

May 1, 2015

Ms. Rosalie Nava, Director of Safety and Quality
Crane Nuclear, Inc.
860 Remington Boulevard
Bolingbrook, IL 60440

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION REPORT OF CRANE
NUCLEAR, INC NO. 99901450/2015-201 AND NOTICE OF
NONCONFORMANCE

Dear Ms. Nava:

On March 16-20, 2015, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Crane Nuclear, Inc. (Crane) facility in Bolingbrook, IL. The purpose of this limited-scope routine inspection was to assess Crane's compliance with provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and selected portions of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

This inspection specifically evaluated Crane's implementation of quality activities associated with the fabrication and inspection of safety-related valves for the Westinghouse Electric Company AP1000 reactor design, as well as for the operating reactor fleet. The enclosed report presents the results of the inspection. This NRC inspection report does not constitute NRC endorsement of your overall quality assurance (QA) or Part 21 programs.

During this inspection, NRC inspectors found that the implementation of your QA program failed to meet certain NRC requirements imposed on you by your customers. Specifically, the NRC inspection team determined that Crane was not fully implementing its QA program in the areas of design control, corrective actions and control of purchased material, equipment, and services. The specific findings and references to the pertinent requirements are identified in the enclosures to this letter. In response to the enclosed notices of nonconformance (NONs), Crane should document the results of the extent of condition review for these findings and determine if there are any effects on other safety-related components.

Please provide a written explanation or statement within 30 days of this letter in accordance with the instructions specified in the enclosed NONs. We will consider extending the response time if you show good cause for us to do so.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (Agencywide Documents Access and Management System), accessible at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response, (if applicable), 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 that such material is withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (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.

Sincerely,

/RA/

Edward H. Roach, Chief
Mechanical Vendor Inspection Branch
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 99901450

Enclosures:

1. Notices of Nonconformance
2. Inspection Report No. 99901450/2015-201
and Attachment

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NOTICE OF NONCONFORMANCE

Crane Nuclear, Inc.
860 Remington Blvd.

Bolingbrook, IL 60440
Docket No. 99901450

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Crane Nuclear, Inc. (Crane) facilities located in Bolingbrook, IL, on March 16, 2015, through March 20, 2015, certain activities were not conducted in accordance with NRC requirements which were contractually imposed on Crane by its customers or NRC licensees:

- A. Criterion III, "Design Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," states, in part, that "measures shall be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of the structures, systems, and components." Design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. The verifying or checking process shall be performed by individuals or groups other than those who performed the original design, but who may be from the same organization.

Crane Procedure DED-4, "Dedication of Commercial Material, Items and Calibration services for Safety related Applications," states, in part, that "the technical evaluation process requires using the Commercial Grade Item Evaluation (CGIE) to document the safety function and define critical characteristics of the item." It also states that "commercial grade items designated for installation in environmentally qualified equipment or in locations which require such qualification shall include the selection of appropriate critical characteristics required to maintain the qualification of the component or equipment. Environmental qualification is identified for use in a harsh or mild environment, including temperature and radiation."

Crane Procedure 03-106, "Design Calculation Preparation, review, and approval," specifies the requirements for the preparation, review, and approval of design calculations, which support the design of valves and valve components.

Contrary to the above, as of March 19, 2015, Crane failed to review for suitability of parts that are essential to the safety-related functions of components, and failed to verify or check the adequacy of design, such as by the performance of design reviews. Specifically:

- a) Crane failed to appropriately dedicate or establish environmental qualification (EQ) similarity for twelve replacement Ethylene Propylene Diene Monomer (EPDM) rubber discs to be used in 1-inch American Society of Mechanical Engineers (ASME) Section III swing check valves. These discs were commercially procured for

installation in 1-inch ASME automatic depressurization system (ADS) accumulator swing check valves at the Pilgrim Nuclear Power Station (located between the ADS accumulator and the ADS relief valve). The CGIE did not identify disc dimensions as critical characteristics, and did not specify acceptance criteria and dedication acceptance/verification method as required by Crane Procedure DED-4. Therefore, when Crane performed source inspection verification at the commercial supplier's facility, the measured dimensions were not appropriately compared to any criteria for acceptance.

- b) Crane failed to review and approve an engineering calculation that was referenced in the CGIE as an "Engineering Evaluation" and was performed to establish environmental qualification similarity to original environmental temperatures and radiation dose levels as a safety-related calculation. Thus, the calculation did not receive independent verification and approval, as required by Crane Procedure 03-106.

These issues have been identified as Nonconformance 99901450/2015-201-01.

- B. Criterion XVI, "Corrective Action," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," states, in part, that "Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and corrective action shall be documented and reported to appropriate levels of management."

Crane Procedure 16-100, "Corrective Action Reports" states, in part, that "conditions adverse to quality are promptly identified and corrected with follow up to verify implementation of corrective action; and preclude repetition," and "report to appropriate levels of management the condition, corrective action, and root cause of any conditions significantly adverse to quality."

Crane Procedure CCP-1, "Customer Complaint Procedure" states, in part, that "if it is determined that corrective measures are necessary to preclude recurrence, the Director Safety and Quality or other qualified individual shall implement the Crane Nuclear Inc. Procedure 16-100, "Corrective Action Reports."

Contrary to the above, as of March 19, 2015, Crane failed to implement measures to assure the cause of conditions adverse to quality were determined and corrective action taken to preclude repetition. Specifically, Crane did not initiate corrective action reports (CARs) for three significant conditions adverse to quality, and as a result, did not determine the significance, root cause and did not identify actions to prevent recurrence. Three examples involved customer returns that required rework of the components:

- a) Two safety-related valve stems, used in 20-inch Y-pattern globe valves, were shipped to Dresden Nuclear Power Station per Purchase Orders 00491344 and 00488650 and were found to be out of specification on March 7, 2013.
- b) A safety-related valve stem, used in an 8-inch gate valve, was shipped to North Anna Power Station per Sales Order 39801 and was returned due to the stem's center being out of specification on May 21, 2013.
- c) Safety-related valve stems and wedges, for a 12-inch gate valve, per Purchase Order 186484-2 for Browns Ferry Nuclear Plant could not be properly fitted together by the customer. The stems and wedges were not fitted together prior to shipment, which Crane identified as a poor practice on December 3, 2012.

These issues have been identified as Nonconformance 99901450/2015-201-02.

- C. Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," states, in part, that "Measures shall be established to assure that purchased material conforms to the procurement documents."

Crane Procedure 07-100, "Receiving, Inspection, Material Release and Storage," states, in part, "Certified Material Test Reports (CMTR's) and other such test reports shall be reviewed to verify that all elements reported such as the chemistry, physical properties, etc. are checked against the required specification in the Purchase Order."

Contrary to the above, as of March 19, 2015, Crane failed to establish measures to assure that purchased material conformed to the procurement documents. Specifically, Crane accepted non-conforming round bar from supplier TW Metals. Purchase order number 21004090 specified a range of 248-258 Brinell for the physical property of hardness in order to satisfy both the original design specification and a customer-imposed upper limit. The CMTR from TW Metals states that hardness of the round bar received was 23.5 Rockwell, which is less than the lower limit of the specification of 248 Brinell (approximately equal to 24 Rockwell). Crane staff assigned to review the CMTR failed to note that the round bar did not meet the required specification. The round bar was subsequently used to manufacture a 24-inch Walworth safety-related gate valve stem and shipped to Brown's Ferry Nuclear Plant with a Certificate of Conformance that stated it conformed to all the specifications of the purchase order. This nonconforming condition was noted by the NRC inspection team during a review of the CMTR.

This issue has been identified as Nonconformance 99901450/2015-201-03.

Please provide 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 Chief, Mechanical Vendor Inspection Branch, Division of Construction and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this notice of nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each noncompliance: (1) the reason for the noncompliance, or if contested, the basis for disputing the noncompliance, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid noncompliances, and (4) the date when your corrective action will be completed. Where good cause is shown, consideration will be given to extending the response time.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system, Agencywide Documents Access Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/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.

Dated this 1st day of May 2015.

**U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NEW REACTORS
DIVISION OF CONSTRUCTION INSPECTION AND OPERATIONAL PROGRAMS
VENDOR INSPECTION REPORT**

Docket No.: 99901450

Report No.: 99901450/2015-201

Vendor: Crane Nuclear, Inc.
860 Remington Blvd.
Bolingbrook, IL 60440

Vendor Contact: Ms. Rosalie Nava
Director of Safety and Quality
E-mail: rnava@cranevs.com
Phone: (630) 226-4940

Nuclear Industry Activity: Crane Nuclear, Inc. (Crane) manufactures safety-related ball and plug valves for the Westinghouse Electric Company AP1000 reactor design as well as valves and valve parts for the operating reactor fleet.

Inspection Dates: March 16-20, 2015

Inspectors: Laura Micewski NRO/DCIP/MVIB Team Leader
Richard McIntyre NRO/DCIP/MVIB
Richard Laura NRO/DCIP/QVIB

Approved by: Edward H. Roach, Chief
Mechanical Vendor Inspection Branch
Division of Construction Inspection
and Operational Programs
Office of New Reactors

EXECUTIVE SUMMARY

Crane Nuclear, Inc.
99901450/2015-201

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a vendor inspection at the Crane Nuclear, Inc. (Crane) facility to verify that it had implemented an adequate quality assurance (QA) program that complies with the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities." In addition, the NRC inspection also verified that Crane implemented a program under 10 CFR Part 21, "Reporting of Defects and Noncompliance," that met the NRC's regulatory requirements. The NRC inspection team conducted the inspection from March 16-20, 2015. This was the initial NRC inspection at the Crane facilities.

Some of the specific activities observed by the NRC inspection team included:

- Acceptance activities for 1-inch swing check valve disc, ½-inch globe valve snap ring, ¾-inch plug valve and repair kit
- Pre-test activities and subsequent valve disassembly and inspection to determine cause of pre-test back seat valve leakage
- American Society of Mechanical Engineers (ASME) Section III Hydrostatic Shell test, seat leak, and back seat leak tests for a 6-inch angle globe valve
- Liquid penetrant (PT) inspection of a disc for a 16-inch swing check valve
- Receipt inspection of American Society for Testing and Material (ASTM) A194 Grade 2H heavy hex nuts

The following regulations served as the bases for the NRC inspection:

- Appendix B to 10 CFR Part 50
- 10 CFR Part 21

During the course of this inspection, the NRC inspection team implemented Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors"; IP 43004, "Inspection of Commercial-Grade Dedication Programs"; and IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance."

The information below summarizes the results of this inspection.

Commercial-Grade Dedication

The NRC inspection team issued Nonconformance 99901450/2015-201-01 in association with Crane's failure to implement the regulatory requirements of Criterion III "Design Control," of Appendix B to 10 CFR Part 50. Nonconformance 99901450/2015-201-01 cites Crane for failing to appropriately dedicate and establish environmental qualification (EQ) similarity for twelve replacement Ethylene Propylene Diene Monomer (EPDM) rubber discs to be used in 1-inch ASME Section III swing check valves. Also, Crane failed to perform independent verification of an engineering calculation that was performed to establish EQ similarity to original design qualification for environmental temperatures and radiation dose levels.

Corrective Action

The NRC inspection team issued Nonconformance 99901450/2015-201-02 in association with Crane's failure to implement the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. Nonconformance 99901450/2015-201-02 cites Crane for failing to initiate corrective action reports (CARs) for three significant conditions adverse to quality, and as a result, failing to determine the significance, root cause and actions to prevent recurrence.

Control of Purchased Material, Equipment, and Services

The NRC inspection team issued Nonconformance 99901450/2015-201-03 in association with Crane's failure to implement the regulatory requirements of Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. Nonconformance 99901450/2015-201-03 cites Crane for failing to establish measures to assure that purchased round bar used for fabrication of a replacement stem for a 24-inch Walworth safety-related gate valve conformed to the procurement documents.

Other Inspection Areas

The NRC inspection team determined that Crane is implementing its program for 10 CFR Part 21, as well as its programs for training and qualification of personnel; control of nonconformances; internal audits; material traceability; manufacturing, inspection, and test control; control of special processes; control of measuring and test equipment; and oversight of contracted activities in accordance with the applicable regulatory requirements of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed and activities observed, the NRC inspection team also determined that Crane is implementing its policies and procedures associated with these programs. No findings of significance were identified.

REPORT DETAILS

1. Manufacturing Control

a. Inspection Scope

The NRC inspection team reviewed Crane's policies and implementing procedures that govern the control of special processes to verify compliance with the following regulatory requirements:

- Criterion IX, "Control of Special Processes," of Appendix B , "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities"

The NRC inspection team reviewed a sample of certified material test reports (CMTRs) for materials and used to fabricate valves and valve replacement parts to verify that those materials met all of the applicable ASTM, American Welding Society (AWS), and design requirements.

The NRC inspection team discussed the special processes program with Crane's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team determined that Crane is implementing its manufacturing and special processes programs in accordance with the regulatory requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Crane is implementing its policies and procedures associated with the control of special processes program. No findings of significance were identified.

2. Nonconforming Materials, Parts, or Components

a. Inspection Scope

The NRC inspection team reviewed Crane's policies and implementing procedures that govern the control of nonconformances to verify compliance with the requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of deficiency reports (DRs) which were generated during the manufacturing process. DRs adequately documented problems and contained corrective action to resolve the issue. There were 146 DRs initiated in 2015 at the time of the inspection, the majority were issued due to repair/rework and also "use-as-is" categories. There were 846 DRs initiated in 2014.

Crane staff initiated DRs on a regular basis to address nonconforming conditions that arose during the manufacturing process.

The NRC inspection team evaluated Crane's receipt inspection area to determine whether Crane had adequate material control. The NRC inspection team observed that accepted materials were adequately identified and rejected materials were segregated in a nonconformance hold area and were properly marked with hold tags.

The NRC inspection team discussed the nonconformances program with Crane's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team determined that Crane is implementing its nonconformances program in accordance with the regulatory requirements of Criterion XV, "Control of Nonconforming Material, Parts, or Components," of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Crane is implementing its policies and procedures associated with the control of nonconformances program. No findings of significance were identified.

3. 10 CFR Part 21 Program

a. Inspection Scope

The NRC inspection team reviewed the policies and implementing procedures of Crane that govern the facility's compliance with the requirements of 10 CFR Part 21, "Reporting of Defects and Noncompliance." In addition, the NRC inspection team evaluated the 10 CFR Part 21 postings and a sample of Crane's purchase orders (POs) for compliance with the requirements of 10 CFR 21.21, "Notification of Failure to Comply or Existence of a Defect and its Evaluation," and 10 CFR 21.31, "Procurement Documents." The NRC inspection team also verified that Crane's nonconformance and corrective action procedures provide a link to the 10 CFR Part 21 program. Furthermore, the NRC inspection team discussed the 10 CFR Part 21 program with Crane's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team determined that Crane is implementing its 10 CFR Part 21 program in accordance with the regulatory requirements of 10 CFR Part 21. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Crane is implementing its policies and procedures associated with the 10 CFR Part 21 program. No findings of significance were identified.

4. Design Control

a. Inspection Scope

The NRC inspection team reviewed Crane's policies and implementing procedures that govern the design control program to verify their compliance with the regulatory requirements of Criterion III, "Design Control," in Appendix B to 10 CFR Part 50. The team reviewed Crane's process for preparing fabrication drawings as described in Crane's Quality Procedure. For a sample of Crane drawings, the NRC inspection team verified that the design specifications, including technical and quality requirements, were adequately translated into Crane's design documents.

The NRC inspection team also reviewed the process for implementing design changes. The team confirmed that Crane is using the latest approved design drawings for fabrication, that the appropriate quality standards were specified and included in design documents, and that design changes were being effectively controlled and approved.

The NRC inspection team reviewed Crane's policies and implementing procedures that govern the dedication of commercial-grade items (CGIs) for use in safety-related applications to verify compliance with the applicable regulatory requirements of 10 CFR Part 21 and Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Specifically, the team reviewed dedication packages to assess the different elements of the commercial-grade dedication (CGD) program which included purchase orders, the technical evaluation process including the commercial-grade item evaluations, receipt inspection reports, certificates of compliance, quality control source inspection reports, various design drawings, and valve technical information. The team evaluated the criteria for the identification of item functions, credible failure mechanisms/modes, selection of critical characteristics and acceptance criteria, and the identification of verification methods to verify effective implementation of Crane's dedication process. The NRC inspection team discussed design control and the conduct of the commercial-grade dedication activities with Crane's technical staff involved in the development of the commercial-grade item evaluations. The team reviewed the CGD packages and associated documents prepared for safety-related material, and conducted interviews with personnel responsible for quality activities to assess the adequacy of the CGD program. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

The NRC inspection team reviewed Crane procedure DED-4, "Dedication of Commercial Material, Items and Calibration services for Safety related Applications," revision 0, dated February 12, 2012, which provides the methodology for dedicating commercial-grade items and services for use in safety-related applications, including the development of critical characteristics, identification of dedication methods and the acceptance criteria. At the time of the inspection, Crane was not performing any specific commercial-grade dedication activities for commercially procured items.

The inspectors reviewed a sample of completed and in-process dedication packages of CGIs performed as part of supply of basic components to domestic utilities. Crane has performed very limited dedication of CGIs over the last few years and stated their preferred procurement philosophy is to procure items as safety-related from suppliers with Appendix B quality programs and/or American Society of Mechanical Engineers (ASME) certificate holders whenever possible.

The inspectors reviewed the procurement and dedication activities related to sales order (SO) 42390-01 for twelve Ethylene Propylene Diene Monomer (EPDM) rubber discs to be used in 1-inch ASME Section III swing check valves. The EPDM disc material was procured from commercial supplier, J & A Sales Inc. The valve application was identified as an ADS accumulator charging check valve (drywell) requiring specific temperature and radiation dose requalification. The inspectors reviewed the dedication package and acceptance activities prepared by Crane. This included the Commercial Grade Item Evaluation (CGIE) form, which is the document where Crane identified the item to be dedicated, the description of the application/usage, the identification of the safety-function, the identification of credible failure mechanism/modes, the identification of the critical characteristics and acceptance criteria, the identification of the acceptance/verification methods, and whether seismic or environmental qualification was required.

The CGIE, dated April 13, 2013, documented the safety function described by the customer as "required to form a seal against the seat portion of the valve body to prevent reverse flow through the valve and allow flow in the required direction. It must also maintain structural properties so as not to bind and increase cracking pressure or degrade and affect downstream equipment." The CGIE also stated the credible failure mechanism/mode as loss of flexibility due to temperature, radiation and aging. A separate supporting Engineering Evaluation (EE), referenced in the CGIE, provided much more detail related to qualification requirements of the EPDM rubber for temperature and radiation. This supporting EE included calculation of the maximum contact pressure on the EPDM rubber disc face to calculate the acceptable operational radiation conditions. The engineer used as input to the calculation, information identified from a 2007 paper found on the internet, "Degradation of Elastomer by Heat and/or Radiation" for environmental qualification equivalence to the previously qualified temperature and radiation dose. However, Crane did not treat this as a safety-related calculation under the design control process, and it was not independently reviewed and approved as required per Crane Procedure 03-106, "Design Calculation, Preparation, Review and Approval." Therefore, no independent verification and approval was

performed for acceptability of the safety-related calculation, or use of the industry paper from the internet as input into this safety-related calculation. The NRC inspection team identified this as an example of Nonconformance 99901450/2014-201-01 for failure to verify or check the adequacy of design, such as by the performance of design reviews.

Finally, the CGIE did not identify disc dimensions as a critical characteristic and hence did not specify acceptance criteria and dedication acceptance verification methods to provide assurance that the discs would maintain the required safety function to form a seal against the valve seat. Therefore, when Crane performed a QC source inspection at the commercial supplier, J&A Sales Inc., the measured dimensions were not appropriately compared to any criteria for acceptance. Crane did identify that a source inspection was performed at the commercial supplier, to verify material lot/batch traceability for the twelve discs by witnessing the cutting of the EPDM rubber valve discs. The NRC inspection team identified this as another example of Nonconformance 99901450/2014-201-01 for failure to review for suitability of parts that are essential to the safety-related functions of components.

On March 18, 2015, Crane issued Corrective Action Report (CAR) 15-04 to document that this dedication had not identified dimensions with appropriate acceptance criteria as a critical characteristic and also had a safety-related calculation that was not subjected to procedural requirements for review (independent verification) and approval. Finally, on March 27, 2015, Crane issued a letter to Entergy Nuclear Generating Company, Pilgrim Nuclear Power Station to notify them that CAR 15-04 was issued and that Crane would take action to evaluate the findings and take corrective actions as necessary to address the nonconforming conditions.

c. Conclusion

The NRC inspection team issued Nonconformance 99901450/2014-201-01 in association with Crane's failure to implement the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Nonconformance 99901450/2015-201-01 cites Crane for failing to review for suitability of parts that are essential to the safety-related functions of components and failing to verify or check the adequacy of design, such as by the performance of design reviews. Specifically, Crane failed to identify valve disc dimensions with appropriate acceptance criteria and dedication acceptance/verification methods as a critical characteristic and failed to treat a referenced engineering evaluation performed as part of a CGIE for EPDM valve discs as a safety-related calculation under the design control process, and thus did not independently verify the calculation, as required per Crane procedures.

5. Corrective Action

a. Inspection Scope

The NRC inspection team reviewed Crane's policies and implementing procedures that govern the corrective action program to verify compliance with the requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed a sample of CARs to verify the adequacy of Crane's implementation and control of its corrective action program (CAP). The NRC inspection team also evaluated the adequacy of Crane's implementation of corrective actions for addressing customer complaints and returns. In addition, the NRC inspection team verified that Crane's corrective action process provides a connection to the 10 CFR Part 21 program.

The NRC inspection team discussed the CAP with Crane's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

The NRC inspection team reviewed the list of CARs for 2013, 2014 and 2015. Crane initiated 63 CARs in 2013, 79 CARs in 2014, and eight in 2015 at the time of the inspection. The team reviewed a sample of CARs and found them to be generally written with adequate detail and appropriate corrective actions planned and implemented.

The majority of CARs were closed out on schedule or had authorized extensions to extend the due date. In a recent internal audit, Crane self-identified that additional resources were necessary to ensure that all CARs are completed on schedule. At the time of the NRC inspection, there were approximately twenty CARs from 2014 that remained open. Crane management informed the NRC inspection team that they were in the process of adding additional resources to support the CAR process.

The NRC inspection team reviewed a sample of twelve customer complaints associated with safety-related work dated from 2012 to present. The team selected the sample based on the significance of the rework involved to address the customer complaint. Crane Procedure CCP-1, "Customer Complaint Procedure," established the process for the review and evaluation of customer complaints for resolution and review for the applicability of 10 CFR Part 21. A customer complaint form is used to document and process the issue. Additionally, CCP-1, step 4.6.2 specifies that if corrective measures are necessary to preclude recurrence, the Director Safety and Quality or other qualified individuals shall implement the Crane Procedure 16-100, "Corrective Action Reports."

The team identified three customer complaints for which Crane did not initiate corrective action reports, and as a result, did not determine the significance or root cause, or identify actions to prevent recurrence. These customer returns included out-of-specification safety-related valve stems, and safety-related valve stems and wedges that could not be fitted together by the customer. The NRC inspection team identified this as Nonconformance 99901450/2014-201-02 for Crane's failure to implement measures to assure the cause of conditions adverse to quality were determined and corrective action taken to preclude repetition.

c. Conclusion

The NRC inspection team issued Nonconformance 99901450/2014-201-02 in association with Crane's failure to implement the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. Nonconformance 99901450/2015-201-02 cites Crane for failing to enter significant conditions adverse to quality into the corrective action program as required per Crane procedure. Specifically, for three customer complaints that required rework of components, Crane did not initiate corrective action reports, and thus did not determine the significance or root cause, or identify actions to prevent recurrence.

6. Control of Inspection and Testing

a. Inspection Scope

The NRC inspection team reviewed Crane's policies and implementing procedures that govern the inspection program to verify compliance with the regulatory requirements of Criterion X, "Inspection," of Appendix B to 10 CFR Part 50. The team also reviewed Crane's policies and implementing procedures that govern test control activities to verify compliance with the regulatory requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50, as well as the requirements of Section III, Division 1 of the ASME Boiler & Pressure Vessel Code.

The NRC inspection team witnessed the Visual Examination Test of a machined valve cover, the Penetrant Examination Test for a swing check valve disc, and ASME Section III Hydrostatic Test of a 6-inch angle globe valve. The team verified that the examinations and tests were performed by qualified persons other than those who performed or directly supervised the work being inspected. In addition, the team verified that inspection tools used were calibrated and within the applicable inspection range; confirmed that detailed design reference materials were adequately used and observed the process for identifying and documenting any nonconformance identified during in-process inspection activities.

During performance of initial ASME Section III, Division 1, Class II production pre-test activities for the hydrostatic shell test, seat leakage, and back seat test for a 6-inch angle globe valve, leaks were identified during the back seat test. Testing was stopped, DR 12359 was written, and the valve was disassembled, inspected and repaired to correct the existing leak mechanisms. Since the corrective actions required weld repair, the inspectors reviewed the DR 12359, the weld repair report, and the Repair/Rework Routing traveler associated with DR 12359. The inspectors also verified that these actions were completed and accepted by Crane QC inspector and the Hartford Global Services authorized nuclear inspector (ANI) prior to performance of actual Section III code testing activities with witness by the ANI and testing.

The inspectors also witnessed the ASME Section III Hydrostatic shell and seat leak tests, after completion of the weld repair activities, and both QC and ANI inspection activities during the testing.

The NRC inspection team verified that Crane's procedures for inspection activities provided measures for the generation of inspection documents, such as travelers, instructions, checklists, or other appropriate means. For a sample of inspection documents, the NRC inspection team verified that these documents included the appropriate information as required by Crane procedures such as the inspection date, type of observation, results of examination and tests, and the initials of the QC inspector, mandatory hold points were indicated and that work did not proceed without appropriate approval.

The NRC inspection team observed QC inspections on the shop floor that included traceability checks, in-process and final inspections to verify that Crane was performing inspections in accordance with policies and procedures and applicable codes and standards. The NRC inspection team verified that inspection results were documented by the QC inspector and reviewed by authorized personnel qualified to evaluate the technical adequacy of the inspection results.

The NRC inspection team discussed the inspection program with Crane's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team determined that Crane is implementing its inspection program in accordance with the regulatory requirements of Criterion X, "Inspection" and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Crane is implementing its policies and procedures associated with the inspection program. No findings of significance were identified.

7. Control of Measuring and Test Equipment (M&TE)

a. Inspection Scope

The NRC inspection team reviewed Crane's policies and implementing procedures that govern the M&TE program to verify compliance with the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50.

For a sample of M&TE, the NRC inspection team determined that the M&TE had the appropriate calibration stickers and current calibration dates, including the calibration due date. The NRC inspection team also verified that the M&TE had been calibrated, adjusted, and maintained at prescribed intervals prior to use. In addition, the calibration records reviewed by the NRC inspection team indicated the as-found or as-left conditions, accuracy required, calibration results, calibration dates, and the due date for

recalibration. The NRC inspection team also verified that the selected M&TE was calibrated using procedures traceable to known industry standards.

The NRC inspection team performed a walk down to ensure that equipment located in the M&TE storage area, M&TE hold area and fabrication shop were labeled, handled, and stored in a manner that indicated the calibration status of the instrument and ensured its traceability to calibration test data.

The NRC inspection team discussed the M&TE program with Crane's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team determined that Crane is implementing its control of M&TE program in accordance with the regulatory requirements of Criterion XII "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Crane is implementing its policies and procedures associated with the control of M&TE. No findings of significance were identified.

8. Control of Purchased Material, Equipment, and Services

a. Inspection Scope

The NRC inspection team reviewed Crane's policies and implementing procedures that govern the implementation of oversight of Control of Purchased Material, Equipment, and Services to verify compliance with the requirements of Criterion IV, "Procurement Document Control," Criterion VII, "Control of Purchased Material, Equipment, and Services," and Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed Crane's Approved Suppliers List (ASL) to ensure that qualified and approved suppliers were listed, and that any revisions to the list were processed following the applicable procedures. The NRC inspection team verified that, for the sample of vendors selected, Crane performed supplier audits as required and that the corrective actions related to these audits were implemented in a timely manner.

The NRC inspection team reviewed a sample of four external supplier audits performed by Crane and Nuclear Industry Assessment Committee (NIAC) members and required their annual audits/performance assessments to verify implementation of the Crane audit program. The NRC inspection team verified that Crane prepared and approved plans that identified the audit scope, focus, and applicable checklist criteria before the initiation of the audit activity. The NRC inspection team confirmed that the audit reports contained a review of the relevant QA criteria in Appendix B to 10 CFR Part 50 for the

activities that individual suppliers performed, as well as documentation of pertinent supplier guidance associated with each criterion. For audits that resulted in findings, the NRC inspection team verified that the supplier had established a plan for corrective action and that Crane had reviewed and approved the corrective action and verified its satisfactory completion and proper documentation in a timely manner.

In the case of third-party audits performed by NIAC members, the NRC inspection team verified that Crane reviewed and accepted the supplied third-party audit scope and implementation documentation as required by Crane procedure and the NIAC charter and procedures, before accepting the NIAC audit results.

The NRC inspection team reviewed a sample of CMTRs provided by suppliers of materials used to fabricate valves and valve replacement parts to verify that those materials met all of the applicable ASTM, AWS, and design requirements as specified in the purchase order with the supplier.

The NRC inspection team discussed the oversight of contracted activities and internal audit programs with Crane's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

During the review of a sample of CMTRs provided by suppliers of materials, the inspectors noted that Crane had accepted non-conforming round bar from TW Metals.

Purchase order number 21004090 specified a range of 248-258 Brinell for the physical property of hardness in order to satisfy both the original design specification and a customer-imposed upper limit. The CMTR from TW Metals states that hardness of the round bar received was 23.5 Rockwell, which is less than the lower limit of the specification of 248 Brinell (approximately equal to 24 Rockwell). Crane staff assigned to review the CMTR failed to note that the round bar did not meet the required specification. The NRC inspection team identified this as Nonconformance 99901450/2014-201-03 for Crane's failure to establish measures to assure that purchased material conformed to the procurement documents.

The round bar was subsequently used to manufacture a 24-inch gate valve stem and shipped to Brown's Ferry Nuclear Plant.

c. Conclusion

The NRC inspection team issued Nonconformance 99901450/2014-201-03 in association with Crane's failure to implement the regulatory requirements of Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. Nonconformance 99901450/2015-201-03 cites Crane for failing to establish measures to assure that purchased round bar used for fabrication of a replacement stem for a 24-inch Walworth safety-related gate valve conformed to the procurement documents.

9. Training and Qualification of Personnel

a. Inspection Scope

The NRC inspection team reviewed Crane's policies and implementing procedures that govern the training and qualification program to verify compliance with the requirements of Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed the indoctrination, training and qualification of lead auditors and auditors, nondestructive examination personnel, and QC personnel to ensure that proficiency is achieved and maintained. The NRC inspection team verified that all personnel performing activities affecting quality had completed the required training and met all the specified requirements in accordance with Crane's policies and procedures.

The NRC inspection team discussed the training and qualification program with Crane's staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

d. Observations and Findings

No findings of significance were identified.

e. Conclusion

The NRC inspection team determined that Crane is implementing its training and qualification program in accordance with the regulatory requirements of Criterion II of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Crane is implementing its policies and procedures associated with the training and qualification program. No findings of significance were identified.

12. Entrance and Exit Meetings

On March 16, 2015, the NRC inspection team discussed the scope of the inspection with Mr. Kirk Kelhofer, President, and other members of Crane's management and technical staff. On March 20, 2015, the NRC inspection team presented the inspection results and observations during an exit meeting with Ms. Rosalee Nava, with Mr. Kirk Kelhofer participating by phone, and other members of Crane's management and technical staff. The attachment to this report lists the attendees of the entrance and exit meetings, as well as those individuals whom the NRC inspection team interviewed.

ATTACHMENT

1. ENTRANCE AND EXIT MEETING ATTENDEES

Name	Title	Affiliation	Entrance	Exit	Interviewed
Laura Micewski	Inspection Team Leader	NRC/NRO	X	X	
Richard Laura	Inspector	NRC/NRO	X	X	
Richard McIntyre	Inspector	NRC/NRO	X	X	
Kirk Kelhofer	President	Crane Nuclear	X	X	X
Rosalie Nava	Director, Safety and Quality	Crane Nuclear	X	X	X
David Dwyer	Manager, Engineering	Crane Nuclear	X	X	X
Chris Presz	Quality Assurance Engineer	Crane Nuclear	X	X	
Pat Beland	Manager, Inside Sales	Crane Nuclear	X	X	
Everette Motley	Quality Assurance Engineer	Crane Nuclear	X	X	
Burt Anderson	Site Leader	Crane Nuclear	X	X	X
Chris Nelson	Manufacturing Manager	Crane Nuclear	X	X	
Jennifer Bregovy	Quality Assurance Engineer	Crane Nuclear	X	X	
Astrid Hernandez	NPC Project Manager	Crane Nuclear		X	
John Visser	Manager, Contract Administration	Crane Nuclear		X	
Lauren Russo	Manager, Supply Chain	Crane Nuclear		X	
Ricardo Mederos	Quality Inspector Level 2	Crane Nuclear			X
Michael Prazak	Asembler/Tester	Crane Nuclear			X
Richard Scellati	Quality Inspector Level 3	Crane Nuclear			X
Jason Sample	Quality Inspector Level 2	Crane Nuclear			X

2. INSPECTION PROCEDURES USED

Inspection Procedure (IP) 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated February 13, 2012.

IP 43002, "Routine Inspections of Nuclear Vendors," dated July 15, 2013.

IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated November 29, 2013.

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Item Number	Status	Type	Description	Applicable ITAAC
99901450/2015-201-01	Opened	NON	Criterion III	N/A
99901450/2015-201-02	Opened	NON	Criterion XVI	N/A
99901450/2015-201-03	Opened	NON	Criterion VII	N/A

4. INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA

The U.S. Nuclear Regulatory Commission (NRC) inspection team identified no inspections, tests, analyses, and acceptance criteria (ITAAC) related to components being fabricated and inspected by Crane.

DOCUMENTS REVIEWED

Policies and Procedures

Crane Procedure (CP) 03-106, "Design Calculation Preparation, Review and Approval," revision 7, dated September 9, 2011

CP 07-100, "Receiving, Inspection, Material Release and Storage," revision 15, dated December 5, 2011

CP 12-100, "Calibration," revision 7, dated June 2, 2004

CP 12-100A, "Verification and Calibration of Micrometers, Vernier Instruments, Dial Indicators and Thread Valves," revision 7, dated June 4, 2004

CP 12-100D, "Calibration of Torque Wrenches," revision 4, dated September 26, 1996

CP 12-100E, "Calibration of Pressure Gauges," revision 5, dated August 31, 2010

CP 15-100, "10 CFR 21 Reporting of Defects and Non-Compliance," Revision 8
CP 15-104, "Deficiency Report Control," revision 11, dated August 12, 2014
CP 16-100, "Corrective Action Reports," dated July 27, 2012
CP 18-101, "Internal Audits," dated August 30, 2013
CP 18-102, "Supplier Surveys and audits," revision 14, dated August 30, 2013
CP 18-103, "Supplier Inspection Procedure," revision 5, dated March 7, 2014
CCP-1, Customer Complaint Procedure dated April 1, 2011
DED-4, "Dedication of Commercial Material, Items and Calibration services for Safety related Applications," revision 0, dated February 12, 2012,
HYT-1, "Hydrostatic, Seat Leak, and Operational Test Procedure," revision 20, dated July 14, 2014

Design Documents

Commercial Grade Item Evaluation (CGIE), for sales order 42390-01, dated April 18, 2013
Engineering Evaluation for Sales Order 42390 Entergy – Pilgrim, by Paul Sund, dated April 5, 2013
Science Direct Article (internet), Degradation of Elastomer by Heat and/or Radiation, Masayuki Ito, dated September 8, 2007
Entergy PNPS Valve Data Sheet, dated March 20, 2013
Aloyco Steel products Co, 1-inch Valve body dimension drawing A-32220 dated March 4, 1959
Aloyco Steel products Co, 1-inch Valve disc drawings D-288548 dated May 11, 1951
Certificate of Compliance from Crane Nuclear, Inc. to Tennessee Valley Authority – Browns Ferry Nuclear Plant, for PO# 703105 for 8" Class 150 Figure 5312 WE Walworth Globe Valve replacement disc, dated October 31, 2014
Certified Material Test Report from TW Metals for 6" DIA x 73" A276 Type 410 Cond. H Round Bar, dated December 8, 2014
Certificate of Conformance/Compliance from TW Metals to Crane Nuclear, for TW Warehouse Order Number 21004090 for 6" DIA x73" round bar ASTM A276-13a Type 410 Cond. H, Heat/Lot Number 262944-1H, dated December 8, 2014

Test Certificate from Element Materials Technology to TW Metals, for PO #MP21005773 for 1 pc – 6” dia x 7” bar, Heat # 262944-1H, dated December 5, 2014

Certification from Solar Atmospheres of Western PA to TW Metals, for PO # MP 21005719, for processing of 6” dia x 80” long bar, Heat # 262944-1H, dated December 1, 2014

Design Specification Details, Westinghouse Design Specification No: APP-PV10-Z0-001 (419A33),”Ball and Plug Valves, ASME Boiler and Pressure Vessel Code Section III, Class 2 and 3,” revision 7, dated November 15, 2011

Calibration, Heat Treatment, Non-Destructive Examination, Inspection and Material Reports

Certified Material Test Report from PRL Industries, Inc. for 8” globe disc casting, dated September 25, 2014

Certificate of Compliance from Crane Nuclear, Inc. to Tennessee Valley Authority – Browns Ferry Nuclear Plant, for PO# 707596 for 24” 5202WE Gate Valve replacement stem, dated December 31, 2014

Calibration record for Perma-Cal Pressure Gauge, 0-1000 psi, ID # TG-31, dated March 18, 2015

Calibration record for Perma-Cal Pressure Gauge, 0-600 psi, ID # TG-38, dated March 18, 2015

Calibration record for Mitutoyo Vernier Dial Caliper, 0-8”, ID# DVC806, dated April 1, 2015

Calibration record for Mitutoyo Height Gage, 0-18”, ID# HG018, dated April 1, 2015

Purchase Orders (PO)

PO 57662, to Exova for material testing verification of EPDM rubber valve disc material, revision 0, dated May 30, 2013

PO 57319, to J&A Sales Inc. for EPDM rubber valve disc material, revision 0, dated April 18, 2013

PO 703105, Customer TVA – Browns Ferry Nuclear, replacement disc for 8” Walworth globe valve, dated June 25, 2014

PO 727596, Customer TVA – Browns Ferry Nuclear, replacement stem for 24” Walworth gate valve, dated August 25, 2014

PO 4500312906, Customer Westinghouse Electric Co., VC Summer Units 2 & 3 – PV10 Ball and Plug Valves, dated July 31, 2009

Change to PO 4500312906, Customer Westinghouse Electric Co., VC Summer Units 2 & 3 – PV10 Ball and Plug Valves, dated August 19, 2010

Change to PO 4500312906, Customer Westinghouse Electric Co., VC Summer Units 2 & 3
– PV10 Ball and Plug Valves, dated October 13, 2010

Change to PO 4500312906, Customer Westinghouse Electric Co., VC Summer Units 2 & 3
– PV10 Ball and Plug Valves, dated February 1, 2011

Change to PO 4500312906, Customer Westinghouse Electric Co., VC Summer Units 2 & 3
– PV10 Ball and Plug Valves, dated September 9, 2011

Change to PO 4500312906, Customer Westinghouse Electric Co., VC Summer Units 2 & 3
– PV10 Ball and Plug Valves, dated November 8, 2011

Change to PO 4500312906, Customer Westinghouse Electric Co., VC Summer Units 2 & 3
– PV10 Ball and Plug Valves, dated March 29, 2012

Change to PO 4500312906, Customer Westinghouse Electric Co., VC Summer Units 2 & 3
– PV10 Ball and Plug Valves, dated October 13, 2014

Audit Reports

Quality Control Source Inspection Report, J&A Inc, dated April 14, 2013

Crane Internal Audit, dated July 17, 2014

Quality Control Source Inspection Report, J&A Sales Inc., dated April 14, 2013

Supplier Audit Report of Exova Materials Division, for metallurgical testing services, dated
January 27, 2103

Supplier Audit Report of PRL Industries Inc., for material supply, dated February, 21, 2012

Supplier Audit Report of Dubose National Energy Services, 2012 for ASME code and safety
related material supply, dated March 12, 2012

Supplier Audit Report of TW metal, for material supply for ASME code and safety related
material supply, dated April 6, 2014

Training and Qualification Records

R. Mederos, QC Inspector, Level II

J. Sample, QC Inspector, Level II

M. Prazak, Assembler/Tester, Level II

R. Scallate, QC Inspector, Level II & III

E. Garcia, trainee

Deficiency Reports

DR 9203, T-Slot Dimensions dated October 6, 2011
DR 10307, Incomplete PO requirements for sales order 2390-01, dated May 7, 2013
DR 11658, Heat Treat Code Case N-497, dated April 17, 2014
DR 11750, Length of Time For Hydro, June 3, 2014
DR 11892, Failed PTS-2 on Wedge, September 16, 2014
DR 12359, Failed Backseat Leak on Production Pretest, May 18, 2015
Weld Repair Report for DR 12359, dated March 18, 2015

Corrective Action Reports

CAR 13-31, Ferrite Content Determination Method
CAR 13-32, Customer Specification Requirement Not Met
CAR 13-42, Late Corrective Action Reports
CAR-13-48, SO 42390 and dedication of 1" ASME swing check valve EPDM rubber discs
CAR 14-22, Use of ASME Section II 1989 Edition, No addenda with Code Case N-497
CAR 14-33, Design Specification for Manual Operators

Corrective Action Reports Generated during the NRC Inspection

CAR-15-04, Dedication Issue, dated March 20, 2015
CAR-15-05, Out of Spec Material Accepted by QA, dated March 20, 2015
CAR-15-06, Ineffective Customer Complaint Process, dated March 20, 2015

Customer Complaint Forms

Burr on Pilot Seat of 20 inch Main Steam Isolation Valve, for PO 00489730, Sales Order (SO) MRA080A (40927), dated November 26, 2012

Measurement of T-Slots Inadequate, PO 186484-2, SO 38141, dated October 20, 2012

Damaged Valve Stem, PO 755400, SO 39277, dated December 10, 2012

Grind Marks and Indications on Surface of Seat Ring, PO 00501950, SO 37685, dated February 5, 2013

Stem Out of Tolerance, PO 00491344, SO 41120, dated March 7, 2013

Stem Out of Tolerance, PO 00488650, SO 40814, dated March 7, 2013

Plug Valve Body Leak, PO 45896086, SO 40224, dated April 25, 2013

Stem Center Out of Specification, SO39801, dated May 21, 2013

Indications of Valve Body Housing, PO 760054, SO 4115, dated July 25, 2013

Customer Administrative Questions, PO 760054, SO 41145, dated January 27, 2014

Hydrostatic Seat Leak Test Time Interval, PO 47113, SO 42584, dated May 15, 2014

Wedge Shows Signs of Rust and Porosity, PO 90 059978, SO 42757, dated June 26, 2014

Miscellaneous

Crane Nuclear As-Built Drawing, DWG No. CC06426, "Disc Walworth 8" Globe Piston Check Valve," revision A, dated October 21, 2013

Crane Nuclear Drawing, DWG No. CB03059, "Disc Casting (Walworth Globe Check Valve)," revision A, dated October 25, 2002

Walworth Company Drawing, DWG No. A-12381-M-1-E, "Cast Steel (Ball Type) Globe Stop Check Valvewith Welding Ends, Impactor Handwheel & Locking Assembly," revision E, dated March 12, 1971

Walworth Company Drawing, DWG No. C-7924-5C, "8" C.S. Globe Piston Check Valve S-150 Detail of Disc," revision C, dated March 8, 1955

Crane Nuclear Drawing, DWG No. CB06832, "Stem Fabrication Walworth Gate Valve," revision A, dated September 19, 2014

Walworth Assembly Drawing, DWG No. A-12349-M-2, "Gate (Nuclear)," revision B, dated March 2, 1972

Walworth Company Drawing, DWG No. A-12349-M-2A, "Cast Steel Gate Valve with Limatorque SMB-1-25 Operator (Nuclear) Assembly," revision A, dated April 27, 1971

Walworth Company Drawing, DWG No. A-12349-8A, "Cast Steel Gate Valve Stem," revision A, dated February 7, 1969

Crane Nuclear Drawing, DWG No. CB06832, "Stem Fabrication Walworth Gate Valve," revision A, dated September 19, 2014

Crane Nuclear Drawing, DWG No. CC06963, "General Assembly Weld End Angle Globe Valve with Handwheel," revision A, dated December 10, 2014

Customer Purchase Order Review for Sales Order 44169, Purchase Order 703105, Customer TVA – Browns Ferry, dated July 8, 2014

Engineering Summary Sheet – Parts for Sales Order 44169, Customer TVA – Browns Ferry, dated July 15, 2014

Customer Purchase Order Review for Sales Order 44394, Purchase Order 727596, Customer TVA – Browns Ferry, dated December 29, 2014

Engineering Summary Sheet – Parts for Sales Order 44394, Customer TVA – Browns Ferry, dated October 7, 2014

Walworth Company Specification W-551, "Wrought 13% Chromium Stainless Steel (Type 410)," revision 8, dated February 17, 1978

Customer Purchase Order Review for Sales Order 35739, Purchase Order 4500312906, Customer Westinghouse Elec. Co., revision 12, dated May 30, 2014

Work Order 44521-04

APP-PV10-Z0D-100, PV10 Datasheet 100," revision 2, dated

Repair/Rework Routing traveler for DR 12359, dated March 18, 2015

10 CFR Part 21 Notification, Non-Safety Related Levers dated August 1, 2014

10 CFR Part 21 Notification, Potential Valve Body Leakage, dated May 17, 2013

CNI Quality Procurement Plan for Source Inspection at J&A Sales Inc.

J&A COC for EPDM disc material dated May 13, 2013

Management Review of the Quality Program Effectiveness and Trend Analysis for 2012-2013, dated August 15, 2014