



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

April 27, 2022

Mary Workoff, General Manager  
Curtiss-Wright Steam and Air Solutions  
585 Trade Center Parkway,  
Summerville, SC 29483

SUBJECT: NUCLEAR REGULATORY COMMISSION VENDOR INSPECTION REPORT OF  
CURTIS WRIGHT STEAM AND AIR SOLUTIONS NO. 99902102/2022-201

Dear Ms. Workoff,

On March 14-18, 2022, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Curtiss-Wright Steam and Air Solutions' (CW-SAS) facility in Summerville, South Carolina. The purpose of this limited-scope inspection was to assess CW-SAS' compliance with the provisions of selected portions 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," and 10 CFR Part 21, Reporting of Defects and Noncompliance."

This technically-focused inspection specifically evaluated CW-SAS' implementation of the quality activities associated with design, fabrication, and testing of safety-related components being supplied to the U.S. operating nuclear power plants. The enclosed report presents the results of the inspection. This NRC inspection report does not constitute NRC endorsement of CW-SAS' overall quality assurance (QA) or 10 CFR Part 21 programs.

Based on the results of this inspection, the NRC inspection team found the implementation of your QA program met the applicable technical and regulatory requirements imposed on you by your customers or NRC licensees. No findings of significance were identified.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," the NRC will make available electronically for public inspection a copy of this letter and its enclosure through the NRC's Public Document Room or from the NRC's Agencywide Documents Access and Management System, which is accessible at <http://www.nrc.gov/reading-rm/adams.html>.

If you have any questions concerning this matter, please contact Mr. Greg Galletti of my staff at (301) 415-1831.

Sincerely,

 Signed by Kavanagh, Kerri  
on 04/27/22  
Kerri Kavanagh, Chief  
Quality Assurance and Vendor Inspection Branch  
Division of Reactor Oversight  
Office of Nuclear Reactor Regulation

Docket No.: 99902102

Enclosure:  
Inspection Report No. 99902102/2022-201  
and Attachment

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION VENDOR  
INSPECTION REPORT OF CURTISS-WRIGHT STEAM AND AIR SOLUTIONS  
NO. 99902102/2022-201 Dated: April 27, 2022

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NRR-106

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<b>DATE</b>	04/25/2022	04/27/2022	

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**U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
DIVISION OF REACTOR OVERSIGHT  
VENDOR INSPECTION REPORT**

Docket No.: 99902102

Report No.: 99902102/2022-201

Vendor: Curtiss-Wright Steam and Air Solutions (CW-SAS)

Vendor Contact: Scott Rennick  
Phone: +1 (843) 486-6056  
Email: [srennick@curtisswright.com](mailto:srennick@curtisswright.com)

Nuclear Industry Activity: CW-SAS provides Terry Turbine pumps, spare parts, and services to the commercial nuclear industry.

Inspection Dates: March 14-18, 2022

Vendor Location: 585 Trade Center Parkway  
Summerville, SC 29483

Inspection Team Leader: Greg Galletti                      NRR/DRO/IQVB

Inspectors: Andrea Keim                                      NRR/DRO/IQVB  
Yamir Diaz-Castillo                                      NRR/DRO/IQVB  
Frankie Vega    NRR/DRO/IQVB

Approved by: Kerri Kavanagh, Chief  
Quality Assurance and Vendor Inspection Branch  
Division of Reactor Oversight  
Office of Nuclear Reactor Regulation

Enclosure

## EXECUTIVE SUMMARY

Curtiss-Wright Steam and Air Solutions  
99902102/2022-201

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a routine vendor inspection at the Curtiss-Wright Steam and Air Solutions' (hereafter referred to as (CW-SAS) facility in Summerville, SC, to verify it had implemented an adequate quality assurance (QA) program that complies with the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," and 10 CFR Part 21, "Reporting of Defects and Noncompliance." The NRC inspection team conducted this inspection on-site from March 14 – 18, 2022.

This technically-focused inspection specifically evaluated CW-SAS' implementation of the quality activities associated with the design, fabrication, and testing of safety-related Terry Turbine pump components and replacement parts being supplied to U.S. nuclear power plants.

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

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

During the course of this inspection, the NRC inspection team implemented Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," dated January 27, 2017, IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated January 27, 2017; and IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting of Defects and Noncompliance," dated May 16, 2019.

The NRC inspection team observed the following specific activities:

- Shop area walkdown and work practices of CW-SAS' implementation for identification of parts and materials, areas of nonconforming materials, welding, and non-destructive examination.
- Commercial-grade dedication (CGD) of a stainless steel Grade 440C guide bushing.

The NRC inspection team concluded that CW-SAS' QA policies and procedures comply with the applicable requirements of Appendix B to 10 CFR Part 50 and 10 CFR Part 21, and that CW-SAS' personnel are implementing these policies and procedures effectively. The information below summarizes the results of this inspection.

### 10 CFR Part 21 Program

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its 10 CFR Part 21 program to verify compliance with the requirements of 10 CFR Part 21. The NRC inspection team: 1) reviewed the 10 CFR Part 21 postings; 2) reviewed a sample of safety-related purchase orders (POs) to ensure 10 CFR Part 21 was specified; 3) verified that CW-SAS' nonconformance and correction action programs

provide a link to the 10 CFR Part 21 program; and 4) reviewed CW-SAS' process for Part 21 evaluations. No findings of significance were identified.

#### Design Control and Commercial Grade Dedication

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its design control and CGD programs to verify compliance with the requirements of Criterion III, "Design Control," and Criterion VII, "Control of Purchase Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of CW-SAS' implementation processes, including on-line access systems and databases associated with the design information for Terry Turbine replacement parts.

The NRC inspection team identified that commercial-grade surveys did not consistently provide objective evidence to validate the adequate implementation of the commercial suppliers' quality controls over the critical characteristics, rather they were more broadly programmatic in nature, and the POs did not specifically address the commercial supplier's processes credited for controlling critical characteristics in quality or technical requirements. The NRC inspection team determined this issue to be minor because CW-SAS performs additional tests and inspections as part of the CGD process, and the results of these tests and inspections demonstrate that the critical characteristics were adequately controlled. CW-SAS initiated corrective action report CAR No. 2022-0046 to address this issue.

#### Supplier Oversight

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its supplier oversight program to verify compliance with the regulatory requirements of Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. The NRC inspection team CW-SAS' program for the development and maintenance of its approved suppliers list. The NRC inspection team selected a sample of suppliers to review the methodology for conducting and documenting audits and the review of third-party audits to verify adequate evaluation of the suppliers' controls for meeting the applicable requirements of Appendix B to 10 CFR Part 50.

The NRC inspection team noted that CW-SAS had not performed annual evaluations for five suppliers that had recent POs issued. CW-SAS' procedure does have adequate guidance for the conduct of annual evaluations. The NRC inspection team determined this issue to be minor because CW-SAS performs additional tests and inspections as part of the receipt inspection process, and the results of these tests and inspections provide reasonable assurance that the suppliers are providing products that meet the applicable requirements. CW-SAS initiated CAR No. 2022-0047 to address this issue.

#### Identification and Control of Materials, Parts, and Components

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its materials identification and control program to verify compliance with the requirements of Criterion VIII, "Identification and Control of Materials, Parts, and Components," of Appendix B to 10 CFR Part 50. The NRC inspection team also observed implementation of the material identification and control program by CW-SAS' employees during in-process fabrication activities including receipt inspection, special testing, storage and inventory control, and machining. No findings of significance were identified.

### Manufacturing Control and Special Processes

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its manufacturing control program to verify compliance with the regulatory requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50 and the American Society for Nondestructive Testing (ASNT) SNT-TC-1A, "Personnel Qualification and Certification in Nondestructive Testing." The NRC inspection team reviewed CW-SAS' process for controlling weld filler metal. The NRC inspection team also performed a walk-down of the weld storage area and confirmed that weld filler materials were adequately controlled to prevent degradation, inadvertent use, or loss of traceability. The NRC inspection team reviewed a sample of procedures and test reports associated with magnetic particle testing and visual testing for a bracket actuator and a valve bonnet, as applicable. No findings of significance were identified.

### Control of Measuring and Test Equipment

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its measuring and testing equipment (M&TE) program to verify compliance with the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. The NRC inspection team performed a walkdown of CW-SAS' M&TE area and selected a sample of M&TE for review. The NRC inspection team verified the M&TE were labeled, handled, and stored in a manner that indicated the calibration status of the instrument and ensured its traceability to calibration test data. The NRC inspection team also verified that the M&TE had been calibrated, adjusted, and maintained at prescribed intervals prior to use. The NRC inspection team performed a walkdown of the area assigned to their main calibration supplier.

The NRC inspection team identified that contrary to CW-SAS calibration procedures, two calibration certificates from one of CW-SAS' calibration suppliers did not include a statement that the calibration was provided in accordance with PO requirements. The NRC inspection team determined this issue to be minor because the calibration laboratory is accredited to the 2017 edition of the International Standard Organization /International Electrotechnical Commission standard No. 17025 (2017 edition ISO/IEC 17025), "General Requirements for the Competence of Testing and Calibration Laboratories," and all the other conditions included in Revision 1 of NEI 14-05A were met. CW-SAS initiated CAR No. 2022-0048 to address this issue.

### Test Control

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its test control program to verify compliance with the regulatory requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of completed hydrostatic test reports for a packing assembly and gland assembly cases. The NRC inspection team verified that the hydrostatic test reports included the acceptance range and documented the equipment used to document the results. The NRC inspection team reviewed CW-SAS' process for pre-testing and set-up of hydrostatic testing. The NRC inspection team also performed a walk-down of the test set-up area for hydrostatic testing and other equipment expected to be operational at the CW-SAS' facility. No findings of significance were identified.

### Nonconforming Materials, Parts, or Components and Corrective Action

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its nonconforming materials, parts, or components and corrective action programs to verify compliance with the requirements of 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 CW-SAS' nonconformance and corrective action reports and confirmed the sample was documented, evaluated, and dispositioned in accordance with CW-SAS' program requirements. No findings of significance were identified.



## REPORT DETAILS

### 1. 10 CFR Part 21 Program

#### a. Inspection Scope

The U.S. Nuclear Regulatory Commission (NRC) inspection team reviewed Curtiss-Wright Steam and Air Solutions (CW-SAS) policies and implementing procedures that govern the implementation of its Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," program to verify compliance with the regulatory requirements. The NRC inspection team also evaluated the 10 CFR Part 21 postings and a sample of CW-SAS' purchase orders (POs) to verify compliance with the requirements of 10 CFR 21.21, "Notification of Failure to Comply or Existence of a Defect and its Evaluation," and 10 CFR 21.31, "Procurement Documents."

In addition, the NRC inspection team reviewed a sample of CW-SAS' nonconformance and corrective action reports to verify that CW-SAS adequately considered issues for evaluation under their 10 CFR Part 21 program. The NRC inspection team also verified that CW-SAS' nonconformance and corrective action procedures provide a link to the 10 CFR Part 21 program.

The NRC inspection team discussed the 10 CFR Part 21 program with CW-SAS' management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

#### b. Observations and Findings

No findings of significance were identified.

#### c. Conclusion

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

### 2. Design Control

#### a. Inspection Scope

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its design control program to verify compliance with the regulatory requirements of Criterion III, "Design Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." CW-SAS' scope of supply is limited to replacement parts and repair work for the existing Terry Turbines used in operating US nuclear power plants. CW-SAS owns the design of the Terry Turbines and there hasn't been any significant design changes.

The NRC inspection team reviewed CW-SAS' processes for performing design and configuration control, including design reviews and design changes. The NRC inspection team reviewed design documentation (e.g. drawings, parts qualification and design records, engineering change notices) associated with a sample of replacement/spare parts (i.e., washer, valve bonnet, guide bushings) and a complete valve bonnet assembly. CW-SAS explained how the design control process is implemented electronically using a product lifecycle management system. Specifically, CW-SAS uses this electronic system to manage design control activities such as design reviews, design interface, engineering changes, verification, validation, and maintaining design records.

The NRC inspection team verified that CW-SAS' design review process includes the purpose of each design change, method of conduct, and documentation of the results. Design changes resulting from design reviews are implemented through the Engineering Change Review and Notification Process with the results of the design review documented in the Engineering Part Qualification and Design Record. The NRC inspection team confirmed that the design review process was conducted in accordance with CW-SAS' implementing procedures, and the results of design reviews were adequately documented.

The NRC inspection team also discussed the design control program with CW-SAS' management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that CW-SAS is implementing its design control program in accordance with the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that CW-SAS is implementing its policies and procedures associated with the design control program. No findings of significance were identified.

3. Commercial-Grade Dedication

a. Inspection Scope

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its commercial-grade dedication (CGD) program to verify compliance with the regulatory requirements of Criterion III and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. In addition, the NRC inspection team conducted interviews with CW-SAS personnel, observed of dedication activities in-process, and review of related CGD documentation. Specifically, the NRC inspection team reviewed dedication packages to assess the different elements of the CGD program, including the technical evaluation process, design drawings, commercial-grade surveys, and test and inspection reports.

The sample of CGD packages included the following items: spring, packing ring stop, guide bushing, carbon ring, sliding nut, and a hydraulic cylinder. The CGD packages included: 1) POs; 2) the technical evaluation for the identification and documentation of the basis and justification for the selection of the critical characteristics; 3) acceptance methods and acceptance criteria; 4) receiving inspection records; and 5) Certificates of Conformance. The NRC inspection team evaluated the criteria for the identification of item functions, credible failure mechanisms/modes, selection of critical characteristics and acceptance criteria, and the identification of verification methods to verify the effective implementation of CW-SAS' CGD process.

The NRC inspection team also witnessed the verification of the critical characteristics as part of the CGD of a sample of guide bushing. The NRC inspection team verified that CW-SAS' quality control (QC) inspector was adequately following the applicable procedures and documenting the inspection results. In addition, the NRC inspection team confirmed that CW-SAS' QC inspector was using calibrated equipment to take the appropriate measurements.

The NRC inspection team also discussed CGD program with CW-SAS management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

During the review of a sample of commercial-grade surveys, the NRC inspection team noted that the commercial-grade surveys did not consistently provide objective evidence to validate the adequate implementation of the commercial suppliers' quality controls over the critical characteristics. The NRC inspection team also noted that the commercial-grade surveys included the review of other areas from the commercial suppliers' quality program unrelated to the control of the critical characteristics. During discussions with CW-SAS' staff, the NRC inspection team learned that CW-SAS reviews other areas of their commercial suppliers' quality program during commercial-grade surveys as they also purchase other components for use in non-nuclear projects. The NRC inspection team discussed with CW-SAS' staff that the purpose of a commercial-grade survey is to verify one or more critical characteristics based on the merits of a commercial supplier's quality controls. This verification is accomplished by reviewing the suppliers' quality program and procedures that control the critical characteristics and observing the actual implementation of these controls in the manufacturing of items identical or similar to the items being purchased. In addition, a commercial-grade survey should be critical characteristic and item specific. Furthermore, during the review of a sample of POs issued to these commercial suppliers, the NRC inspection team noted that the POs did not invoke the applicable quality manual, procedures, and/or controls applicable to the critical characteristics identified during the commercial-grade survey that should be implemented during the manufacturing process.

The NRC inspection team determined these issues to be minor because CW-SAS performs additional tests and inspections as part of the CGD process, and the results of these tests and inspections demonstrate that the critical characteristics were adequately controlled. CW-SAS initiated Corrective Action Report (CAR) No. 2022-0046 to address this issue.

c. Conclusion

The NRC inspection team concluded that CW-SAS is implementing its CGD program in accordance with the regulatory requirements of Criterion III and Criterion VII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that CW-SAS is implementing its policies and procedures associated with the CGD program. No findings of significance were identified.

4. Supplier Oversight

a. Inspection Scope

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its supplier oversight program to verify compliance with the regulatory requirements of Criterion IV, "Procurement Document Control," and Criterion VII of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed CW-SAS' program for the development and maintenance of its approved suppliers list (ASL). The NRC inspection team selected a sample of suppliers to review the methodology for conducting and documenting audits and the review of third-party audits to verify adequate evaluation of the suppliers' controls for meeting the applicable requirements of Appendix B to 10 CFR Part 50. The NRC inspection team verified that for a sample of POs, CW-SAS adequately invoked the applicable technical, regulatory, and quality requirements. The NRC inspection team also reviewed CW-SAS' process for conducting audits at an established frequency and verified that the audit reports provided adequate objective evidence of compliance with the applicable requirements. Audit findings were documented and resolved in the CW-SAS and the suppliers' corrective action programs. In addition, the NRC inspection team verified that the audits were performed by qualified personnel.

The NRC inspection team also discussed the supplier oversight program with CW-SAS' management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

During the review of a sample of supplier audits and the ASL, the NRC inspection team noted that CW-SAS had not performed annual evaluations for five suppliers that had recent POs issued. CW-SAS' procedure SASINST 4200.1a, "Management of the Approved Suppliers List, Supplier Audits, and Supplier Selection," dated December 22, 2022, requires suppliers to be evaluated on an annual basis using the template in Appendix A, "Supplier Annual Evaluation," of the procedure.

The NRC inspection team determined this issue to be minor because CW-SAS performs additional tests and inspections as part of the receipt inspection process, and the results of these tests and inspections provide reasonable assurance that the suppliers are providing products that meet the applicable requirements. CW-SAS initiated CAR No. 2022-0047 to address this issue.

c. Conclusion

The NRC inspection team concluded that CW-SAS is implementing its supplier oversight program in accordance with the regulatory requirements of Criterion IV and Criterion VII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team determined that CW-SAS is adequately implementing its policies and procedures associated with the supplier oversight program. No findings of significance were identified.

5. Identification and Control of Materials, Parts, and Components

a. Inspection Scope

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its material identification and control program to verify compliance with the regulatory requirements of Criterion VIII, "Identification and Control of Materials, Parts, and Components," of Appendix B to 10 CFR Part 50. The NRC inspection team also observed implementation of the material identification and control program by CW-SAS' employees during in-process fabrication activities including receipt inspection, special testing, storage and inventory control, and machining. The NRC inspection team verified that all materials inspected were adequately marked with appropriate lot, batch and/or heat numbers using the markings and labeling conventions in accordance with written procedures and instructions.

The NRC inspection team discussed the material identification and control program with CW-SAS' management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that CW-SAS is implementing its material identification and control program in accordance with the regulatory requirements of Criterion VIII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed and direct observation of material control practices in the manufacturing facility, the NRC inspection team also determined that CW-SAS is adequately implementing its policies and procedures associated with the material identification and control program. No findings of significance were identified.

6. Manufacturing Control and Special Processes

a. Inspection Scope

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its manufacturing control program to verify compliance with the regulatory requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50 and the American Society for Nondestructive Testing (ASNT) SNT-TC-1A, "Personnel Qualification and Certification in Nondestructive Testing."

During the week of the inspection, there were no safety-related welding or non-destructive examination (NDE) activities being performed. As such, the NRC inspection team reviewed a completed weld procedure specification (WPS) and supporting procedure qualification record (PQR) for a bracket actuator. This is the only safety-related welding performed by CW-SAS since the facility started operating in 2020. The NRC inspection team verified that the applicable welding data was adequately recorded in the WPS and PQR (e.g., procedures used, type of weld filler material, etc.).

The NRC inspection team reviewed CW-SAS' process for controlling weld filler metal. The NRC inspection team also performed a walk-down of the weld storage area and confirmed that weld filler materials were adequately controlled to prevent degradation, inadvertent use, or loss of traceability. The weld filler materials were kept in containers and ovens at specified temperatures to control moisture, as applicable, and the environmental condition of the weld filler material storage facility was adequately controlled. In addition, the NRC inspection team reviewed the associated welder performance qualification records and confirmed the welder had completed the required training and had maintained his qualification in accordance with CW-SAS procedures.

The NRC inspection team reviewed a sample of procedures and test reports associated with magnetic particle testing (MT) and visual testing (VT) for a bracket actuator and a valve bonnet, as applicable. The NRC inspection team confirmed that the NDE reports contained the required information in accordance with CW-SAS' NDE procedures. In addition, the NRC inspection team reviewed the qualification records for the Level II inspector who performed the MT and VT and confirmed that she was qualified in accordance with the requirements of ASNT SNT-TC-1A.

The NRC inspection team also discussed the manufacturing control program with CW-SAS' management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that CW-SAS is implementing its manufacturing control program in accordance with the regulatory requirements of Criterion IX of Appendix B to 10 CFR Part 50 and the requirements of ASNT SNT-TC-1A. Based on the limited sample of documents reviewed, the NRC inspection team also determined that CW-SAS is implementing its policies and procedures associated with the manufacturing control program. No findings of significance were identified.

7. Control of Measuring and Test Equipment

a. Inspection Scope

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its measuring and testing equipment (M&TE) program to verify compliance with the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50.

Most of CW-SAS' calibration services are performed by a single calibration supplier. This supplier has a full-time staff at the CW-SAS facility. The NRC inspection team noted that this supplier is included in CW-SAS' ASL for calibration services and is accredited to the 2017 edition of the International Standard Organization (ISO)/ International Electrotechnical Commission (IEC) Standard 17025, "General Requirements for the Competence of Testing and Calibration Laboratories." In addition to this main supplier, CW-SAS maintains other calibration suppliers in their ASL that are also accredited to ISO/IEC 17025-2017. The NRC inspection team confirmed that CW-SAS performs CGD of calibration services in accordance with the requirements of the Nuclear Energy Institute (NEI) 14-05A, "Guidelines for the use of Accreditation in Lieu of Commercial Grade Surveys for Procurement of Laboratory Calibration and Test Services," Revision 1, dated September 11, 2020.

The NRC inspection team performed a walkdown of CW-SAS' M&TE area and selected a sample of M&TE for review. The NRC inspection team verified the M&TE were labeled, handled, and stored in a manner that indicated the calibration status of the instrument and ensured its traceability to calibration test data. The NRC inspection team also verified that the M&TE had been calibrated, adjusted, and maintained at prescribed intervals prior to use. In addition, the NRC inspection team confirmed that for the calibration records reviewed, the records indicated the as-found or as-left conditions, accuracy required, calibration results, calibration dates, and the due date for recalibration. Furthermore, the NRC inspection team also verified that the selected M&TE was calibrated using procedures traceable to known industry standards.

The NRC inspection team performed a walkdown of the area assigned to their main calibration supplier. The NRC inspection team selected a micrometer that was placed on a rack labeled "Out of Calibration" for further evaluation. The NRC inspection team noted that this item was tagged, segregated, and separated from the rest of the calibrated equipment. CW-SAS explained the process followed when items are found out of calibration, how these issues are documented, tracked, and items are segregated. CW-SAS issues corrective actions and performs an extent of condition to identify items that have been accepted using this equipment since the last valid calibration date.

The NRC inspection team also discussed the M&TE program with CW-SAS' management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

During the review of a sample of POs issued to a commercial calibration laboratory, the NRC inspection team noted that, contrary to CW-SAS calibration procedures and the requirements of NEI 14-05A Revision 1, two calibration certificates from one of CW-SAS' calibration suppliers did not include a statement that the calibration was provided in accordance with PO requirements. The NRC inspection team considered this issue to be minor since the calibration laboratory is accredited to ISO/IEC-17025:2017 and all the other conditions from Revision 1 of NEI 14-05A were met. CW-SAS initiated CAR No. 2022-0048 to address this issue.

c. Conclusion

The NRC inspection team concluded that CW-SAS' is implementing its M&TE program in accordance with the regulatory requirements of Criterion XII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that CW-SAS' is implementing its policies and procedures associated with the M&TE program. No findings of significance were identified.

8. Test Control

a. Inspection Scope

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its test control program to verify compliance with the regulatory requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50.

During the week of the inspection, there were no safety-related testing activities being performed. The CW-SAS facility started operation in 2020 and is still setting up some larger testing operations. As such, the NRC inspection team reviewed a sample of completed hydrostatic test reports for a packing assembly and gland assembly cases. The NRC inspection team verified that the hydrostatic test reports included the acceptance range and documented the equipment used to document the results.

The NRC inspection team reviewed CW-SAS' process for pre-testing and setup of hydrostatic testing. The NRC inspection team also performed a walk-down of the test setup for hydrostatic testing and other equipment expected to be operational at the facility. In addition, the NRC inspection team discussed the qualification of personnel performing testing.

The NRC inspection team also discussed the test control program with CW-SAS' management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that CW-SAS is implementing its test control program in accordance with the regulatory requirements of Criterion XI of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team determined that CW-SAS is implementing its policies and procedures associated with the test control program. No findings of significance were identified.



## 9. Nonconforming Materials, Parts, or Components and Corrective Action Program

### a. Inspection Scope

The NRC inspection team reviewed CW-SAS' policies and implementing procedures that govern the implementation of its nonconformances and corrective action programs to verify compliance with the requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. The NRC inspection team verified that CW-SAS' processes and procedures provide for the identification, documentation, segregation, evaluation, and disposition of nonconforming items. These processes also apply the principles of rework/repair, scrap, return to vendor, or "use as-is."

The NRC inspection team observed CW-SAS' assembly floor operations and verified that nonconforming materials, parts or components were properly identified, marked, and segregated, when practical, to ensure that they were not reintroduced into the production processes. The NRC inspection team reviewed a sample of nonconforming reports (NCRs) associated with the production of safety-related parts and confirmed that CW-SAS: (1) dispositioned the nonconforming materials in accordance with the applicable procedures; (2) documented an appropriate technical justification for the dispositions; and (3) took adequate corrective action regarding the nonconforming items to prevent recurrence, as appropriate.

Additionally, the NRC inspection team discussed the nonconformance program with CW-SAS' personnel to verify they were cognizant of program requirements, designated areas to segregate and control nonconforming materials, parts, or components, and that they actively used the nonconforming materials reporting process to identify and document any nonconforming conditions.

The NRC inspection team also reviewed a sample of CARs and confirmed: (1) there was adequate documentation and a description of conditions adverse to quality; (2) an appropriate analysis of the cause of these conditions and the corrective actions taken to prevent recurrence; (3) direction for review and approval by the responsible authority; (4) a description of the current status of the corrective actions; and (5) the follow-up actions taken were verified to be timely and that effective implementation of the corrective actions had been implemented. In addition, the NRC inspection team confirmed that there was adequate connection between the nonconformance, corrective action, and CW-SAS' 10 CFR Part 21 program to assure conditions adverse to quality were appropriately considered for 10 CFR Part 21 applicability.

The NRC inspection team also discussed the nonconformance and corrective action programs with CW-SAS' management and technical personnel. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

### b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that CW-SAS is implementing its nonconformance and corrective action programs in accordance with the regulatory requirements of Criterion XV and XVI of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team determined that CW-SAS is implementing its policies and procedures associated with the nonconformance and corrective action programs. No findings of significance were identified.

10. Entrance and Exit Meetings

On March 14, 2022, the NRC inspection team presented the inspection scope during an entrance meeting with Ms. Mary Workoff, CW-SAS' General Manager, and other members of CW-SAS' management and technical staff. On March 18, 2022, the NRC inspection team presented the inspection results to Ms. Workoff and other members of CW-SAS' management and technical staff. The attachment to this report lists the attendees of the entrance and exit meetings, as well as those individuals whom the NRC inspection team interviewed.

## ATTACHMENT

### 1. ENTRANCE/EXIT MEETING ATTENDEES

<b>Name</b>	<b>Position</b>	<b>Affiliation</b>	<b>Entrance</b>	<b>Exit</b>	<b>Interviewed</b>
Mary Workoff	General Manager	Curtis-Wright Steam and Air Solutions (CW-SAS)	X	X	
Bob Shepard	Director New Equipment	CW-SAS	X	X	
Adriana Welsh	Director of After Market	CW-SAS	X		
Shane Sablotsky	Quality Assurance (QA) Manager	CW-SAS	X	X	X
Tom Frost	Director of Operations	CW-SAS	X		
TJ Hines	Manager of QA and Testing	CW-SAS	X	X	
Brian Fogarty	Sr. QA Engineer	CW-SAS			X
Ron Burdick	Senior Nuclear Quality Engineer	CW-SAS	X	X	X
Todd Johnson	Product Engineer	CW-SAS	X		X
Caitlin Burley	Lead Quality Control (QC) Inspector	CW-SAS			X
Sean Pexton	Welding Engineer	CW-SAS			X
Scott Rennick	Regulatory Compliance Engineer	CW-SAS	X	X	X
Joe Cabaup	QC Supervisor	CW-SAS			X
Eric Cotton	Purchasing	CW-SAS	X	X	X
Greg Galletti	Inspector	NRC	X	X	
Yamir Diaz-Castillo	Inspector	NRC	X	X	
Frankie Vega	Inspector	NRC	X	X	
Andrea Keim	Inspector	NRC	X	X	

<b>Name</b>	<b>Position</b>	<b>Affiliation</b>	<b>Entrance</b>	<b>Exit</b>	<b>Interviewed</b>
Kerri Kavanagh	Branch Chief	NRC		X	

2. INSPECTION PROCEDURES USED:

Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," dated January 27, 2017

IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated January 27, 2017

IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting of Defects and Noncompliance," dated May 16, 2019

3. DOCUMENTS REVIEWED

- Curtis-Wright Steam and Air Solutions' (CW-SAS) Quality Management System Manual, Revision D, dated September 30, 2021
- Document No. 004-120-501, "Qualification and Certification of Nondestructive Testing Personnel Steam and Air Solutions," Revision 13, dated December 8, 2021
- Document No. 004-161-300, "Inspection to Nonconformance," Revision C, dated January 14, 2022
- Document No. EA-001, "Engineering Design Control," Revision R, dated September 15, 2020
- Document No. NNSOP-1-1-008, "Control and Dispersal of Welding Filler/Electrode," Revision R, dated January 19, 2022
- Document No. NNSOP-1-1-010, "Welding Procedure and Welder Qualification Control," Revision L, dated November 30, 2021
- Document No. NNSOP-1-1-011, "Commercial Grade Dedication," Revision 6, dated September 20, 2007
- Document No. NNSOP-1-1-015, "Visual Acuity Requirements and Testing," Revision 11, dated October 7, 2020
- Document No. NNSOP-1-1-025, "Part Dedication and Inspection Record Control," Revision 11, dated May 15, 2018
- Document No. NNSOP-1-2-002, "Engineering Change Notice Navy and Nuclear Products," Revision 14, dated November 29, 2012
- Document No. NNSOP-1-2-003, "Engineering Change Request Commercial Navy and Nuclear Products," Revision 7, dated October 14, 2014

- Document No. NNSOP-1-2-016, "Part Configuration Review," Revision 5, dated March 8, 2017
- Document No. NNSOP-1-2-018, "Part Qualification and Design Documentation," Revision 8, dated December 1, 2009
- Document No. NNSOP-1-2-019, "Generation and Control of Engineering Design Documents," Revision 6, dated May 15, 2018
- Document No. NNSOP-1-3-004, "Welding Quality Record Instructions," Revision 6, dated September 1, 2021
- Document No. NNSOP-1-6-001, "Order Entry and Processing for Nuclear Parts Marketing Orders," Revision 17, dated March 2, 2018
- Document No. NNSOP-4-009, "Design Basis Qualification Report Index, Nuclear CCS-CS, ZS, GS Frames," Revision 2, dated February 4, 2008
- Document No. NNSOP-1-2-001, "Reporting Defects and Noncompliance 10CFR21 Part 21 of Title 10 of the Code of Federal Regulations for Nuclear Turbines," Revision 20, dated November 17, 2017
- Document No. PS-0701, "Post Weld Heat Treatment of Ferrous Weldments and Stress Relief of Material Stock and Semi-Finished Components," Revision H, dated June 29, 2018
- Document No. QA5-25.SC0340050, "Calibration Program - Curtis-Wright Corporation SAS - SC0340050," Revision 3, dated June 2021
- Document No. SASINST 4200.1a, "Management of the Approved Supplier List, Supplier Audits, and Supplier Selection," Revision A, dated December 22, 2020
- Document No. SASINST 4122.2a, "Guidelines for Processing Purchase Orders," dated August 24, 2020
- Document No. SASINST 4122.20b, "Supplier Selection and Proposal Evaluation," dated April 12, 2021
- Document No. SASINST 4734.1d, "Measuring and Test Calibration," Revision D, dated March 8, 2022
- Document No. SASINST 7520.1e, "Audits and Surveillances," Revision E, dated May 13, 2021
- Document No. SS-3072, "Magnetic Particle Inspection of Plate Edges," Revision J, dated September 24, 2021
- Document No. SS-9307, "Hydrostatic Testing Procedure," Revision R, dated March 14, 2022

- Document No. SASINT 0288.1b, "Quality Event System," dated August 23, 2021
- Document No. 004-161-300, "Inspection to Nonconformance," Revision C, dated January 14, 2022
- Document No. IPM-005-024, "Fraudulent Product – Document and Material Inspection," Revision 0, dated July 16, 2009
- Document No. SS-3040, "Traceability and Material Control," Revision T, dated November 22, 2021
- Document No. 6050823, "Parts Marking Spec," Revision L, dated July 6, 2021
- Purchase Order (PO) No. 906124 for a spring compression, Revision 3, dated October 18, 2021
- PO No. 907298 for a guide bushing, Revision 2, dated January 14, 2022
- PO No. 906242 for a carbon ring, Revision 1, dated January 14, 2022
- PO No. 906760 for a relay AC or DC, Revision 3, dated January 28, 2022
- PO No. 907218 for calibration services, dated January 6, 2022
- PO No. 906028 multiple items including Woodward Governor 505 Digital, EMC Filter and Power Supply, Change Notice 5, dated January 19, 2022
- PO No. 906028 for Filter, Revision 4, dated February 3, 2022
- PO No. 905702 for a waldron coupling, Revision 3, dated August 24, 2021
- PO No. 907621 for an element filter schroeder, dated February 9, 2022
- PO No. 905348 for a solenoid valve, Revision 4, dated August 23, 2021
- PO No. 906760 for a relay, Revision 3, dated January 28, 2022
- PO No. 907231 for repair PQ005682, Revision 1, dated March 3, 2022
- PO No. 908082 for repair PQ005597, Revision 1, dated March 18, 2022
- CW-SAS' Approved Suppliers List, dated February 7, 2022
- Certification of Conformance/Compliance (CoC) for a spring compression, Part No. 105594A02, dated December 8, 2021
- CoC for a carbon ring, Part No. 6894, dated January 26, 2022
- CoC for a hydraulic cylinder, Part No. 890412-001, dated September 30, 2020

- CoC for a stop packing ring, Part No.12887, dated March 31, 2021
- CoC for a relay AC or DC, Part No. 75899A02, dated February 16, 2022
- Certified Material Test Report for a guide bushing, material specification N4264, Revision B (ASTM A276 - Grade 440C), Heat No. 430612, dated January 27, 2022
- Hydrostatic Test Report for Order No. C2362333 (AAB2395), dated March 10, 2021
- Hydrostatic Test Report for Order No. C2362333 (AAB2396), dated March 10, 2021
- Hydrostatic Test Safety Checklist for Job No. 1173941, dated February 21, 2022
- Hydrostatic Test Report for Order No 1173941, dated February 21, 2022
- Hydrostatic Test Safety Checklist for Job No. 1174005, dated February 21, 2022
- Hydrostatic Test Report for Order Number 1174005, Case Gland Assembly, dated February 21, 2022
- Part Inspection Record for a spring compression, Part No. 105594A02, dated December 9, 2021
- Part Inspection Record for a carbon packing ring stop, Part No. 12887, dated March 8, 2021
- Part Inspection Record for a guide bushing, Part No. 79344A01, dated March 15, 2021
- Part Inspection Record for a carbon ring, Part No. 6894, dated December 16, 2021
- Part Inspection Record for a sliding nut, Part No. 108017A19, dated December 3, 2020
- Part Inspection Record for a hydraulic cylinder, Part No. 890412-001, dated September 12, 2020
- Part Inspection Record for a stop packing ring, Part No. 12887, dated March 9, 2021
- Part Inspection Record for a relay AC or DC, Part No. 75899A02, dated February 15, 2022
- Positive Material Identification Record for a carbon packing stop, Part No. 12887, dated March 8, 2021
- Positive Material Identification Record for a guide bushing, Part No. 79344A01, dated February 25, 2022
- Commercial-grade survey report No. SAS 21-04 of a supplier of springs, dated May 5, 2021

- Commercial-grade survey report No. CW-SAS 20-02 of a supplier of guide bushings, dated July 2, 2020
- Commercial-grade survey report No. SAS 21-09 of a supplier of sliding nut, dated June 10, 2021
- Commercial-grade survey report No. DR 18-17 of a supplier of carbon rings, dated July 27, 2018
- Engineering Part Qualification and Design Record for a guide bushing, Part No. 79344A01, Revision G, dated November 11, 2021
- Engineering Part Qualification and Design Record for a carbon ring, Part No. 6894, Revision L, dated December 7, 2020
- Engineering Part Qualification and Design Record for a sliding nut, Part No. 108017A19, Revision F, dated April 18, 2006
- Engineering Part Qualification and Design Record for a hydraulic cylinder, Part No. 890412-001, Revision 00, dated January 31, 2012
- Engineering Part Qualification and Design Record for a spring compression, Part No. 105594A02, Revision U, dated April 17, 2020
- Engineering Part Qualification and Design Record for a carbon packing ring stop, Part No. 12887, Revision D, dated February 9, 2021
- Engineering Part Qualification and Design Record for a drive shaft, Part No.58179
- Engineering Part Qualification and Design Record for a valve bonnet, Part No.57878
- Engineering Part Qualification and Design Record for a washer, Part No.800738-001
- Engineering Part Qualification and Design Record, valve bonnet assembly, Part No.800491-709
- Engineering Part Qualification and Design Record for a packing retainer plate, Part No.800820-001
- Engineering Part Qualification and Design Record for a cap screw, Part No. 75234A03
- Engineering Part Qualification and Design Record for a carbon spacer, Part No. 800714-002
- Engineering Part Qualification and Design Record for an internal retaining ring, Part No.890352-001
- Engineering Part Qualification and Design Record for a valve bonnet, Part No.800825-003



- Engineering Part Qualification and Design Record, valve bonnet sleeve, Part No.800408D02
- Valve Bonnet Assembly Drawing No. 801518
- Valve Bonnet Assembly Drawing No. 800491
- Hardness Exam Report for a guide bushing, Part No. 79344A01, dated March 15, 2022
- Drawing No. F-1881, "Stop, Packing Ring," Revision E, dated March 12, 2021
- Lead Auditor Qualification Record, dated December 30, 2019
- Document No. NNSOP-1-1-002 CERT, "Level 2B Inspection Certification," Revision 1, dated April 8, 2020, qualification as a Level II B Quality Inspector, date of the Certificate of Qualification is July 16, 2020
- Visual Acuity Examination Record, dated August 6, 2021
- Magnetic Particle Testing Level II Qualification and Certification Record, Certification Date May 4, 2021
- Visual Testing Level II Qualification and Certification Record, Certification Date April 19, 2021
- Magnetic Particle Examination Record for a valve bonnet, item No. 57878, Revision AB, dated July 12, 2021
- Magnetic Particle Examination Record for a bracket actuator, item No. 801363-701, Revision B, dated August 9, 2021
- Visual Examination Record for a bracket actuator, item No. item No. 801363-701, Revision B, dated August 9, 2021
- Penetrant Testing Level II Qualification and Certification Record, Certification Date April 19, 2021
- Welder Performance Qualification (WPQ) Record, WPQ No. W10.1-10 W005, dated April 16, 2021
- Technical Evaluation for ISO17025:2017 Accredited Calibration Service Providers, "Documented Accreditation Certificate Review for Acceptance of Calibration and Testing Services," dated October 12, 2020
- Calibration Supplier Program - CW Corporation SAS - SC0340050, dated June 2021
- Certificate of Calibration No. 20228410, dated February 25 ,2022
- Certificate of Calibration No. 316798-659961, Revision 1, dated May 28, 2021Certificate of Calibration No. 332202-545069, Revision 1, dated December 21, 2021

- Certificate of Calibration No.1026586-202140229, dated August 25, 2021
- Certificate of Calibration No.1 20225476, dated February 8, 2022
- Certificate of Calibration No.1030113-2022869, dated January 10, 2022
- Certificate of Calibration No. 202210431, dated March 9, 2022
- Certificate of Calibration No. 333173-812564, dated January 11, 2022
- Certificate of Calibration No. 321437-6999048, dated August 11, 2021
- Certificate of Calibration No. 3315028-639333, dated May 6, 2021
- Certificate of Calibration No. 314585-633780, dated May 3, 2021
- Certificate of Calibration No. 314585-633779, Revision 1, dated May 3, 2021
- Audit Plan DR 19-09, dated July 1, 2019
- Audit Checklist Audit No. 19-09, dated July 10, 2019
- Audit Report No. DR 19-09, dated September 30, 2019
- Nuclear Industry Assessment Corporation (NIAC) Audit No. 27008, dated January 28, 2022
- CW-SAS Evaluation of NIAC Audit No. 27008, dated February 7, 2022
- NIAC Audit No. 24034, dated March 20, 2019
- CW-SAS Evaluation of NIAC Audit No. 24034, dated May 28, 2021
- NIAC Audit No. 26004, dated June 30, 2021
- CW-SAS Evaluation of NIAC Audit No. 26004, dated March 11, 2022

Corrective Action Reports (CARs) Opened During the NRC Inspection

- CAR-2022-0045
- CAR-2022-0046
- CAR-2022-0047
- CAR-2022-0048
- CAR-2022-0049

CARS Reviewed During the NRC Inspection

- CAR 2021-0130, dated September 14, 2021
- CAR-2020-0152, dated October 16, 2020
- CAR-2021-0014, dated January 20, 2021
- CAR-2021-0038, dated March 11, 2021
- CAR-2021-0084, dated June 21, 2021
- CAR-2021-0091, dated July 1, 2021
- CAR-2021-0104, dated August 6, 2021
- CAR-2021-0126, dated September 7, 2021
- CAR-2021-0171, dated December 9, 2021
- CAR-2022-0010, dated January 14, 2021