

October 9, 2014

Mr. Steven Waisanen, President
Konecranes Nuclear Equipment and Services LLC
5300 South Emmer Drive
New Berlin, WI 53151

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION REPORT
NO. 99901451/2014-201 OF KONECRANES NUCLEAR EQUIPMENT
AND SERVICES LLC

Dear Mr. Waisanen

On September 8-9, 2014, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Konecranes Nuclear Equipment and Services LLC (KNES) facility in New Berlin, WI. The purpose of the limited-scope inspection was to assess KNES's 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 inspection specifically evaluated KNES's design control, nonconformance, corrective action, and 10 CFR Part 21 activities for cranes supplied compliant with American Society of Mechanical Engineers (ASME) Nuclear Overhead and Gantry Cranes (NOG) -1 requirements, especially as they relate to the replacement fuel handling crane for Indian Point Unit 3. The enclosed report presents the results of the inspection. This NRC inspection report does not constitute NRC endorsement of your overall quality assurance (QA) or 10 CFR Part 21 programs.

Within the scope of this inspection, no violations or nonconformances were identified.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response (if applicable) will be made available electronically for public inspection in the NRC's Public Document Room or through the NRC's document system, Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

S. Waisanen

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Sincerely,

Kerri Kavanagh, Chief **/RA/**
Quality Assurance Vendor Inspection Branch
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 99901451

Enclosures:

1. Inspection Report 99901451/2014-201

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S. Waisanen

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1. Inspection Report 99901451/2014-201

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Concurred via email

NRO-002

OFFICE	NRO/DCIP/QVIB	NRO/DCIP/QVIB	NRR/DSS/SBPB	NRO/DCIP/QVIB
NAME	TKendzia	AKeim	SJones	KKavanagh
DATE	10/1/2014	10/1/2014	10/1/2014	10/9/2014

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

Docket No.: 99901451

Report No.: 99901451/2014-201

Vendor: Konecranes Nuclear Equipment and Services LLC
5300 South Emmer Drive
New Berlin, WI 53151

Vendor Contact: Mr. Thomas McCann
thomas.mccann@konecranes.com

Nuclear Industry Activity Konecranes Nuclear Equipment and Services LLC, located at 5300 South Emmer Drive, New Berlin, WI 53151, provides new, replacement, or refurbished material handling equipment; cask cranes; cask transporters; fuel handling cranes; polar cranes; and turbine hall cranes, for the nuclear industry.

Inspection Dates: September 8-9, 2014

Inspection Team Leader: Thomas Kendzia, NRO/DCIP/QVIB

NRC inspection team: Andrea Keim, NRO/DCIP/QVIB
Steve Jones, NRR/DSS/SBPB

Approved by: Kerri Kavanagh, Chief
Quality Assurance Vendor Inspection Branch
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Enclosure

EXECUTIVE SUMMARY

Konecranes Nuclear Equipment and Services, LLC
99901451/2014-201

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a vendor inspection at Konecranes Nuclear Equipment and Services LLC (hereafter referred to as KNES), to verify that it had implemented an adequate quality assurance (QA) program that complies with the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," and 10 CFR Part 21, "Reporting of Defects and Noncompliance." The NRC inspection team conducted the inspection from September 8-9, 2014.

This inspection specifically evaluated KNES's design control, nonconformance, corrective action, and 10 CFR Part 21 activities for cranes supplied compliant with American Society of Mechanical Engineers (ASME) Nuclear Overhead and Gantry Cranes (NOG) -1 requirements, especially as they relate to the replacement fuel handling crane for Indian Point Unit 3. The NRC inspection team reviewed the design control and engineering process, to ensure compliance with applicable codes and standards, such as ASME NOG-1, and the Part 21, nonconformances, corrective action processes to ensure compliance with regulatory requirements. The NRC conducted this inspection at KNES's facility in New Berlin, WI.

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

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

The NRC inspection team used Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," dated July 15, 2013, and IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated February 13, 2012.

The information below summarizes the results of this inspection.

10 CFR Part 21 Program

The NRC inspection team determined that the implementation of KNES's program for 10 CFR Part 21 was consistent with the regulatory requirements of 10 CFR Part 21. No findings of significance were identified.

Design Control

The NRC inspection team determined that the implementation of KNES's programs for design control was consistent with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Nonconformance Program

The NRC inspection team determined that the implementation of KNES's program that documents and evaluates nonconformances was consistent with the regulatory requirements of

Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Corrective Action Program

The NRC inspection team determined that the implementation of KNES's program that documents and evaluates corrective actions was consistent with the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

REPORT DETAILS

1. 10 CFR Part 21

a. Inspection Scope

The NRC inspection team reviewed KNES's policies and implementing procedures that govern its Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21 program to verify compliance with the requirements of 10 CFR Part 21, "Reporting of Defects and Noncompliance." Specifically, the NRC inspection team reviewed KNES's 10 CFR Part 21 procedure which describes the authorities and responsibilities for evaluating and reporting defects and noncompliance.

The NRC inspection team reviewed the procedures for corrective action, nonconformance, and other processes (such as audits, customer complaints, and customer returns) that could identify a defect or deviation, to ensure that they provided for screening to determine if an evaluation for 10 CFR Part 21 reporting was required. The NRC inspection team reviewed the last two years of corrective action reports for nuclear work to evaluate if they included audit findings, customer requests, complaints and returns, inspection/examination reports, or non-conformance reports to verify that KNES was implementing its requirements. The NRC inspection team walked down the facility to ensure that the 10 CFR Part 21 posting was in place as required. The NRC inspection team interviewed the Director Global Quality to assess his understanding of 10 CFR Part 21 and the reporting requirements as he has performed all the screening for 10 CFR Part 21 that were reviewed.

The NRC inspection team reviewed the KNES procedure for 10 CFR Part 21 to ensure it required records to be maintained in accordance with the requirements of 10 CFR Part 21. The NRC inspection team reviewed 12 samples of the nuclear corrective action reports (P/CARs) and verified that screening for Part 21 applicability was performed adequately and documented with additional explanations when appropriate.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team determined that the implementation of KNES's program for 10 CFR Part 21 was consistent with the regulatory requirements of 10 CFR Part 21. No findings of significance were identified.

2. Design Control

a. Inspection Scope

The NRC inspection team reviewed KNES's policies and procedures for design control to verify compliance with Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC inspection team evaluated KNES's implementation of the design control process and procedures established in KNES's Nuclear Quality Manual (NQM). Document NQM 2.1, "Design Control," provided specific information for the implementation of the design process.

To evaluate implementation of the design control process, the NRC inspection team sampled design features included in three of the most recent complete cranes or trolley upgrades produced under nuclear safety-related purchase orders (POs). These POs consisted of a complete 40 ton crane for the Indian Point Unit 3 Fuel Building Crane, a replacement trolley for the Clinton Fuel Building Crane, and a complete 130 ton crane for the Crystal River Auxiliary Building. The specific design features considered included mechanical design of the hoist reeving system on the trolleys, electrical design features related to the hoist system, and structural design elements for the two crane bridges designed for the complete cranes. In addition, the NRC inspection team interviewed KNES engineering staff to understand how the design control process had been implemented.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

The selected POs specified the provision of cranes designed to the American Society of Mechanical Engineers (ASME) NOG-1 standard, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)," 2004, unless changes were mutually agreed between the purchaser and KNES. The NRC inspection team noted that alternative design criteria from NUREG-0554, "Single-Failure-Proof Cranes for Nuclear Power Plants," were also specified in the POs.

The NRC inspection team selected implementation of ASME NOG-1 design criteria for Type 1 (single-failure-proof) crane drums as a sample of reeving system design criteria. The ASME NOG-1 design criteria for hoist drums included the following: the drum shall be constructed of rolled or centrifugal cast steel with flanged ends; the drum gear shall be pressed on and keyed to the drum or bolted to the flange; and, in the event of failure of the drum shaft or bearing, the drum must be retained in a manner that precludes disengagement of the drum from gearing or brakes necessary to hold the load. Through review of drawings and calculations and interviews with KNES engineering staff, the NRC inspection team verified that the above criteria had been incorporated in the design of the Indian Point Unit 3 Fuel Building Crane and the Clinton Trolley upgrade. Through further interviews, the NRC inspection team determined that the KNES design process had incorporated appropriate design control methods from KNES NQM 2.1 to ensure the design criteria were satisfied. The NRC inspection team verified the method of compliance with the ASME NOG-1 criteria had been documented in each compliance matrix.

The NRC inspection team reviewed the electrical design features related to the hoist system. The ASME NOG-1 design criteria include requirements to prevent a two-blocking event. Through the review of drawings and interviews with KNES staff, the inspection team verified that a two-blocking event is prevented. The design includes two separate overhoist limit switch systems. The first switch is a geared limit switch and it prevents any upward movement and sets the brakes. The second over travel switch sets the brakes and prevents motion up and down. The design of the main hoist motor has three independent and redundant means of directly removing power from the hoist motor. The NRC inspection team verified that the ASME NOG-1 two-blocking criteria had been incorporated in the design of the Indian Point Unit 3 Fuel Building Crane and the method of compliance had been documented in the compliance matrix.

The NRC inspection team also evaluated the structural design of the crane bridges for the Indian Point Unit 3 and Crystal River cranes by sampling the seismic analysis calculations and the design of the bridge end ties. The NRC inspection team determined that the seismic design calculations had been performed consistent with ASME NOG-1 criteria, and satisfied the specified acceptance criteria from ASME NOG-1, 2004. However, the NRC inspection team noted that the design of the end ties did not match typical end tie designs presented in industry standards, which either provided pinned wheel truck connections or a moderately flexible connecting member that would allow all four wheels on one end of the crane to remain in contact with uneven crane runway rails. Instead, the end tie consisted of two structural members: one rigidly connected at each end to a girder and one pinned at each end to the girder wheel trucks. These two connecting members formed a structure with limited capacity to deform. The NRC inspection team confirmed this by review of a finite element model completed in 2013 to evaluate the end tie stresses for the Indian Point Unit 3 crane with one wheel 0.25 inches lower than the other crane wheels. This is a condition specified for evaluation in ASME NOG-1 when the wheel trucks are not an equalizing design. The results of the finite element analysis indicated the crane would not naturally conform to that boundary condition under the weight of the crane and its rated load because the crane structure supporting the downward deflected wheel was in tension. The 0.25 inch displacement was within the acceptance criteria for rail elevation specified in Paragraph 4160 of ASME NOG-1, and, therefore, the NRC inspection team concluded the end tie was not sufficiently flexible to satisfy the criteria of ASME NOG-1 for design of the end tie. Contrary to the results of the analysis, KNES reported in the compliance matrix for the Indian Point Unit 3 crane that the crane bridge was provided with a flexible end tie to satisfy the criteria of Paragraph 4442 of ASME NOG-1.

The condition was resolved by completion of rail surveys establishing that the rails were sufficiently flat to ensure the structure would maintain wheel contact. Evaluation of the rail conditions at Indian Point Unit 3 after the crane had been placed in service revealed that the crane runway rails were sufficiently flat. A rail survey for the Crystal River fuel building had been completed prior to installation of the crane, and the condition of the rails were also sufficiently flat to support continuous contact of the bridge wheels with the runway rails. The NRC inspection team concluded that the limited flexibility of the end tie was not identified and controlled during the design process for the Indian Point Unit 3 crane, but the deviation in design is minor because the end tie flexibility was acceptable for the actual operating conditions. KNES submitted P/CAR 633 to address NOG-1 Interpretations, including clear communication of KNES interpretations in their compliance matrices and the need to perform rail surveys to ensure the limited flexibility of the end tie was acceptable.

c. Conclusions

The NRC inspection team determined that the implementation of KNES's program for design control was consistent with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The inspection team identified no findings of significance.

3. Nonconformances

a. Inspection Scope

The NRC inspection team reviewed policies, implementing procedures, and records that governed the control of nonconforming materials, parts, and components to verify compliance with Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed the KNES Nuclear Quality Manual, to ensure it addressed the regulatory requirements for nonconforming items.

To verify that KNES's implementation and control over these processes were adequate, the NRC inspection team reviewed the KNES procedure, NQM 10.0, "Nonconforming Product," Version 6, dated March 2014, that governs identification, control and correction of nonconforming items. The NRC inspection team reviewed the training record and interviewed the Nuclear Quality Specialist, who administered the nonconformance process to ensure she was trained on the regulatory requirements and KNES processes and implementation for nonconforming items.

The NRC inspection team reviewed the Nonconforming Report Log for 2014, and selected 16 samples to review in detail to ensure the processes were being followed and the dispositions appeared appropriate. The samples included rework items, accept as is items, and reject items.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team determined that the implementation of KNES's program that documents and evaluates nonconformances was consistent with the regulatory requirements of Criterion XV, "Nonconforming Materials, Parts, of Components," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

4. Corrective Actions

a. Inspection Scope

The NRC inspection team reviewed policies, implementing procedures, and records that govern corrective actions to verify compliance with Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed the KNES Nuclear Quality Manual, to ensure it addressed the regulatory requirements for corrective action.

To verify that KNES's implementation of the corrective action process meet regulatory requirements, the NRC inspection team reviewed KNES procedures, reviewed P/CARs, and interviewed personnel. Specifically the NRC inspection team reviewed NQM 10.1, "Corrective Action," Version 3, dated June 2011, to ensure that it implemented the regulatory requirements. The NRC inspection team reviewed other processes at KNES that could identify a condition adverse to quality (such as internal and external audits, customer complaints, review of nonconformance reports, and review of trend analysis) to ensure that they used the corrective action process.

The NRC inspection team reviewed the logs for P/CARs from 2013 and 2014 and selected 12 samples to review in detail to ensure the process was being followed and the dispositions appeared appropriate. The NRC inspection team verified that KNES implemented their corrective action process for the CARs reviewed, identified conditions adverse to quality were promptly identified and corrected, and for significant conditions adverse to quality that, the cause was determined and actions taken to prevent recurrence, and that appropriate KNES management were being notified.

The NRC inspection team reviewed the training records and interviewed the Global Director of Nuclear Quality to ensure he was trained on the regulatory requirements and KNES processes and implementation for corrective action. The NRC inspection team also interviewed other personnel to ensure that they knew the requirements of the corrective action process, and how to initiate a P/CAR.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team determined that the implementation of KNES's program that documents and evaluates corrective actions was consistent with the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

8. Entrance and Exit Meetings

On September 8, 2014, the NRC inspection team presented the inspection scope during an entrance meeting with Mr. Steven Waisanen, President of KNES, and other KNES personnel. On September 9, 2014, the NRC inspection team presented the inspection results during an exit meeting with Mr. Steven Waisanen, President of KNES, and other KNES personnel.

ATTACHMENT

1. PERSONS CONTACTED AND NRC STAFF INVOLVED

Name	Title	Affiliation	Entrance	Exit	Interviewed
S. Waisanen	President	KNES	X	X	
J. Edmundson	Chief Engineer	KNES	X	X	X
T. McCann	Global Director Nuclear Quality	KNES	X	X	X
J. Yustus	Assistant Chief Engineer	KNES	X	X	X
S. Lawrence	Product Manager	KNES	X	X	X
D. Gupta	Senior Seismic Engineer	KNES		X	X
D. Ford	Project Engineer, Structural	KNES			X
B. Orozco	Nuclear Quality Specialist	KNES			X
T. Bies	Senior Project Engineer, Electrical	KNES			X
S. Allen	Senior project Engineer	KNES		X	X
T. Kendzia	Inspection Team Leader	NRC	X	X	
A. Keim	Inspection Team Member	NRC	X	X	
S. Jones	Inspection Team Member	NRC	X	X	

2. INSPECTION PROCEDURES USED:

IP 43002, "Routine Inspections of Nuclear Vendors"
 IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance"

3. ITEMS OPENED, CLOSED, AND DISCUSSED:

None

4. DOCUMENTS REVIEWED:

Procedures

Konecranes Nuclear Equipment & Services, LLC, NUCLEAR Quality Manual, Version 2, June, 2014

NQM 2.0, "Contract Review-Order Entry," Version 4, March 2012

NQM 2.1, "Design Control," Version 5, March 2012

NQM 10.0, "Nonconforming Product," Version 6, March 2014

NQM 10.1, "Corrective Action," Version 3, June 2011

NQM 10CFR21, "Konecranes Nuclear Equipment & Services, LLC – Operations Policy (10CFR21)," Version 5, June 2011

Nuclear Operating Procedure (NOP) 2.1.0, Procedure for Calculations, Version 6, February 2014

NOP 2.1.1, "Control of Design Activities," Version 4, February 2014

NOP 2.1.2, Commercial Grade Dedication-Application Software, Version 3, February 2012

NOP 2.1.3, Procedure for Software Quality Assurance Documentation, Version 0, February 2012

Reference Standards

American Society of Mechanical Engineers NOG-1 standard, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)," 2004

Purchase Orders

HOLTEC P.O. No. 1775PH, Change 7, for Indian Point Unit 3 Fuel Building Crane, dated October 29, 2010.

Exelon KNES Contract for Clinton Safety-Related Crane Upgrade, dated November 30, 2012.

Progress Energy Contract for Crystal River Spent Fuel Cask Crane System, dated April 27, 2009.

KNES PO 4500095810 to Lincoln Structural Solutions LLC, dated February 19, 2014

KNES PO 4500095810 to Team Industrial Services Inc., dated March 20, 2014

Equipment Qualification and Test Reports

Geometric Analysis, Runway – Crystal River Unit 3, dated August 29, 2011

Weld Visual Inspection Report - Indian Point 3 Trolley Frame, Weldall P. O. No. 036576W-CBT, dated March 25, 2010.

NOG-1 Compliance Matrix, Indian Point 3 Fuel Handling Crane, P&H Document No. CN-36576-04, Revision 3, March 21, 2013.

NOG-1 Compliance Matrix, Single Failure Proof Upgrade for Clinton Fuel Handling Crane, Document No. US52-00085-04, Revision 2, October 3, 2013.

Calculations

P&H Calc 036576-09, Revision 2, Seismic Analysis of Indian Point III Crane, December 7, 2009.

P&H Calc 36576-10, Revision 2, Indian Point 3 Single Failure Proof Crane Critical Weld Calculations, January 29, 2010.

P&H Calc 36576-01, Revision 3, Indian Point 3 Hoist/Reeving Equipment Calculation, March 31, 2010.

P&H Calc 036576-23, Revision1, Flexibility Analysis of End Tie Indian Point III Crane, July 3, 2013.

P&H Calc 036539-09, Revision 2, Crystal River Unit 3 Cask Crane Structural Calculations, May 13, 2011.

Calc US52-00085-23, Clinton Main Hoist Reeving Calculations, May 30, 2014.

Drawings

P&H Drawing QR89229, Revision 2, Trolley Frame Weldment Diagram, Indian Point 3, March 30, 2010.

P&H Drawing QR89677, Revision 1, Seismic Restraint Weldment Diagram, Indian Point 3, February 23, 2010.

P&H Drawing QR89299, Revision 7, Main Hoist Drum Weldment Diagram, Indian Point 3, June 3, 2010.

P&H Drawing R89199, Revision 3, Top Level Crane Assembly, Indian Point 3, December 16, 2010.

P&H Drawing 54251168, Revision 0, M. H. Drum Weldment Diagram, Clinton, January 7, 2013.

P&H Drawing 54251167, Revision 0, M. H. Drum Machining Diagram, Clinton, January 17, 2013.

P&H Drawing R88786, Revision 3, "Fuel Storage Building Crane," Indian Point 3, dated September 2, 2009

P&H Drawing R88749, "Mainline Power Distribution Circuit 489VAC/3PH/60Hz," Indian Point 3, dated December, 14, 2012

Preventative/Corrective Action Reports

List of all Preventative/Corrective Action Reports (P/CARs) from 2013 & 2014
P/CARs 580, 581, 582, 590, 595, 606, 607, 608, 609, 619, 620, and 623

Nonconformance Reports

List of all Nonconformance Reports (NCRs) from 2013 & 2014
NCRs 200003216, 200005262, 200007408, 200007850, 200007928, 200008000,
200008399, 200008571, 200008802, 200009311, 200009530, 200009902, 200010106,
200010255, 200010924, and 200011743

New Condition Reports Generated

P/CAR 633, "NOG-1 Interpretation", dated 9/12/2014

5. ACRONYMS USED:

ADAMS	Agencywide Documents Access and Management System
ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
IP	inspection procedure
KNES	Konecranes Nuclear Equipment and Services LLC
NOG	Nuclear Overhead and Gantry Cranes
NQM	Nuclear Quality Manual
NRC	Nuclear Regulatory Commission
P/CAR	corrective action reports
PO	purchase order
QA	quality assurance