June 6, 2012

Richard Kuntz, Quality Assurance Manager
SPX, Copes-Vulcan
5620 West Road
McKean, PA 16426-1504

SUBJECT: NRC INSPECTION REPORT NO. 99900080/2012-201 AND NOTICE OF NONCONFORMANCE

Dear Mr. Kuntz:

On February 13, 2012, through February 17, 2012, the U.S. Nuclear Regulatory Commission (NRC) staff conducted a limited scope inspection at the SPX, Copes-Vulcan facility (hereafter referred to as SPX), in McKean, PA. The purpose of this inspection was to assess SPX compliance with 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 Program Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." The technically focused inspection specifically evaluated quality assurance activities associated with the design and manufacturing of the squib valves for the AP1000 reactor design. The enclosed report presents the results of this inspection. This inspection report does not constitute the NRC's endorsement of your overall quality assurance or 10 CFR Part 21 programs.

During this inspection, the NRC inspection team found that implementation of your quality assurance program did not meet certain NRC requirements imposed on SPX by its customers or NRC licensees. Specifically, the NRC inspection team determined that SPX was not fully implementing its quality assurance program in design control, instructions, procedures and drawings, control of special processes, and corrective actions consistent with regulatory and contractual requirements, and applicable procedures. The specific findings and references to the pertinent requirements are identified in the enclosed Notice of Nonconformance (NON) to this letter, and the enclosed inspection report describes in detail the circumstances surrounding them.

Information on the design and manufacturing of the squib valves for the AP1000 reactor design is summarized in this letter and its enclosures to avoid disclosure of proprietary material. This letter and its enclosures will be withheld for 5 days from the date of issuance to allow you to identify any information you consider to be proprietary. If you consider any information in this letter or its enclosures to be proprietary, you must submit a timely request for to the NRC to withhold that information in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice."

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

In accordance with 10 CFR 2.390, the NRC will make a copy of this letter, its enclosure(s), and your response available electronically for public inspection in the NRC's Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or Safeguards Information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, please submit a bracketed copy of your response that identifies the information that should be protected, along with a redacted copy of your response that deletes such information. If you request that such material be 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, "Protection of Safeguards Information: Performance Requirements."

Sincerely,

/RA/

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

Docket No.: 99900080

Enclosures:
1. Notice of Nonconformance
2. Inspection Report No. 99900080/2012-201 and Attachment

In accordance with 10 CFR 2.390, the NRC will make a copy of this letter, its enclosure(s), and your response available electronically for public inspection in the NRC's Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or Safeguards Information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, please submit a bracketed copy of your response that identifies the information that should be protected, along with a redacted copy of your response that deletes such information. If you request that such material be 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, "Protection of Safeguards Information: Performance Requirements."

Sincerely,

/RA/

Edward H. Roach, Chief
Mechanical Vendor Branch
Division of Construction Inspection
and Operational Programs
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Docket No.: 99900080

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DATE	06/06/2012	04/02/2012	04/02/2012
OFFICE	NRO/DCIP/CEVB	NRO/DE/SEB1	RII/DCI/CIB3
NAME	SSmith	TScarbrough	JBartleman
DATE	04/02/2012	04/02/2012	04/02/2012
OFFICE	NRO/DCIP/CAEB	NRO/DCIP/CMVB	
NAME	TFrye	ERoach	
DATE	04/02/2012	06/06/2012	

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NOTICE OF NONCONFORMANCE

SPX, Copes-Vulcan
5620 West Road
McKean, PA 16426-1504

Docket No. 99900080
Report No. 2012-201

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the SPX, Copes-Vulcan facility (hereafter referred to as SPX) in McKean, PA, from February 13, 2012, through February 17, 2012, it appears that certain activities were not conducted in accordance with NRC requirements that were contractually imposed upon SPX by its customers or by 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 also 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. The 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."

   Contrary to the above, as of February 17, 2012, SPX failed to verify the adequacy of the initiator assembly design as part of its commercial-grade dedication program. Specifically, the NRC inspection team identified that the initiator assembly was being procured as a commercial-grade item and dedicated by SPX for use as a basic component. The design of the initiator assembly was performed by the commercial vendor and was not validated by SPX as part of its commercial-grade dedication program. Although SPX had identified some important design attributes as critical characteristics for the purposes of commercial-grade dedication of the initiator assembly, the acceptance criteria specified by SPX for the characteristics primarily were restatements of manufacturing tolerances and inspections contained in the vendor's manufacturing procedure. SPX did not obtain the knowledge of the initiator assembly design necessary to validate the design parameters or account for any material, manufacturing, or assembly tolerances.

   This issue has been identified as Nonconformance 99900080/2012-201-01.

B. Criterion III of Appendix B to 10 CFR Part 50, states, in part, that "[m]easures shall be established to assure that applicable regulatory requirements and the design basis…are correctly translated into specifications, drawings, procedures, and instructions. Measures shall also 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. The 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."

   Contrary to the above, as of February 17, 2012, SPX failed to establish measures to verify or check the adequacy of the mechanical design of squib valves with safety functions to be used in the AP1000 reactor design. Specifically, SPX failed to adequately justify the design and installation of energy absorbing material inside the squib valve. For example, SPX did

not perform an analysis of the failure modes of the energy absorbing material and its installation, and their potentially adverse effects on the operation of the squib valve.

This issue has been identified as Nonconformance 99900080/2012-201-02.

C. Criterion III of Appendix B to 10 CFR Part 50 states, in part, that "[m]easures shall be established to assure that applicable regulatory requirements and the design basis…are correctly translated into specifications, drawings, procedures, and instructions. Measures shall also 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. The 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."

SPX Procedure No. 50-5.27.79, "Commercial Grade Dedication for Parts Within and Attached to the Valve Assembly and for Services," Revision 9, dated February 2, 2012, establishes the processing of commercial grade items and services to justify their use in safety-related applications. The procedure states, in part, that "[t]o provide reasonable assurance that commercial grade items or services will perform the intended safety function, SPX shall verify that the commercial-grade item or service meets the acceptance criteria for the identified critical characteristics."

Contrary to the above, as of February 17, 2012, SPX failed to establish appropriate measures to verify the suitability of the commercial software used to perform finite element analyses on aspects of the squib valve design. Specifically, SPX failed to institute adequate measures to ensure the suitability of the example models, identify appropriate acceptance methods and critical characteristics, and evaluate error notices obtained from the manufacturer for potential impact on the analyses being performed.

This issue has been identified as Nonconformance 99900080/2012-201-03.

D. Criterion V, "Instructions, Procedures, and Drawings," of Appendix B to 10 CFR Part 50 states that "[a]ctivities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished."

Contrary to the above, as of February 17, 2012, SPX failed to establish adequate procedures for the assembly of the 8-inch and 14-inch squib valves. Specifically, SPX Assembly Procedure No. 1.2.446, "14 inch ADS Squib Valve," Revision 3, dated February 3, 2012, and SPX Assembly Procedure No. 1.2.453, "8-inch LP Squib Valve," Revision 5, dated February 9, 2012, have several steps in which measuring and test equipment (M&TE) data are not recorded. In addition, SPX Assembly Procedure 1.2.446 directed personnel to use inside micrometers for final measurement readings which is contrary to the SPX standard to not use inside micrometers for final measurement (due to the inherent difficulties with the many attachments for inside micrometers) as specified in procedure 50-5.07.01, "Control and Inspection of Micrometers and Gages," Revision 39, dated August 30, 2010. Furthermore, SPX Assembly Procedure 1.2.453 directed personnel to perform an activity that could have introduced stresses into components of the 8-inch valve potentially causing

material weakening, damage, or failure of these components. This issue has been identified as Nonconformance 99900080/2012-201-04.

E. Criterion IX, Control of Special Processes," of Appendix B to 10 CFR Part 50 states that "[m]easures shall be established to assure that special processes, including welding, heat treating, and nondestructive testing, are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements."

Step 3.5 of Procedure 1-6.10, "Control of Special Processes," Revision 1, dated January 14, 2012, states, in part, that "[a]ll completed welds shall be visually inspected by the Inspector," and step 4.1 states that "SPX nondestructive personnel shall be qualified in accordance with the Code and Procedure 1-6.02." Procedure 1-6.02, "Quality Assurance Administration and Responsibilities," Revision 1, dated January 14, 2012, specifies the requirements for training, testing, and qualifying inspectors.

Contrary to the above, as of February 17, 2012, SPX failed to ensure that the SPX inspector had the qualifications and training necessary to successfully perform the inspection. Specifically, the NRC inspection team reviewed the training records for the SPX inspector and determined that the SPX inspector was not qualified to perform weld inspections, particularly inspections of the type of welds in question.

This issue has been identified as Nonconformance 99900080/2012-201-05.

F. Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50 states, in part, that "[m]easures 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."

Step 3.2 6 of Procedure 1-6.17, "Corrective Action," Revision 1, dated January 14, 2012, defines conditions adverse to quality as "any condition that could affect the components ability to function within design requirements. This includes safety-related items."

Contrary to the above, as of February 17, 2012, SPX failed to provide sufficient guidance to identify conditions adverse to quality related to deficiencies, deviations and nonconformances. Specifically, key SPX personnel involved in the assembly of the squib valves did not identify in the corrective action process, until questioned by the NRC inspection team, conditions adverse to quality related to deficiencies, deviations and nonconformances.

This issue has been identified as Nonconformance 99900080/2012-201-06.

Please submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Chief, Mechanical Vendor Branch, Division of Construction Inspection 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 noncompliance, and (4) the date the corrective action will be completed. If good cause

is shown, the NRC will consider 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 Agencywide Documents Access and Management System, (accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html), to the extent possible, do 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, "Protection of Safeguards Information: Performance Requirements."

Dated at Rockville, MD, this 4th day of April 2012.

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

Docket No.:	99900080
Report No.:	99900080/2012-201
Vendor:	SPX, Copes-Vulcan 5620 West Road McKean, PA 16426-1504
Vendor Contact:	Mr. Richard Kuntz, Quality Assurance Manager
Background:	SPX, Copes Vulcan (hereafter referred to as SPX) is a valve manufacturer that has been providing valves to the domestic and international community since the construction of nuclear power plants began. SPX squib valves, as well as other valve designs, will be used in new nuclear plant construction of the AP1000 reactor design at the Vogtle, V.C. Summer, and Levy County nuclear plants, as well as in the construction of Chinese AP1000 nuclear plants.
Inspection Dates:	February 13 - 17, 2012

Inspection Team:		
Yamir Diaz-Castillo	NRO/DCIP/CMVB	Team Leader
Edward Roach	NRO/DCIP/CMVB	Branch Chief
Jeffrey Jacobson	NRO/DCIP/CEVB	
Thomas Kendzia	NRO/DCIP/CQAB	
Stacy Smith	NRO/DCIP/CEVB	
Thomas Scarbrough	NRO/DE/CIB	
John Bartleman	RII/DCI/CIB1	
Jia Fengcia	Observer from the National Nuclear Safety Administration (NNSA)	
Ma Xiangrui	Observer from NNSA	

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

EXECUTIVE SUMMARY

SPX, Copes-Vulcan
99900080/2012-201

The U.S. Nuclear Regulatory Commission (NRC) conducted this inspection to verify that SPX, Copes-Vulcan facility (hereafter referred to as SPX) implemented an adequate quality assurance (QA) program for the design and manufacturing of the AP1000 squib valves that complied 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 performed this inspection to verify that SPX implemented a program under 10 CFR Part 21, "Reporting of Defects and Noncompliance," that met the NRC's regulatory requirements. The NRC conducted the inspection at the SPX facility, in McKean, PA, on February 13-17, 2012.

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

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

During the conduct of this inspection, the NRC inspection team implemented Inspection Procedure (IP) 43002, "Routine Vendor Inspections," as supplemented by 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 NRC inspection team observed various activities associated with the design, manufacturing, and assembly of the 8-inch and 14-inch inch squib valves, conducted interviews with responsible SPX personnel, and reviewed fabrication documents to determine if SPX performed these activities in accordance with the applicable design, quality, and technical requirements imposed in the Westinghouse Electric Company purchase orders. Some of the activities observed by the NRC inspection team include:

- Installation of the energy absorbing material in an 8-inch squib valve.
- Receipt inspection, cleaning, and testing processes for parts procured for use in the manufacture of the squib valves.
- Assembly of an 8-inch and 14-inch squib valves intended for testing and international installations.
- Hydrostatic test of a fully assembled 8-inch squib valve at pressures of 2,485 pound-force per square inch gauge (psig) and 9,000 psig and on two components of two 8-inch squib valves at a pressure of 2,850 psig.

In addition to observing these activities, the NRC inspection team walked down SPX's assembly floor and verified that nonconforming materials were properly identified, marked, and segregated when practical, to ensure they were not reintroduced into the production processes.

With the exception of the nonconformances described below, the NRC inspection team concluded that SPX is effectively implementing its QA and 10 CFR Part 21 programs in support of the design and manufacture of the squib valves. The results of this inspection are summarized below.

10 CFR Part 21 Program

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

Design Validation and Control

The NRC inspection team issued Nonconformances 99900080/2012-201-01, 99900080/2012-201-02, and 99900080/2012-201-03 in association with SPX's failure to implement the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Nonconformance 99900080/2012-201-01 cites SPX for failing to verify the adequacy of the initiator assembly design as part of its commercial-grade dedication program. Specifically, the NRC inspection team identified that the initiator assembly was being procured as a commercial-grade item and dedicated by SPX for use as a basic component. The design of the initiator assembly was performed by a commercial vendor and was not validated by SPX as part of its commercial-grade dedication program. Nonconformance 99900080/2012-201-02 cites SPX for failing to establish measures to verify or check the adequacy of the mechanical design of the squib valves. Specifically, SPX failed to adequately justify the design and installation of energy absorbing material inside the squib valve. Nonconformance 99900080/2012-201-03 cites SPX for failure to establish appropriate measures to verify the suitability of the commercial software used to perform finite element analyses on aspects of the squib valve design. Specifically, SPX failed to institute adequate measures to ensure the suitability of the example models, identify appropriate acceptance methods and critical characteristics, and evaluate error notices obtained from the software manufacturer for potential impact on the analyses being performed.

Oversight of Contracted Activities

The NRC inspection team concluded that SPX is implementing its oversight of contracted activities consistent with the regulatory 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. Based on the limited sample of documents reviewed, the NRC inspection team also determined that SPX is implementing its policies and procedures associated with its oversight of contracted activities. No findings of significance were identified.

Control of Manufacturing Process

The NRC inspection team concluded that SPX is implementing its test control and measuring and test equipment programs consistent with the regulatory requirements of Criterion XI, "Test Control," and Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50, respectively. Based on the limited sample of documents reviewed, the NRC inspection team also determined that SPX is implementing its policies and procedures associated with test control and control of measuring and test equipment. No findings of significance were identified.

The NRC inspection team issued Nonconformance 99900080/2012-201-04 associated with SPX's failure to implement the regulatory requirements of Criterion V, "Instructions, Procedures

and Drawings", of Appendix B to 10 CFR Part 50. Specifically, Nonconformance 99900080/2012-201-04 cites SPX for failing to establish adequate procedures for the assembly of the 8-inch and 14-inch squib valves. For example, some assembly procedures did not contain procedural steps to record M&TE data for equipment used during the assembly process. Furthermore, some procedural steps conflicted with another SPX procedure, and directed personnel to perform an activity that could have caused damage to some critical components of the 8-inch squib valve.

The NRC inspection team issued Nonconformance 99900080/2012-201-05 associated with SPX's failure to implement the regulatory requirements of Criterion XI, "Control of Special Processes", of Appendix B to10 CFR Part 50. Specifically, SPX failed to ensure that the inspector who performed the weld inspections was adequately qualified and trained.

Nonconforming Material, Parts or Components and Corrective Action

The NRC inspection team concluded that SPX is implementing its nonconforming materials, parts, or components program in accordance with the regulatory requirements of Criterion XV, "Nonconforming Materials, 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 SPX is implementing its policies and procedures associated with the control of nonconforming materials, parts or components. No findings of significance were identified.

The NRC inspection team issued Nonconformance 99900080/2012-201-06 associated with SPX's failure to implement the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. Specifically, key SPX personnel involved in the assembly of the squib valves did not identify in the corrective action process, until questioned by the NRC inspection team, conditions adverse to quality related to deficiencies, deviations and nonconformances.

REPORT DETAILS

The NRC inspection team observed various activities associated with the design, manufacturing, and assembly of the 8-inch and 14-inch inch squib valves, conducted interviews with responsible SPX personnel, and reviewed fabrication documents to determine if SPX performed these activities in accordance with the applicable design, quality, and technical requirements imposed in the Westinghouse Electric Company (WEC) purchase orders (POs). Some of the activities observed by the NRC inspection team include:

- Installation of the energy absorbing material in an 8-inch squib valve.
- Receipt inspection, cleaning, and testing processes for parts procured for use in the manufacture of the squib valves.
- Assembly of an 8-inch and 14 inch squib valves intended for testing and international installations.
- Hydrostatic test of a fully assembled 8-inch squib valve at pressures of 2,485 pound-force per square inch gauge (psig) and 9,000 psig and on two components of two 8-inch squib valves at a pressure of 2,850 psig.

In addition to observing these activities, the NRC inspection team walked down SPX's assembly floor and verified that nonconforming materials were properly identified, marked, and segregated when practical, to ensure they were not reintroduced into the production processes.

1. 10 CFR Part 21 Program

a. Inspection Scope

The U.S. Nuclear Regulatory Commission (NRC) reviewed SPX, Copes-Vulcan (hereafter referred to as SPX) policies and implementing procedures that govern the SPX program under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," to verify compliance with the regulatory requirements. In addition, the NRC inspection team evaluated the 10 CFR Part 21 postings and a sampling of SPX POs for compliance with the requirements of 10 CFR 21.6, "Posting Requirements," and 10 CFR 21.31, "Procurement Documents," respectively. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

b.1 Postings

The NRC inspection team verified that SPX had posted notices that included (1) a copy of Section 206 of the Energy Reorganization Act of 1974, (2) a copy of 10 CFR Part 21, and (3) a description of the SPX procedure that implements the regulation.

b.2 Purchase Orders

The NRC inspection team reviewed a sample of POs to verify that SPX had implemented a program consistent with the requirements described in 10 CFR 21.31, which specify the applicability of 10 CFR Part 21 in POs for safety-related services. The NRC inspection team verified that SPX imposed the requirements of 10 CFR Part 21 on qualified suppliers with programs that met the requirements 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."

b.3 10 CFR Part 21 Procedures and Implementation

SPX Procedure 1-6.21, "Identification, Evaluation, and Notification Requirements per 10 CFR Part 21," Revision 1, dated January 14, 2012, establishes the requirements for compliance with the regulatory requirements of 10 CFR Part 21. These documents define the process for reporting defects; the posting requirements; and the responsibilities, timelines, and actions for identifying and evaluating deviations and failures to comply. The NRC inspection team verified that SPX's nonconforming items and corrective action programs, as described in Procedure 1-6.16, "Non-Conforming Materials or Items", Revision 1, dated January 14, 2012, and Procedure 1-6.17, "Corrective Action" Revision 1, dated January 14, 2012, respectively, provide a connection to the 10 CFR Part 21 program during the initial screening process.

The NRC inspection team verified that SPX's procedural guidance was adequate to initiate the 10 CFR Part 21 process and that SPX's staff is knowledgeable about the conditions that would warrant a 10 CFR Part 21 evaluation.

The NRC inspection team noted that SPX had not performed any 10 CFR Part 21 evaluations in the last 5 years. The NRC inspection team reviewed the nonconforming item (Q-Ticket) log for the last 2 years and a sample of corrective action reports (CAR) for the last 5 years and did not identify any specific issues that would have warranted further evaluation under the SPX 10 CFR Part 21 program.

c. Conclusion

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

2. Design Validation and Control

a. Inspection Scope

The NRC inspection team reviewed the SPX programs and processes associated with validating and controlling the design of the 8 and 14 inch squib valves to verify compliance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed the implementation of measures established by SPX to:

- verify the adequacy of the design, such as by the performance of design reviews, the use of alternate or simplified calculational methods, or the performance of a suitable testing program,

- assess the suitability of application of materials, parts, equipment, and processes essential to the safety-related functions of the squib valves, and

- ensure that the design of key elements of the squib valves is effectively controlled.

Specifically, the NRC inspection team reviewed SPX's programs for validating the design through testing and analysis; translating key WEC design specifications into SPX design reports, procedures, and drawings; dedicating commercial-grade subcomponents and analysis software; and making changes to the design and controlling the design throughout the design and manufacturing phases. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

b.1 Design Validation

SPX suppliers squib valves that are designed to be "highly reliable." Their operation is critical to the successful implementation of accident mitigation strategies for the AP1000 reactor design. Unlike other valves, and most other safety-related components, squib valves are designed primarily for a one-time operation under accident conditions. Therefore, once installed, their operability and performance over time cannot be verified easily through routine surveillance testing. As such, it is critical that the performance of these valves be fully demonstrated through a rigorous design validation process. While the term "highly reliable" is not explicitly defined in the WEC design specifications, the probabilistic risk assessment for the AP1000 reactor design assumes the failure on demand rate for both the 8-inch and 14-inch squib valve designs to be 5.8E-04. These assumed failures rates are derived primarily from industry data on other squib valve designs; however, the NRC inspection team noted that other designs currently in use in the nuclear power industry are significantly different in size. As such, the NRC inspection team focused its inspection efforts on the steps SPX had taken to validate that the design of the squib valves was sufficient to ensure highly reliable operation over the lifecycle specified for the valves.

The NRC inspection team noted that SPX's methodology to validate the valve design relies on both testing and analysis because the relatively small number of actual valve actuations during testing is not sufficient to statistically establish the desired reliability for the valves. The NRC inspection team reviewed SPX's design and test reports to determine the adequacy of SPX's efforts to validate various aspects of the squib valve design. The NRC inspection team found that SPX had performed a number of functional and prototype tests to establish critical parameters associated with the squib valve design. The NRC inspection team reviewed the sensitivity analysis SPX prepared to quantify variations observed in the critical parameters during the functional tests, as necessary to account for tolerances in materials, manufacturing, and assembly processes. The NRC inspection team also reviewed the failure modes and effects analysis (FMEA) that SPX and WEC prepared to evaluate potential failure modes for the squib valves. In addition, the NRC inspection team reviewed the lot acceptance testing to be conducted to satisfy the WEC design specifications for testing each production lot.

Although the NRC inspection team determined that the sensitivity analysis, FMEA, and functional testing program appropriately addressed key mechanical requirements (with the exceptions discussed in this report) associated with the operation of the 8-inch and 14-inch squib valves, it also found that the analyses did not include the initiator assembly, which performs the critical function of igniting the charge that ultimately provides the motive force to operate the valve. In addition, the NRC inspection team found that the design of the initiator assembly was performed by a commercial vendor and these initiator assemblies were procured as a commercial-grade item and dedicated by SPX for use as a basic component. Furthermore, SPX did not validate the design of the initiator assemblies as part of its commercial-grade dedication program.

The initiator assembly performs its function when it receives a firing signal from the plant protective systems. The applied signal supplies an electrical current that heats a fine wire (bridge wire) located within the initiator assembly to a point sufficient to ignite the explosive powder. The NRC inspection team found that SPX had not performed testing or analysis sufficient to validate critical attributes of the initiator assembly design, including but not limited to: the current temperature and resistance profile of the wire; the flashpoint, quantity, and packing force used to install the explosive powder; the effects of aging, temperature, or radiation on the explosive powder; and the strength and effects of temperature, fatigue, and vibration on the weld used to secure the bridge wire to the connector pins. The NRC inspection team determined that although SPX had identified some of these attributes as critical characteristics for the purposes of commercial-grade dedication of the initiator design, the acceptance criteria for the characteristics were primarily restatements of manufacturing tolerances and inspections contained in the vendor's commercial manufacturing procedure. When the NRC inspection team questioned SPX, it had insufficient knowledge of the initiator assembly design parameters, as necessary to account for any material, manufacturing, or assembly tolerances. The NRC inspection team identified this issue as an example of Nonconformance 99900080/2012-201-01 for SPX's failure to verify the adequacy of the initiator assembly design as part of its commercial-grade dedication program.

The NRC inspection team found that although the squib valves are required to be environmentally and seismically qualified for operation in a harsh environment, WEC has taken the direct responsibility for these qualification programs; therefore, this inspection did not assess the adequacy of the proposed environmental qualification programs for these valves.

The NRC inspection team reviewed the ongoing development of SPX and WEC surveillance requirements for the AP1000 squib valves during plant operation. For example, the team noted the specification of the design life for the explosive booster charge. Further, the team found several surveillance recommendations specified in the FMEA. The NRC inspection team discussed with SPX personnel the NRC license condition for squib valve surveillance requirements in NRC Commission Memorandum and Order CLI-12-02, dated February 9, 2012, for the combined operating license for Vogtle Units 3 and 4. The team also noted the provision in the Vogtle Units 3 and 4 final safety analysis report that the lessons learned from the design and qualification of the squib valves will be applied in the development of surveillance requirements for those valves in the Vogtle inservice testing program. During the inspection, WEC representatives stated that surveillance requirements for the AP1000 squib valves are being developed to include consideration factors such as the Vogtle license conditions, the booster design life, and the FMEA recommendations.

b.2 Design Control

The NRC inspection team found that the final designs of the 8-and 14-inch squib valves include energy absorbing material. Prior to the inspection, SPX modified the design feature of the energy absorbing material in later functional tests of the squib valve design. The NRC inspection team observed the installation process for the energy absorbing material in an 8-inch squib valve and discussed with SPX personnel the operational and research experience with other types of power-operated valves. The NRC inspection team found that this design feature was not adequately addressed in the sensitivity analysis or FMEA. The NRC inspection team identified this issue as an example of Nonconformance 99900080/2012-201-02 for SPX's failure to establish measures to verify or check the adequacy of the mechanical design of squib valves.

b.3 Commercial Grade Engineering Software

The NRC inspectors reviewed the control of the ANSYS software SPX used for finite element analysis and solid modeling of the squib valves. The NRC inspection team found that SPX was using a commercial version of the software for evaluating the components for stress, loads, deflection, modal analysis, weight, and center of gravity. SPX explained its methodology for dedicating this software in a safety-related application. This included SPX verifying it is using the appropriate version of the ANSYS software and then verifying the acceptability of the software by solving known example problems and comparing the answers obtained with the software against the known correct answer. SPX personnel demonstrated the convergence of the model solution to support its argument that the specific application of the ANSYS model is verified.

The NRC inspection team found that this method of commercial-grade dedication was incomplete and was not sufficient to verify the suitability of the software used. SPX Procedure GT-14, "Verification and Validation of Commercially Procured Software for Design Analysis for Safety Related and Section 3 Jobs," Revision 4, dated January 31, 2012, states, in part, that the "software received shall be reviewed to confirm that the software received is the version purchased," but the manufacturer and version are not specified in the commercial- grade dedication instruction. In addition, SPX does not establish measures to collect or evaluate notices or errors issued by the software supplier and capture them in a nonconformance process to determine if they have an adverse effect on the versions of the software used in safety-related applications. Furthermore, the measures provided to validate the suitability of the modeling used in safety-related applications do not require acceptance criteria or methods to ensure that an appropriate selection of an example problem with similar geometrical properties and boundary conditions is used to validate the use of the software for a specific safety-related application. The measures to dedicate the software also lacked the necessary guidance to ensure the modeling results demonstrate convergence, such as through the use of a more precise mesh size to arrive at a unique solution. The NRC inspection team identified this issue as an example of Nonconformance 99900080/2012-201-03 for SPX's failure to institute adequate measures to ensure the suitability of the example models, identify appropriate acceptance methods and critical characteristics, and evaluate error notices obtained from the manufacturer for potential impact on the analyses being performed.

b.4 Dedication and Acceptance Testing of Subcomponents

SPX has implemented an extensive testing program to verify the critical characteristics of key subcomponents of the squib valves, including subcomponents procured as commercial-grade and those procured as safety-related. For safety-related procured subcomponents, the NRC inspection team reviewed and found acceptable SPX Procedure 4.4.624, "Lot Acceptance Test Procedure, 8-inch HP Squib Valve," Revision 0, dated February 24, 2011, which specifies that acceptance testing satisfy the WEC design specifications for each production lot for two of the more critical subcomponents that make up the valve assembly. SPX procured all of these subcomponents as safety-related.

The NRC inspection team also reviewed SPX's testing to dedicate individual parts used in the manufacture of the initiator assembly. The initiator assembly is procured as a commercial-grade item. SPX, which along with another commercial company, assemble the various individual parts that comprise the initiator assembly. SPX has taken on the responsibility for dedicating the initiator assembly since the commercial vendors providing the

initiator assembly do not have quality assurance programs that meet the regulatory requirements of Appendix B to 10 CFR Part 50.

The NRC inspection team found that although SPX had developed dedication instructions for each of the piece parts that provide a safety-related function, some of the tests it specified as part of the dedication instructions were only performed on a sample basis. The sampling methodology SPX employs is based on Electrical Power Research Institute NP-7218, "Guideline for Utilization of Sampling Plans for Commercial-Grade Item Acceptance (NCIG-19)", issued June 1992. This guidance contains a discussion about the different methods for establishing lot formation ensuring the homogeneity of the lot, as necessary for developing a supportable sampling plan. The NRC inspection team found that in some cases, SPX had defined as product lots, for the purpose of material verification, individual pieces for which traceability back to the original equipment manufacturer (OEM) was not apparent. In general, the NRC inspection team noted that traceability back to the OEM is necessary for each piece in a defined lot to ensure that the pieces actually tested were representative of the material lot. For example, with respect to the connector pins used in the initiator assembly, SPX performed material verification testing on a representative sample of the pins that were drawn from a lot for which material traceability back to the OEM did not exist. However, in this case, the NRC inspection team concluded that SPX's overall approach for the dedication of these items was acceptable because SPX was performing other testing on every subassembly, including electrical continuity, insulation resistance, and leakage tests sufficient to give reasonable assurance of the suitability of the connector pins.

c. Conclusion

The NRC inspection team issued Nonconformances 99900080/2012-201-01, 99900080/2012-201-02, and 99900080/2012-201-03 in association with SPX's failure to implement the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50. Nonconformance 99900080/2012-201-01 cites SPX for failing to verify the adequacy of the initiator assembly design as part of its commercial-grade dedication program. Specifically, the NRC inspection team identified that the initiator assembly was being procured as a commercial-grade item and dedicated by SPX for use as a basic component. The design of the initiator assembly was performed by a commercial vendor and SPX did not validate it as part of its commercial-grade dedication program. Nonconformance 99900080/2012-201-02 cites SPX for failing to establish measures to verify or check the adequacy of the mechanical design of the squib valves. Specifically, SPX failed to adequately justify the design and installation of the energy absorbing material. Nonconformance 99900080/2012-201-03 cites SPX for failure to establish appropriate measures to verify the suitability of the commercial software used to perform finite element analyses on aspects of the squib valve design. Specifically, SPX failed to institute adequate measures to ensure the suitability of the example models, identify appropriate acceptance methods and critical characteristics, and evaluate error notices from the software manufacturer for potential impact on the analyses being performed.

3. Oversight of Contracted Activities

a. Inspection Scope

The NRC inspection team reviewed the SPX policies and implementing procedures that govern the implementation of SPX's oversight of contracted activities to verify compliance with the regulatory 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 a sample of purchase requisitions and POs associated with the 8-inch and 14-inch squib valves to evaluate compliance with the SPX program requirements. The NRC inspection team observed the receipt inspection, cleaning, and testing processes for parts SPX procured for use in the manufacture of the squib valves. In addition, the NRC inspection team reviewed a sample of external audits SPX performed on suppliers that provided material and machining services for parts associated with the design and manufacturing of the squib valves. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

b.1 Procurement Document Control

The NRC inspection team reviewed a sample of POs SPX issued in support of the design and manufacturing of the 8-inch and 14-inch squib valves to determine if the requirements identified in the procedures were imposed on applicable purchasing documents. The NRC inspection team found that the POs adequately documented the procurement requirements as established by SPX's governing policies and procedures which include (1) task definitions and responsibilities, (2) imposition of appropriate quality, technical, and regulatory requirements, and (3) identification of applicable codes and standards. The NRC inspection team also found that these POs adequately defined contract deliverables, disposition of nonconformances, access rights to subtier suppliers, and extension of contractual requirements to subcontractors.

b.2 Maintenance of the Approved Supplier List

The NRC inspection team reviewed the approved suppliers list (ASL) to ensure that qualified and approved suppliers were listed; authorized personnel maintained, distributed, and periodically updated the list; and any revisions to the list were implemented following the applicable procedures. The NRC inspection team confirmed that the suppliers performing work for SPX were appropriately listed on the ASL. In addition, the NRC inspection team confirmed that the scope of supply was documented and consistent for the activities contracted.

b.3 External Audits

The NRC inspection team reviewed a sample of external audits to verify the implementation of the SPX audit program. The NRC inspection team verified that SPX had prepared and approved plans identifying 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 SPX had reviewed and approved the corrective action and verified its satisfactory completion and proper documentation.

b.4 Receiving Inspection

The NRC inspection team reviewed control of critical parts of the 8-inch squib valve material and machining, including inconel bar material machining, and the electrical connectors. In addition, the NRC inspection team observed the cleaning and visual inspection of some of the critical parts of the 8-inch squib valve. Furthermore, the NRC inspection team also observed a

minimum wall thickness inspection. The NRC inspection team noted that SPX had procured material for the 8-inch and 14-inch squib valves as safety-related. After receiving the material, SPX sent the material to an approved supplier on its ASL to be machined. The NRC inspection team noted that the PO SPX issued to machine some of the critical parts does not require the work to be completed under Appendix B to 10 CFR Part 50 or 10 CFR Part 21. However, when SPX received the machined material back from its suppliers, it performed a 100 percent inspection on the parts to verify all critical components.

c. Conclusion

The NRC inspection team concluded that SPX is implementing its oversight of contracted activities consistent with the regulatory requirements of Criterion IV, Criterion VII, and Criterion XVIII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents it reviewed, the NRC inspection team also determined that SPX is implementing policies and procedures associated with its oversight of contracted activities. No findings of significance were identified.

4. Control of Manufacturing Process

a. Inspection Scope

The NRC inspection team reviewed the SPX policies and implementing procedures that govern the implementation of SPX's manufacturing process to verify compliance with the regulatory requirements of Criterion V, "Instructions, Procedures and Drawings," Criterion IX, "Control of Special Processes," Criterion XI, "Test Control," and Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. The NRC inspection team observed various activities associated with the assembly of the 8-inch and 14-inch inch squib valves, conducted interviews with responsible SPX personnel, and reviewed fabrication documents to determine if SPX performed assembly activities in accordance with the applicable design, quality, and technical requirements imposed in the WEC POs. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

b.1 Instructions, Procedures, and Drawings

The NRC inspection team verified that SPX had specific instructions, procedures, and drawings established for the control of manufacturing, assembly, testing and handling of the 8-inch and 14-inch squib valves. During the course of the inspection, the NRC team observed several instances in which SPX procedures were not adequate.

In its review of SPX Procedure No. 50-5.07.01, "Control and Inspection of Micrometers and Gages," Revision 39, dated August 30, 2010, the NRC inspection team noted that step 3.3 stated that "[i]nside micrometers are used as transfer gages only. Final measurement is taken using outside micrometers." During the assembly of a 14-inch squib valve using Assembly Procedure 1.2.446, "14 inch ADS Squib Valve," Revision 3, dated February 3, 2012, the NRC inspection team observed that during the performance of step 3.12.6, SPX personnel used inside micrometers to measure and confirm data necessary to verify the acceptance criteria of this step and then continued to the next step. However, SPX personnel did not use outside micrometers to make the final determination if the measurements were satisfactory. Upon further discussion with SPX personnel, the NRC inspection team found that step 3.12.6 of Assembly Procedure 1.2.446 directed personnel to use inside micrometers for final

measurement, which is contrary to the SPX standard to not use inside micrometers for final measurement (due to the inherent difficulties with the many attachments for inside micrometers) as specified in Procedure No 50-5.07-01. In addition, the NRC inspection team noted that no measuring and test equipment (M&TE) data were recorded in step 3.12.6 of the procedure. The procedure step did not have a place for personnel to record M&TE data. The NRC inspection team identified these issues as an example of Nonconformance 99900080/2012-201-04 for SPX's failure to provide adequate assembly procedures for the recording of M&TE data and for the use of micrometers. SPX initiated CAR No. 643 and No. 644 to address these issues, respectively.

The NRC inspection team witnessed the assembly of an 8-inch squib valve in accordance with Assembly Procedure No. 1.2.453, "8 inch LP Squib Valve," Revision 5, dated February 9, 2012. The NRC inspection team noted that during assembly of the 8-inch squib valve step 3.12.12 could not be performed as written without potentially causing damage or inducing stresses into valve components. Step 3.12.12 of Assembly Procedure 1.2.453 directed personnel to use the crane to lift the piston assembly. The NRC inspection team brought this issue to the attention of SPX and WEC personnel present during the attempted performance of this step during valve assembly.

The NRC inspection team noted that vertical movement of the closure device assembly could introduce stresses into components of the valve potentially causing material weakening, damage, or failure of these components. The NRC inspection team identified this issue as another example of Nonconformance 99900080/2012-201-04 for SPX's failure to have adequate procedures to prevent damage to some critical components during assembly of the 8-inch squib valve. SPX initiated CAR No. 645 to address this issue.

b.2 Control of Special Processes

The NRC inspection team verified that SPX had established and implemented procedures for the control of special processes such as welding, and nondestructive examination (NDE). The procedures provide measures for generating of special process control documents, including travelers, shop orders, inspection and test reports, assembly test reports, and weld orders. The NRC inspection team verified that the process control documents include personnel and equipment requirements, conditions for accomplishing the process, acceptance criteria, results of inspections, and appropriate signatures.

The NRC inspection team reviewed a sample of the training and qualification records for SPX's NDE personnel and confirmed that these personnel had completed all required training and maintained qualification and certification in accordance with SPX's policies and procedures.

The NRC inspection team reviewed Procedure Qualification Record (PQR) No. 38 and Welding Procedure Specification (WPS) No. 20-881. The NRC inspection team noted that PQR No. 38 did not contain all the essential variables for base metals and filler metals as required by Section IX, "Welding and Brazing Qualifications," of the American Society of Mechanical Engineers (ASME) Code. The essential variables missing from PQR No. 38 were the thickness range in the base metals and deposited weld thickness. Although the PQR did not contain these essential variables, the NRC inspection team verified that the missing variables did not invalidate the WPS. SPX initiated CAR No. 648 to address this issue.

The NRC inspection team witnessed the assembly of two 8-inch and one 14-inch squib valves; direct measurement verification of four critical components of 14-inch squib valves; NDE liquid

penetrant testing (PT) of a critical component of one 14-inch squib valves; and welding and subsequent NDE PT of a critical component on one the welds of one 8-inch squib valve. The NRC inspection team also reviewed records for the measurement of an additional four critical components of 14-inch squib valve.

During review of Procedure 17399 (01) MP, "Manufacturing Procedure for the Initiator Assembly," Revision 0, dated September 23, 2009, the NRC inspection team found that the manufacturing procedure appeared to contain an appropriate amount of detail and inspection steps for verifying critical aspects of the manufacturing process. As described elsewhere in this report, SPX procures the initiator assemblies as a commercial-grade item and then dedicates the assemblies for use as a basic component by performing a combination of testing and in process inspection. SPX's strategy and requirements for dedicating the initiator assembly is described in Commercial Grade Dedication Instruction No. 17399400, dated February 10, 2012, and Safety Related Check List QC-86-398312, Revision 6. The NRC inspection team found that as part of the vendor's manufacturing process for the initiator assembly, a very fine bridge wire is welded onto electrical connector pins using bridge wire installation tool TN 18301-1 with weld Standard 5059. The manufacturing procedure also contained a directive for an inspector from the commercial vendor to perform a visual examination of the weld using 10x magnifications and provided qualitative acceptance criteria. SPX then transferred these acceptance criteria into its safety related checklist for the initiator assembly used to perform the commercial-grade dedication. The checklist included a signoff for an SPX inspector to inspect the weld at the commercial vendor's facility, using essentially the same instructions given to the commercial vendor's inspector.

The NRC inspection team questioned that such an inspection would be difficult to perform because the completed weld was recessed within the initiator assembly and the actual weld was extremely small. The NRC inspection team reviewed the qualification and training records for the SPX inspector and determined that he did not have weld inspector qualifications, or any specific training on performing weld inspections, particularly inspections of the type of weld in this instance. Although the electrical continuity of the completed connector is verified for each initiator assembly as part of the dedication process, failure of the weld after installation could prevent operation of the squib valve. The NRC inspection team identified this issue as Nonconformance 99900080/2012-201-05 for SPX's failure to ensure that the inspector tasked with performing weld inspections had the qualifications and training necessary to successfully perform the inspection.

b.2.a Squib Valves' Inspections, Testing, Analyses and Acceptance Criteria

The inside diameter of the flow area of the 14-inch squib valves will be used to help determine acceptable closure of Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) 2.01.02.08d.iii. ITAAC 2.01.02.08d.iii, which states that "the flow area through each fourth-stage ADS valve is $\geq$ 67 in^2 [square inches]." The NRC inspection team reviewed the minimum inside diameter measurements on the eight 14-inch squib valve flow components and are listed below by part serial number (S/N), along with their corresponding areas:

14-inch Shear Cap S/N	Measured Inside Diameter *(in inches)*	Date Measured	Area *(in square inches)*
10-05	9.2395 in	8/30/11	67.048 in^2

14-inch Shear Cap S/N	Measured Inside Diameter *(in inches)*	Date Measured	Area *(in square inches)*
10-07	9.2413 in	8/25/11	67.074 in^2
10-08	9.2400 in	8/25/11	67.055 in^2
10-09	9.2395 in	8/30/11	67.048 in^2
11-03	9.2381 in	2/14/12	67.028 in^2
11-04	9.2384 in	2/14/12	67.032 in^2
11-05	9.2391 in	2/14/12	67.042 in^2
11-06	9.2382 in	2/14/12	67.029 in^2

These eight 14-inch minimum inside diameter measurements represent a sample size of 20 percent. The NRC inspection team questioned the final condition of the valve's flow opening after the valve opened, and how much material would protrude into the flow opening. The "as-measured" dimensions of the 14-inch squib valve flow area met the flow area requirements of ITAAC 2.01.02.08d.iii with the valve in its normally closed position. However, the flow area of the valve opening may change slightly after the valve has been opened. Further review by NRC staff is necessary to verify the adequacy of meeting ITAAC 2.01.02.08d.iii with the valve in the open position. The NRC inspection team initiated Technical Assistance Request No. AP-GG-M-005 to resolve this issue. This NRC review will be followed up during the ITAAC closure process.

b.3 Test Control

The NRC inspection team witnessed a hydrostatic test of a fully assembled 8-inch squib valve at pressures of 2,485 pound-force per square inch gauge (psig) and 9,000 psig and on two components of two 8-inch squib valves at a pressure of 2,850 psig. The NRC inspection team also reviewed testing records for a hydrostatic test conducted on one fully assembled 14-inch squib valve tested at pressures of 9,000 psig and 450 psig. The NRC inspection team also determined that the performance of the hydrostatic test and the supporting documentation were consistent with the requirements of Section III, "Rules for Construction of Nuclear Power Plant Components," of the ASME Boiler and Pressure Vessel Code and with SPX procedures.

b.4 Control of Measuring and Test Equipment

The NRC inspection team verified that the M&TE used during the assembly and inspection of the squib valves had appropriate calibration stickers and current calibration dates, including calibration due dates, and that the associated calibration records were current and available for review. The NRC inspection team reviewed a sample of calibration records and verified that they included information on as-found or as-left conditions, calibration results, reference standards used, calibration date, 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 and certified equipment that has known valid relationships to nationally recognized standards.

c. Conclusion

The NRC inspection team concluded that SPX is implementing its test control and measuring and test equipment programs in a manner consistent with the regulatory requirements of Criterion XI and Criterion XII of Appendix B to 10 CR Part 50, respectively. Based on the limited sample of documents it reviewed, the NRC inspection team also determined that SPX is implementing its policies and procedures associated with test control and control of measuring and test equipment. No findings of significance were identified.

The NRC inspection team issued Nonconformance 99900080/2012-201-04 associated with SPX's failure to implement the regulatory requirements of Criterion V of Appendix B to 10 CFR Part 50. Specifically, Nonconformance 99900080/2012-201-04 cites SPX for failing to establish adequate procedures for the assembly of the 8-inch and 14-inch inch squib valves. For example, some assembly procedures did not contain procedural steps to record M&TE data for equipment used during the assembly process. Furthermore, some procedural steps conflicted with another SPX procedure, and directed personnel to perform an activity that would have caused damage to some critical components of the 8-inch squib valve.

The NRC inspection team issued Nonconformance 99900080/2012-201-05 associated with SPX's failure to implement the regulatory requirements of Criterion XI, "Control of Special Processes", of Appendix B to10 CFR Part 50. Specifically, SPX failed to ensure that the inspector who performed the weld inspections was adequately qualified and trained.

5. Nonconforming Materials, Parts, or Components and Corrective Action

a. Inspection Scope

The NRC inspection team reviewed SPX's policies and procedures that govern the implementation of SPX's nonconforming materials, parts, or components and corrective action programs to verify compliance with Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of nonconforming item reports (Q-Tickets) and CARs, and discussed the nonconforming materials, parts, or components and the corrective action programs with SPX management and staff. In addition, the NRC inspection team reviewed how issues outside the nonconforming materials, parts, or components and the corrective action processes are considered for input into the appropriate process. The attachment to this inspection report lists the documents reviewed and the personnel interviewed by the NRC inspection team.

The NRC inspection team performed walkdowns of material storage, work areas, and the facility to inspect the segregation of nonconforming materials and material conditions that could contribute to quality issues. The NRC inspection team also observed ongoing craft work and inspection activities for the identification and control of Q-Tickets and CARs.

b. Observations and Findings

b.1 Implementation of the Nonconforming Materials, Parts, or Components Program

SPX's program defines nonconforming materials, parts, or components as a deficiency in a characteristic, documentation, or procedure that renders an item unacceptable or indeterminate.

SPX applies the nonconformance process to items it receives for use in the manufacturing process; for items it works on during the manufacturing process, including items sent out to a vendor for work and returned to SPX; and any existence of nonconformance with the physical item in the manufacturing process or its associated documentation.

The NRC inspection team verified that SPX processes and procedures identify, document, segregate, evaluate, and dispose of nonconforming items. This process also applies the principles of accepted, rework, scrap, on-hold, or use-as-is, and provides for the applicable justifications to be adequately supported and properly documented. Because SPX performs work under Section III of the ASME Code, the nonconformance authorizes the Authorized Nuclear Inspector to review work performed under the ASME Code. Through interviews with SPX staff, the NRC inspection team verified that all personnel knew they could initiate a Q-Ticket and were familiar with the requirements for notifying their supervisor, engineering department, or QA Personnel for any nonconforming items identified. The NRC inspection team also verified that SPX's nonconformance process provides guidance to evaluate nonconformances for reportability under SPX's 10 CFR Part 21 program. The nonconformance process is also linked to the corrective action program.

The NRC inspection team walked down SPX's assembly floor and verified that nonconforming materials were properly identified, marked, and segregated when practical, to ensure they were not reintroduced into the production processes. The NRC inspection team also verified that SPX had adequate controls for segregation of in process nonconforming materials. The NRC inspection team reviewed material on hold and verified that it was physically tagged with a Q-Ticket and that the document package clearly identified the issue and status. The NRC inspection team observed that all Q-Ticketed items are placed on hold and there is no work allowed on the item until the item is dispositioned. During review of Q-Ticket 43179, the NRC inspection team identified that the disposition appeared to incorrectly identify the parts to be scrapped. SPX indicated that the correct items were scrapped; the disposition in the Q-Ticket was in error. SPX initiated CAR No. 638 to address this discrepancy.

The NRC inspection team verified that, for the sample of nonconformances reviewed, SPX had (1) dispositioned the nonconformances it identified in accordance with SPX approved procedures, (2) presented an appropriate technical justification for each disposition, (3) taken adequate action with regard to the nonconforming material or item, and (4) subjected all identified nonconformances, as appropriate, to a 10 CFR Part 21 assessment or evaluation.

The NRC inspection team attended the daily Materials Review Board (MRB) meeting where representatives from different SPX departments meet to discuss the disposition of nonconforming materials and items. The MRB is tasked with determining if the nonconformance should also be documented in a CAR, and performing a screening to determine if a 10 CFR Part 21 evaluation is required.

b.2 Implementation of the Corrective Action Program

The SPX program for corrective action defines conditions adverse to quality as any condition that could affect the component's ability to function within design requirements, including safety-related items. This definition is different than the definition in Criterion XVI of 10 CFR Part 50 Appendix B, which states, in part, that "conditions adverse to quality such as, failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected."

The NRC inspection team verified that the SPX processes and procedures for corrective action require prompt identification, at the minimum for an apparent cause, and corrective action for all conditions adverse to quality. For significant conditions adverse to quality root cause analysis and action to prevent recurrence is required. The SPX corrective action process requires the QA manager to review the completed CAR and allows for verification of actions taken. Through interviews with SPX personnel, the NRC inspection team verified that personnel were aware they could initiate a CAR, although when a problem is identified the personnel interviewed indicated they would contact staff from the QA or engineering departments to initiate a CAR or a Q-Ticket.

The NRC inspection team reviewed the CAR log for the last 5 years and determined that CARs were submitted for a wide variety of issues, including internal and external audit findings, internal QA assessments, customer complaints or returns, failures in implementing QA requirements, adverse trends identified in Q-Tickets, and some more significant Q-Ticket items. QA personnel initiated most CARs. The NRC inspection team reviewed a sample of CARs and associated documentation on a variety of issues, but it mainly focused on issues affecting the manufacturing of the squib valves, including some QA issues and audit findings. The NRC inspection team verified that each CAR contained a detailed description of the nonconformance and a justification for the disposition. None of the CARs was identified as a significant condition adverse to quality, and the NRC inspection team did not identify that any should have been.

On February 14, 2012, when assembling a 14-inch squib valve in accordance with SPX Assembly Procedure 1.2.446, the NRC inspection team observed the supervising engineer noting a misalignment. The supervising engineer stopped the work and directed the valve to be partially disassembled past a quality control hold point where damage was discovered. The damage was documented in a separate Q-Ticket for each damaged part. The engineer proceeded to direct reperformance of the assembly including the reperformance of the quality control hold point. The NRC inspection team's review of the procedure noted that the engineering direction appeared to be in excess of what the procedure allowed. The NRC inspection team also questioned if difficulty in performing a procedure results in damage to a part, a CAR should have been initiated to address the issue of the procedure's adequacy. SPX determined that a CAR should have been written for both of these concerns and initiated CARs No. 635 and No. 636. SPX took prompt corrective action to provide more guidance on how to handle needed changes to the procedure. During discussions with the engineers who supervise assembly of the squib valves, the NRC inspection team found that none of the engineers fully understood the circumstances under which a CAR should be initiated for a condition adverse to quality. These engineers stated they would take action to correct the result of a condition adverse to quality, but would not identify the problem in a CAR, which could result in the condition adverse to quality not being identified and corrected. The NRC identified this issue as Nonconformance 99900080/2012-201-06 for SPX's failure to provide sufficient guidance to identify conditions adverse to quality related to deficiencies, deviations and nonconformances.

c. Conclusion

The NRC inspection team concluded that SPX is implementing its nonconforming materials, parts, or components program in accordance with the regulatory requirements of Criterion XV of Appendix B to 10 CFR Part 50. Based on the limited sample of documents it reviewed, the NRC inspection team also determined SPX is implementing its policies and procedures associated with the control of nonconforming materials, parts or components. No findings of significance were identified.

The NRC inspection team issued Nonconformance 99900080/2012-201-06 associated with SPX's failure to implement the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. Specifically, key SPX personnel involved in the assembly of the squib valves did not identify in the corrective action process, until questioned by the NRC inspection team, conditions adverse to quality related to deficiencies, deviations and nonconformances.

6. Entrance and Exit Meetings

On February 13, 2012, the NRC inspection team discussed the inspection scope during an entrance meeting with Mr. Jerry Skolnik, the site director, and other SPX personnel. On February 17, 2012, the NRC inspection team presented the inspection results during an exit meeting with Mr. Skolnik and other SPX personnel.

ATTACHMENT

1. PERSONS CONTACTED

Name	Title	Affiliation	Entrance	Exit	Interviewed
Jerry Skolnik	Site Director	SPX	X	X	
Christian Sundberg	Project Manager	SPX	X	X	
Richard Kuntz	Quality Assurance Manager	SPX	X	X	X
Chris McVicker	Chief Financial Officer, SPX Americas	SPX	X	X	
Tony Renzi	President, SPX Americas	SPX		X	
Tom Bierman	Quality Director, SPX FT Americas	SPX		X	
Aaron Hegman	Project Manager	SPX	X	X	
John Greaves	Product Manager	SPX	X	X	X
Dale Mays	Vice President Sales	SPX	X	X	
Fred Spataro	Squib Project Manager	SPX	X	X	
Adam Bosworth	Squib Design Engineer	SPX	X	X	X
Mark Crays	Design Engineer	SPX	X	X	X
Dave Ristau	Engineering Manager	SPX	X	X	X
Julia Burton	Manufacturing Manager	SPX		X	X
Linda Hites	QA Engineer	SPX			X
Dave Martin	Sales Engineer	SPX			X
Tom Cables	Welding Inspector	SPX			X
Don Grossman	Welder	SPX			X
Doug Williams	Welder	SPX			X
Dennis Kinzel	QA Inspector	SPX			X

Name	Title	Affiliation	Entrance	Exit	Interviewed
Robert Wnek	Design Engineer	SPX			X
Curt Lipinski	NDE Level 1 Inspector for PT	SPX			X
Floyd Porter	NDE Level 3 Inspector for MT, PT and RT	SPX			X
Jamie Vasquez	Director Supplier Quality Oversight	Westinghouse	X	X	
Gerald Riegel	Engineer	Westinghouse	X	X	
James Boltz	Project Manager Contractor	Westinghouse			X
Rachel Bottorff	Product Engineer	Westinghouse			X
Daniel Cooper	Lead Auditor	Global Quality Assurance	X	X	
Francis Riley	Lead Auditor	Global Quality Assurance	X	X	
Yamir Diaz-Castillo	Team Lead	NRC	X	X	
Edward Roach	Branch Chief	NRC	X	X	
Jeffrey Jacobson	Senior Operations Engineer	NRC	X	X	
Stacy Smith	Operations Engineer	NRC	X	X	
Thomas Kendzia	Operations Engineer	NRC	X	X	
Thomas Scarbrough	Senior Mechanical Engineer	NRC	X	X	
John Bartleman	Senior Construction Inspector	NRC	X	X	
Ma Xiang Rui	Inspector	China NNSA	X	X	
Jia Jenycui	Inspector	China NNSA	X	X	

2. INSPECTION PROCEDURES USED

Inspection Procedure 36100, “Inspection of 10 CFR Part 21 and 50.55(e) Programs for Reporting Defects and Noncompliance,” dated April 25, 2011.

Inspection Procedure 43002, “Routine Inspections of Nuclear Vendors,” dated April 25, 2011.

Inspection Procedure 43004, “Inspection of Commercial-Grade Dedication Programs,” dated April 25, 2011.

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Item Number	Status	Type	Description
99900080/2012-201-01	Open	NON	Criterion III
99900080/2012-201-02	Open	NON	Criterion III
99900080/2012-201-03	Open	NON	Criterion III
99900080/2012-201-04	Open	NON	Criterion V
99900080/2012-201-05	Open	NON	Criterion IX
99900080/2012-201-06	Open	NON	Criterion XVI

4. INSPECTIONS, TESTS, ANALYSES AND ACCEPTANCE CRITERIA

The NRC inspection team identified the following Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) related to the squib valves. These ITAAC are referenced in this section for future use by the NRC staff during the ITAAC closure process and by no means constitute that the ITAAC have been met and closed.

AP1000 Design Control Document, Tier 1, Revision 19	Table 2.1.2-4	ITAAC 8.d and ITAAC 12
AP1000 Design Control Document, Tier 1, Revision 19	Table 2.2.3-4	ITAAC 12

5. DOCUMENTS REVIEWED

- SPX Corporation Quality Assurance Manual, Sixth Edition, Revision 1, dated February 6, 2012
- Procedure 1-6.02, “Quality Assurance Administration and Responsibilities,” Revision 1, dated January 14, 2012,
- Procedure 1-6.04, “Design Control,” Revision 1, dated January 14, 2012
- Procedure 1-6.05, “Purchasing Control,” Revision 1, dated January 14, 2012
- Procedure 1-6.06, “Instructions, Procedures and Drawings,” Revision 1, dated January 14, 2012
- Procedure 1-6.07, “Document Control,” Revision 1, dated January 14, 2012
- Procedure 1-6.08, “Control of Purchased Items and Services,” Revision 1, dated January 14,2012
- Procedure 1-6.09, “Identification and Control of Items,” Revision 1, dated January 14, 2012

- Procedure 1-6.10, “Control of Special Processes,” Revision 1, dated January 14, 2012
- Procedure 1-6.11, “Inspection,” Revision 1, dated January 14, 2012
- Procedure 1-6.12, “Test Control,” Revision 1, dated January 14, 2012
- Procedure 1-6.13, “Control of Measuring and Test Equipment,” Revision 1, dated January 14, 2012
- Procedure 1-6.14, “Handling, Storage, Shipping and Preservation,” Revision 0, dated November 15, 2011
- Procedure 1-6.16, “Non-Conforming Materials or Items,” Revision 1, dated January 14, 2012
- Procedure 1-6.17, “Corrective Action,” Revision 1, dated January 14, 2012
- Procedure 1-6.18, “Quality Assurance Records,” Revision 1, dated January 14, 2012
- Procedure 1-6.19, “Audits,” Revision 1, dated January 14, 2012
- Procedure 1-6.21, “Identification, Evaluation, and Notification Requirements Per 10 CFR Part 21,” Revision 1, dated January 14, 2012
- Engineering Procedure No. GT-12, “Sales Order Write-Up ASME SECTION III Orders,” Revision 5, dated November 12, 2011
- Procedure No. GT-14,”Verification and Validation of Commercially Procured Software for Design Analysis for Safety Related and Section 3 Jobs”, Revision 4, dated January 31, 2012
- Procedure No. 3.5.149, “Material Handling/Containment Controls Procedure,” Revision 3, dated June 14, 2010
- Procedure No. 3.5.150, “Cleaning and Testing of Cleanliness Westinghouse AP1000 Usage,” Revision 1, March 31, 2011
- Procedure No. 4.4.624, “Lot Acceptance Test Procedure, 8-inch HP Squib Valve,” Revision 0, dated February 24, 2011
- Procedure No. 50-5.07.01, “Control and Inspection of Micrometers and Gages, “ Revision 39, dated August 30, 2010
- Procedure No. 50-5.9.12, “Liquid Penetrant Inspection - Solvent Removable Visible Dye Method,” Revision 22, dated June 7, 2007
- Procedure No. 50-5.9.17, “Liquid Penetrant and Magnetic Particle Inspection Acceptance Standards,” Revision 11, dated June 28, 2011
- Procedure No. 50-5.9.20, “Visual Inspection of Welds per ASME Section III and Section V, Revision 1,” dated February 4, 2010

- Procedure No. 50-5.24.10, “Processing Corrective Action Reports,” Revision 6, dated February 8, 2012

- Procedure No. 50-5.27.17, “Work Instruction - Inspectors (ASME Section III Controlled),” Revision 18, dated February 12, 2012

- Procedure No. 50-5.27.79, “Commercial Grade Dedication for Parts within and Attached to the Valve Assembly and for Services, “ Revision 9, dated February 12, 2012

- Procedure No. 61-5.1, “Maintenance - Material Handling Equipment,” Revision 15, dated November 16, 2005

- Procedure No. 61-5.4, “Material Handling (Storage), Packaging and Shipping,” Revision 9, dated August 21, 2006

- Assembly Procedure No. 1.2.446, “14-inch ADS Squib Valve,” Revision 3, dated February 3, 2012

- Assembly Procedure No. 1.2.453, “8-inch LP Squib Valve,” Revision 5, dated February 9, 2012

- Procedure 17399 (01) MP, “Manufacturing Procedure for the Initiator Assembly,” Revision 0, dated September 23, 2009

- Procedure Qualification Record No. 38, dated April 30, 1980

- Welding Procedure Specification No. 20-881, Revision 2, dated December 28, 1982, with Addendum No. 1, Revision 2

- SPX Corporation Drawing No. D-403793, “14-inch Squib Valve Shear Cap Finished Machining,” Revision 5, dated August 3, 2010

- SPX Corporation Drawing No. D-403097, “8-inch HP Piston Machining,” Revision 5, dated April 15, 2010

- Sheet 1 of 2 of SPX Corporation Drawing No. D-405223,” 8-inch [200] HP Squib Valve Critical Dimension,” Revision 1, dated March 7, 2011

- Sheet 2 of 2 of SPX Corporation Drawing. No. D-405223,” 8-inch [200] HP Squib Valve Critical Dimension,” Revision 1, dated March 7, 2011

- SPX Design Report 10.2.189 8-inch Class 2500 Squib (Pyrotechnic Actuated) Valve, Revision 0, issued October 2010

- SPX Design Report 10.2.190, 8-inch Class 2500 Squib (Pyrotechnic Actuated) Valve, Revision 0, issued October 2010

- SPX Design Report 10.2.191, 14-inch Class 2500 Squib (Pyrotechnic Actuated) Valve, Revision 0, issued October 22, 2010

- SPX Report No. 7.12.105 14" ADS Squib Valve Critical Dimensions, Revision 1, dated March 4, 2011
- SPX Report No. 7.12.106 8-inch HP-L Squib Valve Critical Dimensions, Revision 1, dated March 4, 2011
- SPX Report No. 7.12.107 8-inch HP-R Squib Valve Critical Dimensions, Revision 1, dated March 4, 2011
- SPX Report No. 7.12.108, 8-inch LP Squib Valve Critical Dimensions, Revision 1, dated March 4, 2011
- Dimensional inspection report for 14-inch Squib Valve Component, Part Serial No. 10-05, checked on August 30, 2011
- Dimensional inspection report for 14-inch Squib Valve Component, Part Serial No. 10-07, checked on August 25, 2011
- Dimensional inspection report for 14-inch Squib Valve Component, Part Serial No. 10-08, checked on August 25, 2011
- Dimensional inspection report for 14-inch Squib Valve Component, Part Serial No. 10-09, checked on August 30, 2011
- Dimensional inspection report for 14-inch Squib Valve Component, Part Serial No. 11-03, checked on February 14, 2012
- Dimensional inspection report for 14-inch Squib Valve Component, Part Serial No. 11-04, checked on February 14, 2012
- Dimensional inspection report for 14-inch Squib Valve Component, Part Serial No. 11-05, checked on February 14, 2012
- Dimensional inspection report for 14-inch Squib Valve Component, Part Serial No. 11-06, checked on February 14, 2012
- Inspection and Test Report - "Special Part Hydro for an assembled 8-inch Squib Valve tested at 2485 psi and 9000 psi, Serial No. 0920-164447-2-1," tested on February 14, 2012
- Inspection and Test Report - "Special Part Hydro for an assembled 14-inch Squib Valve tested at 450 psi and 9000 psi, Serial No. 0920-164447-3-1," tested on February 10, 2012
- SPX Test Report 10.4.368 (Revision 0, January 6, 2012), Functional Testing - Squib (Pyrotechnic Actuated) Valve
- Inspection Report Data Sheet, "Part No: 403097 – 8-inch HP Piston Finish Machining," dated January 19, 2012
- Commercial Grade Dedication Instruction #17399400, dated February 10, 2012

- Safety Related Check List QC-86-398312, Revision 6
- Procedure 17399 (01) MP, “Manufacturing Procedure for the Initiator Assembly,” Revision 0, dated September 23, 2009
- Westinghouse Design Specification APP-PV70-Z0-001 Squib (Pyrotechnic Actuated) Valves, ASME Boiler and Pressure Vessel Code, Section III Class 1, Revision 2, dated August 23, 2011
- Westinghouse Report APP-PV70-GRA-001 AP1000 Squib Valve Failure Modes and Effects Analysis (FMEA), Revision 1, issued April 2011
- Westinghouse Report APP-PV70-VDR-006 AP1000 Squib Valve Final Design Review Report, Revision 0, issued July 29, 2010
- Purchase Order (PO) No.4500298895, Westinghouse Electric Corporation Purchase Order to SPX Flow Control, March 30, 2009, Change Notice 8, June 28, 2011.
- PO No.4500298895, Westinghouse Electric Corporation Purchase Order to SPX Flow Control, March 30, 2009, Change Notice 10, June 28, 2011
- PO No.4500298895, Westinghouse Electric Corporation Purchase Order to SPX Flow Control, March 30, 2009, Change Notice 11, June 28, 2011
- PO 4500442785, Vendor Machine P/N 403097, 8” HP Piston, dated August 18, 2011
- Certificate of Conformance for the 8” Piston Squib for PO 4500442785
- Audit Report, “Reddog,” dated March 31, 2011
- PO No. 4500256619, 8-inch Piston Material for P/N 403377III, dated June 1, 2010
- PO No. 450042785, 8-inch Piston for P/N 403087, dated August 18, 2011
- Performance Assessment, “Consolidated Power,” dated August 19, 2011
- PO No. 4500306750, EGS Connector P/N V404394, dated October 10, 2007
- PO No. MCK291213, Inconel Bar for 14-inch Shear Caps P/N V400962R, dated December 16, 2010
- PO No. 4500330129, Vendor Machine for Shear Cap P/N D400961-HP-B, dated December 6, 2010
- PO No. 4500417675, Ultrasonic and Liquid Penetrant Shear Cap P/N 400961-HP-B, dated June 30, 2011
- PO No. 4500427481, Vendor Machine for 8-inch Shear Cap Side B P/N 403065, dated July 20, 2011

- CARs: 371, 387, 428, 448, 496, 498, 501, 507, 510, 531, 532, 533, 539, 541, 545, 546, 553, 554, 560, 562, 563, 564, 565, 566, 567, 568, 570, 572, 573, 574, 578, 579, 581, 582, 585, 586, 588, 589, 590, 591, 592, 593, 594, 596, 597, 605, 607, 614, 635, 636, 637, 638, 639, 640, 641, 643, 644, 645, 646, 647, 648, 676

- Q-Tickets: 40151, 42237, 42248, 42266, 42344, 42373, 42508, 42552, 42583, 42414, 42709, 42750, 42785, 42816, 42426, 42988, 42201, 43158, 43179, 43236, 43279, 43009, 43385, 43398, 43614, 43398, 43614, 43661, 43726, 43426, 43480, 43534, 43487, 43837, 43858, 43896, 43910, 43925, 43954, 43973, 44047, 44134, 44137, 44147