



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

April 29, 2016

Mr. David Del Vecchio
President and Chief Operating Officer
CB&I AREVA MOX Services
Savannah River Site
P.O. Box 7097
Aiken, SC 29804-7097

**SUBJECT: MIXED OXIDE FUEL FABRICATION FACILITY- NRC INSPECTION REPORT
NUMBER 70-3098/2016-001**

Dear Mr. Del Vecchio:

During the period from January 1 through March 31, 2016, the U. S. Nuclear Regulatory Commission (NRC) completed inspections pertaining to the construction of the Mixed Oxide Fuel Fabrication Facility. The purpose of the inspections was to determine whether activities authorized by the construction authorization and license application 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 and license application as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your authorization. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, the enclosed report documents findings which were determined to involve violations of NRC requirements. However, because these findings were Severity Level (SL) IV violations and were entered into your corrective action program, the NRC is treating them as a non-cited violations (NCVs) consistent with Section 2.3.2 of the NRC Enforcement Policy. The NCVs are described in the subject inspection report. If you contest the NCVs or the significance of the NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the United States Nuclear Regulatory Commission, ATTENTION: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Senior Resident Inspector at the MFFF.

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

Sincerely,

/RA/

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

Docket No. 70-3098

Construction Authorization No.: CAMOX-001

Enclosure: NRC Inspection Report No. 70-3098/2016-001
w/attachment: Supplemental Information

cc w/encl: (See next page)

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SIGNATURE	/RA/	/RA via email/	/RA/		/RA/	
NAME	W. Gloersen	C. Huffman	D. Harmon		D. Seymour	
DATE	4/28/2016	4/28/2016	4/28/2016		4/28/2016	
E-MAIL COPY?						

cc w/encl:

Mr. Scott Cannon, Federal Project Director
NA-262.1
P.O. Box A
Aiken, SC 29802

Ms. Joyce Connery, Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Ave., NW, Suite 700
Washington, DC 20004

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

Ms. Susan Jenkins
Division of Radioactive Waste Management
Bureau of Health and Environmental Control
2600 Bull St.
Columbia, SC 29201

D. Silverman
Morgan, Lewis, and Bockius
1111 Penn. Ave., NW
Washington, DC 20004

G. Carroll
Nuclear Watch South
P.O. Box 8574
Atlanta, GA 30306

Ms. Diane Curran
Harmon, Curran, Spielburg and Eisenberg, LLP
1726 M St., NW, Suite 600
Washington, DC 20036

L. Zeller
Blue Ridge Environmental Defense League
P.O. Box 88
Glendale Springs, NC 28629

Mr. Dealis Gwyn, Licensing Manager
CB&I AREVA MOX Services
Savannah River Site
P.O. Box 7097
Aiken, SC 29804-7097

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 70-3098

Construction
Authorization No.: CAMOX-001

Report No.: 70-3098/2016-001

Applicant: CB&I AREVA MOX Services

Location: Savannah River Site
Aiken, South Carolina

Inspection Dates: January 1 – March 31, 2016

Inspectors: C. Huffman, Senior Resident Inspector, Division of Construction
Projects (DCP)
W. Gloersen, Senior Project Inspector, DCP
D. Harmon, Construction Inspector, Division of Construction
Inspection

Accompanying Personnel: W. Jones, Director, DCP
C. Regan, Acting Deputy Director, DCP

Approved by: D. Seymour, Chief
Construction Projects Branch 1
Division of Construction Project

Enclosure

EXECUTIVE SUMMARY

CB&I AREVA MOX Services (MOX Services)
Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF)
NRC Inspection Report (IR) Number (No.) 70-3098/2016-001

The scope of the inspections encompassed a review of various MFFF activities related to Quality Level (QL)-1 (safety-related) construction for conformance to U.S. Nuclear Regulatory Commission (NRC) regulations, the Construction Authorization Request (CAR), the MOX Project Quality Assurance Plan (MPQAP), applicable sections of the license application and applicable industry codes and standards. This inspection included, as applicable, the following inspection attributes: corrective action program, design control, special processes, procedures, and installation.

Routine Resident Inspections

The inspectors routinely attended the applicant's weekly construction status meetings, reviewed the status of work packages maintained at various work sites, conducted daily tours of work and material storage areas, observed installation of mechanical equipment, and reviewed various corrective action documents to assess the adequacy of the MOX Services' corrective action program. Except as noted below, construction activities were performed in a safe and quality-related manner. No findings of significance were identified (Section 2).

PSSC Inspections

PSSC-021, Fire Barriers

The inspectors observed construction activities related to Principle System, Structure, and Component (PSSC)-021, Fire Barriers, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were design control and special processes. The associated items relied on for safety (IROFS) components were pellet handling unit (PML) fire doors to be installed in the MOX Process Building (BMP). The detailed inspection activities identified Non-cited Violation (NCV) 70-3098/2016-01-03, *Failure to Maintain Design Control for Structural Steel Anchorage*. This NCV is associated with the inadequate design control activities of Engineering Change Request (ECR)-008080 which resulted in the fabrication by welding of safety-related structural steel fire doors and their concrete anchors that were not designed or fabricated in accordance with the American Welding Society (AWS) D1.6, *Structural Welding Code – Stainless Steel*, minimum fillet weld sizes for small diameter studs (Section 3.a).

PSSC-041, Process Cells

The inspectors reviewed construction activities related to PSSC-041, Process Cells, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were design control, procedures, special processes and installation. The associated IROFS component was the support structure for demister (DMST) 2310 in Room C-234. The detailed inspection activities identified NCV 70-3098/2016-01-01, *Failure to Maintain Design Control for Structural Steel Welding*. This NCV is associated with the inadequate design control activities of Field Change Request (FCR)-004483 which resulted in the fabrication by welding of safety-related structural steel built up members that were not designed or fabricated in accordance with the AWS D1.6 prohibited joint design requirements (Section 3.b).

PSSC-050, Supply Air System

The inspectors observed construction activities related to PSSC-050, Supply Air System, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation. The associated IROFS component was heating, ventilation, and air conditioning (HVAC) Supply Air System (HSA). Specifically, the inspectors observed installed ductwork and associated supports and reviewed documentation associated with its installation and inspection. The detailed inspection activities identified NCV 70-3098/2016-01-02, *Failure to Meet IROFS Ductwork Bolted Connection Requirements*, associated with HSA ductwork; and NCV 70-3098/2016-01-04, *Failure to Maintain Appropriate Controls for the Inspection Planning of QL-1 Systems, Components and Structures* (Section 3.c).

PSSC-023, Fluid Transport Systems

The inspectors observed construction activities related to PSSC-023, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation. The associated IROFS component was Active Gallery, Aqueous Polishing Building (BAP), and room C-134 piping and pipe supports. Specifically, the inspectors observed installed piping and pipe support frames and reviewed documentation associated with its installation and inspection. No findings of significance were identified (Section 3.d).

PSSC-004, C2 Confinement System Passive Barrier

The inspectors observed construction activities related to PSSC-004, C2 Confinement System Passive Barrier, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation. The associated IROFS component was BMP Medium Depressurization Exhaust (MDE) HVAC commodities. Specifically, the inspectors observed installed ductwork and ductwork supports and reviewed documentation associated with its installation and inspection. No findings of significance were identified (Section 3.e).

PSSC-005, C3 Confinement System

The inspectors observed construction activities associated with PSSC-005, C3 Confinement System, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were installation and special processes. The associated IROFS component was high depressurization exhaust (HDE) filter housing FLU0004B. Specifically, the inspectors observed welding installation of HDE filter housing FLU0004B. The observed activities were performed in accordance with the applicable codes, procedures and quality requirements. No findings of significance were identified (Section 3.f).

PSSC-024, Gloveboxes

The inspectors reviewed construction activities related to PSSC-024, Gloveboxes, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were fabrication, vendor oversight, and special processes. The associated IROFS component was glovebox NXR-1000. Specifically, the inspectors reviewed welding and other fabrication documents associated with the vendor's fabrication of glovebox NXR-1000. The glovebox welds and associated records met the applicable code, procurement, and quality requirements. No findings of significance were identified (Section 3.g).

PSSC-10, Double Walled Pipe

The inspectors reviewed construction activities related to PSSC-10, Double Walled Pipe, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were fabrication, vendor oversight, and special processes. The associated IROFS component were Demisters (DMSTs) 1400 and 2310. Specifically, the inspectors reviewed welding and other fabrication documents associated with the vendor's fabrication of DMSTs 1400 and 2310. The demister welds and associated records were found to meet the applicable code, procurement, and quality requirements. No findings of significance were identified (Section 3.h).

PSSC-03, Backflow Prevention Features

The inspectors reviewed construction activities related to PSSC-03, Backflow Prevention Features, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were fabrication, vendor oversight, and special processes. The associated IROFS component were DMST 4030. Specifically, the inspectors reviewed welding and other fabrication documents associated with the vendor's fabrication of DMST 4030. The components and associated records for DMST 4030 met the applicable code, procurement, and quality requirements. No findings of significance were identified (Section 3.i).

Program Inspections

Special Processes (Welding)

The MOX project welder qualification program was administered in accordance with the applicable site procedures which met the applicable requirements of AWS and American Society of Mechanical Engineers codes. The construction welding engineer had the requisite skills and knowledge to qualify welders. No findings of significance were identified (Section 4).

REPORT DETAILS

1. Summary of Facility Status

During the inspection period, the applicant (CB&I AREVA MOX Services (MOX Services)) continued construction activities of principle systems, structures and components (PSSCs). Construction activities continued related to closure of temporary construction openings (TCOs) related to walls in the MOX Process Building (BMP). Other construction activities included staging of process piping and installation of supports in the Aqueous Polishing Building (BAP) and BMP; installation of process piping in the BAP; installation of ventilation system ductwork and supports in the BAP and BMP; installation of drip trays in the BAP; installation of fire doors and dampers in the BAP and BMP; and installation of various gloveboxes in the BAP and 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 Activities; (Inspection Procedure (IP) 88130, Construction: Resident Inspection Program for On-Site Construction Activities at the Mixed Oxide Fuel Fabrication Facility

a. Scope and Observations

The inspectors routinely reviewed the applicant's construction weekly status meetings notes. The inspectors routinely held discussions with MOX Services design engineers, field engineers, quality assurance (QA) and quality control (QC) personnel, and subcontractor construction personnel in order to maintain current knowledge of construction activities and any problems or concerns.

The inspectors reviewed the status of work packages (WPs) maintained at various work sites. The inspectors monitored the status of WP entries to verify construction personnel obtained proper authorizations to start work. The inspectors conducted daily tours of material storage and work areas to verify that materials and equipment were properly stored in accordance with QA requirements.

The inspectors reviewed various corrective action documents. The review included non-conformance reports (NCRs) and condition reports (CRs). The inspectors also reviewed the closure of selected NCRs and CRs.

The inspectors routinely performed tours of the MOX Fuel Fabrication Facility (MFFF) work areas to verify that MOX Services' staging of piping, pipe supports, installation of ductwork, and installation of glove-boxes, installation of fire dampers and fire doors met regulatory commitments and procedural requirements. The inspectors conducted tours of material storage areas at the MFFF, PAF, and Barnwell to determine if MOX Services was properly storing equipment and materials in accordance with MOX Project Quality Assurance Plan (MPQAP) storage requirements. Specifically, the inspectors assessed MOX Services compliance with Project Procedure (PP) 10-38, *Storage and Control of Material*.

b. Conclusions

The inspectors routinely attended the applicant's weekly construction status meetings, reviewed the status of WPs maintained at various work sites, conducted daily tours of work and material storage areas, observed installation of mechanical equipment, and reviewed various corrective action documents to assess the adequacy of the MOX Services' corrective action program. Except as noted below, construction activities were performed in a safe and quality-related manner. No findings of significance were identified.

3. PSSC Related Inspections

a. PSSC-021, Fire Barriers

(1) Attribute: Design Control and Special Processes

(a) Scope and Observations

The inspectors observed construction activities related to PSSC-021, Fire Barriers, as described in Table 5.6-1 of the MFFF Construction Authorization Request (CAR). The inspection attributes observed were design control and special processes. The associated items relied on for safety (IROFS) components were pellet handling unit (PML) fire doors to be installed in the BMP.

The inspectors observed construction activities associated with PML fire doors FD0092, FD00101, FD0253, FD0011, FD0012, FD0021 and FD00251. The inspectors observed completed welds on the fire doors to determine whether compliance with the visual acceptance criteria specified in American Welding Society (AWS) D1.6, *Structural Welding Code – Stainless Steel*, was achieved. The inspectors also reviewed drawings DCS01-PML-MG-PLD-M-70112, *BMP, Levels 1 & 2 Pellet Handling Unit – PML Vertical Fire Door Left Hand Door Assembly and Section Detail*, Revision (Rev.) 1; and DSC01-PML-MG-PLD-M-70213, *BMP, Levels 1 & 2 Pellet Handling Unit – PML Vertical Fire Door Interior Seal Retainers*, Rev. 1; to determine whether the as-built condition of the PML fire doors met the drawing requirements. The inspectors reviewed ECR-008080, Subject: 3799-SR-00045, *Adding Missing Welding Symbols*, Rev. 0, to determine whether AWS D1.6 code requirements were correctly translated into site design documents.

MPQAP Section 3, *Design Control*, states, in part, that measures are established in MOX Services QA procedures to assure that applicable requirements are correctly translated by MOX Services into design documents.

The MFFF structural stainless steel welding is to be constructed in accordance with the requirements of AWS D1.6, *Structural Welding Code – Stainless Steel*. Table 7.2 of AWS D1.6 specifies the minimum fillet weld sizes for small diameter studs. For studs with a ½ inch diameter, as specified for use on the PML doors by ECR-008080, a minimum fillet size of 6 millimeters (mm) is required. ECRs are design change documents that are subject to the same code requirements and rigor as the original design.

Contrary to the above, on July 30, 2010, measures to assure that applicable requirements were correctly translated by MOX Services into design documents were inadequate. Specifically, Subject: 3799-SR-00045, *Adding Missing Welding Symbols*, Rev. 0, was created with the allowance for ½” diameter studs to be attached to the PML fire door embed plates with 5 mm welds. Inspection of the fire doors revealed that approximately half of the installed studs achieved a 5 mm fillet weld with the remaining half achieving a 6 mm fillet weld. Therefore, ECR-008080 allowed the welding of safety-related structural studs that were not designed in accordance with the AWS D1.6, Table 7.2, *Minimum Fillet Weld Sizes for Small Diameter Studs*.

The detailed inspection activities identified one violation associated with failure to meet AWS D1.6 requirements for minimum fillet weld sizes for small diameter studs.

This finding was determined to be a severity level (SL) IV violation using Section 6.5 of the Enforcement Policy. Because this was a SL IV violation and the example supporting the violation was entered into the applicant’s corrective action program (CR-15-316 – added to existing CR), this violation is being treated as a non-cited violation (NCV), consistent with Section 2.3.2 of the NRC Enforcement Policy and is identified as NCV 70-3098/2016-01-03, *Failure to Maintain Design Control for Structural Steel Anchorage*.

The inspectors determined that this finding was more than minor because it represented a failure to exercise design control that will result in a detailed engineering analysis, code deviation, or rework of safety-related components to correct the condition. Specifically, PML fire door designs as detailed in ECR-008080 specified a 5 mm fillet weld for studs that did not meet the minimum size requirements for this application as specified in AWS D1.6 Table 7.2.

(b) Conclusions

The inspectors observed construction activities related to PSSC-021, Fire Barriers, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were design control and special processes. The associated IROFS components were PML fire doors to be installed in the BMP. The detailed inspection activities identified NCV 70-3098/2016-01-03, *Failure to Maintain Design Control for Structural Steel Anchorage*. This NCV is associated with the inadequate design control activities of ECR-008080 which resulted in the fabrication by welding of safety-related structural steel fire doors and their concrete anchors that were not designed or fabricated in accordance with the AWS D1.6 minimum fillet weld sizes for small diameter studs.

b. PSSC-041, Process Cells

(1) Attributes: Installation, Special Processes and Procedure Controls

(a) Scope and Observations

The inspectors reviewed construction activities related to PSSC-041, Process Cells, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were design control, procedures, special processes and installation. The associated IROFS component was the support structure for Demister (DMST) 2310 in Room C-234.

The inspectors observed structural stainless steel supports for equipment in Room C-234. The inspectors observed completed welds on structural steel supports for piping, vessels and demisters. The inspectors reviewed field change request (FCR) 004483, *DMST*2310 Conflicting Support Structure Design*, Rev. 6, to determine whether AWS D1.6 code requirements were correctly translated into site design documents.

MPQAP Section 3, *Design Control*, states, in part, that measures are established in MOX Services QA procedures to assure that applicable requirements are correctly translated by MOX Services into design documents.

The MFFF structural stainless steel welding is to be constructed in accordance with the requirements of AWS D1.6, *Structural Welding Code – Stainless Steel*. Section 2.12.2 of AWS D1.6 specifies that an intermittent partial joint penetration weld design is prohibited for built up members. FCRs are design change documents that are subject to the same code requirements and rigor as the original design.

Contrary to the above, on or before December 10, 2015, measures to assure that applicable requirements are correctly translated by MOX Services into design documents were inadequate. Specifically, FCR-004483, *DMST*2310 Conflicting Support Structure Design*, Rev. 6, was created with the allowance for built up members to be assembled with intermittent partial joint penetration welds. Specifically, drawing DCS01-BMF-DS-PLS-B-02951-0, Sheet 16, allowed the fabrication by welding of safety-related structural steel built up members that were not designed or fabricated in accordance with the AWS D1.6, Section 2.12.2 prohibited joint design requirements.

The detailed inspection activities identified one violation associated with failure to meet AWS D1.6 requirements for stainless steel built-up member fabrication. This finding was determined to be a SL IV violation using Section 6.5 of the Enforcement Policy. Because this was a SL IV violation and the example supporting the violation was entered into the applicant's corrective action program (CR-16-004), this violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy, and is identified as NCV 70-3098/2016-01-01, *Failure to Meet AWS D1.6 Requirements for Built-Up Structural Members*.

The inspectors determined that this finding was more than minor because it represented a failure to exercise proper design control that resulted in a detailed engineering analysis and repair work of safety-related components. Specifically, built-up member joint designs specified an intermittent partial joint penetration weld that is prohibited for this application by AWS D1.6 which resulted in a redesign as specified in FCR-004483, Rev. 7.

(b) Conclusions

The inspectors reviewed construction activities related to PSSC-041, Process Cells, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were design control, procedures, special processes and installation. The associated IROFS component was the support structure for DMST 2310 in Room C-234. The detailed inspection activities identified NCV 70-3098/2016-01-01, *Failure to Maintain Design Control for Structural Steel Welding*. This NCV is associated with the inadequate design control activities of FCR-004483 which resulted in the fabrication by welding of safety-

related structural steel built up members that were not designed or fabricated in accordance with the AWS D1.6 prohibited joint design requirements.

c. PSSC-050, Supply Air System

(1) Attributes: Installation, Special Processes and Procedure Controls

(a) Scope and Observations

The inspectors observed construction activities related to PSSC-050, Supply Air System, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation. The associated IROFS component was the heating, ventilation, and air conditioning (HVAC) Supply Air System (HSA). Specifically, the inspectors observed installed ductwork and associated supports and reviewed documentation associated with its installation and inspection.

The inspectors observed welds, gaskets and bolted connections associated with the fabrication and installation of HSA ductwork and hangers. The inspectors reviewed work package 15-B360-HAS-0001-V-3204, *Installation of HVAC Commodities in B-360*, to determine whether adequate documentation existed for material traceability, adherence to referenced specifications, and required inspections. The inspectors reviewed DCS01-QGA-DS-SPE-V-15890-8, *Construction Specification, Ductwork Fabrication and Installation Quality Level 1 (IROFS)*, to determine whether the installed equipment met the necessary requirements detailed within the specification. The inspectors reviewed the welder qualifications for welder S093 to determine whether the appropriate weld types and examinations were performed to authorize the welder to perform work.

MPQAP Section 5, *Instructions, Procedures and Drawings*, Section 5.1, states, in part, that quality-affecting activities are 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.

MOX Services DCS01-QGA-DS-SPE-V-15890-8, *Construction Specification, Ductwork Fabrication and Installation Quality Level 1 (IROFS)*, Section 3.3.22 states, in part, that, "Fasteners for all ductwork shall be snug tight and provide for even compression of the gaskets. Snug tight shall be defined as the condition that exists when all of the plies in a connection have been pulled into firm contact by the bolts in the joint, and all of the bolts in the joint have been tightened sufficiently to prevent the removal of the nuts without the use of a wrench. After snug tight connections have been assembled, they shall be visually ensured that the plies of the connected elements have been brought into firm contact and all bolts have been tightened sufficiently to prevent the turning of the nuts without the use of a wrench."

Contrary to the above, on or around December 23, 2015, MOX Services failed to adhere to specification DCS01-QGA-DS-SPE-V-15890-8, in that bolts used in assembling HSA ductwork in Room B-360 were found to be less than snug tight after final inspection. Specifically, multiple bolts on three flanged connections were found to spin freely by hand alone.

The detailed inspection activities identified one violation associated with the failure to meet bolted connection requirements for HSA ductwork. This finding was determined to

be a SL IV violation using Section 6.5 of the Enforcement Policy. Because this was a SL IV violation and the example supporting the violation was entered into the applicant's corrective action program (CR-16-132), this violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy, and is identified as NCV 70-3098/2016-01-02, *Failure to Meet IROFS Ductwork Bolted Connection Requirements for HSA Ductwork*.

The inspectors determined that this finding was more than minor because it represented a failure to follow procedures that resulted in an adverse effect on the quality of the construction of safety-related components. Specifically, bolted connections were found to be less than snug tight which could result in the inability of the Seismic Category 1 system to maintain pressure boundary integrity.

MPQAP Section 10, *Inspection*, Section 10.2.1.K, states, in part, that documented inspection planning shall include the organization responsible for the inspection. MOX Services Project Procedure PP03-30, *Quality Inspection Plans and Inspection Reports*, Rev. 5, Section 2.0 states, in part, "that performance of in-process and final inspections for QL-1 systems, components and structures shall be performed by the Quality Control Organization."

Contrary to the above, on February 13, 2015, MOX Services failed to adhere to Project Procedure 03-30 in that final inspections for QL-1 ductwork installation were not performed by the quality control organization. Specifically, Inspection Plan M350, *Installation of HVAC Duct*, Rev. 6, specified that construction inspectors perform final inspections on flanged connection ductwork. Construction inspectors are not part of the independent quality assurance personnel.

The detailed inspection activities identified one violation associated with the failure to maintain appropriate controls for the inspection planning of QL-1 systems, components and structures. This finding was determined to be a SL IV violation using Section 6.5 of the Enforcement Policy. Because this was a SL IV violation and the example supporting the violation was entered into the applicant's corrective action program (CR-16-132), this violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy and is identified as NCV 70-3098/2016-01-04, *Failure to Maintain Appropriate Controls for the Inspection Planning of QL-1 Systems, Components and Structures*.

(b) Conclusions

The inspectors observed construction activities related to PSSC-050, Supply Air System, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation. The associated IROFS component was HSA. Specifically, the inspectors observed installed ductwork and associated supports and reviewed documentation associated with its installation and inspection. The detailed inspection activities identified NCV 70-3098/2016-01-02, associated with failure to meet bolted connection requirements for HSA ductwork; and NCV 70-3098/2016-01-04, associated with the failure to maintain appropriate controls for the inspection planning of QL-1 systems, components and structures.

d. PSSC-023, Fluid Transport Systems

(1) Attributes: Installation; Nuclear Welding General Inspection Procedure (IP 55050)

(a) Scope and Observations

The inspectors observed construction activities related to PSSC-023, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation. The associated IROFS component was Active Gallery, BAP, and room C-134 piping and pipe supports. Specifically, the inspectors observed installed piping and pipe support frames and reviewed documentation associated with its installation and inspection.

The inspectors observed pipe support module 21 prior to installation in the Active Gallery to determine whether the module was fabricated in accordance with AWS D1.1, *Structural Welding Code – Steel*; and AWS D1.6 welding code. Specifically, the inspectors reviewed the weld quality of completed welds on the embed plates, anchors and structural steel to determine whether they met the requirements of AWS D1.6 and PP 11-51, *AWS D1.1 and D1.6 General Welding Procedure*. The inspectors also observed installation activities associated with support module 21 in order to determine whether the installation was in accordance with drawing DCS01-BMF-DS-PLS-B-02920, *MOX Fuel Fabrication Facility BAP Active Gallery Area Module Steel Support Form System Modules 20 and 21 Area Layout Plan at TOC Elevation 35' -0"*, Sheet 1, Rev. 0.

The inspectors observed completed welds and inspection reports for KCD-DS-PLI-T-0126000-02 FW0001-C0R0, KPA-0192001-04-FW002-C0R0, KDD-0675502-02-FW001-C1R0, KWG-5139-501-01-FW001-C1R0, and KPA-0600001-05-FW003-C0R0, to determine whether required inspections were performed and that inspection results with respect to the acceptability of the welds were properly documented.

The inspectors met with quality assurance personnel to discuss the system used to track progressive weld examination. The inspectors reviewed documentation for welders across multiple disciplines to determine whether weld lots were appropriately maintained for each welder and sampled appropriately based on the requirements of American Society of Mechanical Engineers (ASME) B31.3, *Process Piping*; and American Institute of Steel Construction (AISC) N690, *Specification for Safety-Related Steel Structures for Nuclear Facilities*. The inspectors reviewed progressive examination documentation to determine whether the correct inspection types were performed for the particular weld joint designs and code application.

(b) Conclusions

The inspectors observed construction activities related to PSSC-023, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation. The associated IROFS component was Active Gallery, BAP, and room C-134 piping and pipe supports. Specifically, the inspectors observed installed piping and pipe support frames and reviewed documentation associated with its installation and inspection. No findings of significance were identified.

e. PSSC-004, C2 Confinement System Passive Barrier

(1) Attributes: Installation

(a) Scope and Observations

The inspectors observed construction activities related to PSSC-004, C2 Confinement System Passive Barrier, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation. The associated IROFS component was BMP Medium Depressurization Exhaust (MDE) HVAC commodities. Specifically, the inspectors observed installed ductwork and ductwork supports and reviewed documentation associated with its installation and inspection.

The inspectors requested work package records for MDE HVAC installments in the BMP. The following work packages were selected for review:

1. WP-15-B384-MDE-0002-V-3067 Installation of HVAC Commodities in B-384
2. WP-15-B384-MDE-0002-V-3068 Installation of HVAC Commodities in B-384
3. WP-15-B384-MDE-0002-V-3069 Installation of HVAC Commodities in B-384
4. WP-15-B384-MDE-0005-V-3069 Installation of HVAC Commodities in B-384
5. WP-15-B384-MDE-0003-V-3067 Installation of HVAC Commodities in B-384

The inspectors examined records and installments of BMP HVAC components to determine whether ductwork was installed in accordance with QGA-DS-SPE-V-15890-8, *Construction Specification, Ductwork Fabrication and Installation Quality Level 1 (IROFS)*. The inspectors observed welded connections of duct supports to determine whether they met the requirements of AWS D1.1, *Structural Welding Code – Steel*. The inspectors held discussions with Superior Air Handling Company (SAHCO) staff to determine the installation requirements, location and types of HVAC commodity installments.

The inspectors reviewed inspection results and observed that any unsatisfactory inspection items were documented and addressed appropriately. For completed BMP HVAC work packages, the inspectors observed appropriate documentation of properly installed components by the installer, the construction or field engineer, and the quality assurance/certified inspector.

(b) Conclusions

The inspectors observed construction activities related to PSSC-004, C2 Confinement System Passive Barrier, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation. The associated IROFS component was BMP MDE HVAC commodities. Specifically, the inspectors observed installed ductwork and ductwork supports and reviewed documentation associated with its installation and inspection. No findings of significance were identified.

f. PSSC-005, C3 Confinement System

(1) Attributes: Installation and Special Processes

(a) Scope and Observations

The inspectors directly observed construction activities related to PSSC-005, C3 Confinement System, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were installation and special processes. The inspectors observed welding in progress as part of the installation of high depressurization exhaust (HDE) filter housings. Specifically, the inspectors observed gas tungsten arc welding (GTAW) of field weld 213 joining HDE filter housing FLU0004B to the floor mount. The inspectors checked to verify if the following attributes were adequate:

- Welding was performed within the designated preheat and interpass temperatures
- Welding filler metal used was as specified on the welding procedure and issue slips
- Polarity and travel speed were as specified on the welding procedure
- The weld area was clean and free of detrimental greases, oils, paints or other contaminants
- Welding was protected from adverse environmental effects such as wind and rain.

(b) Conclusions

The inspectors observed construction activities associated with PSSC-005, C3 Confinement System, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were installation and special processes. The associated IROFS component was HDE filter housing FLU0004B. Specifically, the inspectors observed welding installation of HDE filter housing FLU0004B. The observed activities were performed in accordance with the applicable codes, procedures and quality requirements. No findings of significance were identified.

g. PSSC-024, Gloveboxes

(1) Attributes: Fabrication, Vendor Oversight, and Special Processes

(a) Scope and Observations

The inspectors reviewed construction activities related to PSSC-024, Gloveboxes, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were fabrication, vendor oversight, and special processes. The inspectors visually examined the welds comprising glovebox NXR-1000, which was fabricated by the applicant's vendor, URS Corporation, to determine if they were free of rejectable indications and would be able to perform their structural and confinement design functions.

The inspectors also reviewed receipt inspection report (RIR) 11-22964 which contained the vendor's fabrication records for glovebox NXR-1000. The inspectors reviewed a sample of welding and non-destructive examination (NDE) records from within the receipt inspection report, such as welding procedures, welder qualification records, certified material test reports (CMTRs), and NDE reports, to determine if the glovebox had been fabricated in accordance with the applicable code requirements.

(b) Conclusions

The inspectors reviewed fabrication, vendor oversight, and special processes related to PSSC-024, Gloveboxes, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were fabrication, vendor oversight, and special processes. The associated IROFS component was glovebox NXR-1000. Specifically, the inspectors reviewed welding and other fabrication documents associated with the vendor's fabrication of glovebox NXR-1000. The glovebox welds and associated records met the applicable code, procurement, and quality requirements. No findings of significance were identified.

h. PSSC-10, Double Walled Pipe

(1) Attributes: Fabrication, Vendor Oversight, and Special Processes

(a) Scope and Observations

The inspectors reviewed construction activities related to PSSC-10, Double Walled Pipe, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were fabrication, vendor oversight, and special processes. The inspectors visually examined the welds comprising DMSTs 1400 and 2310, which were fabricated by the applicant's vendor, Diversified Metal Products Inc., to determine if they were free of rejectable indications and would be able to perform their structural and confinement design functions.

The inspectors also reviewed RIRs 14-50547 and 14-51932 which contained the vendor's fabrication records for DMSTs 1400 and 2310, respectively. The inspectors reviewed a sample of welding and NDE records from within the receipt inspection reports, such as welding procedures, welder qualification records, CMTRs, and NDE reports, to determine if the demisters had been fabricated in accordance with the applicable code requirements. The inspectors also reviewed radiographic films associated with DMST 1400 to verify that the welds were free of rejectable defects.

(b) Conclusions

The inspectors reviewed construction activities related to PSSC-10, Double Walled Pipe, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were fabrication, vendor oversight, and special processes. The associated IROFS component were DMSTs 1400 and 2310. Specifically, the inspectors reviewed welding and other fabrication documents associated with the vendor's fabrication of DMSTs 1400 and 2310. The demister welds and associated records were found to meet the applicable code, procurement, and quality requirements. No findings of significance were identified.

i. PSSC-03, Backflow Prevention Features

(1) Attributes: Fabrication, Vendor Oversight, and Special Processes

(a) Scope and Observations

The inspectors reviewed construction activities related to PSSC-03, Backflow Prevention Features, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were fabrication, vendor oversight, and special processes. The inspectors visually examined DMST 4030, which was fabricated by the applicant's vendor, Diversified Metal Products Inc., to determine if the demister was fabricated in accordance with the drawings and if the welds were the correct size and free of rejectable indications and would be able to perform their structural and confinement design functions.

The inspectors also reviewed receipt inspection report 13-47927 which contained the vendor's fabrication records for DMST 4030. The inspectors reviewed a sample of welding and NDE records from within the receipt inspection report, such as welding procedures, welder qualification records, CMTRs, and NDE reports, to determine if the demister had been fabricated in accordance with the applicable code requirements. The components and associated records associated with DMST 4030 met the applicable code, procurement, and quality requirements.

(b) Conclusions

The inspectors reviewed construction activities related to PSSC-03, Backflow Prevention Features, as described in Table 5.6-1 of the MFFF CAR. The inspection attributes observed were fabrication, vendor oversight, and special processes. The associated IROFS component was DMST 4030. Specifically, the inspectors reviewed welding and other fabrication documents associated with the vendor's fabrication of DMST 4030. The components and associated records met the applicable code, procurement, and quality requirements. No findings of significance were identified.

4. Programmatic Inspections

a. Special Processes (Welding)

(1) Scope and Observations

The inspectors reviewed the applicant's welder qualification program to determine if welders were qualified in accordance with the applicable codes and standards. Specifically, the inspectors:

- Interviewed the construction welding engineer who administers the program to determine if he was qualified to examine welds, if the program followed the site procedure for qualifying welders, and if the program positively verified the identity of the individuals taking the tests,
- Checked to determine if welder qualification tests were performed in accordance with a written welding procedure.

- Reviewed the welder qualification procedure, PP11-60, *Welder / Welding Operator Qualification*, Rev. 1, to determine if it adequately implemented applicable code requirements,
- Performed a visual examination of a completed test coupon and viewed the radiographic images to determine if that individual had been adequately qualified to perform a specific type of IROFS welding.

(2) Conclusions

The MOX project welder qualification program was administered in accordance with the applicable site procedures which met the applicable requirements of AWS and ASME codes. The construction welding engineer had the requisite skills and knowledge to qualify welders. No findings of significance were identified.

5. Follow-up of Previously Identified Items

a. (Closed) Inspector Follow-up Item (IFI) 70-3098/2009-004-002, Review and Evaluate Responses from Root Cause Analysis (RCA)-09-04

The paragraph below corrects a typographical error identified in inspection report (IR) 70-3098/2015-004, Section 5.a, (Closed) Inspector Follow-up Item (IFI) 70-3098/2009-004-002, *Review and Evaluate Responses from RCA-09-04*.

IR 70-3098/2015-004, Section 5.a.(1)(a)(i), *As-Built Structural Analysis*, contained a typographical error indicating penetration dimensions that were more than approximately 10 feet by 10 feet in size. The dimensional unit should have been *inches* instead of *feet*. The corrected paragraph is provided below:

In modeling, the major design changes of the BMF occurred by the freeze date as provided in the executive summary report. Calculation DCS01-XGA-DS-CAL-B-01401-1 made a number of idealizations, simplifications, and assumptions. Penetrations that were more than approximately 10 *inches* by 10 *inches* in size were modeled discretely. The groups of smaller penetrations were conservatively modeled as one large penetration. However, the effects of isolated smaller penetrations were assumed to be insignificant for load path and distribution of load. The changes to the wall thickness and location were incorporated in the ANSYS model based on the updated construction drawings up to the freeze date.

IFI 70-3098/2009-004-002, *Review and Evaluate Responses from RCA-09-04*, remains closed.

6. Exit Interview

The inspection scope and results were summarized throughout this reporting period and by the Senior Resident Inspector at an exit meeting with applicant senior management on April 12, 2016. Dissenting views were not expressed by 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 this report.

SUPPLEMENTAL INFORMATION

1. PARTIAL LIST OF PERSONS CONTACTED

D. Del Vecchio, President and Chief Operating Officer
M. Gober, Vice President, Engineering
R. Alley, Engineering Assurance Manager
D. Gwyn, Licensing/Nuclear Safety Manager
D. Ivey, Project Assurance Manager
D. Livernois, Quality Control Manager
A. Johnston, Quality Control
S. King, Vice President, Operations
A. Olorunniwo, Civil/Structural Manager
E. Radford, Regulatory Compliance
G. Rousseau, Executive Vice President, Deputy Project Manager
P. Wilkie, Quality Assurance
K. Trosen, Lead Welding and Materials Engineer
B. Dickamore, SAHCO Manager

2. INSPECTION PROCEDURES (IPs) USED

IP 88130 Resident Inspection Program For On-Site Construction
Activities at the Mixed-Oxide Fuel Fabrication Facility
IP 55050 Nuclear Welding General Inspection Procedure

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

<u>Item Number</u>	<u>Status</u>	<u>Description</u>
70-3098/2016-01-01	Closed	NCV: Failure to Maintain Design Control for Structural Steel Welding (Section 3.b)
70-3098/2016-01-02	Closed	NCV: Failure to Meet IROFS Ductwork Bolted Connection Requirements (Section 3.c)
70-3098/2016-01-03	Closed	NCV: Failure to Maintain Design Control for Structural Steel Anchorage (Section 3.a)
70-3098/2016-01-04	Closed	NCV: Failure to Maintain Appropriate Controls for the Inspection Planning of QL-1 Systems, Components and Structures (Section 3.c).

4. **LIST OF ACRONYMS USED**

AISC	American Institute of Steel Construction
ASME	American Society of Mechanical Engineers
AWS	American Welding Society
BAP	Aqueous Polishing Building
BMF	Fuel Manufacturing Building
BMP	MOX Process Building
CAR	Construction Authorization Request
CMTR	Certified Material Test Report
CR	Condition Report
DCI	Division of Construction Inspection
DCP	Division of Construction Projects
DMST	Demister
ECR	Engineering Change Request
FCR	Field Change Request
GTAW	Gas Tungsten Arc Welding
HDE	High Depressurization Exhaust
HVAC	Heating, Ventilation, and Air Conditioning
HSA	Supply Air System
IFI	Inspection Follow-Up Item
IP	Inspection Procedure
IR	Inspection Report
IROFS	Items Relied on for Safety
KCD	Oxalic Mother Liquors Recovery
MDE	Medium Depressurization Exhaust
MFFF	MOX Fuel Fabrication Facility
mm	Millimeter
MOX	Mixed Oxide
MOX Services	CB&I AREVA MOX Services
MPQAP	MOX Project Quality Assurance Plan
NCR	Non-conformance Report
NCV	Non-cited Violation
NDE	Non-destructive Examination
No.	Number
NRC	Nuclear Regulatory Commission
PAF	Process Assembly Facility
PML	Pellet Handling Unit
PP	Project Procedure
PSSC(s)	Principle System(s), Structure(s), and Component(s)
QA	Quality Assurance
QC	Quality Control
QL	Quality Level
QL-1	Quality Level 1
RCA	Root Cause Analysis
RII	Region II
Rev.	Revision
RIR	Receipt Inspection Report
SAHCO	Superior Air Handling Company
SL	Severity Level
TCO	Temporary Construction Opening

WP Work Package

5. LIST OF PSSCs REVIEWED

PSSC-003	Backflow Prevention Procedures
PSSC-004	C2 Confinement System Passive Barrier
PSSC-005	C3 Confinement System
PSSC-010	Double-Walled Pipe
PSSC-021	Fire Barriers
PSSC-023	Fluid Transport Systems
PSSC-024	Gloveboxes
PSSC-041	Process Cells
PSSC-050	Supply Air System

6. RECORDS AND DOCUMENTS REVIEWED

Engineering Change Requests (ECRs)

ECR-020701 Rev. 0, *Remove Practice C Testing Requirement in DCS01-KKJ-DS-SPE-L-12045-3*

Engineering Documents

DCS01-ZMJ-DS-SPE-M-19107-7, *Process Equipment Welding Requirements*
 DCS01-KKJ-DS-SPE-L-12045-3, *Specification for Demisters, Leakage Detection Pots, and Separator Pots*

NDE Reports

MOX Radiography Report CRT-MOX-WQ-2471

Project Procedures

PP11-60, *Welder / Welding Operator Qualification*, Rev. 1

Quality Assurance Records

DMST 1400: QC-RIR-14-50547
 DMST 2310: QC-RIR-14-51932
 Glovebox NXR1000: QC-RIR-11-22964

Letter to D. Del Vecchio from Deborah Seymour dated April 29, 2016.

SUBJECT: MIXED OXIDE FUEL FABRICATION FACILITY- NRC INSPECTION REPORT
NO. 70-3098/2016-001

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