NRC FORM 591S PART 1
(10-2013)
10 CFR 2.201

U.S. NUCLEAR REGULATORY COMMISSION

SAFETY INSPECTION REPORT AND COMPLIANCE INSPECTION

1. CERTIFICATE/QUALITY ASSURANCE PROGRAM (QAP) HOLDER	2. NRC/REGIONAL OFFICE
Alpha-Omega Services, Inc 9156 Rose Street Bellflower, CA 90706	Headquarters U. S. Nuclear Regulatory Commission Mail Stop TWFN 4B-34 Washington, DC 20555-0001
REPORT NUMBER(S) 71-0086/2016-201	

3. CERTIFICATE/QAP DOCKET NUMBER(S)	4. INSPECTION LOCATION	5. DATE(S) OF INSPECTION
71-0086 (QAP)	Bellflower, CA	March 8-10, 2016

CERTIFICATE/QUALITY ASSURANCE PROGRAM HOLDER:

The inspection was an examination of the activities conducted under your QAP as they relate to compliance with the Nuclear Regulatory Commission (NRC) rules and regulations and the conditions of your QAP Approval and/or Certificate(s) of Compliance. The inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspector. The inspection findings are as follows:

☑ 1. Based on the inspection findings, no violations were identified.

☐ 2. Previous violation(s) closed.

☐ 3. The violations(s), specifically described to you by the inspector as non-cited violations, are not being cited because they were self-identified, non-repetitive, and corrective action was or is being taken, and the remaining criteria in the NRC Enforcement Policy, to exercise discretion, were satisfied.

_____ Non-cited violation(s) was/were discussed involving the following requirement(s) and Corrective Actions(s):

☐ 4. During this inspection, certain of your activities, as described below and/or attached, were in violation of NRC requirements and are being cited in accordance with NRC Enforcement Policy. This form is a NOTICE OF VIOLATION, which may be subject to posting in accordance with 10 CFR 19.11.
(Violations and Corrective Actions)

Statement of Corrective Actions

I hereby state that, within 30 days, the actions described by me to the Inspector will be taken to correct the violations identified. This statement of corrective actions is made in accordance with the requirements of 10 CFR 2.201 (corrective steps already taken, corrective steps which will be taken, date when full compliance will be achieved). I understand that no further written response to NRC will be required, unless specifically requested.

TITLE	PRINTED NAME	SIGNATURE	DATE
CERTIFICATE/QAP REPRESENTATIVE	Troy Hedger		04-12-2016
NRC INSPECTOR	Jeremy Tapp		4/13/16
BRANCH CHIEF	Patricia Silva		4/21/16

INSPECTOR NOTES COVER SHEET

Licensee/Certificate Holder (name and address)	Alpha-Omega Services, Inc. 9156 Rose Street Bellflower, CA 90706
Licensee/Certificate Holder contact and phone number	Mr. Troy Hedger, CEO 562-804-0604
Docket No.	71-0086
Inspection Report No.	71-0086/2016-201
Inspection Dates(s)	March 8-10, 2016
Inspection Location(s)	Bellflower, CA
Inspectors	Jeremy Tapp, Team Leader, Safety Inspector Marlone Davis, Senior Safety Inspector Jon Woodfield, Safety Inspector
Summary of Findings and Actions	The purpose of the inspection was to verify the adequacy of activities related to design, fabrication, procurement, and maintenance of transportation packagings at Alpha-Omega Services, Inc. (AOS) facility in Bellflower, CA. The focus of the inspection was to determine whether AOS' activities associated with transportation of radioactive material were executed in accordance with the requirements of 10 CFR Parts 21 and 71, Certificate of Compliance 71-9316, safety analysis report, and AOS' NRC approved quality assurance (QA) program. The team determined that the transportation packaging was safe to use based on an examination of selected design, fabrication, maintenance, and QA activity records and procedures, and interviews with personnel. Overall, the team assessed that AOS implementation of its NRC-approved QA program was adequate. The team identified two violations of minor safety significance related to independent verification and classification of quality components. AOS acknowledged these issues during the inspection and documented them in their corrective and preventive action program.
Lead Inspector Signature/Date	4/13/16 Jeremy Tapp
Inspector Notes Approval Branch Chief Signature/Date	4/21/16 Patricia Silva

Inspection Background

Alpha-Omega Services, Inc. (AOS) corporate was last inspected in February 2012 and before that in late 2008 and early 2009. The team issued a Notice of Violation (NOV) as a result of the 2008/2009 inspection. Based on the NOV and from a limited review of other aspects of AOS' NRC-approved quality assurance (QA) program, the team assessed that while the basic structure of AOS' QA program was adequate, AOS' implementation was programmatically weak. As a result, AOS brought in a contractor to be the QA manager for Part 71 activities and the QA program was rewritten and approved by the NRC in January 2011.

The February 2012 inspection focused on AOS' readiness to fabricate new transportation packages designed to ship Type B quantities of radioactive materials, including by-products, sources, and special nuclear materials either as normal form or special form, at RANOR Inc. (RANOR), located in Westminster, MA. AOS had been pursuing a new packaging design for the past several years. The inspection concluded that AOS had proper measures in place for the planned fabrication of the new packages and that the previous NOV from 2008/2009 had been adequately corrected. On February 28, 2012 the NRC issued, to AOS, certificate number USA/9316. This certificate authorized Model Nos.: AOS-025A, AOS-050A, AOS-100A, AOS-100B, and AOS-100A-S.

Since the 2012 fabrication inspection, a number of new AOS-100A packagings have been fabricated at RANOR. In addition, AOS reported a potential Part 21 in August 2015 (EN51291) to the NRC. A potential shielding noncompliance was identified by one of AOS' contractors, which was due to an unconservative shielding analysis where a point source in a corner of the packaging was not analyzed.

Inspection Purpose

The purpose of the full scope inspection was to assess AOS' activities associated with transportation of radioactive material to determine if they were executed in accordance with the requirements of 10 CFR Parts 21 and 71, Certificate of Compliance (CoC) 9316 for the AOS-25/50/100 packaging, safety analysis report, and AOS' NRC-approved QA program. Overall, the team inspected AOS' management, design, maintenance, and fabrication controls.

The team reviewed QA program implementing procedures and instructions, and selected documents, records, and drawings. The team also reviewed various design, fabrication, and maintenance activities of the AOS-25/50/100 packaging approved by CoC 71-9316. In addition, the team focused on the assessment of fabrication controls in place during fabrication of packagings at RANOR. This was performed through a documentation review and assessment of one packaging onsite at the Bellflower, CA office. Further, the team assessed AOS' Part 21 report and evaluation from August 2015 as a result of a packaging shielding potential noncompliance issue.

Primary Inspection Procedures/Guidance Documents

IP-86001, "Design, Fabrication, Testing, and Maintenance of Transportation Packagings"
NUREG/CR-6314, "Quality Assurance Inspections for Shipping and Storage Containers"
NUREG/CR-6407, "Classification of Transportation Packaging and Dry Spent Fuel Storage System Components According to Importance to Safety"

INSPECTOR NOTES: APPLICABLE SECTIONS FROM IP 86001 WERE PERFORMED DURING THE INSPECTION WITH RESULTS DOCUMENTED BELOW UNDER THE BASIC HEADINGS OUTLINED IN NUREG-6314

1.0 Management Controls

Quality Assurance Policy

The team reviewed AOS' QA program PR9000, Revision E and implementing Quality Procedures [Standard Operating Procedures (SOPs)] and assessed the effectiveness of the QA program implementation at AOS. The team conducted reviews of AOS' quality program, policies, and procedures, and discussed portions of the reviewed documents with selected AOS staff to determine whether activities subject to 10 CFR Part 71 were adequately controlled and implemented under AOS' NRC-approved QA program. Further, the team reviewed the AOS quality organization chart and interviewed AOS QA personnel to assess their organizational independence from cost, schedule, and production activities.

The team reviewed procedures and documents regarding training, qualification, and certification of personnel involved in quality activities. Specifically, the team reviewed SOPs:

PR9001.1, "Organization and Responsibility," Revision C
PR9002.1, "Control of the Quality Assurance Program Revisions," Revision E
PR9002.2, "Indoctrination and Training of Personnel," Revision E

The team noted that the organizational chart in PR9000 was different from the organizational chart in PR9001.1 but that there was no quality or safety significance to the differences. AOS initiated Corrective and Preventive Action (CAPA) 032016-002 to address the differences.

The team reviewed the qualifications and training for selected Quality Managers, Quality Engineers, and Service staff to determine if they met the requirements stated in the QA program. In addition, the team reviewed training records of a random selection of employees in quality related positions to determine if they received the required QA indoctrination and QA program revision training. The team found that for all records reviewed, each had completed the required training and attained the applicable qualifications, except one. The team determined that one AOS staff member in their service department had not been trained to the latest revision of PR9000. AOS initiated CAPA 032016-001 to address the issue. It was determined that there was no safety significance to the issue as the employee was involved in

other projects and had not been working on AOS packaging related quality activities. However, the employee did complete the required training during the NRC inspection.

The team also reviewed the following AOS SOPs which address a graded approach to quality components and commercial grade dedication (CGD) of packaging components when required:

PR9007.1, "Control of Purchased Material, Equipment, and Services," Revision E
PR9007.2, "Identification of Quality Categories," Revision B
PR9007.5, "Dedication of Commercial Grade Items," Revision B

The team reviewed AOS-100 Cask Assembly Drawings 105E9711, Sheet 1 of 2, Revision I and 105E9712, Sheet 1 of 3, Revision I where the safety categories of the packaging components were provided in Parts Lists. Every component on the Parts Lists for assembly of the packaging was important to safety (ITS) category A, B, or C. The team verified that the material dedication program/procedure included requirements for the identification, documentation, and implementation of ITS levels in dedication plans. The team noted the procedure provided significant guidance on the identification of critical characteristics needed during the dedication process. Guidance on the associated audits or approvals of the supplier or testing company commensurate with the safety rating of the part or material being procured is also provided in the procedures.

AOS does not fabricate its own packagings and contracted with approved vendor RANOR to fabricate the most recent AOS-100 packagings. The team reviewed the CGD documentation for one AOS-100 packaging fabricated by RANOR and provided to AOS. The team focused on the procurement by RANOR of two ITS Category A components, the lid attachment bolts and packaging turnbuckles. RANOR purchased the lid attachment bolts from quality supplier Dubose, which was on RANOR's Approved Vendors List. The team found the documentation on the lid attachment bolts to be very detailed, verifying the critical characteristics and quality of the bolts provided. The packaging turnbuckles were commercial grade dedicated by RANOR. The team found the turnbuckle material certification documentation provided by RANOR to show all critical characteristics tested and verified, ensuring the quality of the turnbuckles. The team also reviewed AOS' CGD plans 042012-001 and 042012-002 to purchase spare turnbuckles for their AOS-100 packagings. The AOS turnbuckle CGD plans contained the same critical characteristics as in the RANOR turnbuckle CGD plans and therefore the team found them acceptable. The team noted that AOS engineering is required to prepare AOS CGD plans and sign the document. However, there is no independent reviewer from engineering of the preparer's CGD evaluation. Quality Assurance does approve the CGD plan so it was determined that the QA reviewer acts to some extent as an independent reviewer of the preparer's evaluation. The team found this minimally acceptable and noted it as an area of improvement.

Overall, the team assessed that the quality assurance controls at AOS were adequate and in accordance with their NRC-approved QA program.

Nonconformance and Corrective Action Controls

The team reviewed selected records and interviewed personnel to verify that AOS effectively implemented the nonconformance control and corrective action programs. Specifically, the team reviewed AOS' policies and approved implementing procedures PR9015.1, "Nonconforming Material, Parts, and Components," Revision C and PR9016.1, "Corrective Action," Revision C that govern the nonconformance and corrective action programs for AOS to verify compliance with applicable requirements to 10 CFR Part 71.

The team discussed the nonconformance and CAPA program controls with the AOS staff and reviewed a sample of nonconformance reports, and CAPAs for appropriate disposition. The team also reviewed measures used to keep track of the status of nonconforming items and that AOS completed CAPAs for identified deficiencies in a technically sound and timely manner. The team evaluated a sample of cause analyses, trend analyses, and verified that the nonconformance reports and CAPAs provided a connection to the 10 CFR Part 21 program.

The nonconformance sample focused on reports associated with ITS Category A and B components and included a mix of accept-as-is, repair, and rejected component dispositions. The team determined if AOS dispositioned the nonconformances in accordance with documented standard operating procedure, PR9015.1. The CAPA sample included a review of supplier discrepancies, audit findings, measuring and test equipment (M&TE) calibration issues, and nonconformances that needed a CAPA. During the review of nonconformance reports, the team identified that an associated Part 21 evaluation was originally evaluated and then reviewed by the same individual. This is contrary to the requirements of 10 CFR 71.107(b) that an independent review of evaluations to verify adequacy be performed. The team determined this issue to be of minor safety significance since the associated nonconformance report was independently reviewed. AOS entered this issue into their CAPA program.

The team also reviewed program controls for 10 CFR Part 21, "Reporting of Defects and Noncompliances," including PR9015.2, "Reporting of Defects and Noncompliances in Accordance With 10CFR21," Revision C. The team verified that AOS' procedure adequately implemented the requirements of the regulation. The team reviewed the documentation surrounding a Part 21 notification AOS made to the NRC on August 5, 2015 to verify AOS complied with the applicable regulations and PR9015.2 requirements.

AOS identified a potential issue that the current shielding configuration fails to comply with 10 CFR Part 71 requirements. AOS initiated a CAPA and completed a Part 21 Applicability Form as required, which determined a potential Part 21 existed. AOS then notified the NRC by fax within 48 hours, in which this notification also served as the required 30 day written notification. On September 2, AOS issued the required 60 day interim report because they determined a final report could not be completed within 60 days of the initial notification. At the time of this inspection, the final evaluation was not complete so it could not be reviewed. In the interim, the team noted that AOS sent the NRC a revision request to their CoC 9316 to ship in a more restrictive configuration. The NRC approved this request on August 20, 2015, which ensured

that the potential shielding non-compliance did not result in any adverse safety consequences during radioactive material shipment activities. All documentation reviewed was found to be adequate and meet the applicable regulatory and procedural requirements.

The team verified that AOS was meeting the 10 CFR Part 21 posting requirements of both the regulations and PR9015.2. The team found that AOS posted the 10 CFR Part 21 regulations, Section 206 of the Energy Reorganization Act of 1974, and PR9015.2 on boards where each employee could readily see them. No issues were identified by the team regarding 10 CFR Part 21 program controls or implementation at AOS.

Overall, the team concluded that AOS had an adequate nonconformance control and corrective action program in place to identify, track and resolve quality related deficiencies and deviations. One minor violation in the area of independent review of evaluations was identified by the team, in which AOS promptly entered it into their CAPA program.

Documentation Controls

The team reviewed AOS' documentation control program to assess the effectiveness of controls established for the approval, issuance, revision and use of quality documents. The team reviewed PR9006.1, "Document Control," Revision E. The team assessed that the procedures provided adequate guidance for the processing of quality document approvals, issuance to the appropriate outside organizations when necessary, and revision control for each documented organization. For the documents reviewed, the team verified that the quality documents were approved per procedure by appropriate personnel and the most current version was available for use. The team observed AOS' use of a controlled computer database for procedure control and use and noted it was controlled in accordance with the applicable requirements. The team interviewed personnel responsible for the program to ensure they were knowledgeable of the program requirements and were implementing the program as required. The team verified that the latest revision to procedure PR9110, from Revision C to Revision D, was performed as required including the associated forms required with this change.

In addition, the team reviewed PR9017.1, "Quality Assurance Records," Revision C. The team then discussed with document control and QA personnel how the applicable regulatory and procedural requirements for quality record control were being implemented by AOS' QA program to ensure they were being performed as required. Specifically, the team discussed where and how the quality documents were stored. The team noted that AOS stores dual copies of electronic records on the company servers and on hard drives made weekly as permanent backups. The hard drives are stored at a different location than where the company servers are located. The team also verified that a randomly selected quality document was filed in the appropriate location on the document control file server. The team reviewed an official letter sent to the NRC from AOS and noted that it could not be found in the appropriate location, but it was stored on the email partition of the permanent record storage drive. Therefore, the letter could have been produced as a quality record if necessary. This observation was discussed with AOS management and they acknowledged it as an area for improvement.

Overall, the team determined that AOS was implementing its document control program, including quality record control, as required by the applicable regulatory and procedural requirements.

Audit Program

The team reviewed the AOS QA program and the following implementing procedures for performing external audits of AOS vendors on its Approved Suppliers List (ASL) and internal audits of AOS.

PR9002.5, "Qualification and Certification of Quality Assurance Audit Personnel," Revision D
PR9018.1, "Audits," Revision C

The team reviewed the qualifications and training records for AOS' two Lead Auditors to determine if they met the requirements stated in PR9002.5. The team found each had completed the required training and attained the applicable qualifications to perform their duties as Lead Auditor.

The team reviewed the audits of three vendors on the AOS ASL. The three vendors were on the ASL for: 1) Calibration of Precision Measuring Instruments, 2) also Calibration of Precision Measuring Instruments, and 3) Design and Manufacture of High-Performance Metal Seals and Sealing Systems for use in Critical Sealing Nuclear Applications.

The first audit reviewed by the team was a Commercial Grade Survey performed by AOS in November, 2015 of a calibration vendor. The team found the audit package to contain the proper forms for supplier performance assessment, Commercial Grade Survey Plan, Commercial Grade Survey Checklist, and Commercial Grade Survey Summary. The Commercial Grade Survey Summary identified the activities audited, scope of the audit, summary of results, effectiveness of the program, corrective action, follow-up action, and corrective action due date. Overall, AOS found the vendor to be in compliance with the vendor's QA Program and added them to the ASL, however with certain restrictions shown on the ASL for this vendor. AOS' audit certification will remain in effect for a period of three years.

The second audit reviewed by the team was a Commercial Grade Survey performed by AOS in March, 2014 of another calibration vendor. The team found the audit package to contain the proper forms for supplier performance assessment, Commercial Grade Survey Plan, Commercial Grade Survey Checklist, and Commercial Grade Survey Summary. The Commercial Grade Survey Summary identified the activities audited, scope of the audit, summary of results, effectiveness of the program, corrective action, follow-up action, and corrective action due date. Overall, AOS found the vendor to be in compliance with the vendor's QA Program and added them to the ASL, however with certain restrictions. These restrictions are shown on the ASL for this vendor. AOS' audit certification will remain in effect for a period of three years.

The third audit reviewed by the team was conducted in March, 2015 and was for AOS to verify a metal seal vendor's compliance to the requirements of 10CFR50 Appendix B, ANSI N45.2, ASME NQA-1, AND 10CFR21. The team found the audit package to have the proper forms which provided the audit plan, audit checklist, audit summary, scope of audit, summary of results, effectiveness of the program, corrective action, follow-up action, and corrective action due date. Overall, AOS found the vendor to be in compliance with the vendor's QA Program and retained them on the ASL, with no restrictions. AOS' audit certification will remain in effect for a period of three years.

The team found the sampled vendor audit results to be very detailed and well documented with the findings, audit checklists, supporting audit documentation reviewed, and vendor written responses all recorded and retrievable. All the requirements of procedure PR9018.1 were found to be met. No concerns were identified by the team in the review of external audits.

The team reviewed the latest AOS internal audit report from January 2015, which covered AOS' implementation of their QA program and SOPs, and verified compliance with the quality requirements stated in 10 CFR Part 71 and 10 CFR Part 21. Internal audits are performed by AOS on a yearly basis. The audit team consisted of only one auditor contracted to AOS. There was an audit plan, audit checklist and audit summary per AOS audit procedure PR9018.1. The team reviewed the audit results in the report. The audit identified 7 observations and 1 audit finding. The internal audit summary in the report identified all the observations and assigned a CAPA number to address the one finding and track it to closure. The 2015 Internal Audit Report also reviewed all the elements of the 2014 Internal Audit and any identified audit findings for completion and adherence to committed actions.

The team found the audit results to be comprehensive and the findings, audit checklists, and supporting audit documentation reviewed well documented; along with a CAPA assigned to resolve the finding identified. The team determined that the internal audit was effective in its structured approach for finding issues affecting quality at AOS. All the requirements of procedure PR9018.1 were found to be met. The team did make the observation that mainly due to the size of AOS, there was only one auditor for the internal audit. The lead, and only auditor, was contracted to AOS through the contractor that is responsible for AOS' QAP. On a yearly basis the internal lead auditor is involved with the AOS QA Program, which has the potential to influence the auditor's independence. However, the team did not find anything during its review of the 2015 Internal Audit Report that would question the lead auditor's objectivity. PR9018.1 states that the AOS President shall select the audit personnel for internal audits, so that the personnel having direct responsibility for performing the activities being audited are not involved in the selection. The team verified with the AOS President that he did select the 2015 internal audit lead auditor. No concerns were identified by the team in the internal audit review.

Overall, no concerns were identified with the performance of AOS' external and internal audits.

2.0 Design Controls

The team reviewed the AOS procedures specifically related to design development/control for modification activities and held discussions with the AOS engineering manager. The team also reviewed the training and qualification for selected engineering personnel. The team focused its review on AOS design activities related to Revision 3 and the current in-process revision of CoC 9316 for the Part 71 AOS-025A/050A/100A/100B/100A-S packagings. The team reviewed the following AOS procedures associated with design control and training to verify they were being properly implemented:

- SOP PR 9003.1, "Design Control," Rev. C
- SOP PR 9003.2, "Project Plan," Rev. B
- SOP PR 9003.3, "Calculations," Rev. B
- SOP PR 9003.5, "Design Review," Rev. D
- SOP PR 9002.2, "Indoctrination and Training of Personnel," Rev. E
- SOP PR 9002.6, "Qualification of Engineering Personnel," Rev. C

For the current in-process revision of CoC 9316, the team reviewed the project plan for the packaging modification and found it was approved by appropriate personnel and completed per procedure. The team did not review any other related documentation since it had not received final approval before the end of the on-site inspection. For Revision 3 of CoC 9316, the team reviewed a modification that added a lifting bar to the package assembly, amongst other changes. The modification was discussed in the project plan, as required. The team verified the applicable drawings were revised and calculations performed, as necessary. The team also verified that a dimensional error in cask assembly drawing 105E9719, Revision J, identified by AOS, was appropriately corrected.

In addition, the team reviewed a selected licensing drawing to verify the design details were adequately translated to the associated fabrication drawings. Specifically, the team reviewed licensing drawing 105E9712, Revision J and compared it to three related fabrication drawings. For the design details reviewed, all were correctly translated to the fabrication drawings.

As discussed in the Quality Assurance Policy section above, the team reviewed the CGD activities related to the procurement of AOS-100 packaging turnbuckles. From the CGD paperwork the team noted that they were procured as ITS Category A components, but the approved licensing drawing specified them as ITS Category B. The team found that the component was only required to be classified as ITS Category B, therefore, there was no issue with procuring a component to a higher ITS classification. This caused the team to request AOS' ITS classification documentation to determine if other selected ITS components were properly evaluated for their ITS classification and weren't being procured to a lower ITS classification than required. AOS could not locate those records or provide any objective evidence that the required evaluation process was performed for determining the ITS classifications for components. The team determined this was a violation of 10 CFR 71.107(a) for failure to establish measures for selection and review for suitability of application of materials

and parts that are essential to the functions of the components of the packaging that are important to safety. The team found this violation to be of minor safety significance since all ITS component's safety classifications were documented on the approved licensing drawings and all those reviewed by the team were adequate. AOS entered this issue into their CAPA program.

The team assessed that overall, AOS was effectively implementing its design control program and that implementing procedures were in place and effective in controlling activities in accordance with the applicable regulations and approved CoC. The team concluded that AOS processed and developed project plans and licensing and fabrication drawings in accordance with the applicable procedures. This included receiving the proper independent verification reviews and approvals. One minor violation in the area of classification of quality components was identified by the team, in which AOS promptly entered it into their CAPA program.

3.0 Fabrication Controls

The team evaluated the fabrication process to ensure that AOS controlled and verified the process from the onset of design through the completion of the manufacturing process. The team noted that AOS controlled the design development and RANOR conducted the fabrication and manufacturing of the transportation packaging. The team reviewed AOS' fabrication controls to verify that AOS controlled and implemented all fabrication activities of the transportation packaging in accordance with their documented SOPs. The team inspected fabrication controls in the area of the purchase order specifications, and receipt inspections. The team reviewed selected drawings and records, and interviewed personnel to verify that the procurement specifications for materials, equipment, and services met design requirements.

The team reviewed the procurement documents specific to Model No. AOS-100A packaging associated with the cask lid and the impact limiters. RANOR procured the cask lid and impact limiters as ITS Category A components in accordance with AOS purchase order (PO) number 5216. The team noted that AOS properly transferred the description of the Category A from the design drawing to the PO. Specifically, the team noted appropriate technical and quality requirements within the PO including reference to AOS fabrication specification SS9000, Revision I. The team also noted that the requirements of the supplier in the PO for the Category A items were appropriate. The team verified that RANOR was on the AOS ASL.

The team reviewed the cask lid, and impact limiter procurement records, material traceability documents, drawings and procedures, shelf life of both components, and the receipt inspection program conducted under the AOS standard operating procedure PR9007.4, "Receiving Inspection," Revision B. This review included activities concerning fabrication travelers, special processes including welding and polyurethane foam filling, assembly, cleaning, and storage. The assessment of test and inspection activities included the review of inspection requirements, acceptance criteria, test conditions, test documentation, nondestructive examination controls, and QA hold points.

Overall, the team concluded that AOS had adequate control of the fabrication and manufacturing process of the AOS-100A transportation packaging for the ITS Category A cask lid and impact limiters components. The team determined that AOS developed the procurement documents consistent with design requirements and implementing procedures.

4.0 Maintenance Controls

Maintenance Activities

The team reviewed AOS' packaging maintenance program which requires a series of routine and periodic inspections. The team specifically reviewed AOS procedure PR9110, "AOS Radioactive Material Transport Packaging System Generic Maintenance and Operating Procedure for Model AOS-025, AOS-050, and AOS-100 Transport Packages," Revision D. AOS stated that procedure PR9110 is provided to all the licensed users of its AOS series packagings. PR9110 provides the general operating procedures for use of the AOS packagings in compliance with the AOS safety analysis report (SAR) and NRC CoC 9316. The procedure also covers the required actions to properly maintain the packaging. The team compared the instructions in the procedure for the various packaging activities against the approved operating procedures provided in Chapter 7 of the AOS packaging SAR and found them to be consistent.

The team noted that Chapter 11, "Inspection and Maintenance," of PR9110 states that the packaging requires a series of routine and periodic inspections, which are performed at each loading and assembly operation. These inspections include visual checks of the packaging and any support structure for damage. The procedure in Chapter 11 lists what is considered unacceptable packaging damage. Also, pre-shipment leak testing must be performed if the cask vent and drain ports were opened during operations.

AOS itself performs an annual inspection on the AOS packagings or prior to being used after a storage period of more than one year. The annual inspection is perform in accordance with PR9110.1, "Annual Maintenance Procedure for AOS Transport Packaging System," Revision B. The team noted that testing of the cask sealing capability must be performed after each loading, every 12 months and/or returning to service after repairs. The general packaging inspection acceptance criterion is that there is no indication of significant damage that would affect the shipping cage, impact limiters, and transport pallet from performing their intended functions. PR9110.1 includes descriptive examples of what would be considered indications of significant packaging damage, which must be evaluated by AOS engineering for disposition. The team reviewed AOS Form FM9110.4, "AOS Annual Inspection Plan Check Sheet," that is used to document the annual maintenance was performed on each packaging. After the inspection, AOS generates a certificate of compliance for the packaging user certifying that the annual inspections and maintenance have been performed. The team reviewed the CoC Annual Maintenance Certification for packaging serial number AOS-100A-0002. The CoC contained detailed information that included an effective date, expiration date (period of one year), and was signed by the President and QA Manager of AOS. The team found the packaging periodic and annual maintenance program at AOS to be comprehensive with detailed guidance on inspection acceptance criteria.

Packaging annual inspections and tests could be outsourced to an AOS approved supplier or could be performed by AOS personnel who have been qualified and certified in accordance with SOP PR9002.3, "Qualification and Certification of Inspection and Test Personnel," and SOP PR9002.4, "Qualification and Certification of NDE Personnel." The team reviewed the training records for the individual that performed the most recent annual maintenance on packaging serial number AOS-100A-0002. The training records contained a certificate that the individual had successfully completed 40 hours of AOS Radioactive Material Transport Packaging System Maintenance and Operation Training. In addition, the training record contained the individual's current quality control certifications in accordance with SOPs PR9002.3 and PR9002.4. The team found the training records thorough and current.

The team reviewed a sample of the materials used during the performance of package maintenance. Specifically, the team reviewed the procurement and receipt inspection of a quantity of one-time use consumable metal seals.

The team also reviewed the following AOS SOPs which address receipt inspection and control of materials:

PR9007.4, "Receiving Inspection," Revision B
PR9008.1, "Identification and Control of Materials, Parts and Components," Revision B

The team reviewed a PO for metal seals from a quality supplier on the AOS ASL and the Data Certification Package that was provided to AOS. The team reviewed AOS Incoming Material Inspection form 102014-001 for this metal seal PO and found it complete and compliant with PR9007.4. The team also inspected the storage and segregation of the spare metal seals as maintenance parts and verified the proper identification and control per PR9008.1. The team verified that there was no vendor shelf life for the metal seals that had to be identified on them. The team identified no concerns with the procurement, traceability, storage, and identification/controls of maintenance materials.

Tools and Equipment

The team reviewed AOS SOP PR9012.1, "Control of Measuring and Test Equipment," Revision C for the QA requirements for maintenance of measuring and test equipment (M&TE) and to verify that it was being properly implemented. In general, at AOS the calibration of M&TE was subcontracted to and performed by an approved supplier. The team noted that AOS inspection/maintenance personnel are responsible to report on work travelers, or appropriate documentation, the M&TE serial number and calibration data used for all inspections and tests. They are also required prior to use to ensure M&TE is identified with a serial number and a calibration label, the M&TE has been calibrated and the calibration has not expired, and the M&TE is in good working order.

AOS QA prepares and controls the M&TE Equipment Log in a database. The Equipment Log lists all M&TE used in activities affecting the quality of AOS packaging and includes calibration

and preventive maintenance requirements. Using the Equipment Log, inspection generates a report to identify the M&TE requiring calibration. The team noted that if an M&TE device receives three reported nonconforming conditions for calibration during its service life and/or two consecutive reported nonconforming calibration cycles, it is removed from service and scrapped.

The team reviewed the Equipment Log and current calibration documentation/records for the following three M&TE devices that were used on AOS packagings:

Torque Wrench 150 ft-lb	Id. QC-291	Serial Number 973719
Torque Wrench 220-750 ft-lb	Id: QC-308	Serial Number 2014/164849
Torque Wrench 200 N-M	Id: QC-348	Serial Number 2015/119711

The team visually inspected all three torque wrenches to verify that a calibration sticker was attached showing component identification information and calibration dates. The team found the sticker to be in compliance with PR9012.1 requirements. The latest calibration and calibration documentation for all three torque wrenches was provided by an outside vendor that the team verified to be on the ASL.

The team reviewed AOS' Acceptance of Calibration Services Form for each torque wrench. The forms were properly filled out with the Receipt of M&TE from Calibration Supplier, Review of Supplier Documents to determine if PO requirements have been met, and Return of M&TE to Service sections all completed and signed off. The team also reviewed the Calibration Certificate for each torque wrench received from the outside vendor. The team found the vendor's documentation comprehensive in the calibration process and provided the temperature and humidity at the time of calibration.

The team found the M&TE program to be adequate with no concerns Overall, the team did not identify any issues or concerns with the AOS packaging maintenance controls and related documentation.