



OFFICE OF INSPECTOR GENERAL

U.S. Department of Energy

INSPECTION REPORT

DOE-OIG-21-17

March 2021

**ALLEGATION ON WEAPONS QUALITY
ASSURANCE AT THE KANSAS CITY
NATIONAL SECURITY CAMPUS**



Department of Energy
Washington, DC 20585

March 17, 2021

MEMORANDUM FOR THE ACTING UNDER SECRETARY FOR NUCLEAR SECURITY
& ADMINISTRATOR, NATIONAL NUCLEAR SECURITY
ADMINISTRATION

SUBJECT: Inspection Report on “Allegation on Weapons Quality Assurance at the Kansas City National Security Campus”

The attached report discusses our review of allegations regarding Weapons Quality Assurance at the Kansas City National Security Campus. This report contains no recommendations because the National Nuclear Security Administration implemented corrective actions during the course of our review based on our two Management Notification Memos (and we commend them for taking immediate action).

We conducted this inspection from January 2020 through July 2020 in accordance with the Council of the Inspectors General on Integrity and Efficiency’s *Quality Standards for Inspection and Evaluation*. We appreciate the cooperation and assistance received during this evaluation.

A handwritten signature in black ink, appearing to read "Jennifer L. Quinones", with a long horizontal flourish extending to the right.

Jennifer L. Quinones
Deputy Inspector General
Office of Inspector General

cc: Acting Deputy Secretary
Chief of Staff



Department of Energy Office of Inspector General

Allegation on Weapons Quality Assurance at the Kansas City National Security Campus (DOE-OIG-21-17)

WHY OIG PERFORMED THIS REVIEW

The Office of Inspector General (OIG) received two serious allegations of non-compliance with nuclear weapon product designs that, if true, could have had a detrimental effect on the reliability of the nuclear stockpile. Specifically, the allegations stated that the Kansas City National Security Campus (KCNSC) accepted: (1) parts 2A3555 and 2A3557 flex cables despite those cables failing continuity testing; and (2) part 3A3917 rigid-flex cables that did not conform to their design specifications and that KCNSC did not consult the design agency, Sandia National Laboratories, regarding the actual methods used to produce these rigid-flex cables.

The OIG initiated this inspection to determine the validity of these allegations.

What Did OIG Find?

We partially substantiated the allegations. Specifically, we substantiated that the KCNSC incorrectly accepted a limited number of parts 2A3555 and 2A3557 flex cables that were erroneously reported to have passed continuity testing but had, in fact, failed the continuity testing. We attributed this to the continuity testing subcontractor's failure to update their testing requirements. Based on our work, KCNSC either scrapped the flex cables or determined that they were acceptable for use through the Specification Exception Release (SXR) Process.

We substantiated that the KCNSC had part 3A3917 rigid-flex cables manufactured in a manner that did not conform to the design's specification. We attributed this to the poor communication between the design and production agency regarding the change to a copper foil construction. However, we were unable to substantiate that the KCNSC had not consulted with the design agency regarding the actual method used to produce Part 3A3917. According to both the Department of Energy and contractor officials, the manufactured 3A3917 rigid-flex cables were reviewed and determined to be acceptable for use. In addition, the National Nuclear Security Administration (NNSA) completed a root-cause analysis designed to prevent issues in other product lines.

What Is the Impact?

Because of the quick action taken by NNSA in response to our management notification memos and inspection findings, there is no expected impact as a result of these allegations.

What Is the Path Forward?

NNSA implemented corrective actions during the course of our review based on our two Management Notification Memos (and we commend them for taking immediate action). Therefore, we have no additional recommendations.

BACKGROUND

Established by Congress in 2000, the National Nuclear Security Administration (NNSA) is a semi-autonomous agency within the Department of Energy responsible for enhancing national security through the military application of nuclear science. One of NNSA's core missions is to ensure that the U.S. maintains a safe, secure, and reliable nuclear stockpile through the application of science, technology, engineering, and manufacturing.

One of the eight sites that comprise NNSA is the Kansas City National Security Campus (KCNSC) located near Kansas City, Missouri. KCNSC is responsible for manufacturing and procuring non-nuclear components for nuclear weapons, including electronic, mechanical, quality assurance, and engineered material components. Formerly known as the Kansas City Plant, the site is managed and operated by Honeywell Federal Manufacturing & Technologies, LLC. Another one of NNSA's sites is Sandia National Laboratories (SNL). SNL is responsible for the design, development, testing, and production of specialized non-nuclear components, and quality assurance and systems engineering for all U.S. nuclear weapons. SNL is headquartered in Albuquerque, New Mexico, and is operated and managed by National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc.

The purpose of Department Order 414.1D, *Quality Assurance*, is to ensure that products and services meet or exceed the customer's requirements and expectations. It requires contractors to procure items and services that meet established requirements and perform as specified. NNSA Policy NAP 401.1, *Weapon Quality Policy*, identifies the quality requirements applicable to weapons activities of contractors, and notes that the design agency shall be responsible for the design of its items and design processes under their responsibility. It requires that designs provide a clear link between design inputs and design requirements, including production requirements and specifications. It further requires that designs incorporate critical characteristics required for aspects such as function, reliability, interchangeability, design life, safety, dismantlement, and reuse.

In September 2019, the Office of Inspector General (OIG) received two serious allegations of non-compliance with nuclear weapon product designs that, if true, could have had a detrimental effect on the safety and reliability of the nuclear stockpile. Specifically the allegations stated that KCNSC accepted: (1) parts 2A3555 and 2A3557 flex cables despite those flex cables failing continuity testing; and (2) part 3A3917 rigid-flex cables that did not conform to their design's specifications and that KCNSC did not consult the design agency, SNL, regarding the actual methods used to produce these rigid-flex cables.

FLEX CABLES THAT FAILED CONTINUITY TESTING WERE ACCEPTED

We substantiated the allegation that KCNSC incorrectly accepted parts 2A3555 and 2A3557 flex cables that were erroneously reported to have passed continuity testing but had, in fact, failed continuity testing. Specifically, use of outdated testing requirements resulted in a false pass

result rather than the correct fail result.¹ Based on our work, KCNSC took immediate action by either disposing of the flex cables or determining that they were acceptable for use through the Specification Exception Release (SXR) process.

Parts 2A3555 and 2A3557 flex cables are produced for KCNSC by Printed Circuits, Inc (PCI). The technical drawings for these parts contained testing requirements and stated that continuity checks should be performed per a table attached to the technical drawing. The table then noted the maximum resistance that each pad on the part was required to meet. PCI subcontracted with Gardien to perform the continuity testing for these parts. Gardien performed continuity testing against the specification requirements provided to them, which should have matched the actual specifications. However, according to a KCNSC corrective action, Gardien had not updated their Resistance Test program with the production build requirements. As a result, PCI's continuity test reports contained false pass results for some of the parts. Specifically, we determined that 20 flex cables (16 from part 2A3555 and 4 from part 2A3557) identified as having passed continuity testing had actually failed to meet the more stringent production build test requirements and, therefore, should have failed continuity testing.

We issued a Management Notification Memo to NNSA on this issue in June 2020. The Memo contained two suggestions for corrective actions that, if implemented, would ensure that the reliability of the nuclear stockpile and similar issues did not occur within other product lines. Based on our work, KCNSC took immediate action and either disposed of the flex cables or determined that they were acceptable for use through the SXR process. Further, KCNSC's review determined that Gardien had failed to update their Resistance Test program with the production build requirements. Because both suggestions from the Memo have been completed, we have no further recommendations related to this allegation.

RIGID-FLEX CABLE 3A3917 DID NOT MEET THE DESIGN SPECIFICATIONS

We substantiated the allegation that KCNSC had part 3A3917 rigid-flex cables manufactured in a manner that did not conform to the design's specification. However, we were unable to substantiate that KCNSC had not consulted with SNL, the design agency, regarding the method used to produce part 3A3917. According to NNSA, the change from a copper clad to a copper foil construction was not communicated to the design agency at the time of the change, although we found that SNL had approved the Engineering Evaluation Release² (EER) and that the EER showed the use of copper foil in the production of the rigid-flex cable. While the design agency did not notice this detail, the EER activities still communicated that change to the design agency. Therefore, while the part, as produced, did not meet the design's specifications, the design agency-approved EER gave the appearance that the parts were produced in accordance with the product definition.³ SNL officials have attributed their erroneous approval of the EER to the

¹ In this instance, a "false pass" is a test result that should have returned as a failure but instead was returned as a pass. A "correct fail result" is a result that correctly returned as a failure.

² The EER is a release that contains the qualification plan describing the activities for evaluating or re-evaluating a product and/or acceptance equipment, and specifies the participants, quantities, activities, schedules, procedures, and methods of evaluation.

³ The product definition is the information set released by the design agency that defines a product, specifies acceptance requirements to satisfy product performance requirements, and describes product identification elements. Product definition may also specify additional design and manufacturing requirements to assure design intent is met.

lack of communication by the production agency, KCNSC, at the time of the change to a copper foil construction. While a more thorough review of the EER documentation may have caught the use of copper foil in the part's construction, a clear communication from the production agency at the time of the change to copper foil may have also prevented the production of several lots of part 3A3917 that did not meet design specifications.

The design drawing for part 3A3917 specified the use of one-sided laminate. However, according to KCNSC officials, one-sided laminate is not readily available and, therefore, either two-sided laminate must have one side etched off, or one-sided laminate must be fabricated. We examined five purchase orders for part 3A3917 and found that PCI fabricated the one-sided laminate using a material called prepreg, a reinforcement material that has been pre-impregnated with either a thermoplastic or thermoset resin, and copper foil, to create a one-sided laminate. When we discussed this production approach with the part designer, he stated that this method, specifically using copper foil, would not produce the smooth surface that the design required. Instead, this method of producing the rigid-flex cables would create a less uniform, more irregular surface on the part, which could leave the part susceptible to contaminants or cleaning fluids that over time could negatively impact the part's ability to function as designed. A production deviation from the design's specifications may require coordination with the design agency and potential re-approval on an EER. However, because the EER was approved, KCNSC believed that the part met the design's specifications.

We issued a Management Notification Memo to NNSA on this issue in April 2020. The Memo contained three suggestions for corrective actions that, if implemented, would ensure the reliability of the nuclear stockpile. During interviews with SNL officials after release of the Management Notification Memo, they indicated that while they reviewed the documentation on the fabrication of these parts and approved the EER, they incorrectly approved the use of copper foil. Specifically, SNL noted that the copper foil construction was not in accordance with the design's specifications. SNL officials also noted that had KCNSC communicated the change to copper foil at the time the change was made, they would not have approved the EER. Following the release of our Management Notification Memo, SNL completed its SXR review of the part and determined that although copper foil construction and copper clad construction differ in how they are processed, the end material in both construction methods is identical. The SXR further noted that cables analyzed with foil construction appeared as clean as, if not cleaner than, the cable analyzed with clad construction. Therefore, the SXR concluded that the cables would perform the same when exposed to environments and that the foil construction cables were acceptable. NNSA completed the SXR process, which implemented all three suggestions in the Memo. In addition, they completed a root-cause analysis designed to prevent issues in other product lines. As such, we have no recommendations related to this allegation.

RECOMMENDATION

NNSA implemented corrective actions during the course of our review based on our two Management Notification Memos (and we commend them for taking immediate action). Therefore, we have no additional recommendations.

MANAGEMENT RESPONSE

With no recommendations, NNSA was not required to respond to this report. Based on conversations with NNSA, we were informed that they were choosing not to formally respond to this report.

INSPECTOR COMMENTS

As indicated earlier, NNSA implemented corrective actions during our review based on our two Management Notification Memos. We commend them for taking immediate action.

Appendix I: Objective, Scope, and Methodology

OBJECTIVE

The Office of Inspector General received two allegations of non-compliance with nuclear weapon product designs that, if true, could have had a detrimental effect on the nuclear stockpile. Specifically, the allegations stated that Kansas City National Security Campus accepted: (1) parts 2A3555 and 2A3557 flex cables despite those cables failing continuity testing; and (2) part 3A3917 rigid-flex cables that did not conform to their design's specifications and that Kansas City National Security Campus did not consult with the design agency, Sandia National Laboratories, regarding the actual methods used to produce these rigid-flex cables. We conducted this inspection to determine the validity of these allegations.

SCOPE

The inspection was performed from January 2020 through July 2020 at Kansas City National Security Campus in Kansas City, Missouri; and Sandia National Laboratories in Albuquerque, New Mexico. The inspection was conducted under Office of Inspector General project number S20AL015.

METHODOLOGY

To accomplish our inspection objective, we:

- Reviewed Federal and contractor requirements documents regarding quality assurance;
- Conducted interviews with the alleging party to gain an understanding of the actual allegations;
- Conducted interviews with Kansas City Field Office and contractor officials to gain an understanding of the product manufacturing, testing, and acceptance process and requirements;
- Conducted interviews with Sandia Field Office and contractor officials to gain an understanding of the design requirements for part 3A3917 as well as the Engineering Evaluation Release approval process;
- Reviewed 100% of continuity test data supplied by Gardien for parts 2A3555 and 2A3557 work orders; and
- Reviewed related reports on the subject of weapons quality assurance issues.

We conducted this inspection in accordance with the Council of the Inspectors General on Integrity and Efficiency's *Quality Standards for Inspection and Evaluation*. Those standards require that we plan and perform the inspection to obtain sufficient, appropriate evidence to provide a reasonable basis for our conclusions and observations based on our inspection objective. We believe that the evidence obtained provided a reasonable basis for our conclusions and observations based on our inspection objective. Accordingly, the inspection included a

Appendix I: Objective, Scope, and Methodology

limited review of controls and compliance with laws and regulations to the extent necessary to satisfy the inspection objective. Because our review was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our inspection. Finally, we assessed the reliability of test results data by (1) observing Kansas City Field Office Officials retrieve original testing data received from the subcontractor; (2) analyzing the data with Kansas City Field Office Officials to gain a better understanding of the data; and (3) confirming the results of our testing of the data with Kansas City Field Office Officials. We determined that the data was sufficiently reliable for the purposes of this report.

We held an exit conference with management officials on February 18, 2021.

Appendix 2: Prior Report

Audit Report on [*National Nuclear Security Administration Nuclear Weapons Systems Configuration Management*](#) (DOE/IG-0902, March 2014). The report concluded that the National Nuclear Security Administration sites did not always ensure that parts that did not conform to specifications were actually fit for use in nuclear weapons. Sites had not always included justifications on nonconformance reports, instead sometimes relying on undocumented expert engineering opinions in lieu of formally documented technical justifications for the approval of the use of nonconforming parts. Sites did not always use a Specification Exemption Release to obtain authorization for nonconforming parts use, which is required for appropriate justification. Sites had performed inadequate quality inspections on vendor supplied parts to ensure that unqualified parts were not introduced into the U.S. nuclear weapons inventory. These parts and components were found to have unacceptable deviations and were subsequently used or made available for use in the production of nuclear weapons. All recommendations have a closed status.

FEEDBACK

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