components to be installed, location, welding completion, and cleanliness. The installer was required to perform the step and then sign and date the step.

Interviews and discussions with the various contractors disclosed that there was a misunderstanding in the field on how to execute the WP checklists. Due to the misunderstanding, some of the checklists were signed correctly as they were completed; some were being signed from weeks to over a year later, and some were not signed.

The issue was brought to the attention of the applicant and CR-11-665 was initiated on November 21, 2011, that stated, "Signoffs in the WPs are not being accomplished as work is being performed" and "there is a misunderstanding in the field how to effectively execute the support/piping/duct work checklist/attribute sheets."

In the first quarter of 2012, the inspectors performed a more detailed review of piping support installation WPs. The WPs associated with BAP Room C-133 were selected. The five WPs were identified as: 10-CP27-C133-ZMS-S-M-001B, 001C, 001E, 0004, and 0005. Section 2.3 of each WP specified that, "All work shall be performed in accordance with Project Procedure (PP) 11-74, Piping Support Installation." Section 5.0, requires that inspections shall be documented on Form PP11-74A, Piping Support Installation Checklist. Form PP11-74 A required that the installer verify the correct drawings and associated ECRs for current revision levels; verify that support identification matched design drawing: verify the proper support attachment to embed plate; verify that the support configuration and orientation were per the design drawings; verify that the support members were the correct size, type, material, grade, etc; verify the proper support location; verify proper tolerances; and verify that all required welding was complete.

The inspectors noted that the work activities were not adequately documented in that required surveys had not been signed off prior to support installation. Specific to WP-001E and WP-0004, the inspectors noted that the Work Performed Sheet was incomplete and lacked specific detail even though the actual field work was completed in 2011. The inspectors also reviewed Piping Support Installation Checklists for supports: C133-PS-145 welded in March 2011; C133-PS-151 welded in January 2011; C133-PS-197 welded in June 2011; C133-PS-199 welded in January 2011; and C133-PS-200 welded in June 2011, and noted that the checklists were not completed by the installer and construction engineer until February 27, 2012. For WP-001B the Piping Installation Checklists were not included in the WP although several pipe supports were installed in 2011. For WP-0004 the Piping Installation Checklists were not completed for the supports installed in 2011.

MPQAP, Section 5, Instructions, Procedures, and Drawings, requires that Quality-affecting activities 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. PP11-74 requires the installer to verify individual inspection items and to document those verifications.

Contrary to the above, for the supports and WPs listed above, from January 2011 to February 2012, the Piping Support Installation Checklist had not been completed for the following: (1) documentation of the verification of proper drawings and associated ECR for current revision levels; (2) verification that the support identification matched design drawings; (3) verification of the proper support attachment to embed plate; (4) verification that the proper support configuration and orientation were per the design drawings; (5) verification that support members were the correct size, type, material, grade, etc; (6) verification of the correct support location; (7) verification that tolerances were met; and (8) verification that welding was completed per the current drawing.

Failure to perform quality-affecting activities in accordance with approved QA procedures and implementing documents was considered to be a violation of NRC requirements and is identified as the second example of VIO 70-3098/2012-001-001,

Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents. This issue was entered into the MOX Services' corrective action program as CR 11-665.

The issue was considered to be more than minor because it represented a failure to implement procedural requirements related to installation of QL-1 equipment which could render the quality of construction indeterminate.

(b) Conclusion

The inspectors observed construction activities related to PSSC-23, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation and the associated SSCs were FTS pipe supports located in Room C-133 of the BAP. Example 2 of VIO 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents, was identified.

c. PSSC-50 (Supply Air System)

(1) Installation Attribute (IP 88136 Mechanical Components)

(a) Scope and Observations

On March 6, 2012, the inspectors observed installation activities associated with WP 11-CP23-B102-HAS-S-M-004 (ventilation ductwork support). Section 2.3 of the WP specified that, "All work shall be performed in accordance with PP11-38." PP11-38, HVAC Duct and Equipment Supports Fabrication, Modification, and Installation, Section 5.0, required that inspections shall be documented on Form PP11-38A, HVAC Duct and Equipment Support Installation Checklist. Form PP11-38A required that the installer perform the following verifications: drawing and associated ECRs for current revision levels, the matching of support identification and design drawings, support attachment to embed plate, and support configuration and orientation per the design drawings. The inspectors noted that, although the supports were installed, the installer had not documented any of the verifications.

MPQAP, Section 5, Instructions, Procedures, and Drawings, requires quality-affecting activities 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. PP11-38 requires the installer to verify individual inspection items and to document those verifications.

Contrary to the above, on March 6, 2012, while a ventilation support was installed per work package WP 11-CP23-B102-HAS-S-M-004, the associated PP11-38A Installation Checklist had not been completed to document the verification for current drawing, support identification matched design drawing, proper support attachment to embed plate or proper support configuration and orientation. Failure to prescribe and perform quality-affecting activities in accordance with approved QA procedures and implementing documents was considered to be a violation of NRC requirements and is identified as the third example of VIO 70-3098/2012-001-001, Failure to Provide Work

Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents. This issue was entered into the MOX Services' corrective action program as CR 11-665.

The issue was considered to be more than minor since it represented a failure to implement procedural requirements related to installation of QL-1 equipment which could render the quality of construction indeterminate.

(b) Conclusion

The inspectors observed construction activities related to PSSC-50, Supply Air System, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation and the associated SSCs included supply air ventilation ductwork supports located in Room B-102 of the BMP. Example 3 of VIO 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents, was identified.

d. PSSC-21 (Fire Barriers)

(1) QA Attribute (IP 88136 Mechanical Components)

(a) Scope and Observations

The inspectors performed a detailed review of the work packages associated with the fire dampers installed on January 27 and 28, 2012. The inspectors identified various issues related to quality of the WPs as follows:

The fire damper installation WP 12-CP23-B143-MDE-T-M-001, dated January 19, 2012, Section 2.3 requires that the "installer shall disconnect operator or fusible link to ensure workability of the damper blade or fire curtain to avoid jamming or binding." As written, the WP did not require the installer to re-connect the operator or fusible link. This would leave the fire damper in a non-operating state. Therefore the procedure was considered not appropriate to the nature and circumstances of the work.

The fire damper installation WP 12-CP23-B143-MDE-T-M-001, dated January 19, 2012, Section 2.3 provided detailed instructions such as disconnect the operator, damper should be installed in the open position, and ensure the fusible link is mounted on the fire damper frame outside the air stream. However; the WP did not provide for any methodology for demonstrating that the work was performed as required, such as a signature, initial, or check. Therefore the procedure was considered not appropriate to the nature and circumstances of the work.

Installation requirements for the fire dampers were documented in WP 12-CP23-B143-MDE-T-M-001, dated January 19, 2012 and WP 12-CP23-B138-HSA-T-M-001, dated January 17, 2012. Section 2.3 of both WPs detailed the installation requirements and specified that, "All work shall be performed in accordance with PP11-37, HVAC Ductwork field Fabrication and Installation for Nuclear Clean Air Systems." PP11-37, Section 5, Field Installation, documented the various requirements for installation of components in the nuclear clean air system. For example, Section 5.2.1.5, required

that, "All installation work shall be in accordance with the manufacturer's instructions, MOX Services drawings, and specification DCS01-QGA-DS-SPE-V-15890," and Section 5.2.1.7 required that, "Ductwork shall be installed in according to Sheet Metal and Air Conditioning Contractors National Association (SMACNA) HVAC Construction Standards-Metal and Flexible, Rectangular Industrial Duct Construction Standards, Round Industrial Duct construction Standards, and MOX Services documents and design documents." Because the WPs referenced various industry standards and practices, specifications and design documents without identifying the appropriate installation requirements, the WPs were considered not appropriate to the nature and circumstances of the work.

MPQAP, Section 5, Instructions, Procedures, and Drawings, required that the type of document used to perform work shall be appropriate to the nature and circumstances of the work being performed. MPQAP Section 5.2.2.G, Content of Implementing Documents, required that, "Implementing documents shall include...methods for demonstrating that the work was performed as required (such as provisions for recording inspection and test results, checklists or signoff blocks)."

Contrary to the above, the documents contained in WP 12-CP23-B143-MDE-T-M-001 and WP 12-CP23-B138-HSA-T-M-001, used to perform installation of fire dampers, were not appropriate to the nature and circumstances of the work being performed. Specifically, PP11-37 referenced installation documents that did not provide appropriate installation requirements. The WPs did not provide for a methodology for demonstrating that the work was performed as required, and the WPs did not require the installer to re-connect the operator or fusible link after it was procedurally disconnected which would leave the fire damper in a non-operating state.

The failure to provide work documents appropriate to the nature and circumstances of the work being performed was considered to be a violation of NRC requirements and is identified as the fourth example of VIO 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents. This issue was entered into the MOX Services' corrective action program as CR 11-665.

The issue was considered to be more than minor since it represented a failure to establish adequate procedural requirements related to installation of QL-1 equipment which could render the quality of construction indeterminate.

(b) Conclusion

The inspectors observed construction activities related to PSSC-21, Fire Barriers, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was QA and the associated SSCs were fire dampers located in various rooms of the BMP. Example 4 of VIO 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents, was identified.

- e. PSSC-23 (Fluid Transport Systems)
- (1) QA Attribute (IP 88143 Pipe Supports and Restraints)
- (a) Scope and Observations

The inspectors performed a detailed review of the WPs associated with the installation of piping supports installed between January 2011 and January 2012. The inspectors identified various issues related to quality of the WPs as follows:

The WPs associated with BAP room C-133 were selected. The five WPs were identified as: 10-CP27-C133-ZMS-S-M-001B, 001C, 001E, 0004, and 0005. Section 2.3 of each WP specifies that, "All work shall be performed in accordance with PP11-74, Piping Support Installation." PP11-74, Section 4.6, Installation Activities, documented the various requirements for installation of process piping supports. Section 4.6.1 requires that, "All installation activities shall comply with the requirements of DCS01-ZMS-DS-SPE-M-15145 and the applicable codes and standards referenced therein, unless otherwise approved by MOX Services Design Engineering."

DCS01-ZMS-DS-SPE-M-15145 referenced the following codes and standards in Section 1.4.3, Codes and Standards:

- American National Standards Institute/ American Institute for Steel Construction ANSI/AISC N690-1994, Specification of the Design Fabrication, and Erection of Steel Safety-related Structures for Nuclear Facilities, including Supplement 1, 2002
- American Society of Mechanical Engineers (ASME) Quality Assurance Requirements for Nuclear Facility Applications (NQA-1) 1994
- ASME NQA-1 2004, American Welding Society (AWS) D1.1 Structural Welding Code 1998
- AWS D1.3 Structural Welding Code-Sheet Steel 1998
- AWS D1.6 Structural Welding Code-Stainless Steel 1999
- AWS A2.4 Standard Welding Symbols for Welding, Brazing and Nondestructive Examination (latest edition)
- AWS A3.0 Standard Welding Terms and Definitions (latest edition)
- Manufacturers Standardization Society (MSS) MSS-SP-58-2002 Pipe Hangers and Supports-Materials, Design and Manufacture
- MSS-SP-89-2003, Pipe Hangers and Supports-Fabrication and Installation Practices
- American Society of Testing Materials (ASTM) A380 Cleaning, Descaling and Passivation of Stainless Steel Parts, Equipment and Systems (latest edition)

- Nuclear Construction Issues Group (NCIG) -01 Visual Acceptance Criteria for Structural Welding of Nuclear Power Plants, Revision 2
- American Society for Nondestructive Testing Recommended Practice SNT-TC-1A, 1988, Personnel Qualification and Certification in Nondestructive Testing.

MPQAP, Section 5, Instructions, Procedures, and Drawings, requires that the type of document used to perform work shall be appropriate to the nature and circumstances of the work being performed. As detailed above, the documents contained in WPs 10-CP27-C133-ZMS-S-M-001B, 001C, 001E, 0004, and 0005, for work performed from January 2011 to January 2012, used to perform installation of QL-1 process piping supports, were not appropriate to the nature and circumstances of the work being performed. Specifically, Section 2.3, of the WPs, required that, "All work shall be performed in accordance with PP11-74, Piping Support Installation." PP 11-74, Section 4.6.1, required that, "All installation activities shall comply with the requirements of DCS01-ZMS-DS-SPE-M-15145 (Construction Specification-Field Fabrication and Installation of Pipe and Electrical Raceway Supports) and the applicable codes and standards referenced therein, unless otherwise approved by MOX Services Design Engineering." DCS01-ZMS-DS-SPE-M-15145 listed codes and standards, including the following: MSS-SP-58-2002, Pipe Hangers and Supports-Materials, Design and Manufacture; and MSS-SP-89-2003, Pipe Hangers and Supports-Fabrication and Installation Practices.

The WPs were not appropriate to the nature and circumstances of the work being performed because they referenced multiple industry standards, practices, specifications, and design documents without specifically identifying the appropriate installation requirements; and because the WPs referenced documents such as MSS-SP-58-2002 and MSS-SP-89-2003, which were intended to provide installation tolerances, and these documents were not approved for use by MOX Services Design Engineering.

The failure to provide work documents appropriate to the nature and circumstances of the work being performed was considered to be a violation of MPQAP requirements and is identified as the fifth example of VIO 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents. This issue was entered into the MOX Services' corrective action program as CR 11-665.

The issue was considered to be more than minor since it represented a failure to establish adequate procedural requirements related to installation of QL-1 equipment which could render the quality of construction indeterminate

(b) Conclusion

The inspectors observed construction activities related to PSSC-23, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was QA and the associated SSCs were FTS pipe supports located in Room C-133 of the BAP. Example 5 of VIO 70-3098/2012-001-001, Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed

and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents, was identified.

f. PSSC-09 (Criticality Control)

(1) QA Interfaces Attribute (IP 88116, Inspection of Safety Function Interfaces for the Mixed Oxide Fuel Fabrication Facility (Pre-Licensing and Construction))

(a) Scope and Observations

The inspectors selected the Homogenizing and Pelletizing (NPG) process unit as an inspection sample to determine if the interfaces that affect MFFF safety functions were adequately controlled such that the PSSCs and items relied on for safety (IROFS) would be completed in accordance with the design basis of the CAR and/or License Application (LA). The inspectors examined the interfaces between the Integrated Safety Analysis (ISA) group and design engineering and design engineering and procurement.

The inspectors reviewed various procedures and interviewed personnel to determine if MOX Services had established and implemented adequate safety function interfaces. The inspectors reviewed various design input and output documents to determine if MOX Services adequately flowed down nuclear safety requirements identified in licensing basis documents. The inspectors reviewed the computer system used by MOX Services to track changes and maintain configuration control of the ISA and LA. The inspectors reviewed PP 8-6, Licensing Basis Configuration Management, to evaluate the process for identifying potential impacts to the licensing basis and to define the requirements for NRC notification.

The inspectors selected several IROFS in the area of criticality control for the Homogenizing and Pelletizing (NPG/NPH) process units to verify that quality levels assigned to quality affecting SSCs were commensurate with the safety significance of the SSCs as defined in the ISA. The inspectors selected various IROFS identified in the ISA to verify that QA controls for the assigned quality level were sufficiently applied to ensure design integrity through compliance with technical, engineering, safety, and design requirements. The inspectors reviewed various procurement documents and procurement specifications for QL-1 IROFS to determine if MOX Services included the appropriate technical requirements. In the area of commercial grade dedication, the inspectors verified that critical characteristics were properly identified and documented.

In the area of commercial grade dedication, the inspectors noted that MOX Services failed to perform an adequate Commercial Grade Item Evaluation (CGIE) for the Lodige Mixer associated with the NPG/NPH process units. The IROFS Description from Integrated Safety Analysis Summary (ISAS) Table 5.3.7-107 for the Lodige Mixer Design states, in part, the internal components (cylindrical Ploughshare® shaft and Ploughshare® arms) of the NPG/NPH Lodige Mixer are inherently robust. The safety function identified in the table is to assure powder homogeneity for pressed pellets. The inspectors reviewed DCS01-NPG-DS-CGD-M-65900-0, Commercial Grade Item Evaluation (CGIE) for Lodige Powder Mixer to determine if the technical evaluation as documented in the CGIE identified the necessary critical characteristics and acceptance methods to provide reasonable assurance that the component could perform its intended safety function. The inspectors noted that the scope of the contract with Lodige included both design services and fabrication. Based on their review, the inspectors concluded

that the CGIE did not identify the appropriate critical characteristics to ensure that the safety related item (Lodige mixer shaft) would be capable of performing its intended safety function.

Specifically, the inspectors concluded that MOX Services (1) failed to identify the necessary QA controls such as design and document control; control of materials, equipment, services; and special processes (welding) as critical characteristics in the CGIE; (2) failed to perform a Commercial Grade Survey of Lodige to confirm their ability to control and verify these critical characteristics; and (3) failed to require dimensional measurements as part of special tests and inspections to confirm assumptions associated with stress concentration factors which are critical parameters when assessing the ability to withstand fatigue.

Specific to the commercial grade survey, MOX Services failed to ensure that (1) requirements in the areas of design process, design analysis, and design verification were followed for a QL-1 design; (2) cleanliness requirements were adhered to during fabrication to prevent possible cross-contamination of the austenitic stainless steel, which could result in corrosion of the equipment; and (3) welding was properly performed to ensure that the Mixer Ploughshares® will not fail as a result of equipment operation and malfunctions. MOX Services also failed to perform an independent QL-1 structural calculation to provide objective evidence that the Mixer Ploughshares® and Lodige mixer shaft were inherently robust to withstand (1) normal operations and equipment malfunctions such as locked rotor torque and (2) fatigue.

Section 7.2.8 of the MPQAP defines critical characteristics as those important design, material, and performance characteristics of a commercial grade item that, once verified, will provide reasonable assurance that the item will perform its intended IROFS function. Critical characteristics for commercial grade items shall be determined and approved by the manager responsible for the procurement based on the performance requirements for the item including the intended IROFS safety function.

Based on the requirements listed above, on and before January 10, 2012, the inspectors concluded that MOX Services failure to define adequate critical characteristics to provide reasonable assurance that the Lodige mixer shaft would perform its intended IROFS function is a violation of Section 7, Control of Purchased Material, Equipment, and Services, and is identified as example 1 to VIO 70-3098/2012-001-002, Failure to Identify Adequate Critical Characteristics. MOX Services generated CR-12-017, Inadequate Design Support for NCSE-D Statements Concerning the Lodige Mixers, to address this violation.

This issue was determined to be greater than minor since the condition represents a condition adverse to quality that renders the quality of a SSC or activity, unacceptable or indeterminate.

(b) Conclusions

The inspectors observed construction activities related to PSSC-09, Criticality Control, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was QA interfaces and the associated SSC was the Lodige mixer contained within the NPG/NPH process units. Example 1 of VIO 70-3098/2012-001-002, Failure to Identify Adequate Critical Characteristics, was identified.

- g. PSSC-23 (Fluid Transport System)
- (1) Control of Materials, Equipment, and Services Attribute (IP 88108, Control of Materials, Equipment, and Services)
- (a) Scope and Observations

The inspectors reviewed project procedures, purchase orders, procurement specifications, and CGIEs to determine if MOX Services adequately procured FTS piping and components in accordance with the MPQAP. In the area of commercial grade dedication, the inspectors reviewed DCS01-ZMJ-DS-CGD-M-65694-4, Commercial Grade Item Evaluation of S30403 (304L), S31603 (316L), Incoloy 800H & Titanium Grade 2 Metallic Standard Forms Used in Fluid Transport System Applications, to determine if MOX Services identified the necessary critical characteristics to ensure that the item will be capable of performing its intended safety function. Specifically, the inspectors reviewed the CGIE to determine if MOX Services properly (1) prepared the CGIE including subsequent revisions in accordance with PP 9-18, Commercial Grade Item Evaluations; (2) established the purpose and scope of the CGIE; (3) performed the technical evaluation including a description of the design function of the component; (4) identified the functional classification of the component; (5) developed the failure mechanisms, modes, and effects, (6) identified the necessary critical characteristics; (7) specified the seismic qualification, environmental qualification, and electromagnetic interference/radio frequency interference (EMI/RFI) qualification requirements; and (8) identified the acceptance methods for verification of critical characteristics.

During their review, the inspectors noted that MOX Services removed resistance to intergranular attack (IGA) and intergranular stress corrosion cracking (IGSCC) as a critical characteristic in the latest revision of the CGIE (DCS01-ZMJ-DS-CGD-M-65694-4). IGSCC is a condition associated with stainless steels where the passivating layer rich in chromium (III) oxide suffers an IGA. IGSCC is typically caused by chromium depleted zones due to sensitization after an improper heat treatment such as solution annealing, or during welding; however, it can also occur in steel that is in a non-sensitized condition. The inspectors noted that MOX Services was procuring stainless steel for use in FTS applications as commercial grade; therefore, independent ASTM A262 intergranular corrosion testing performed under an NQA-1 QA program is necessary to ensure that the material has been properly heat treated and is not susceptible to IGSCC.

In order to determine the safety significance of the issue, the inspectors reviewed the applicable sections of the ISA and LA that discuss the potential for corrosion in FTS systems. The inspectors noted that corrosion is a credible initiator for a loss of confinement event for FTS materials/components in the BAP and failure of the confinement boundary in these systems could result in exceeding 10 Code of Federal Regulations (CFR) 70.61 performance requirements for the facility and site worker. Section 5.5.2.1.2 of the CAR lists corrosion-induced confinement failures as one of the primary causes for the potential dispersal of radioactive materials outside of the static confinement boundary. Section 11.3.9.6, Process Equipment of the LA, states that aqueous polishing (AP) process vessels, piping, valves, and pumps provide the primary confinement boundary for their contents and that process equipment is constructed of corrosion resistant materials, typically stainless steel, titanium or zirconium. Section 5.3.3.2.5, Leaks of AP Vessels or Pipes within Process Cells, of the ISA states, in part,

that “IROFS process vessels and pipes are highly reliable passive barriers that provide the primary confinement boundary for process fluids in process cells...These IROFS are welded equipment and are not prone to leaking...Credible failure initiations such as seismic events and corrosion have been considered in the design of these IROFS to ensure they perform their safety function.”

As a response to this issue, MOX Services developed DCS01-ZMJ-DS-NTE-M-61502-0, Basis for Intergranular Corrosion Testing of Fluid Transfer System (FTS) Materials, to provide a technical basis for deleting IGSCC as a critical characteristic. This document was reviewed by the inspectors to determine if the position taken by MOX Services was consistent with NRC regulations and requirements. The paper concluded that IGSCC testing is not a critical characteristic for FTS materials and components contained inside a secondary confinement boundary such as a glovebox, or a double-walled pipe, or where the service does not promote corrosion, or where leak tightness is not part of the safety strategy. However, the evaluation did conclude that in all other cases, where the application involves the use of single walled FTS piping, tanks, and components, ASTM A262 corrosion testing shall be identified as a critical characteristic and corrosion testing shall be performed by an independent laboratory with an approved ASME NQA-1 QA program.

The inspectors reviewed PP9-18 Revision 5, Commercial Grade Item Evaluations, to determine if the procedure used by MOX Services required MOX Services to perform a technical evaluation that included item identification; end use application; functional classification; failure mechanisms, modes and effects; equipment qualification; seismic qualification considerations; environmental qualification considerations; electromagnetic interference and radio frequency interference considerations; and embedded software considerations. The inspectors reviewed the CGIE against the requirements of the procedure and concluded that MOX Services did not perform an adequate technical evaluation to ensure that the material and components procured under the CGIE could perform their intended safety function. Specifically, MOX Services failed to identify corrosion as a critical characteristic and failed to identify corrosion as a potential failure mechanism in the failure modes and effects analysis. The LA and ISA clearly establish credible accidents in the ISA where corrosion is the primary initiator for a loss of confinement event.

Section 7.2.8 of the MPQAP defines critical characteristics as those important design, material, and performance characteristics of a commercial grade item that, once verified, will provide reasonable assurance that the item will perform its intended IROFS function. Critical characteristics for commercial grade items shall be determined and approved by the manager responsible for the procurement based on the performance requirements for the item including the intended IROFS safety function.

Based on the requirements listed above, the inspectors concluded that MOX Services failure to define IGSCC resistance as a critical characteristic to provide reasonable assurance that the FTS piping and components would perform their intended IROFS function is a violation of Section 7, Control of Purchased Material, Equipment, and Services, and is identified as example 2 to VIO 70-3098/2012-001-002, Failure to Define Adequate Critical Characteristics. MOX Services generated CR-12-143, Intergranular Corrosion Testing Required by DCS01-ZMJ-DS-NTE-M-61502, and CR-12-56 to address this non-conformance.

This violation was determined to be greater than minor since the condition represents a condition adverse to quality that renders the quality of a structure, system, or component (SSC) or activity, unacceptable or indeterminate. Specifically, failure to include IGSCC testing as a critical characteristic could adversely affect the ability of the SSC to perform its intended safety function.

(b) Conclusions

The inspectors observed construction activities related to PSSC-23, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was control of equipment, materials, and services and the associated SSC was FTS piping and components located in various rooms of the BAP. Example 2 of VIO 70-3098/2012-001-002, Failure to Identify Adequate Critical Characteristics, was identified.

h. PSSC-036, MOX Fuel Fabrication Building Structure (Including Vent Stack)

(1) Installation and Test Control Attributes (IP 88132, Structural Concrete, and IP 88134, Piping Relied on For Safety)

(a) Scope and Observations

During the inspection period, the inspectors observed the following activities associated with PSSC-036, MFFF building structure (including vent stack):

- 1) Installation of structural reinforcing steel in the BMP, the BAP, and BSR;
- 2) Installation of embedded piping, embedded support plates, and plant grounding system in all three buildings;
- 3) Concrete placements in walls and floors of the BSR, BAP, and BMP and placement of the roof section of the BMP;
- 4) Operation of the concrete batch plant;
- 5) Receipt of cement, fly ash, sand and gravel;
- 6) Concrete testing in the field (slump, air entrainment, and temperature);
- 7) Installation of building grounding cables in various floors and walls;
- 8) Surveys (proper positioning/location) of embedded piping and embedded plates;
- 9) Cleanliness of areas prior to concrete placement, and maintenance of cleanliness during the concrete placements;
- 10) Installation of coatings in the BAP and BMP;

The inspectors observed routine lifts conducted to position reinforcing steel and 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 MPQAP and verified that installations of the structural reinforcing steel, embedded plates, embedded piping, and electrical grounding of the MFFF structures were in accordance with QA programmatic requirements. Specifically, the inspectors verified that installations were in accordance with applicable field drawings and met the general construction notes detailed on the following drawings: 1) MFFF Concrete and Reinforcing General Notes, DCS01-01352, Revision 9 (Sheet 1 of 2); and 2) MFFF Concrete and Reinforcing General Notes and Tolerance Details, DCS-01352, Revision 6 (Sheet 2 of 3), and Revision 0 (Sheet 3 of 3).

The inspectors evaluated the adequacy of ongoing concrete placement activities conducted by Alberici, Soil and Materials Engineers, Inc. (S&ME), and MOX Services. The inspection of these activities focused on reinforcing steel bar installation, formwork preparation, pre-placement testing, and placement procedures associated with QL-1 concrete construction of the MFFF building structure.

The inspectors observed various activities prior to and during each major concrete placement. Prior to selected placements, the inspectors selectively checked for proper placement of reinforcing steel, including proper lap splices, supports, and bar spacing, alignment, and proper clear cover. The inspectors selectively checked for proper embed plate placement by observing ongoing surveys, and verified embed plate support structures were properly restrained, observed placement of embedded piping, installation of piping supports, mounting of piping to supports, installation of galvanic sleeves between piping and supports, and verified cleanliness of the placement area.

The inspectors observed the installation of the grounding system for the reinforcing steel, including embedded grounding posts for future equipment installation. 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 the placements.

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 transport to S&ME for curing and later testing. Batch plant operators correctly implemented procedural requirements and were in constant communication with the concrete placement crews. The inspectors reviewed concrete cylinder break test records performed and documented by S&ME. The inspectors noted that the cylinder breaks met the acceptance criteria specified in American Concrete Institute (ACI)-349.

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

January 6, 2012, BMP-W309.2/W311, BMP Interior Wall, 287 cubic yards
 January 7, 2012, BAP-W210.1/W212, BAP Interior Wall, 148 cubic yards
 January 12, 2012, BMP-F321, BMP Elevated Floor, 16 cubic yards
 January 13, 2012, BAP- GW15A.1, BAP Gabion Wall, 61 cubic yards
 January 18, 2012, BAP-W209.2.1/W207A.3, BAP Interior Wall, 100 cubic yards
 January 20, 2012, BSR-W206.3, BSR Interior Wall, 164 cubic yards
 January 26, 2012, BAP-W301.1/W312.2, BAP Interior Wall, 113 cubic yards
 January 26, 2012, BMP-W322.2, BMP Interior Wall, 260 cubic yards
 January 30, 2012, BAP-TCO181, BAP Temporary Opening, 10 cubic yards
 February 3, 2012, BSR-W301.2, BSR Interior Wall, 150 cubic yards
 February 4, 2012, BAP-W210.1, BAP Interior Wall, 202 cubic yards
 February 10, 2012, BAP-W207B.1, BAP Interior Wall, 15 cubic yards
 February 11, 2012, BMP-W321.2/W323.4B, BMP Interior Wall, 235 cubic yards
 February 15, 2012, BMP-R8A/R7A/R4.2A/R3.2A, BMP Roof, 1126 cubic yards
 February 21, 2012, BAP-W301.2/BSR-W301.3, BAP-BSR Interior Wall, 585 cubic yards
 February 22, 2012, BAP-GW12A.1/ GW13A.1, BAP Gabion Wall, 85 cubic yards
 February 28, 2012, BSR-W206.5, BSR Interior Wall, 238 cubic yards

March 6, 2012, BMP W321.3, BMP Interior Wall, 248 cubic yards
 March 7, 2012, BAP-F306/F305/F303, BAP Elevated Floor, 544 cubic yards
 March 7, 2012, BMP-GW8C/GW7.1C, BMP Gabion Wall, 77 cubic yards
 March 13, 2012, BMP-R1.2/R2.2A/5A/6A, BMP Roof, 1234 cubic yards
 March 16, 2012, BSR-F301.1/F302.3, BSR Elevated Floor, 288 cubic yards
 March 20, 2012, BMP-W327.1/W328.1, BMP Interior Wall, 260 cubic yards
 March 22, 2012, BAP-W303/W304.1, BAP Interior Wall, 219 cubic yards
 March 27, 2012, BMP-GW1C/GW7.2C, BMP Gabion Wall, 85 cubic yards
 March 29, 2012, BAP-W304.2/W305, BAP Interior Wall, 156 cubic yards
 March 29, 2012, BAP GW12A.1, BAP Gabion Wall, 22 cubic yards
 March 30, 2012, BMP-W326.1/W322.3, BMP Interior Wall, 240 cubic yards

The inspectors performed various reviews for the above placements, which included walk downs with the field engineers, walk downs with QC personnel, verification of reinforcing bar (rebar) by use of field drawings, WP reviews and routinely performed walk downs of the area to verify adequate cleanliness prior to concrete placement.

(b) Conclusions

Construction activities related to PSSC-036 as described in Table 5.6-1 of the MFFF CAR were adequately performed and included installations of reinforcing steel, embedded plates and ground cables; concrete placements; operation of the batch plant; heavy lifts of equipment and supplies, verification of equipment placements by surveys, rebar installation, placement of concrete, welding, non-destructive testing, installation of tanks, and receipt of materials. These construction activities were performed in a safe and quality related manner and in accordance with procedures and WPs. No findings of significance were identified.

4. Non-PSSC Inspections

a. Quality Assurance: Program Development and Implementation (Pre-licensing and Construction) (IP 88106)

(1) Scope and Observations

The inspectors evaluated the adequacy of the applicant's independent oversight of commercial grade dedication (CGD) activities, including QA audits of activities at the MFFF, audits of Appendix B suppliers who perform CGD, and commercial grade surveys of non-Appendix B suppliers who control and verify critical characteristics of basic components.

Interviews with responsible managers and review of applicable records identified that the applicant had conducted one internal QA audit and one internal QA surveillance related to the CGD program in 2011. Audit Report SA-11-A02 provided a review of receipt inspection activities, which included activities for dedication of commercial grade items. No significant issues were identified by the auditors; however, two management attention items were initiated for deficiencies in the control and conduct of commercial grade dedications. Surveillance Report SR-QA-11-0028 conducted an in-office review of requirements for dedications of mechanical splices identified as LENTON and Barsplice Zap Screwlok. The report concluded that dedication requirements for the mechanical splices were correctly captured in the dedication plan and that the suppliers' processes

gave reasonable assurance the heat number, etc. established traceability to the certified material test reports (CMTRs). No issues of significance were identified except as discussed in Section 4.b.(1)(c)1).

The inspectors interviewed responsible personnel and reviewed two reports of QA audits of Appendix B suppliers who conduct dedications of commercial grade items. Audit Report SOURIAU-10-VE16 documented a review of a supplier for QL-1 glovebox assemblies. The auditors identified a number of deficiencies which included inadequate control of CGD. MOX Services imposed a restriction against further procurement pending resolution of the issues. A second audit Report, SMCI-09-VE38, provided a review of a supplier of metal embedment plates. The audit included a review of commercial grade dedications. No significant issues were identified and the supplier was retained on the Approved Suppliers List (ASL) with no restrictions.

The inspectors interviewed responsible personnel and reviewed three commercial grade surveys of suppliers who control and perform verifications of critical characteristics of basic components. The review was performed to determine whether the surveys adequately evaluated the specific vendor controls established for critical characteristics defined by MOX Services in the applicable CGIEs. Two of the surveys, KTR-09-VE70 and OST-08-VE160, did not specifically identify the vendor controls that were applicable to each critical characteristic; however, the inspectors found that subsequent changes to the associated procurement specifications specified the use of source verifications in lieu of the commercial grade surveys.

Documents reviewed in this inspection are listed in the attachment.

(2) Conclusions

No issues of significance were identified except as discussed in Section 4.b.(1)(c)1).

b. Quality Assurance: Control of Materials, Equipment, and Services (Pre-licensing and Construction) (IP88108)

(1) Scope and Observations

The inspectors reviewed the implementation of the CGD program. The inspection was conducted to verify activities satisfied the requirements of the MPQAP and NRC regulations and was accomplished in a manner that would assure that installed items will perform their intended safety function.

(a) Identification of Safety Functions and Critical Characteristics of Basic Components

The inspectors reviewed evaluations and specifications that have been issued to define safety functions and associated critical characteristics of basic components. The review was performed to determine whether the documents adequately addressed assumptions of the integrated safety analysis and the bases of design in a manner that assured that dedications of basic components would verify the items would be capable of performing their intended safety function.

The inspection scope included reviews of nine CGIEs, six commercial grade dedication implementing procedures, and the MPQAP.

The inspectors reviewed a sample of design requirement documents (DRDs) and basis of design (BOD) documents used as input into the CGIEs. Those input documents include the integrated safety analysis, functional classification lists, component classifications, and nuclear safety evaluations. The information was compared to the CGIEs to determine if MOX Services correctly translated the IROFS safety functions into the CGIEs. The inspectors noted that safety function information was documented in the "End Use Application" section of the CGIEs in accordance with procedure PP9-18, Commercial Grade Item Evaluations.

Each CGIE reviewed by the inspectors was found to address the assumptions used or adequately referenced a DRD and/or BOD document. The inspectors noted although some CGIEs did not provide direct correlation to the source documents which described the safety function, the safety function and critical characteristics were defined in the CGIE and MOX Services was able to demonstrate that assumptions used to define the safety function and critical characteristics were valid.

The inspectors also reviewed CGD program definitions contained in the MPQAP and implementing procedures to determine if the definitions (i.e. dedication, basic component, commercial grade item, and critical characteristics) were consistently applied in issued CGIEs and were implemented in accordance with 10 CFR Part 21.

The inspectors noted several CGIEs specified the use of a process known as downstream testing or conditional dedication of basic components that were to receive final dedication using verifications during post-installation activities. As defined in procedure PP9-18, those commercial grade items were not fully dedicated until the post verifications activities were complete. The required testing is identified as a to-be-verified (TBV) action in the CGIE. The inspectors reviewed an action matrix list that tracked process systems tagged for downstream testing and cross referenced several verifications actions identified in the CGIEs to verify actions were identified on the confirmation action matrix list.

(b) Translation of CGD requirements into procurement control documents

The inspectors evaluated whether commercial grade purchase orders for services and items requiring dedication as basic components adequately translated technical and quality requirements into procurement controls.

During the review, inspectors interviewed responsible managers and reviewed procurement specifications and purchase orders that were issued for the purchase of commercial grade items. These documents were examined to verify that engineering requirements such as Critical Characteristics for Acceptance (CCAs) as specified in CGIEs were correctly incorporated. The inspectors reviewed flow down of CGIE requirements for grounding cable and material, simple electrical components, process glovebox gloveport assemblies, electrical panels, and continuous flex cable for chains inside gloveboxes.

The inspectors verified the sample of purchase orders were issued to suppliers listed on the MOX Services ASL or the Approved Commercial Grade Vendor List. The review also verified the purchased items and services were consistent with the authorized scopes of supply and complied with any listed restrictions.

A sample of receipt inspection reports (RIRs) associated with received commercial grade items were evaluated to determine whether CCAs were accurately listed and whether the records showed quality control inspections were adequately completed and documented according to Commercial Grade Acceptance Requirements (CGARs). The inspection of the adequacy of procurement control documents included a review of selected CRs and ECRs.

Documents and records reviewed in this inspection are listed in the attachment.

(c) Verifications of critical characteristics and dedications of basic components

The inspectors reviewed records for two commercial grade dedication activities involving verification inspections and tests to evaluate whether the documentation was sufficient to demonstrate effective program implementation. In addition, the inspectors reviewed RIRs that were developed to implement the associated CGIEs to verify they were in accordance with PP 9-18, Commercial Grade Item Evaluations.

1) LENTON Mechanical Splices

While reviewing RIRs issued for QL-1 LENTON mechanical splices supplied by commercial grade supplier ERICO, the inspectors noted the documentation included material test reports (MTRs) provided by an unapproved testing facility identified as Tensile Testing Metallurgical Laboratory (TTML). The capability of the testing laboratory had not been verified using an approved 10 CFR Part 50 Appendix B QA process. A LENTON mechanical splice is an engineered device that is designed to splice two reinforcing bars together by using a thread/screw connection.

The CGIE for the LENTON mechanical splices, DCS01-BKA-DS-CGD-M-65831, stated that the critical characteristics of the basic component included material composition consistent with ASTM A29, and mechanical property yield strength, which was required to conform to Section 12.14.3.4 of ACI 349-97, Code Requirements for Nuclear Safety-Related Concrete Structures. As stated in the CGIE, MOX Services was to verify the critical characteristics by performing a commercial grade survey of the manufacturer. The inspectors confirmed that commercial grade survey ERICO-11-VS295 documented that MOX Services performed a commercial grade survey at ERICO; however no commercial grade survey of TTML had been performed by MOX Services or an approved Appendix B supplier. Therefore, MOX Services did not adequately verify the validity of the MTRs received from TTML.

The inspectors noted that MOX Services missed an opportunity to identify and correct this issue during resolution of CR-11-158. This CR documented an NRC violation for commercial grade dedications where the dedications inappropriately credited non-validated certificates of chemical and material properties of mechanical splice connectors manufactured by Barsplice (VIO 70-3098/2011-001-001). CR-11-158 provided an evaluation of all of the RIR dedication records for mechanical splices, including LENTON splice connectors, where commercial grade dedication was used as a basis of acceptance according to CGIE DCS01-BKA-DS-CGD-M-65831. However, the evaluation failed to identify the deficiency with the certificates provided for LENTON mechanical splices. In addition, the applicant missed another opportunity to identify this issue during the performance of internal surveillance SR-QA-11-0028, where auditors

incorrectly concluded that dedications of mechanical splices, including LENTON splices, were adequate.

Interviews with responsible program personnel, including a manager and a qualified lead auditor indicated that some applicant personnel did not possess a complete understanding of the requirement to establish the validity of vendor certificates that are used to verify critical characteristics. In addition, the applicant's staff expressed an incorrect belief that incidental testing that was not specified in the CGIE as a dedication requirement, and, which was performed after items had been received and dedicated, could be credited for commercial grade dedication. For example, the applicant stated that construction specification DCS01-BKA-DS-SPE-B-09330 requires independent testing of LENTON mechanical splices during assembly in the field. The testing was implemented to verify mechanical properties were in accordance with Section 12.14.3.4 of ACI 349-97. However, the specification did not address testing for material composition. Also, the testing was conducted after final dedication had been completed and the test results for mechanical properties were not credited or controlled by the CGIE.

MPQAP, Revision 10, Section 16, Corrective Action, requires, in part, that conditions adverse to quality are promptly identified, documented, classified and corrected as soon as practical.

Contrary to the above, MOX Services failed to identify and correct a condition adverse to quality in which testing to verify critical characteristics related to chemical and physical properties of mechanical splices was not performed by an approved supplier, as required by DCS01-BKA-DS-CGD-M-65831, Commercial Grade Item Evaluation for Mechanical Splices, Revision 3. Specifically, on May 25, 2011, as documented in CR-11-158, MOX Services completed a review of receipt inspection reports of mechanical splices to verify they contained the required documentation, but failed to identify and correct an adverse condition where chemical and physical property testing for LENTON mechanical splices was not performed by an approved supplier.

The failure to identify and correct a condition adverse to quality was considered to be a violation of NRC requirements and is identified as example 1 to VIO 70-3098/2012-001-003, Failure to Identify and Correct Condition Adverse to Quality. This issue was entered into MOX Services corrective action program as CR-12-060.

The issue meets agency guidance for a more than minor violation since it was not an isolated occurrence, and if left uncorrected, it represents a condition adverse to quality that renders the quality of safety-related LENTON mechanical splices unacceptable or indeterminate, and would require detailed engineering justification; redesign; replacement; supplemental examination, inspection, or test for mechanical splices that have been received, accepted, and installed in the plant structures.

2) Hilti Epoxy Adhesives and the Applicability of Using Design Control to Define Critical Characteristics

The inspection scope included a review of commercial grade dedications conducted in accordance with CGIE DCS01-WWJ-DS-CGD-M-65973, Commercial Grade Item Evaluation for Hilti HIT-RE-500 and HIT-RE-500-SD Epoxy Adhesives.

The inspectors noted that 10 CFR 50 Appendix B, Criterion III and MPQAP, Revision 10, Change 1, Section 3, Design Control, Subsection 3.1 stated in part, that controls are established for the selection and suitability of application of design methods, materials, parts, equipment and processes that are essential to the functions of structures, systems and components. Subsection 3.2.5.A further stated, in part, that changes to final designs shall have documented justification for use and are subject to the same design control measures and reviews as those applied to the original design.

Critical characteristics, as defined in 10 CFR 21.3 and in MPQAP 7.2.8 A, are those important design, material, and performance characteristics of a commercial grade item that, once verified, will provide reasonable assurance that the item will perform its intended safety function. The inspectors also noted that in MPQAP Subsection 7.2.8 B, critical characteristics for commercial grade items are determined and approved by the manager responsible for the procurement based on the performance requirements for the item including the intended IROFS safety function.

The inspectors determined that further review by the NRC staff will be necessary to evaluate the applicability of requirements to use design control for the definition of critical characteristics. IFI 70-3098/2012-001-004, Review the Applicability of Using Design Control to Define Critical Characteristics, was opened to further evaluate this condition.

(2) Conclusion

The samples of evaluations and specifications for dedications of commercial grade items selected for this inspection adequately addressed safety functions and critical characteristics of basic components as described in the integrated safety analysis and bases of design. In addition, the definition of commercial grade dedication requirements specified in the sample of procedures and documents reviewed were in accordance with 10 CFR Part 21. No findings of significance were identified for the sample selected for this inspection element.

The samples of procurement documents selected for this inspection adequately incorporated applicable CGD requirements, including CCAs, and were sufficient to communicate requirements for control and dedication of commercial grade items. No findings of significance were identified for the sample selected for this inspection element.

IFI 70-3098/2012-001-004, Review the Applicability of Using Design Control to Define Critical Characteristics, was identified.

c. Quality Assurance: Problem Identification, Resolution, and Corrective Action (IP 88110)

(1) Scope and Observations

The inspectors performed a detailed review of condition reports, QA surveillances and QA audits, generated between January 2011 and January 2012, related to various WP issues. Based on the review, it was apparent that the WP issues, related to missing signatures, missed steps, and inadequate WPs, were being repeatedly identified. Based on the continuing identification of issues in January and February 2012, the inspectors concluded that MOX Services had not been successful in implementing adequate or

timely corrective actions to resolve the work package deficiencies. The following paragraphs detail the various WP deficiencies.

The Shaw/AREVA MOX Services QA Program Report, SQAP-029, covering the period of January 1-March 31, 2011, listed several condition reports related to WP deficiencies. The report stated, "The violation of WPs (e.g., missed steps/signatures/hold points) is a trend issue." It also stated "All of these CRs have been closed. Common to these CRs is a lack of review of other WPs or documentation of the extent of the condition"; "The common corrective action to brief appropriate employees on the contents of the CRs was ineffective"; and "The repetitive failure of the CR Extent of Condition preparation and analysis to identify programmatic corrective actions that would prevent recurrence of an identified adverse condition is a trend issue."

On June 16, 2011, a B level condition report (a significant condition adverse to quality), 10888-MOX-CR-11-341, was initiated for an unfavorable trend, (e.g., violation of WPs (missed steps/signatures/hold points). Corrective actions included developing a contractor discussion checklist for past lessons learned, revise the implementing procedure to make the supervisor responsible for ensuring WPs were kept up to date prior to the start of each day, and revise the training program to cover expectations for documentation requirements. The new training course was not provided and the condition report was closed in October 2011.

The inspectors reviewed QA Audit Report No SA-11-A04 completed on August 24, 2011. The applicant noted that during a review of WPs deficiencies were identified with incomplete WP step sign-offs, missing pour signatures, and rebar cutting was not signed and dated verifying that an engineering evaluation had been performed. The report went on to identify that, "Numerous CRs were found to have inadequate extent of condition and investigation activities performed." Examples used to support this conclusion were CRs related to unrecorded work performed without work steps, WP documentation missing or not complete, inadequate WP verification, lack of documentation, and concrete forms removed without post inspection.

The inspectors also reviewed Surveillance Report QA-11-0499 completed on October 31, 2011. The applicant identified that work instructions were missing from the WP, prerequisite signatures were missing, WP checklists were incomplete, a WP inspection used an obsolete drawing, no inspections to verify drawings and associated ECRs for current revision, as built drawings were included in the WP but were not part of the work instructions or on the checklists, and no requirements for ensuring identification of vendor welds.

From January 1 through March 31, 2012, the inspectors continued to identify inadequate work instructions in that the work instructions did not provide clear and concise acceptance criteria necessary for QC to verify location, orientation, elevation and plumbness of a steel structure. The inspectors also identified that WPs were potentially using incorrect project procedures or specifications for implementing the work. It was noted that guidelines were lacking to adequately define which procedure or specification applied to the equipment installation work. The inspectors noted that WP checklists/attribute sheets and weld data sheets could not be cross correlated with dates of sign off; that there was a misunderstanding in the field on how to effectively execute the piping/support/duct WPs checklist/attribute sheets; WPs were not written with craft and/or supervisory input on sequencing of tasks; signoffs in the WPs were not being

accomplished as the work was being performed; and signoff dates were out of sequence See Section 3 of this IR for additional details).

MPQAP Revision 10, Change 1, Section 16, Corrective Action, states in part, that conditions adverse to quality are promptly identified, documented, classified and corrected as soon as practical. MPQAP, Section 16.2.B.7 requires that for significant conditions adverse to quality that “responsible management shall investigate and determine the extent of the condition and document the results.” MPQAP, Section 16.2.B.8 requires, in part, that responsible management shall determine the root cause and corrective action based on the investigation results.

MPQAP, Section 16.2.1.B, Significant Conditions Adverse to Quality, defines those conditions that represent significant conditions adverse to quality. Part B.vii defines “a deficiency, repetitive in nature, related to an activity or item subject to the MOX Services QA Program” and Part B. viii, defines “a condition that if left uncorrected, has the potential to have a serious negative impact on activities or items subject to the MOX Services QA Program.” As described in other sections of this report, inadequate work procedures and failure to follow work procedures for installation of QL-1 components are considered to be significant conditions adverse to quality.

Contrary to the above, the applicant failed to promptly identify and correct conditions adverse to quality as soon as practical, and for significant conditions adverse to quality, responsible management failed to investigate, determine the extent of condition, and determine the root cause and corrective action based on the investigation results.

Specifically, following identification of an adverse trend, issuance of B level condition reports, and QA Audit findings, throughout 2011, MOX Services failed to perform an appropriate investigation to determine the actual extent of condition of the WP deficiencies and extent of missing signatures and therefore failed to take appropriate corrective actions to correct WP deficiencies and to take corrective actions to ensure that WP documentation was completed as required. The failure to complete an appropriate extent of condition investigation and to correct significant conditions adverse to quality was considered to be a violation of NRC requirements and is identified as example 2 of VIO 70-3098/2012-001-003, Failure to Identify and Correct Significant Conditions Adverse to Quality. This issue was entered into the MOX Services corrective action program as CR-11-665.

The issue meets the agency guidance for a more than minor violation because it is related to the failure to establish, implement, or maintain an adequate process, program, procedure, or quality oversight function that could render the quality of the construction activity unacceptable or indeterminate.

(2) Conclusion

Example 2 of VIO 70-3098/2012-001-003, Failure to Identify and Correct Condition Adverse to Quality was identified for failure to complete an appropriate extent of condition investigation and to correct significant conditions adverse to quality related to WP deficiencies.

5. Follow-up of Previously Identified Items

a. (Closed) VIO 70-3098/2010-001-02, Failure to Ensure that Quality Affecting Activities are Prescribed and Performed with QA Approved Documents

(1) Scope and Observations

VIO 70-3098/2010-001-02 identified that quality affecting activities were not prescribed and/or performed in accordance with documented, approved QA procedures and/or other approved implementing documents appropriate to the MOX Project work scope as noted in the following examples:

- (a) The applicant used non-applicable implementing guidance provided in ECR 00-3281 to improperly exclude non conformances in BAP W-110, which exceeded maximum clear cover requirements. During March 2010, non-conformances with maximum clear cover in BAP W-110 were not documented in the corrective action program because the MOX field engineers and QC personnel believed that the evaluation contained in ECR 00-3281 bounded the non conforming condition. However, ECR 00-3281 only bounded conditions below elevation 0'-0" and the non conformances with BAP W-110 were above elevations 0'-0".
- (b) The applicant failed to implement the requirements of design specification DCS01-BKA-DS-SSPE-B-09330-4, Section 3.3.C.8. During January 2010, the applicant bent and re-bent numerous embedded hook bars in the BAP precast slabs BAP F-123, F-141 and F-150 with temperatures constantly below 60 degrees and did not perform visual inspections following the bending process.
- (c) The applicant failed to provide adequate guidance to ensure that ACI-117, Section 4.1, Deviation from Plumb, was being met. During the week of March 22, 2010, it was noted that BMP wall BMP W-214 was out of plumb by approximately 1.75 inches. Guidance was not provided in the WP to verify vertical alignment during and following the placement.
- (d) The applicant failed to implement procedures for the storage and control of QL-1 backfill material for PSSC-053, Waste Transfer Line. Documentation did not provide adequate guidance and procedures for the storage, control, and protection of QL-1 backfill material. Specifically, the applicant failed to adequately identify and segregate nonconforming soils in that nonconforming soils received from the on-site borrow pit, and stored in the two designated stockpiling areas were not adequately segregated, nor were adequate precautions establish to preclude inadvertent use. As a result, QL-1 backfill material was neither controlled nor stored consistent with the MPQAP and project procedures.

For the abovementioned example (a), the applicant generated CR-10-161 to evaluate the improper use of ECR 00-3281 to exclude nonconforming clear cover identified in BAP W-110. As part of the corrective actions prescribed in this CR, the applicant performed an immediate re-inspection of the walls located in the BAP, clarified the appropriate use of ECR 00-3281, revised the specifications to include additional guidance, performed additional training of QC staff, and revised the QC inspection plan to incorporate revisions to the specification. Based on the review of CR-10-161, associated NCRs, ECRs, and other related documents; the inspectors determined that

the prescribed corrective actions adequately addressed the conditions adverse to quality in accordance with the applicant's corrective action program (CAP).

For the abovementioned example (b), the applicant generated CR-10-058 to evaluate the failure to implement the requirements of design specification DCS01-BKA-DS-SSPE-B-09330-4, which resulted in improper bending of embedded hook bars in the BAP. As part of the corrective actions prescribed in this CR, the applicant performed a root cause analysis which also identified that work was performed without written authorization. To address both issues, the applicant performed an inspection of the bent bars for potential damage, re-communicated the employee roles and responsibilities to engineering, quality control, and construction management, performed a review of related construction procedures and specifications, revised the concrete and reinforcing steel specification to address work authorizations, and performed additional training for all field personnel. Based on the review of CR-10-058, associated NCRs, ECRs, and other related documents; the inspectors determined that the prescribed corrective actions adequately addressed the conditions adverse to quality in accordance with the applicant's CAP.

For the abovementioned example (c), the applicant generated CR-10-173 to evaluate the failure to provide adequate guidance to ensure that ACI-117, Section 4.1, Deviation from Plumb, was being met. As part of the corrective actions prescribed in this CR, the applicant initiated NCR CE-10-1810 to document existing out of tolerance walls, updated project specifications to incorporate ACI tolerances not previously included, revised project procedures to incorporate updated tolerances, and added provisions to project procedures to monitor concrete formwork prior to and after concrete placement. Based on the review of CR-10-173, associated NCRs, ECRs, and other related documents; the inspectors determined that the prescribed corrective actions adequately addressed the conditions adverse to quality in accordance with the applicant's CAP.

For the abovementioned example (d), the applicant generated CR-10-101 to evaluate the failure to implement procedures for the storage and control of QL-1 backfill material for PSSC-053. As part of the corrective actions prescribed in this CR, the applicant added supplemental guidance to existing WPs to address storage and handling requirements until a project procedure was developed, developed procedure PP11-27, Excavation, Control and Placement of Backfill Materials to address storage and handling for future backfill operations, and performed a review of previously placed materials. Based on the review of CR-10-101, associated NCRs, ECRs, and other related documents; the inspectors determined that the prescribed corrective actions adequately addressed the conditions adverse to quality in accordance with the applicant's CAP.

(2) Conclusions

VIO 70-3098/2010-001-02, Failure to Ensure that Quality Affecting Activities are Prescribed and Performed with QA Approved Documents, is closed based on the review of the associated documentation and implemented corrective actions.

b. (Closed) VIO 70-3098/2009-010-02, Failure to Perform Quality Affecting Activities in Accordance with Approved Implementing Drawings and Specifications

(1) Scope and Observations

VIO 70-3098/2009-010-02 was identified because the applicant failed to perform quality affecting activities in accordance with approved implementing drawings and specifications appropriate to the MFFF Project work scope, as required by the MPQAP, Revision 6, Change 1, Section 5, as noted in the following examples:

- (a) Specifically, the vertical reinforcement for column N10 was placed up to 3 inches from the column ties (required to be less than 1 inch) and the vertical reinforcement for column M10A was placed up to 3 inches from the column ties (required to be less than ½ inch). The vertical rebar were not installed in accordance with Detail 1 of Design Drawing DCS01-BMF-DS-PLF-01352 SH2, Revision 6.
- (b) On March 18, 2009, the applicant failed to ensure that rebar was installed, for wall placement BMP W-117-line 2, within the tolerances specified in ACI 349-97, Section 7.5.2. Specifically, the vertical and horizontal reinforcement was designed to provide 2.5 inches \pm ½ inch of clear cover, while the actual clear cover provided was 4.5 inches.
- (c) On April 22, 2009, the applicant failed to ensure that the minimum clear spacing of the reinforcement in elevated floor placement BMP F-126 was not less than 1 inch, as required by ACI 349-97, Section 7.6, Spacing Limits for Reinforcement, Sub-section 7.6.1. Specifically, ten or more pieces of rebar in this placement had less than 1 inch clearance between the parallel bars, and some had no clearance between the parallel bars.

As documented in inspection report number 70-3098/2011-004, the inspectors reviewed a broad sample of condition reports, non-conformance reports, and engineering change requests associated with the abovementioned examples and determined that the applicant's corrective actions associated for examples (a) and (c) adequately addressed the conditions adverse to quality in accordance with the applicant's CAP; however, additional information was required from the applicant to complete the evaluation of corrective actions associated with example (b). As a result, VIO 70-3098/2009-010-02 was left open pending further review.

Subsequently, the applicant revised ECR-002882 and initiated CR-11-593, CR-11-729 and ECR-014588, providing additional information concerning corrective actions associated with the abovementioned example (b). The inspectors reviewed these documents, as well as, ECR-011013 to evaluate the corrective actions prescribed in CR-2009-0104. Based on a review of CR-2009-0104 and supporting information, including the relevant documents listed in IR 70-3098/2011-004, the inspectors determined that the applicant's corrective actions prescribed in CR-2009-0104 adequately evaluated the conditions adverse to quality in accordance with the applicant's CAP.

(2) Conclusions

VIO 70-3098/2009-010-02, Failure to Perform Quality Affecting Activities in Accordance with Approved Implementing Drawings and Specifications, is closed based on review of associated documentation and implemented corrective actions.

- c. (Discussed) VIO 70-3098/2010-002-004, Inadequate CGD of QL-1 Materials

(1) Scope and Observations

VIO 70-3098/2010-002-004 involved MOX Services failure to perform or verify that the required inspection and/or testing were accomplished to assure conformance with critical characteristics. In addition, the applicant failed to perform evaluations of received items and services, as necessary upon delivery or completion, to ensure that requirements specified in procurement documents were met. The applicant also failed to determine that inspection and/or testing was accomplished as required, to assure conformance with critical characteristics and that documentation, as applicable to the item, was received and acceptable. This was documented in NRC IR 70-3098/2010-002.

For the above mentioned violation MOX Services generated CR 10-312. Due to the complexity and extent of corrective actions for this issue, the inspectors determined that additional review was needed.

(2) Conclusions

VIO 70-3098/2010-002-004, Inadequate CGD of QL-1 Materials, will remain open to facilitate additional review.

6. Exit Interviews

The inspection scope and results were summarized throughout this reporting period and by regional inspectors on February 13, 2012, and by the senior resident inspector on April 11, 2012. No dissenting comments were received from the applicant. Although proprietary documents and processes may have been reviewed during this inspection, the proprietary nature of these documents or processes was not included in the report.

SUPPLEMENTAL INFORMATION

1. PARTIAL LIST OF PERSONS CONTACTED

MOX Services

R. Alley, Engineering Assurance Manager
H. Baldner, Regulatory Compliance
F. Cater, NRC Interface & Issue Management / Equipment Qualification Manager
E. Chassard, Executive Vice President
J. Creech, Chemical/Mechanical Design
R. Gunnels, Quality Control
D. Gwyn, Licensing Manager
D. Ivey, Quality Assurance/ Quality Control Manager
D. Kehoe, Quality Assurance
J. Keklak, Quality Assurance
H. Lopez, Procurement
M. Maier, Commercial Grade Dedication
M. Mamo, Commercial Grade Dedication
J. O'Dell, Compliance Manager
A. Olorunniwo, Civil/Structural Manager
J. Peregoy, Quality Control Manager
M. Peters, Batch Plant Manager
B. Skinner, Fabrication Engineer
K. Trice, MOX President
C. Ward, Technical Programs
R. Whitley, Vice President Project Assurance
L. Wood, Document Control Manager

2. INSPECTION PROCEDURES (IPs) USED

IP 88106	Quality Assurance: Program Development and Implementation (Pre-licensing and Construction)
IP 88108	Control of Materials, Equipment, and Services
IP 88110	Quality Assurance: Problem Identification, Resolution, and Corrective Action
IP 88116	Inspection of Safety Function Interfaces for the Mixed Oxide Fuel Fabrication Facility (Pre-Licensing and Construction)
IP 88130	Resident Inspection Program For On-Site Construction Activities at the Mixed-Oxide Fuel Fabrication Facility
IP 88132	Structural Concrete Activities
IP 88134	Piping Systems Relied on for Safety
IP 88136	Mechanical Components
IP 88143	Pipe Supports and Restraints

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

<u>Item Number</u>	<u>Status</u>	<u>Description</u>
VIO 70-3098/2012-001-01	Open	Five Examples for Failure to Provide Work Documents Appropriate to the Nature and Circumstances of the Work being Performed and to Perform Quality-Affecting Work Activities in accordance with Approved Implementing Documents (Sections 3.a, 3.b, 3.c, 3.d, and 3.e)
VIO 70-3098/2012-001-02	Open	Two Examples of Failure to Identify Adequate Critical Characteristics (Sections 3.f and 3.g)
VIO 70-3098/2012-001-03	Open	Two Examples of Failure to Identify and Correct Significant Conditions Adverse to Quality (Sections 4.b.(1)(c)1) and 4.c)
IFI 70-3098/2012-001-04	Open	Review the Applicability of Using Design Control to Define Critical Characteristics (Section 4.b.(1)(c)2))
VIO 70-3098/2010-001-02	Closed	Failure to Ensure that Quality Affecting Activities are Prescribed and Performed with QA Approved Documents (Section 5.a)
VIO 70-3098/2009-010-02	Closed	Failure to Perform Quality Affecting Activities in Accordance with Approved Implementing Drawings and Specifications (Section 5.b)
VIO 70-3098/2009-010-02	Reviewed	Inadequate CGD of QL-1 Materials (Section 5.c)

4. LIST OF ACRONYMS USED

°F	Degrees Fahrenheit
ACI	American Concrete Institute
ADAMS	Agency-Wide Document Access and Management System
ANSI/AISC	American National Standards Institute/ American Institute for Steel Construction
AP	Aqueous Polishing
ASL	Approved Supplier List
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials

AWS	American Welding Society
BAP	Aqueous Polishing Building
BMP	MOX Manufacturing Building
BOD	Bases of Design
BSR	Shipping and Receiving Building
CA	Construction Authorization
CAP	Corrective Action Program
CAR	Construction Authorization Request
CCA	Critical Characteristics for Acceptance
CFR	Code of Federal Regulations
CGAR	Commercial Grade Acceptance Requirement
CGD	Commercial Grade Dedication
CGIE	Commercial Grade Item Evaluation
CIB1, 2, 3	Construction Inspection Branch 1, 2, or 3
CMTR	Certified Material Test Report
CPB1	Construction Projects Branch 1
CR	Condition Report
DCI	Division of Construction Inspection
DPC	Division of Construction Projects
DRD	Design Requirements Document
ECR	Engineering Change Request
FTS	Fluid Transport System
HVAC	Heating Ventilation and Air Conditioning
IFI	Inspector Follow-up Item
IGA	Intergranular Attack
IGSCC	Intergranular Stress Corrosion Cracking
IP	Inspection Procedure
IR	Inspection Report
IROFS	Items Relied on for Safety
ISA	Integrated Safety Analysis
ISAS	Integrated Safety Analysis Summary
LA	License Application
MFFF	MOX Fuel Fabrication Facility
MOX	Mixed Oxide
MOX Services	Shaw AREVA MOX Services
MPQAP	MOX Project Quality Assurance Plan
MTR	Material Test Reports
NCR	Non-conformance Report
NPG/NPH	Homogenizing and Pelletizing Unit
NOV	Notice of Violation
NQA-1	Quality Assurance Requirements for Nuclear Facilities Applications
NRC	Nuclear Regulatory Commission
PAF	Process Assembly Facility
PDR	Public Document Room
PP	Project Procedure
Psi	Pounds per Square Inch
PSSC	Principle System, Structure, and Component
QA	Quality Assurance
QAP	Quality Assurance Plan
QC	Quality Control

QL	Quality Level
QL-1	Quality Level 1
Rebar	Reinforcing bar
RIR	Receipt Inspection Report
RII	Region II
S&ME	Soils and Materials Engineering, Inc.
SCAQ	Significant Condition Adverse to Quality
SDR	Supplier Deficiency Report
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SQAP	Shaw/AREVA MOX Services Quality Assurance Program
SRD	Safety Requirements Document
SSCs	Systems, Structures, and Components
TBV	To Be Verified
TTML	Tensile Testing Metallurgical Laboratory
VIO	Violation
WP	Work Package

5. **LIST OF PSSCs REVIEWED**

PSSC-009	Criticality Controls
PSSC-021	Fire Barriers
PSSC-023	Fluid Transport Systems
PSSC-036	MOX Fuel Fabrication Building Structure (including vent stack)
PSSC-050	Supply Air System

6. **RECORDS AND DOCUMENTS REVIEWED**

Procedures

PP3-6	Corrective Action Process, Revision 14
PP8-6	Licensing Basis Configuration Management, Revision 5
PP9-3	Design Control, Revision 19
PP9-18	Commercial Grade Item Evaluations
PP9-21	Engineering Change Request, Revision 8
PP9-27	Technical Acquisition Strategy & Evaluation of Digital Equipment with Embedded, Software for IROFS Applications, Revision 1
PP9-32	Equipment Qualification, Revision 1
PP10-0	ICN-01, Integrated Procurement Process and Overview, Revision 1
PP10-8	ICN 01, Requisitioning Items & Services, Revision 9
PP10-35	QA Requirements for Procurement Actions, Revision 0
PP11-12	Placement of Concrete, Embedded Structural Items, and Accessories, Rev. 1
PP11-27	Excavation, Control and Placement of Backfill Material, Revision 0
PP11-37	HVAC Ductwork Field Fabrication and Installation for Nuclear Clean Air Systems
PP11-38	HVAC Duct and Equipment Support Fabrication, Modification, and Installation
PP11-44	Work Package Planning, Development, Approval, and Closure, Revision 6

PP11-74 Piping Support Installation, Revision 0
 PP11-77 Mechanical & Electrical Equipment Installation, Revision 0

Procurement Documents

Approved Suppliers List, dated January 1, 2012
 Approved Commercial Grade Vendors List, dated January 12, 2012
 Procurement Specification for QL-1 Electrical Cabinets, dated January 27, 2011
 Procurement Specification, DCS01-EEJ-DS-CCT-E-5006-3; MFFF Process Glovebox
 Gloveport Assemblies (screw & welded type), DCS01-ZMJ-DS-CCT-M-40500-1,
 dated May 15, 2008
 RIR Inspection Summary, QC-RIR-10-08919, Grounding Plates, PO P-4633
 RIR Inspection Summary, QC-RIR-10-15430, for PO # 6224, Revision 0
 RIR Inspection Summary, QC-RIR-11-16645, Control Cable, PO M-6396-3
 RIR Inspection Summary, QC-RIR-11-16786, Grounding Cell Ring, PO 1417, Rel 003
 RIR Inspection Summary, QC-RIR-11-17553, Electrical Connector, PO 6419 Revision 1
 RIR Inspection Summary, QC-RIR-11-19432, Electrical Connector, PO 6419
 RIR Inspection Summary, QC-RIR-11-20660, for PO # 6224, Revision 0
 RIR Inspection Summary, QC-RIR-11-24625, Grounding Cable & Materials, PO 4950
 RIR Inspection Summary, QC-RIR-11-25281, Electrical Cable, PO O-38445 TOR 011,
 Revision 2
 RIR Inspection Summary, QC-RIR-11-26474, Grounding Cell Ring, PO B-1417, Rel 006
 RIR Inspection Summary, QC-RIR-11-26758, for PO # 6883, Revision 0
 RIR Inspection Summary, QC-RIR-11-26902, for PO # 7609, Revision 0
 RIR Inspection Summary, QC-RIR-12-28743, for PO # 7609, Revision 1

Audits and Assessments

Internal Audit Report SA-10-A07, Procurement, dated February 24, 2011
 Internal Audit Report SA-11-A02, QC Programs and Activities, dated June 20, 2011
 Internal Surveillance Report SR-QA-11-0028, Verify Applicable Requirements were
 Captured in CGD Plan for Mechanical Splices, dated March 21, 2011
 Supplier Audit Report SOURIAU-10-VE16, Souriau S.A.S., dated April 19, 2010
 Supplier Audit Report SMCI-09-VE38, Specialty Maintenance and Construction, Inc.
 (SMCI), dated May 27, 2009
 Commercial Grade Survey Erico-11-VS295 of ERICO, November 15-17, 2011
 Commercial Grade Survey HIL-11-VE128 of Hilti Entwicklungsgesellschaft MBH, 24-25
 January 2011
 Commercial Grade Survey LCI-11-VE22, Getinge La Calhene, Inc., dated April 2, 2011
 Commercial Grade Survey MECA-11-VS167, Mecachime (Cedex, FR) and Mecagest
 (Vicomte and Valognes, FR), dated May 12, 2011
 Commercial Grade Survey OST-08-VE160, Osterwalder, AG, dated February 19, 2009
 Commercial Grade Survey KTR-09-VE70, K-Tron AG, dated October 15, 2010

Commercial Grade Acceptance Requirements

CGAR 65848C, Simple Electrical Components
 CGAR 65848E, Simple Electrical Components
 CGAR 65848B, Simple Electrical Components
 CGAR 65884A, Electrical Control Panels
 CGAR 65946A, Continuous Flex Cable for Chains Inside Gloveboxes

Commercial Grade Item Evaluations

CGIE DCS01-ASI-DS-CDG-R-65815-2, Inergen Extinguishing System, (PSSCs 21 and 22)

CGIE DCS01-BKA-DS-CGD-M-65831, ERICO LENTON Mechanical Splices, Revision 4

CGIE DCS01-EEJ-DS-CGD-E-25208-2; MFFF Grounding cable and material, Q L-1 IROFS, dated November 28, 2007

CGIE DCS01-EEJ-DS-CGD-E-65812-1, Internal Glove box Connector and Receptacles, (PSSC24)

CGIE DSC01-EEJ-DS-CGD-C-65943-1, Pressure Systems Inc. Series 28 Pressure Transmitter, (PSSC 33)

CGIE DCS01-EEJ-DS-CGD-E-65946-2; Continuous Flex Cable for Chains Inside Gloveboxes, Q L-1 IROFS, dated December 12, 2011

CGIE DCS01-FDP-DS-CGD-C-65915-0, Fire Detection and Alarm System Design and Components, (PSSC 21, 22)

CGIE DCS01-WWJ-DS-CGD-M-65973, Hilti HIT-RE-500 and HIT-RE-500-SD Epoxy Adhesives, Revisions. 2 and 3

CGIE DCS01-ZMJ-AG-CGD-E-65848-1, Simple Electrical Components, dated April 16, 2010

CGIE DCS01-ZMJ-DS-CGD-E-65884-3; Electrical Panels, Q L-1 IROFS, dated December 2, 2010

CGIE DCS01-ZMJ-DS-CDG-M-65802-5, MFFFF Process Glovebox Gloveport Assemblies (Screw and Weld Type), (PSSC24)

CGIE DCS01-ZMJ-DS-CGD-M-65804-A, MFFF Polycarbonate Glovebox Window Panels, (PSSC 24)

CGIE DSC01-ZMJ-DS-CGD-M-65817-2, KDA/KDM Dosing Hopper Assembly, dated August 13, 2009

CGIE DCS01-ZMJ-DS-CGD-M-65835-0, Long Lead Equipment, dated November 30, 2008

CGIE DCS01-ZMJ-DS-CDG-M-65879-0, Neutron Absorbing Resin, (PSSC 9)

CGIE DCS02 ZMJ-DS-CGD-M-65901, Mettler Toledo Weigh Scales (PSSC 9)

CGIE DCS01-ZMJ-DS-CDG-M-65964-4, S30403 (304L), S31603 (316L), Incology & Titanium Grade 2 Metallic Standard Forms Used in Fluid Transport System Applications, (PSSC 23)

Specifications

DCS01-BKA-DS-SPE-B-09330, Placing Concrete and Reinforcing Steel for Quality Level 1, 2, 3 & 4, Revisions 4 and 6

DCS01-ZMS-DS-SPE-M-15145

Work Packages

WP 12-CP23-B143-MDE-T-M-001

WP 12-CP23-B138-HAS-T-M-001

WP 10-CP27-C133-ZMS-S-M-001B

WP 10-CP27-C133-ZMS-S-M-001C

WP 10-CP27-C133-ZMS-S-M-001E

WP 10-CP27-C133-ZMS-S-M-0004

WP 10-CP27-C133-ZMS-S-M-0005

WP 11-CP23-B102-HAS-S-M-004

Condition Reports (CR):

- 10888-MOX-CR-12-012, CGD of Flexible Cable Inside Glove Boxes, dated November 10, 2011
- 10888-MOX-CR-12-050, (NRC Identified) CGIE did not identify IROFS safety function
- 10888-MOX-CR-12-055, (NRC Identified) Failure to implement Commercial Grade Acceptance Requirements, dated February 2, 2012
- 10888-MOX-CR-12-057, (NRC Identified) Failure to provide technical justification
- 10888-MOX-CR-12-060, (NRC Identified) Failure to validate material test report
- 10888-MOX-CR-11-081, CGIEs do not assure basis of design are met, dated February 14, 2011
- 10888-MOX-CR-11-158, NRC Violation – Testing of chemical and physical properties of Barsplice connectors by unapproved vendor, dated May 25, 2011
- 10888-MOX-CR-11-384, CGIE not capturing all of the MOX requirements, dated June 30, 2011
- 10888-MOX-CR-11-593, Incorrect reference to ECR to qualify clear cover violation
- 10888-MOX-CR-11-799, Clarification
- 10888-MOX-CR-10-058, Unspecified Handling of Reinforcing
- 10888-MOX-CR-10-101, CGD for underground Utilities Backfill Applications
- 10888-MOX-CR-10-126, Inadequate review of Vendor Submittals
- 10888-MOX-CR-10-130, Acceptance of Soils testing Reports
- 10888-MOX-CR-10-156, Unit Weight Requirements for Select Structural Fill (QL1 Activities)
- 10888-MOX-CR-10-161, Nonconforming Clear Cover Issues in the BAP
- 10888-MOX-CR-10-173, ACI 117 Tolerances
- 10888-MOX-CR-10-180, Soli test Requirements Missed in Spec
- 10888-MOX-CR-10-312, (NRC Identified) Inadequate verification of CGD critical characteristics of materials, dated June 25, 2010
- 10888-MOX-CR-10-399, Cumulative Effect of Structural Issues on ANSYS Model
- 10888-MOX-CR-09-390, CGD Surveillance; SR-QA-09-0352, dated October 19, 2009
- CR 20090050, Column N10 dowels misplaced
- CR 20090104, Nonconforming clear cover of wall reinforcement in BMP placement W121
- CR 20090159, Nonconforming clear cover of wall reinforcement in placement BSR-108
- CR 20090244, Clear spacing of wall reinforcement
- CR 20090104, Nonconforming clear cover of wall reinforcement in BMP placement W121
- CR 20090159, Nonconforming clear cover of wall reinforcement in placement BSR-108

Engineering Change Request (ECR):

- ECR 001512, Cadweld Weld Metal Size CGI Dedication Plan Enhancement, dated December 16, 2008
- ECR 002856, Change page numbers on CGI Dedication Plan, dated May 26, 2009
- ECR 005250, Revise Section 2.4 of DCS01-EEJ-DS0CGD0E-25208-2, dated January 18, 2010
- ECR 005586, Revise Appendix A of DCS01-EEJ-DS0CGD0E-25208-2, dated February 8, 2010
- ECR 007353, PSI Flexible Cable Replacements, dated November 1, 2010

- ECR 008565, Revise Procurement Specification 40500-1 to incorporate revised CGD, dated September 15, 2010
- ECR-010115, Revise Material Verification Requirements in Procurement Specification for KDA/KDM Dosing Hopper Assemblies, dated December 13, 2010
- ECR-011298, Clarification of Procurement Specification for QL-1 Electrical Cabinets, dated March 15, 2011
- ECR-006453, Tolerance for Vertical and Lateral Alignment of Walls, Revision 0
- ECR-011566, Elevation of Sampled Walls Built Out of Plumb, Revision 0
- ECR-6415, Revision to DCS01-WRT-DS-SPE-B-09370 to Include Unit Weight Requirements, Revision 4
- ECR-1789, LTP Changes to SPLC Override Terminology, Revision 0
- ECR-6190, Disposition NCR EN-10-1733, Revision 2
- ECR-6384, BAP-W109.2 Vertical Wall Dowel Clear Cover Along B, C, 3.9 and 4.8 at Elevation 0, Revision 0
- ECR-6666, Qualification and Acceptance of BAP Wall 3.4 (B-E) Elev. 0'-00" to 17'-6" for Pour W111 and W112 for Disposition of NCR QC-10-1770, Revision 0
- ECR-4753, Group Penetration had to be added for Ease of Rebar Placement. Pour BAP W111, Revision 4
- ECR-6484, (BAP W108A.4, W109.1.2) Disposition of NCR Numbers 1774, 1775, and 1776, Revision 0
- ECR-3281, Qualification of All the BAP Critical Walls at Elev. -17'-6" and at Elev. 0'-0" for Clear Cover Violation, Revision 2
- ECR-001833, Column Correction in BMP W120, Revision 2
- ECR-002882, Qualification of all the BMP walls between Elevation 0'-0" to 23'-0" for clear cover violation, Revision 1
- ECR-001804, Revise Minimum Clear Cover to Include Tolerances set forth in ACI 117-90, Revision 1
- ECR-002249, (BMP W112) 24" wall @ Col. 2, El. 0'-0"; 24" Wall @ Col. 3, El. 0'-0"; 12" Wall @ Col. 2-3&N-P, El. 0'-0". Revision 1
- ECR-006666, Qualification & acceptance of BAP Wall 3.4 (B-E) Elev. 0'-0" to 17'-6" for pour W111 & W112 for Disposition of NCR QC-10-1770
- ECR-003535, Column H8 from 0'-0" to 23'-4", Revision 1
- ECR-002864, Clear cover violation of wall at Column line K.3 between line 2 and 4
- ECR-002612, Clear cover violation of wall at Column line 7.2 between Column line L and M (Pour BMP W-122A)
- ECR-001566, BMP Pipe Encasement Rebar Congestion
- ECR-002882, Qualification of all the BMP walls between Elevation 0'-0" to 23'-0" for clear cover violation, Revision 3
- ECR-001804, Revise Minimum Clear Cover to Include Tolerances set forth in ACI 117-90, Revision 1
- ECR-002249, (BMP W112) 24" wall @ Col. 2, El. 0'-0"; 24" Wall @ Col. 3, El. 0'-0"; 12" Wall @ Col. 2-3&N-P, El. 0'-0". Revision 1
- ECR-005957, Rebar Modification for Wall 3, BMP Pour F123 @ Column Line 4.1, Revision 0
- ECR-011013, Update to Attachment F & G of DCS01-XGA-DS-CAL-B-01064-01, Revision 3
- ECR-014588, Wall Qualification of BMP Wall 4.1 (J to K) @ Elev. 0'-0" BMP Pour W128 and W123, Revision 2

Nonconformance Reports

MOX-AT-11-1860, Continuous Flex Cable for Cable Chains Inside Gloveboxes
 NCR QC-11-3528, Electrical Cabinets, dated September 22, 2011
 CE-10-1810, Vertical Alignment of Cast in Place Conc./ACI 117 Section 4.1
 CE-10-1898, ECR-6453
 CE-10-1798, Minimum Clear Cover Due to Wall Dowel Placement
 QC-10-1748, Section 02316 – Excavation, Backfilling, and Compaction of Utilities QL 2,
 DCS01-WRT-DS-SPE-B-09307-2
 EN-10-1737, DCS01-WRT-DS-SPE-B-09307
 CE-10-1789, DCS01-ZMS-DS-CAL-M-12093
 QC-10-1767, Rebar, Excessive Clear Cover
 QC-10-1768, Rebar, Excessive Clear Cover
 QC-10-1769, Rebar, Excessive Clear Cover
 QC-10-1770, Rebar, Excessive Clear Cover
 QC-10-1771, Rebar, Excessive Clear Cover
 QC-10-1774, Rebar, Clear Cover
 QC-10-1775-S, Rebar, Clear Cover
 QC-10-1776, Rebar, Clear Cover
 QC-10-1777, Rebar, Clear Cover
 EN-09-0632, Some of the vertical bars for BMP columns N10 and M10A coming out of
 pour F-111 are not spaced properly within column horizontal ties. This creates a
 rebar spacing violation
 CE-09-0896-S, One (1) column in the BMP W122A pour violate the clear cover
 requirements specified in ECR 1804 Revision 1
 QC-10-1770, Maximum Clear Cover has been violated in various areas along 3.4 Line
 between E Line and B Line at Elevation 0'0"
 CE-09-0799, Maximum Concrete Clear Cover/DCS01-BKA-DS-SPE-B-09330, Revision
 2
 QC-10-1652, Maximum Clear Cover Violation, Revision 0

Specifications

DCS01-BKA-DS-SPE-B-09330, Placing Concrete and Reinforcing Steel for Quality Level
 1, 2, 3 & 4, Revisions 4 and 6

Miscellaneous Documents

Root Cause Analysis – RCA-10-001
 Inspection Plan #C112, Placing Concrete and Reinforcing Steel, Revision 14
 DCS01-BKA-DS-SPE-B-09330, Placing Concrete and Reinforced Steel, Revision 6