



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

January 21, 2022

B. Greene, Vice President of Quality
NAC International
3930 East Jones Bridge, Suite 200
Norcross, GA. 30092

**SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION INSPECTION REPORT
NO. 72-1015/2021-201**

Dear Mr. Greene:

On December 7, 2021, through December 9, 2021, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an announced onsite inspection at Petersen Incorporated (Petersen) in Ogden, Utah. Petersen is under contract with NAC International (NAC) to fabricate important to safety (ITS) components of the NAC MAGNASTOR system.

The purpose of the inspection was to verify and assess the adequacy of NAC's compliance with the NRC requirements for the design, modification, fabrication, assembly, testing, and procurement of MAGNASTOR components. NAC is the holder of the certificate of compliance (CoC) and designer of the NAC MAGNASTOR system.

The inspection scope included observations of in field fabrication activities, reviews of records, and interviews with personnel to determine whether a dry cask storage system (DCSS), fabricated by an offsite entity and for use in an independent spent fuel storage installation (ISFSI), is constructed in accordance with the commitments and requirements specified in the safety analysis report (SAR), the NRC's corresponding safety evaluation report (SER), 10 CFR Part 72 and the CoC and technical specifications (TS); and to determine whether the outside fabricator's activities are conducted in accordance with NRC-approved Quality Assurance Program (QAP) requirements. The enclosed report presents the results of this inspection, which were discussed with you and other members of your staff on December 9, 2021.

Based on the results of this inspection, the NRC inspection team determined that three Severity Level IV violations of NRC requirements occurred. The NRC is treating these violations as Non-Cited Violations (NCVs), consistent with Section 2.3.2 of the Enforcement Policy. The NRC inspection team described these NCVs in the subject inspection report.

If you contest these violations, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to: (1) the Director, Office of Nuclear Materials Safety and Safeguards; and (2) the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* (CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

Hipolito Gonzalez, Acting Chief
Inspections and Operations Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Docket No. 72-1015

Enclosure:
NRC Inspection Report No.
72-1015/2021201

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION INSPECTION REPORT
NO. 72-1015/2021-201

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**U.S. NUCLEAR REGULATORY COMMISSION
Office of Nuclear Material Safety and Safeguards
Division of Fuel Management**

Docket: 72-1015

Report.: 72-1015/2021-201

Enterprise Identifier: I-2021-201-0066

Certificate Holder: NAC International Inc.

Facility: Petersen Incorporated

Location: Ogden, Utah

Inspection Dates: December 7, 2021, through December 9, 2021

Inspection Team: Matthew Learn, Transportation and Storage Safety Inspector, Team Leader
Jeremy Tapp, Transportation and Storage Safety Inspector
Marlone Davis, Senior Transportation and Storage Safety Inspector

Approved By: Hipolito Gonzalez, Acting Branch Chief
Inspections and Operations Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Enclosure

**U.S. NUCLEAR REGULATORY COMMISSION
Office of Nuclear Material Safety and Safeguards
Division of Fuel Management**

EXECUTIVE SUMMARY

NAC International
NRC Inspection Report 72-1015/2021-201

On December 7, 2021, through December 9, 2021, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an announced onsite inspection at Petersen Incorporated (Petersen) in Ogden, Utah. Petersen is under contract with NAC to fabricate important to safety (ITS) components of the NAC MAGNASTOR system.

The purpose of the inspection was to verify and assess the adequacy of NAC International (NAC)'s compliance with the NRC requirements for the design, modification, fabrication, assembly, testing, and procurement of MAGNASTOR components. NAC is the holder of the certificate of compliance (CoC) and designer of the NAC MAGNASTOR system.

Design Control

- The team determined, for the items selected for review, that the fabrication specifications were consistent with the design commitments and requirements documented in the safety analysis report (SAR), the CoC, and technical specifications (TS). (Section 1.1)

Corrective Action and Non-Conformance Reports

- The team determined that generally corrective actions for identified fabrication deficiencies were implemented in a time frame commensurate with their significance, and nonconformance reports documenting the deficiencies were initiated and resolved.
- One Severity Level IV Non-Cited Violation (NCV) of 10 CFR 72.48, "Changes, Tests, and Experiments" was identified for NAC's failure to obtain a CoC amendment for changes to ACI-318 requirements for the MAGNASTOR cask system that required a change to the specifications incorporated in the MAGNASTOR System CoC No. 1031 Amendments 0-6.
- One Severity Level IV NCV of 10 CFR 72.150, "Instructions, procedures, and drawings" was identified for Petersen's failure to ensure a final dimensional verification occurs after adjusting the MAGNASTOR fuel basket within fabrication procedures. (Section 1.2)

Personnel Training and Certifications

- The team determined that individuals performing quality-related activities were trained and certified as required. (Section 1.3)

Human Performance

- The team determined that the offsite fabricator's personnel were familiar with the specified design, designated fabrication techniques, testing requirements, and quality controls associated with the construction of the DCSS. (Section 1.4)

Procurement

- The team determine that materials, components, and other equipment received by the fabricator meet DCSS design procurement specifications, and the procurement specifications conform to the design commitments and requirements contained in the Final Safety Analysis Report (FSAR), CoC and TS. (Section 1.5)

Implementing Procedures

- The team determined that DCSS components were generally being fabricated and inspected per approved quality assurance (QA) and 10 CFR Part 21 implementing procedures and fabrication specifications.
- One Severity Level IV NCV of 10 CFR 72.158, "Control of special processes" was identified for Petersen's failure to perform an adequate Magnetic particle testing (MT) inspection of a fuel tube seam weld. (Section 1.6)

10 CFR Part 21

- The team determined that: fabrication activities were conducted under an NRC-approved QAP; the provisions of 10 CFR Part 21 were implemented; the fabricator's personnel were familiar with the reporting requirements of 10 CFR Part 21; and the fabricator complied with 10 CFR 21.6, "Posting requirements". (Section 1.7)

Oversight and Audits

- The team determined, for the items selected for review, that the CoC holder is performing oversight and audits in accordance with their QA program. (Section 1.8)

REPORT DETAILS

1.0 ISFSI Component Fabrication by Outside Fabricators (Inspection Procedure (IP) 60852)

1.1 Design Control

1.1.1 Inspection Scope

The team determined whether the fabrication specifications were consistent with the design commitments and requirements documented in the SAR, the CoC, and technical specifications.

The team reviewed licensing drawings against the design and fabrication drawings to verify the consistency of critical dimensions and material specification as well as testing and inspection requirements to determine whether they were consistent with the design. Specifically, the team focused on the translation of design commitments and requirements for the important to safety (ITS) Category A, B, and C subcomponents of the Transportable Storage Canisters (TSC)s from the NAC FSAR Revision 12, including associated licensing drawings, to design and fabrication drawings, and subsequently manufacturing plans.

The team reviewed the following Petersen standard operating procedures (SOP) procedures associated with design control during fabrication to verify proper implementation:

PI-SOP-06-01; Document Control Procedure; Revision 14
PI-SOP-17-01; Quality Assurance Records; Revision 9

Additionally, the NAC design and fabrication drawings reviewed by the team are as follows:

30032-266, "Closure Lid Assembly, PWR DF TSC, MAGNASTOR," APS; Revision 1
30032-268, "Fuel Tube Assembly, PWR DF Basket, MAGNASTOR," APS; Revision 1
30032-269, "Corner Weldment, PWR DF Basket, MAGNASTOR," APS; Revision 1
30032-270, "PWR OF Basket Assembly, 37 Cells, MAGNASTOR," APS; Revision 1
30032-273, "Corner Weld, PWR DF Basket, MAGNASTOR," APS; Revision 1
30032-277, "Shell Weldment, PWR TSC, MAGNASTOR," APS; Revision 1
30032-278, "Closure Lid Assembly, PWR TSC, MAGNASTOR, APS; Revision 0
30032-280, "PWR TSC Assembly, 37 Cells, MAGNASTOR," APS; Revision 1
30032-312, "TSC, Weld Mock-up, MAGNASTOR," APS; Revision 0

The team evaluated the design controls that were in place for the transmittal and handling of the above mention design and fabrication drawing received from NAC and how Petersen modified, as applicable, the approval of the fabrication drawings. The team also evaluated the process for distributing controlled drawings, their locations, and retrieval to verify that old or uncontrolled versions were not being used.

1.1.2 Observation and Findings

The team did not identify any unexplained discrepancies between the design and fabrication specifications and the NAC FSAR licensing drawings. The team noted that Petersen captured all requirements that were applicable to fabrication. The team also observed that Petersen was not providing any design engineering services. However, Petersen provided more conservative tolerances on fabrication drawings than those listed in the design drawings. The team noted that NAC incorporated the design change requests (DCR)s associated with design drawings into fabrication drawings. Drawings were legible and contained the relevant information needed for fabrication.

The team observed that Petersen followed their procedure for document control and the storage of quality assurance records. Staff were able to readily retrieve a sample of requested drawings revisions and demonstrate the process of issuing and withdrawing controlled copies of drawings to the field for fabrication. Quality assurance records were kept on a secure digital server onsite, which automatically backed up information to a secure digital server offsite. Petersen also maintained paper copies of records in a storage area onsite.

Overall, the team did not identify any issues of concerns in the translation of design information. The team did note that in most cases fabrication drawings, shop travelers, and procedures were adequately identified at various work locations with each component as necessary. The team also noted that the documents reflected the correct revisions, as applicable.

No findings of significance were identified.

1.1.3 Conclusions

The team determined, for the items selected for review, that the fabrication specifications were consistent with the design commitments and requirements documented in the SAR, the CoC, and TS.

1.2 **Corrective Action and Non-Conformance Reports**

1.2.1 Inspection Scope

The team determined whether corrective actions for identified fabrication deficiencies have been implemented in a time frame commensurate with their significance, and whether nonconformance reports documenting the deficiencies have been initiated and resolved.

The team reviewed a sample of records and interviewed personnel to determine whether Petersen effectively implemented corrective actions identified for fabrication deficiencies in a time frame commensurate with their significance and in accordance with their QA program procedure. Specifically, the team reviewed Petersen's PI-SOP-16-01, "Corrective and Preventive Action Procedure," Revision 14. The team selected and reviewed several preventative/corrective action reports (P/CARs) from December 2018 to November 2021. The team also included a review of P/CAR number 621 to follow-up on the corrective actions to a violation from the previous inspection.

In addition, the team reviewed selected records and interviewed personnel to verify that Petersen effectively implemented a nonconformance control program in accordance with the requirements of 10 CFR Part 72 and approved QA procedures. Specifically, the team reviewed Petersen's approved procedure PI-SOP-15-01, "Nonconforming Material Procedure," Revision 21. The team selected several nonconformance reports (NCRs) to verify that the NCRs were identifiable, traceable, and the disposition of the nonconformance was adequate. The team reviewed NCRs since the 2018 inspection and concentrated on issues involving ITS structures, systems, and components (SSCs). The team reviewed these NCRs to evaluate if the disposition was appropriate, adequately performed as necessary, and properly closed out in accordance with the approved procedure PI-SOP-15-01. The NCRs related to 10 CFR 72.48 screenings and/or evaluations, NAC provided a vendor nonconformance report number (VNCR#). The team focused the review on the NCR/VNCRs with accept-as-is and repair dispositions because generally these required a technical justification or engineering evaluation against the requirements in 10 CFR 72.48.

1.2.2 Observation and Findings

The team reviewed VNCR numbers (Nos.) 845971-04 and 845971-13 with their corresponding 10 CFR 72.48 screening Nos. NAC-20-MAG-004 and NAC-20-MAG-019, respectively. The team also reviewed, design change requests (DCRs) No. 71160-FSAR-0Q and 71160-FSAR-0AX with the corresponding 10 CFR 72.48 screening Nos. NAC-09-MAG-052 and NAC-10-MAG-082, the MAGNASTOR System FSAR Revisions 0,1, and 10, the MAGNASTOR System CoC No. 1031 and associated technical specifications (TSs), and the NRC Safety Evaluation Report (SER) for Amendments 0-6 of the MAGNASTOR System.

During the review of VNCR Nos 845971-04 and 845971-13, the team noted that NAC initiated the VNCRs because the concrete mix for the concrete cask lid did not meet the NAC design drawing (No. 30076-064). The NAC design drawing provided the specified code requirements of the mix and materials used in fabrication activities at Petersen for the concrete cask lid. The team noted that the CoC TS Section 4.2 and MAGNASTOR FSAR Sections 1.3.1.3, 8.2, and 10.1.1 contained the requirements and information for the concrete specifications, procurement, and construction.

Specifically, TS Section 4.2, "Codes and Standards" requires, in part, that the American Concrete Institute (ACI) Specifications ACI-349 and ACI-318 govern the CONCRETE CASK design and construction, respectively.

FSAR Section 1.3.1.3, "Concrete Cask" states, in part, that a carbon steel and concrete lid is bolted to the top of the concrete cask. (See Table 1.3-4 for the Concrete Cask Lid - Concrete Specification Summary.) The lid reduces skyshine radiation and provides a cover to protect the TSC from the environment and postulated tornado missiles. Fabrication of the concrete cask requires no unique or unusual forming, concrete placement, or reinforcement operations. The concrete portion of the cask is constructed by placing concrete between a reusable, exterior form, and the steel liner. Reinforcing bars are used near the inner and outer concrete surfaces to provide structural integrity. The structural steel liner and base are shop fabricated. Refer to Table 1.3-3 for the fabrication specifications for the concrete cask.

The team observed that NAC revised this section of the FSAR including Tables 1.3-3 and 1.3-4 as a part of DCRs Nos. 71160-FSAR-0Q and 71160-FSAR-0AX and 10 CFR 72.48 screening Nos. NAC-09-MAG-052 and NAC-10-MAG-082, to separate the concrete shell fabrication specifications from the concrete lid for the concrete cask and removed specific ACI-318 requirements from the construction/fabrication specifications for the concrete lid (e.g., no strength requirements). As stated in the DCR No. 71160-FSAR-0Q, NAC removed the specific ACI-318 requirements because NAC determined the concrete lid did not take credit for any structural performance.

FSAR Section 8.2 states, in part, the concrete portion of the cask is procured in accordance with the requirements of ACI 318, as supplemented by applicable American Standard Testing and Material (ASTM) standards.

FSAR Section 10.1.1 states, in part, that construction and inspections of the concrete component of the concrete cask shall be performed in accordance with applicable sections and requirements of ACI-318.

The team reviewed the TSs associated with the CoC No. 1031, Amendments 0 through 6 and accompanying NRC SERs. The team noted that there was no change to the TSs to reflect the design changes specified in the FSAR Tables 1.3-3 and 1.3-4 or discussion in subsequent SERs that described the construction alternatives to the ACI-318 code. The team noted that the TS defined term of CONCRETE CASK does not separate the concrete shell and lid and the original NRC SER states, in part, that the concrete used for fabrication is ASTM C150 Type II Portland Cement and specified a minimum compressive strength and density of 4000 psi and 145 pounds per cubic feet, respectively. The NRC SER further states that based on the information provided in the SAR and the staff's independent evaluation, the staff concludes that the concrete materials meet the requirements of ACI 318, and the materials comprising the concrete cask are suitable for structural support, shielding, and protection of the TSC from environmental conditions.

The team determined that NAC made changes that reduced the commitments contained in the CoC TS, applicable FSAR sections, and NRC SER. The team noted that NAC should have answered "yes" to question 5 of 10 CFR 72.48 screening Nos. NAC-09-MAG-52 since it asked does the proposed activity require a change to the cask CoC, including Appendix A of the TS. The team determined that this was a violation of NRC requirements.

10 CFR 72.48(c)(1), requires, in part, that a certificate holder may make changes in the spent fuel storage cask design as described in the FSAR (as updated), [...] without obtaining [...] (ii) A CoC amendment submitted by the certificate holder pursuant to § 72.244 (for general licensees and certificate holders) if: [...] (B) change in the terms, conditions, or specifications incorporated in the CoC is not required.

Contrary to the above, as of November 11, 2009, the certificate holder (NAC) made changes to the spent fuel storage cask design as described in the FSAR (as updated) without obtaining a CoC amendment pursuant to 10 CFR 72.244 for a change required in the terms, conditions, or specifications incorporated in the CoC. Specifically, NAC made changes to ACI-318 requirements for the MAGNASTOR cask system design as

described in FSAR Tables 1.3-3 and 1.3-4 that required a change to the specifications incorporated in the MAGNASTOR System CoC No. 1031 Amendments 0-6.

The team assessed the significance of the violation using the NRC Enforcement Policy and Enforcement Manual. The team determined that the violation impacted the ability of the NRC to perform its regulatory oversight function because the licensee did not receive prior NRC approval for changes in licensed activities. The team determined that the violation was more than minor because the change would require NRC approval. The team characterized the violation as a Severity Level IV violation because the change resulted in a condition having low safety significance. NAC plans to enter this issue into their corrective action program (CAP) for resolution as finding report No. 22-01. The team determined that because the violation was of very low safety significance, the issue was not repetitive or willful, and being entered in the NAC's CAP, the team is treating this issue as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy. **(72-1015/2021-201-01)**

Additionally, the team identified a violation of 10 CFR 72.150, "Instructions, procedures, and drawings," because Petersen did not prescribe activities affecting quality by procedures to ensure that personnel verified the final dimensional checks after making any adjusts to the fuel tube basket during assembly. The team initially identified this issue during the 2018 NRC inspection. Subsequently, Petersen documented the issue in P/CAR 621, and took appropriate corrective actions at the time to require personnel to initiate an NCR for any adjustments made and followed with a dimensional inspection.

When the team reviewed the corrective actions associated with P/CAR 621, the team noted that Petersen had transitioned from the old traveler instructions to a new procedure and instructions. The team noted that Petersen omitted the corrective actions from the previous issue, which allows adjustment of the fuel tubes after final dimensional verification with no subsequent final check. The team determined that this made the current instructions inadequate as the transition created a similar condition adverse to quality contained in P/CAR 621. The team determined that this was a violation of NRC requirements.

10 CFR 72.150, "Instructions, procedures, and drawings," requires, in part, that the certificate holder shall prescribe activities affecting quality by documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall require that these instructions, procedures, and drawings be followed. The instructions, procedures, and drawings must include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

Contrary to the above, prior to December of 2021, a fabricator for certificate holder NAC did not prescribe activities affecting quality by documented instructions, procedures, or drawings of a type appropriate to the circumstances and include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished. Specifically, Petersen, under contract with NAC, did not ensure a final dimensional verification occurs after adjusting the fuel basket assembly within the revised fabrication procedure PSP-APSTSC-06, "Fabrication/Assembly Instructions for MAGNASTOR Transportable Storage Canisters and Components," Revision 3 and component traveler.

The team assessed the significance of the violation using the NRC Enforcement Policy and Enforcement Manual. The team dispositioned the violation using the traditional enforcement process in Section 2.3 of the Enforcement Policy. The team determined the violation was more than minor safety significance in accordance with Inspection Manual Chapter (IMC) 0617, "Vendor and Quality Assurance Implementation Inspection Reports," Appendix E, "Minor Examples of Vendor and QA Implementation Findings," Example 6.a; because Petersen may have adjusted the fuel basket assembly without conducting a final dimensional check. The team characterized the violation as a Severity Level IV violation in accordance with the NRC's Enforcement Policy. Petersen entered the issue into its CAP for resolution as P/CAR P937. Because this violation was of low safety significance and was entered into Petersen's CAP, the issue was not repetitive or willful, this is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy. **(72-1015/2021-201-02)**

1.2.3 Conclusions

The team determined that generally corrective actions for identified fabrication deficiencies were implemented in a time frame commensurate with their significance, and nonconformance reports documenting the deficiencies initiated and resolved by both Petersen and NAC personnel. However, the team identified the following Severity Level IV NCVs:

One Severity Level IV NCV of 10 CFR 72.48, "Changes, Tests, and Experiments" was identified for NAC's failure to obtain a CoC amendment for changes to ACI-318 requirements for the MAGNASTOR cask system design as described in FSAR Tables 1.3-3 and 1.3-4 that required a change to the specifications incorporated in the MAGNASTOR System CoC No. 1031 Amendments 0-6.

One Severity Level IV NCV of 10 CFR 72.150, "Instructions, procedures, and drawings" was identified for Petersen's failure to ensure a final dimensional verification occurs after adjusting the MAGNASTOR fuel basket within fabrication procedures.

1.3 Personnel Training and Certifications

1.3.1 Inspection Scope

The team determined whether individuals performing quality-related activities were trained and certified where required.

The team reviewed selected records, interviewed personnel, and reviewed the following quality procedures:

PI-SOP-09-01; NDT Personnel Qualification and Certification Procedure; Revision 27
PI-SOP-02-07; Welder and Welding Operator Qualification Procedure Used to Qualify Welder, Revision 3

Specifically, the team reviewed the records of two selected quality inspectors and one welder that had performed inspection and welding for NAC related work.

1.3.2 Observation and Findings

The team noted welder performance qualifications and welder continuities conformed to Section IX of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. For the welding qualification records reviewed, the welder was qualified as required by PI-SOP-02-07 in each applicable process, and welding continuity was maintained for each of the welding processes qualified in 2021. The team also noted that Petersen qualifies nondestructive testing (NDT) personnel in accordance with the American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A, which includes the required training, experience, medical testing, and education.

No findings of significance were identified.

1.3.3 Conclusions

The team determined that individuals performing quality-related activities were trained and certified as required.

1.4 Human Performance

1.4.1 Inspection Scope

The team determined whether the offsite fabricator's personnel were familiar with the specified design, designated fabrication techniques, testing requirements, and quality controls associated with the construction of the DCSS.

The team evaluated Petersen's control of the fabrication process through observations, examinations of records, and personnel interviews in the areas of fabrication and assembly, test and inspection, and familiarity with tools and equipment. The team observed the following activities:

- Welding of neutron absorber plate posts,

- Magnetic particle testing (MT) of fuel tubes,
- Damaged fuel can fit up and tack welding
- Machining of corner fuel tubes
- Fuel tube fit up, welding, and machining
- Fuel tube dimensional inspection

The team also reviewed a selection of shop travelers for a completed transportable storage canister (TSC) as a part of the review of final document package number MAG-TSCDF-30032-265-164 to determine if the travelers were being completed adequately. This document package review also included the final Certificate of Conformance, shop travelers, MT and dimensional inspection reports, and NCRs.

1.4.2 Observation and Findings

The team noted that Petersen personnel performed fabrication activities in a climate-controlled environment. The team found that the staff were generally knowledgeable about the specified design, designated fabrication techniques, testing requirements, and quality controls associated with the construction of the MAGNASTOR. Additionally, the team assessed that fabrication activities were generally conducted in a safe and controlled manner. During the observation of fuel tube fit up, welding, and machining activities, the team found that the work was well controlled, individuals were knowledgeable of the applicable fabrication process, and the work was being performed in accordance with the applicable shop traveler and weld procedure specification (WPS).

No findings of significance were identified.

1.4.3 Conclusions

The team determined that the offsite fabricator's personnel were familiar with the specified design, designated fabrication techniques, testing requirements, and quality controls associated with the construction of the DCSS.

1.5 **Procurement**

1.5.1 Inspection Scope

The team determine whether: a) Materials, components, and other equipment received by the fabricator meet DCSS design procurement specifications, and b) The procurement specifications conform to the design commitments and requirements contained in the FSAR, CoC, and TS.

The team reviewed Petersen's process that addresses procurement, including traceability and receipt inspection, including a review of the following quality procedures:

PI-SOP-04-01, "Procurement Document Control Procedure," Revision 15
 PI-SOP-07-01, "Material Receipt, Storage and Issue Procedure," Revision 13
 PI-SOP-07-09, "Commercial Grade Dedication of Items, Services and Software,"
 Revision 12

The team reviewed selected drawings and records and interviewed selected personnel to verify that the procurement specifications for materials, fabrication, inspection, and services performed at Petersen met design requirements of the MAGNASTOR TSCs. The team verified that NAC used a graded approach for identifying ITS components during the design process and Petersen applied this graded quality level to component and material procurement documents.

The team reviewed a sample of procurement documents for various MAGNASTOR Damaged Fuel TSC components.

1.5.2 Observation and Findings

The team observed that Petersen had adequate control of the procurement process for the ITS components reviewed. Petersen procured ITS components consistent with design requirements and their implementing procedures.

Petersen procured each component in accordance with a purchase order (PO) through their commercial grade dedication process. The team noted that Petersen performs all of its own dedication testing for critical characteristics in an on-site lab.

Petersen's material traceability, procurement, and receipt inspection controls were adequate. The team determined that the purchase orders were adequate and specified the applicable criteria and requirements including Part 21. The material ordered and received by Petersen met the design requirements, the critical characteristics and were adequate for the material dedicated. Additionally, Petersen verified and maintained the traceability throughout the procurement and receipt process. The team determined that Petersen purchased the components from vendors currently on the Petersen's Approved Vendors List (AVL).

No findings of significance were identified.

1.5.3 Conclusions

The team determined that materials, components, and other equipment received by the fabricator meet DCSS design procurement specifications, and the procurement specifications conform to the design commitments and requirements contained in the SFAR, CoC and TS.

1.6 Implementing Procedures

1.6.1 Inspection Scope

The team determined whether DCSS components are being fabricated per approved quality assurance (QA) and 10 CFR Part 21 implementing procedures and fabrication specifications.

The team evaluated Petersen's control of the fabrication process through observations, examinations of records, and personnel interviews in the areas of fabrication and assembly, test and inspection, and tools and equipment. The team observed several fabrication activities including MT, fuel tube and damaged fuel can welding, and fuel tube dimensional inspection. The team performed a detailed review of the shop travelers used to conduct the observed fabrication activities and the required WPSs referenced in the travelers for the welds being performed. The team also reviewed a selection of shop travelers for in-process work including TSC shells, damaged fuel cans, and fuel tubes to determine if the documents had been adequately completed to the current point in the fabrication process. In addition, a dye penetrant test (PT) report for a TSC shell currently being fabricated was reviewed by the team to determine if the inspection was performed in accordance with PSP-TSC-03, "Visual and Remote Liquid Penetrant Examination of Ferrous and Non-Ferrous Materials for NAC International Transportable Storage Canisters," Revision 6.

The team reviewed selected measuring and test equipment (M&TE) including records and procedures to assure that equipment used in activities affecting quality were properly controlled and calibrated. The team reviewed PI-SOP-12-01, "General Calibration Procedure," Revision 18, which prescribes activities and requirements concerning control and use of M&TE including calibration to national standards and actions to take when any piece of equipment is found out of calibration. The team also interviewed personnel involved in the checking in and out of M&TE for use on the shop floor, control of out of calibration equipment, and equipment needing periodic recalibration. The team compared a sampling of M&TE used for recent fabrication and testing activities to the applicable requirements in PI-SOP-12-01 and overall compliance to the procedure. The team selected a MT yoke, weld machine, radiometer, and digital thermometer.

1.6.2 Observation and Findings

The team identified that Petersen personnel did not perform a MT examination in accordance with approved quality procedures. During observation of a MT inspection of a fuel tube seam weld on December 7, 2021, it was noted that the inspector utilized the MT yoke installed light bulb as the source of white light for the surface inspection. Step 8.1.1 of PI-SOP-09-02, Revision 8, states "[w]hen performing testing using non-fluorescent particles, the intensity of the white light at the testing surface shall be a minimum of (100 foot candles)." The team further questioned Petersen personnel on how the white light from the MT yoke was verified to meet the light intensity requirement of 100 foot candles. The team was informed, however, that the Petersen inspectors verify and document their hand-held flashlight meets the 100 foot candle requirement at the start of each day. Petersen personnel were then requested to demonstrate whether the white light from the MT yoke was adequate to meet the 100 foot candle requirement with a calibrated radiometer, but the light read at approximately 25 to 30 foot candles.

10 CFR 72.158, "Control of special processes" states, in part, that the certificate holder shall establish measures to ensure that special processes, including welding, heat treating, and nondestructive testing, are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements.

Contrary to the above, on December 7, 2021, a fabricator for certificate holder NAC did not ensure that special processes, including NDT, were accomplished in accordance with applicable specifications and criteria. Specifically, Petersen failed to perform MT inspection of a fuel tube seam weld with the required white light intensity of 100-foot candles.

The team dispositioned the violation using the traditional enforcement process in Section 2.3 of the Enforcement Policy. The team determined the violation was of more-than-minor safety significance in accordance with Inspection Manual Chapter (IMC) 0617, "Vendor and Quality Assurance Implementation Inspection Reports," Appendix E, "Minor Examples of Vendor and QA Implementation Findings," Example 10.b; because the lighting was less than the required minimum and when the welds were re-inspected, a previously unidentified indication was found. The team characterized the violation as a Severity Level IV violation in accordance with the NRC's Enforcement Policy, Section 6.5. Petersen entered the issue into its CAP under P/CAR P940. Because this violation was of low safety significance and was entered into Petersen's CAP, the issue was not repetitive or willful, this is being treated as a NCV, consistent with Section 2.3.2.a of the Enforcement Policy. **(72-1015/2021-201-03)**

1.6.3 Conclusions

The team determined that DCSS components were generally being fabricated and inspected per approved QA and 10 CFR Part 21 implementing procedures and fabrication specifications. One Severity Level IV NCV of 10 CFR 72.158, "Control of special processes" was identified for Petersen's failure to perform an adequate MT inspection of a fuel tube seam weld.

1.7 **10 CFR Part 21**

1.7.1 Inspection Scope

With regard to fabrication activities, the team determined whether: a. They were conducted under an NRC-approved QAP (10 CFR 72.140). b. The provisions of 10 CFR Part 21, Reporting of Defects and Noncompliance for reporting defects that could cause a substantial safety hazard have been implemented. c. The fabricator's personnel are familiar with the reporting requirements of 10 CFR Part 21. d. The fabricator has complied with 10 CFR 21.6, "Posting requirements".

The team reviewed Petersen's approved procedure PI-SOP-15-02, "10 CFR 21 Reporting," Revision 6 and interviewed personnel to determine if provisions were in place for reporting defects that could cause a substantial safety hazard from the NCRs and P/CARs identified and if personnel was familiar with the reporting requirements. This review included looking at some of the fabrication specifications to see if Petersen and NAC included the requirements of 10 CFR Part 21 in the specifications. The team also checked to see if Petersen posted the Part 21 postings in their office and fabrication facility.

1.7.2 Observation and Findings

The team assessed that Petersen has provisions in place for evaluating deviations and reporting defects, as required by 10 CFR Part 21. The team noted that Petersen did not have any Part 21 reports within the last six years. The team also noted that Petersen posted Part 21 requirements throughout their office and fabrication facility.

No findings of significance were identified.

1.7.3 Conclusions

The team determined that: fabrication activities were conducted under an NRC-approved QAP (10 CFR 72.140); the provisions of 10 CFR Part 21 were implemented; the fabricator's personnel were familiar with the reporting requirements of 10 CFR Part 21; and the fabricator complied with 10 CFR 21.6, "Posting requirements".

1.8 **Oversight and Audits**

1.8.1 Inspection Scope

With regard to QA activities, the team determined whether: a. The fabricator has been audited by either the licensee or CoC holder. b. For selected audits and inspection findings from (as applicable) QA audit or surveillance and/or inspection reports issued in the previous 2 years, the findings were appropriately handled with corrective actions implemented in a time frame commensurate with their safety significance. c. Supervision and QC/QA personnel perform appropriate oversight during fabrication activities.

The team reviewed the NAC audit program to determine if NAC scheduled, planned, and performed audits or surveillances of the fabricator (Petersen) in accordance with their QAP. The team selected a sample of audits and surveillances from the time of the last NRC inspection to the present. The team particularly focused on activities related to Petersen fabrication of the MAGNSTOR TSC. The team reviewed the audit results to determine if NAC identified deficiencies and Petersen addressed these deficiencies with their preventative and CAP. The team also evaluated whether NAC provided adequate supervision with QC/QA personnel for appropriate oversight during fabrication activities.

1.8.2 Observation and Findings

Overall, the team assessed that for the audits and surveillances sampled that NAC generally conducted oversight with qualified and certified personnel, scheduled and evaluated applicable quality of Petersen's QA program associated with fabrication activities. The team assessed that Petersen and NAC appropriately identified issues and implemented corrective actions in a time frame commensurate with their safety significance.

No findings of significance were identified.

1.8.3 Conclusions

The team determined, for the items selected for review, that the CoC holder is performing oversight and audits in accordance with their QAP.

2.0 Exit Meeting

The team presented the results of the inspection to Mr. B. Greene and other members of the NAC and Petersen staff at an exit meeting on December 9, 2021. The CoC holder acknowledged the results presented and did not identify any of the information discussed as proprietary.

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

W. Woolsey, Petersen Project Manager
B. Maez, Petersen Director of Quality
B. Greene, NAC Vice President of Quality
M. Read, Petersen Quality Assurance Manager

INSPECTION PROCEDURES USED

IP 60852 ISFSI Component Fabrication by Outside Fabricators

ITEMS OPENED, CLOSED, AND DISCUSSED

<u>Item Number</u>	<u>Status</u>	<u>Type</u>	<u>Description</u>
72-1015/2021-201-01	Opened	NCV	10 CFR 72.48
72-1015/2021-201-02	Opened	NCV	10 CFR 72.150
72-1015/2021-201-03	Opened	NCV	10 CFR 72.158

PARTIAL LIST OF DOCUMENTS REVIEWED

The team identified the documents reviewed during the inspection in the report details above.

LIST OF ACRONYMS USED

ACI	American Concrete Institute
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
ASTM	American Standard Testing and Material
AVL	Approved Vendors List
CAP	Corrective action program
CoC	Certificate of compliance
DCR	Design change requests
DCSS	Dry cask storage system
FSAR	Final Safety Analysis Report
ISFSI	Independent spent fuel storage installation
ITS	Important to safety
M&TE	Measuring and test equipment
MT	Magnetic particle testing
NCV	Non-Cited Violation
NDT	Nondestructive testing
NRC	Nuclear Regulatory Commission
PO	Purchase order
PT	Penetrant test
QA	Quality assurance
QAP	Quality Assurance Program

SAR	Safety analysis report
SER	Safety evaluation report
SOP	Standard operating procedures
TS	Technical specifications
TSC	Transportable storage canister
VNCR	Vendor nonconformance report
WPS	Weld procedure specification