SPX

DATE: July 2, 2012 LTR-NRC12004 Page 1 of 10

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001
USA

Subject: Reply to NRC Report Number 99900080/2012-201- (01, 02, 03, 04, 05, and 06) and Notice of Nonconformance.

Dear Sir,

Enclosed are the SPX Corporation Copes-Vulcan Operation, (SPX) responses to the NRC Report Number 99900080/2012-201 and Notice of Nonconformance 99900080/2012-201-01, 99900080/2012-201-02, 99900080/2012-201-03, 99900080/2012-201-04, 99900080/2012-201-05, and 99900080/2012-201-06 as requested in the cover letter provided with the report. SPX has entered these nonconformance issues into the SPX Corrective Action Report, (CAR) system.

Regards,
Richard Kuntz
Quality Assurance Manager

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

COPES-VULCAN

SPX CORPORATION
COPES-VULCAN OPERATION
5620 WEST ROAD
MCKEAN, PA 16426
UNITED STATES

TEL | 814 | 476 | 5800
FAX | 814 | 476 | 5848

www.spxft.com

IE09
NRO

SPX

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* (10CFR) 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.

The reason for the noncompliance:

The reason for the nonconformance is that SPX Copes-Vulcan considered that the Initiator was an application of an existing technology that functioned as a system and as such the critical characteristics selected were focused on design characteristics to control and provide reasonable assurance that the production initiators were constructed in accordance with the design.

The corrective steps that have been taken and the results achieved:

Review and analysis of the initiator assembly has been performed to develop additional analysis and testing plans to provide the data for the initiator design validation.

The corrective steps that will be taken to avoid noncompliance:

Additional testing and analysis will be performed to evaluate initiator electrical current and thermal, radiation and vibration aging effects on the initiator assembly. Additional analysis of the initiator will be performed to evaluate pressure loading of the initiator.

The date the corrective actions will be completed:

The testing and analysis will be completed by August 2, 2013.

SPX

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

The reason for the noncompliance:

The reason for the nonconformance is that SPX Copes-Vulcan considered that formal calculations were not required for the energy absorbing material due to the part loading and weight. The consideration of the energy absorbing material in the FMEA report did not include a potential failure mode due to shock, vibration and seismic loading due in part to the minimal weight of the energy absorbing material.

The corrective steps that have been taken and the results achieved:

A formal design calculation has been performed for the energy absorbing material confirming the design's structure. The SPX FMEA report was revised to include failure modes for the energy absorbing material for the seismic, shock and vibration causes, and their potential adverse effects on the operation of the squib valve. The noncompliance was reviewed with individuals involved instructing on the above corrective actions.

The corrective steps that will be taken to avoid noncompliance:

Based on the actions taken no additional actions are necessary for the identified nonconformance.

The date the corrective actions will be completed:

The formal design calculations were completed July 2, 2012 and the revisions to the SPX FMEA Report were completed June 7, 2012. No additional actions are required.

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.

The reason for the noncompliance:

The reason for the nonconformance is SPX's interpretation and understanding of the Industry and NRC position on the dedication of services, including the procurement of commercial grade software that is then verified and validated for use in safety-related applications. The requirement to perform commercial grade dedication of software is a new concept for SPX (being identified through audit readiness reviews and NUPIC audit in October and November 2011) and is being developed from information received from the industry. The referenced software, ANSYS finite-element analysis software, was procured by SPX as commercial grade and a Verification/Validation package was completed, as required by Engineering Procedure GT-14, each time the software was used to perform a safety-related analysis. Based on industry discussions, it was identified that a dedication package was required for the software, even though classical analysis calculations are performed each time the software is used. The depth and scope of dedication activities for the software was not fully understood by SPX at the time of this inspection. Based on investigation activities performed, SPX has determined that future safety-related calculations using ANSYS software are affected. The evaluation of this nonconformance identified the need to revise documents related to the dedication and use of software and the need to develop an ANSYS software error reporting evaluation/tracking log/database.

SPX

The corrective steps that have been taken and the results achieved:

Corrective actions taken included the revision of procedure GT-14, "Verification and Validation of Commercially procured Software for Design Analysis for Safety-Related and Section III Jobs," and the Commercial Grade Dedication Instruction for "Software," and the development of an ANSYS software error report log/database. The changes made to / development of these documents are as follows:

GT-14 – The scope of the document was revised to state that, "The verification and validation process also serves to satisfy the commercial grade dedication requirements of procedure 50-5.27.79 and Commercial Grade Dedication Instruction (CDI) Number Software." Section 1.1, Verification was revised to include the statement that "When using ANSYS-supplied verification examples, the provided hand calculation shall be performed and included in the analysis." In Section 2.0 Validation, requirements for validation of analysis were revised to add, "For finite element analysis, element type, analysis type, loading and mesh density must be representative of the analysis problem. Regarding mesh density, the analysis results must be shown to be mesh-independent for cases where peak stress is of interest. For cases where the only program output is linearized stress, mesh-independence need not be shown."

CDI for Software – The CDI for procured software was revised to incorporate requirements for ANSYS finite element software, "...the ANSYS 'Class 3 Error Reports' will be reviewed and evaluated for applicability to previous work performed, with disposition entered in a logbook...".

ANSYS software error reporting log/database – An ANSYS software error reporting log/database has been developed to track and evaluate "Class 3 Error Reports" received from ANSYS for impact on analysis performed on safety-related valves. Prior ANSYS Class 3 error reports are being obtained and evaluated.

The corrective steps that will be taken to avoid noncompliance:

Class 3 software error reports, for the ANSYS software, are being obtained and evaluated for impact on previously performed analysis on safety-related valves. As the error reports are received and evaluated, they are entered into the ANSYS error report log and, if appropriate, a CAR is generated to document nonconforming conditions and their resolution. Evaluation of error reports will be completed on, or before, July 31, 2012.

The date the corrective actions will be completed:

Full completion of the corrective action will be achieved by July 31, 2012.

SPX

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.

The reason for the noncompliance:

The reason for the nonconformance was that the assembly procedures had recently been revised to change the sequence to support requests by manufacturing to provide better flow and continuity of the assembly operations. This was the first build with the revised procedures to prove out the work flow process.

The corrective steps that have been taken and the results achieved:

The valve assembly procedures 1.2.445, 1.2.446 and 1.2.453 were revised based on input during the assembly operations to resolve the issues noted including adding a place to record measuring and test equipment information for steps that did not have a place already designated. Procedure 1.2.446 was revised and personnel were reinstructed on the requirements of procedure 50-5.07.01 for the use of inside micrometers as a transfer gage with final measurements made with outside micrometers. Procedure 1.2.453 was revised to correct the sequence of operations to resolve the conflict which could have caused the loading of parts.

The corrective steps that will be taken to avoid noncompliance:

Based on the actions taken no additional actions are necessary for the identified nonconformance.

SPX

The date the corrective actions will be completed:

Awareness training of the inspection personnel was completed on February 16, 2012. The revisions of the assembly procedures were completed February 23, 2012 and the formal training of inspectors was completed June 21, 2012. No additional actions are required for this nonconformance.

SPX

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.

The reason for the noncompliance:

SPX Copes-Vulcan has investigated the issue and determined that the selection of the inspector performing the inspection of the initiator and cartridge assembly was based on the review of the inspection attributes of the items which were defined as measured dimensions and visual observations to inspection acceptance criteria. Thus, an inspector qualified for visual and dimensional attributes was selected to perform the inspections of the items during the assembly process. The investigation concluded that no production orders have been processed and that the I. E. E. E. initiator and cartridge assemblies were the only items affected by this inspector selection issue.

The corrective steps that have been taken and the results achieved:

The inspector was trained in weld inspection in accordance with SPX weld inspection procedure 50-5.9.20 Revision 1, "Visual Inspection of Welds per ASME Section III and V", and in the specific acceptance criteria for the initiator and cartridge assembly welds.

The corrective steps that will be taken to avoid noncompliance:

Based on the actions taken, no additional actions are necessary for the identified nonconformance.

The date the corrective actions will be completed:

The training of the Inspector was completed March 26, 2012 to the requirements of procedure 50-5.9.20 Revision 1, "Visual Inspection of Welds per ASME Section III and V", and on June 6, 2012 in the specific acceptance criteria for the initiator and cartridge assembly welds. No additional actions are necessary for the identified nonconformance.

SPX

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.

The reason for the noncompliance:

The reason for the nonconformance was a lack of understanding by the supervising engineer, for the activity observed, as to when a nonconforming condition was to be entered into the corrective action process. During the observed activity the supervising engineer noted a misalignment of components during assembly activities and the potential for a rejection of the assembly activity. The supervising engineer halted assembly activities at that point. The supervising engineer instructed personnel to reverse assembly activities to the point that the parts involved in the noted misalignment could be inspected and corrected, as needed. A separate Q-ticket nonconformance record was issued for each damaged part. Since a rejection of the assembly did not occur and Q-ticket nonconformance records were issued for each damaged part, the supervising engineer concluded that appropriate actions were taken. However, the supervising engineer failed to recognize the need to issue a Corrective Action Report (CAR) to document the procedure inadequacy.

The supervising engineer took this action based on interpretation of the requirements, and amount of latitude, that a later step (step 2.13) of affected procedure (Procedure 1.2.446, 14 inch ADS Squib Valve) provided. The supervising engineer's interpretation of procedure step 2.13 was that if a rejection was imminent (or suspected), the step could be practically applied; however, the supervising engineer did not account for the precise interpretation of the step and the need to initiate a CAR. Discussions with other supervising engineering personnel found that there was a general lack of understanding as to the circumstances in which a CAR would be initiated.

In addition to the procedure inadequacy identified in procedure 1.2.446, other related assembly procedures were reviewed for similar condition. As a result of the review, assembly procedure 1.2.445 and 1.2.453 were identified as having a similar inadequacy.

SPX

The corrective steps that have been taken and the results achieved:

Corrective action steps taken to resolve the identified condition included revising affected assembly procedures to address the procedure inadequacy and the additional training of supervising engineers on the requirement of the CAR process and when to initiate a CAR. Specifically, the corrective actions taken included:

1) Assembly procedures 1.2.446, 1.2.445, and 1.2.453 were revised to allow any step to be interrupted and reversed at Engineering's discretion. The affected step in each of the identified assembly procedures was revised to state:

   "If any step in this procedure is signed off as "Reject," contact SPX Engineering for information on how to proceed. If, during the execution of any step in this procedure, it is identified that the assembly process is not proceeding as expected, work shall be halted and SPX Engineering shall be contacted. SPX Engineering may authorize the disassembly or reversal of the assembly sequence to investigate and evaluate the items in question. Actions taken shall be documented at each step of the halt and investigation on a Q-ticket or CAR Form, as appropriate. When re-assembly commences, the repeated steps shall be documented on replacements of the original pages. Prior information shall be retained with the package."

2) An awareness training package, "How & When Do We Create Corrective Action Reports (CARs) at SPX," was developed and presented to supervising engineer personnel at the SPX McKean, PA facility. This training addressed the NRC inspection items from the NRC Inspection Manual 88110, the definition of a CAR and condition adverse to quality, who can initiate a CAR, the process involved, and examples of when a CAR should be initiated, or when other processes would be more appropriate. This training was conducted on June 12 and 13, 2012, with a make-up session finalized on June 20, 2012. The awareness training was provided to other SPX personnel to strengthen understanding of the CAR process and the usage of the CAR process.

The corrective steps that will be taken to avoid noncompliance:

Based on the actions taken, no additional actions are necessary for the identified nonconformance.

The date the corrective actions will be completed:

The revisions of the assembly procedures were completed February 23, 2012, and the awareness training of SPX personnel to strengthen understanding and usage of the CAR process was completed June 12, 13 and 20, 2012. No additional actions are necessary for the identified nonconformance.