

August 6, 2009

Mr. Troy Hedger
CEO
Alpha-Omega Services, Inc.
9156 Rose Street
Bellflower, CA 90706

SUBJECT: APPLICATION FOR THE MODEL NO. AOS-165 PACKAGE – NOT ACCEPTED
FOR REVIEW

Dear Mr. Hedger:

By letter dated June 19, 2009, you submitted an application for the AOS Transport Packaging System. The application encompasses four primary designs: the AOS-025, AOS-050, AOS-100, and AOS-165, with alternate configurations. The staff performed an acceptance review of your application to determine if it contained sufficient technical information in scope and depth to allow the staff to complete a detailed technical review. On July 31, 2009, the staff transmitted to you a Request for Supplemental Information regarding the AOS-025, AOS-050 and AOS-100 packages.

This letter is to advise you that, based on our acceptance review, the application for the AOS-165 package does not contain sufficient technical information to allow the staff to begin its detailed technical review. Because of the extensive nature of the information needed, and the technical design deficiencies identified in Attachment 1, the staff finds the application for the AOS-165 package unacceptable for NRC review pursuant to 10 CFR 71.31 and 71.33. NRC staff activities on this application have ceased.

This letter also confirms our phone call of July 30, 2009, with respect to the non-acceptance of the AOS-165 package for a detailed technical review

If you have any questions regarding this matter, please contact Pierre Saverot of my staff at (301) 492-3408.

Sincerely,

/RA/

Eric Benner, Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material
Safety and Safeguards

Docket No. 71-9316
TAC No. L24353

Enclosure: Deficiencies Regarding the Model No. AOS-165 Package

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ALPHA-OMEGA SERVICES, INC.

DOCKET NO. 71-9316

DEFICIENCIES REGARDING THE MODEL NO. AOS-165 PACKAGE

Chapter 1: General Information

1-1: Key dimensions and tolerances are missing in the Drawings. For example, dimensions and tolerances of the shielding do not appear to be present.

The drawings should be consistent with the guidance in NUREG/CR5502: "Engineering Drawings for 10 CFR Part 71 Package Approvals." A summary materials data sheet or Bill of Materials should be included in the Drawings which will be included as reference in the Certificate of Compliance.

This information is needed to determine compliance with 10 CFR 71.31.

1-2: A detailed description of the contents should be provided and include the chemical composition, type, size, and shape of solids.

This information is needed to determine compliance with 10 CFR 71.33(b)(3).

1-3: The location of the center of gravity shown in Table 1-1 should be verified with the locations shown in Figure 1-2 and Table 4-1.

This information is needed to determine compliance with 10 CFR 71.31.

Chapter 2: Structural Evaluation

2-1: All load combinations should be reevaluated to ensure that Regulatory Guide 7.8, "Load Combinations for the Structural Analysis of Shipping Casks for Radioactive Material" is being properly applied. Justify the evaluation and selection of load combinations.

The staff does not specifically see anticipated load combinations in the Tables of Section 2.10.3 for the AOS-165A package and in the Tables of Section 2.10.4 for the AOS-165B package.

This information is needed to determine compliance with 10 CFR 71.33(b)(3) and 71.43(d).

Chapter 3: Thermal Evaluation

3-1: The impact limiter foam temperatures should be verified. Impact limiter foam temperatures for the AOS-165 package may exceed the temperature rating for the material.

It appears that the temperature limit during Normal Conditions of transport (NCT) may be exceeded for the AOS-165A and AOS-165B packages considering the glass transition temperature of 279°F (137°C), as reported in the “Design Guide for Last-A-Foam FR-3700 for Crash & Fire Protection of Radioactive Material Shipping Containers.” This could affect the performance of the package in NCT and Hypothetical Accident Conditions (HAC) drop conditions.

This information is needed to determine compliance with 10 CFR 71.51, 71.71, and 71.73.

3-2: Information justifying the Ci/Watt values for all nuclides, the energy and type of emissions for each nuclide as well as a reference for the values should be provided.

Based on preliminary calculations performed to verify the Ci/Watt values for certain nuclides, the staff believes that many of the Ci/Watt values used by the applicant may be non-conservative, including (but not limited to) Zr/Nb-95, Ho-166, Se-75, Sm-153, and Yb-169.

The staff compared the applicant’s Ci/Watt values to those in ICRP Publication 38, “Radionuclide Transformations Energy and Intensity of Emissions, 1983,” as well as those from the Microshield 5 Code (Grove Engineering).

This information is needed to determine compliance with 10 CFR 71.31 and 71.33.

3-3: The basis for the design heat load analysis should be explained. It appears, from the decay heat appendix, that 6,936 Watts were analyzed for the AOS-165 package while Table 3-4 of the application reports that 7,000 Watts have been analyzed.

This apparent discrepancy does not provide confidence that design heat loads for the requested contents of the AOS-165 package have been analyzed to demonstrate thermal performance of the package.

This information is needed to determine compliance with 10 CFR 71.51 and 71.33

3-4: The validation of information provided for the LIBRA code should be justified.

Table 3-94 of the application, “Comparison of Heat Test GE Model 2000 and LIBRA Results,” shows that the LIBRA code consistently and significantly underpredicts the cask cavity temperature compared to the results of the heat test. It is not clear how these temperature differences are justified and addressed in the validation of the code.

This information is needed to determine compliance with 10 CFR 71.31.

3-5: All unit conversions in the application and associated analysis files should be verified and any discrepancies found should be corrected and reported.

Table 3-7 has an incorrect unit conversion for thermal conductivity, an incorrect unit conversion for specific heat as well as an incorrect unit label.

This information is needed to determine compliance with 10 CFR 71.31.

3-6: Descriptions, including drawings, of the internal basket assemblies used in the AOS-165 package should be provided. The thermal interactions of the payload with the internal surfaces of the inner canister should be described. The demonstration that the decay heat generated by the contents is appropriately modeled in relation to the interior of the package should be included in the application.

The assumption that the heat on internal surfaces is evenly distributed may not be conservative. The temperature distribution within the inner cavity will be dependent on the arrangement of the contents. While the overall decay heat generated may be represented, the distribution of this heat load is not captured by applying it uniformly on the inner surface of the canister.

This information is needed to determine compliance with 10 CFR 71.33(a)(5)(v).

3-7: The justification that maximum temperatures have been provided in Table 3-4 for the AOS-165 package should be provided in the application. The application should also include the demonstration that maximum temperatures have been provided for package components based upon the entire set of nodes in the analysis.

It appears that samples of nodes were chosen from the thermal analysis and then the temperature of those nodes was monitored to provide maximum temperatures.

This information is needed to determine compliance with 10 CFR 71.35.

3-8: A summary of the results of thermal stress evaluation under NCT and HAC should be included in Sections 3.3 and 3.4, respectively. An evaluation of thermal stresses caused by constrained interfaces among package components resulting from temperature gradients and differential thermal expansion should also be included.

This evaluation should be provided for both NCT and HAC.

This information is needed to determine compliance with 10 CFR 71.71 and 71.73.

3-9: The inconsistency between the elastomeric seal temperature limit on page 2-20 and the value provided in Table 3-4 should be clarified. The applicant should clarify if there are two different types of metallic seals regarding footnote No. 1 in Table 2-3. All seal NCT limits should be provided if these limits are different from HAC limits, as it appears to be the case in Table 2-3 of the application.

This information is needed to determine compliance with 10 CFR 71.33, 71.73, and 71.7.

3-10: The maximum initial pressure and temperature conditions should be provided for the AOS-165 model configurations in Table 3-3 and Table 2-63 of the application.

This information is needed to determine compliance with 10 CFR 71.71 and 71.73.

3-11: The discrepancy between the thermal conductivity values for Last-A-Foam in Table 3-8 of the application in comparison with the thermal conductivity values in the “Design Guide for Last-A-Foam FR-3700 for Crash & Fire Protection of Radioactive Material Shipping Containers” should be clarified.

This information is needed to determine compliance with 10 CFR 71.71 and 71.73.

3-12: The verification that each of the isotope activity limits is not exceeding the analyzed decay heat should be provided. The application should confirm if each isotope is transported individually in a package or if more than one type of isotope could be transported in the same package.

The activity limits for some of the isotopes in Table 1-6 appear to exceed the analyzed decay heat. This includes (but may not be limited to) Co-60, Zr/Nb-95, Se-75, Sm-153, Yb-169, Yb-175.

This information is needed to determine compliance with 10 CFR 71.31, 71.33, and 71.51.

3-13: All thermal input/output files and all Autocad inventor files should be provided on DVDs or CDs, rather than referencing the ftp site.

This information is needed to determine compliance with 10 CFR 71.31 and 71.33.

Chapter 4: Containment Evaluation

4-1: The elastomeric seal material temperature limit for the AOS-165A package appears to be exceeded during NCT or HAC.

On page 3-11 of the application, the elastomeric seal temperature limit of 450°F is indicated. The applicant’s analysis shows that this limit has been exceeded during NCT and HAC for the test port, drain port, and vent port. Exceeding the temperature limit of the seal material can cause failure of the seal and could result in release from the containment system.

This information is needed to determine compliance with 10 CFR 71.71 and 71.73.

4-2: A detailed description of the leakage tests performed on the AOS-165 package should be provided.

The general description, included in Section 4.4 of the application, provides only an overview of the testing that is planned to be done, but a more detailed discussion is needed to ensure that the package can be effectively tested by the package user.

This information is needed to determine compliance with 10 CFR 71.71.

4-3: The seals that are considered as primary seals to be relied upon for the containment of the AOS-165 package contents should be defined.

The containment boundary of the AOS series of packages is described and illustrated in Section 4.1.1. The illustration of the containment boundary does not clearly define which seals are considered as primary seals to be relied upon for containment of the package contents. Such clarification is required for the evaluation of the containment performance and leak testing of the package.

This information is needed to determine compliance with 10 CFR 71.51.

4-4: Additional explanations on the placement of the seals using four small screws should be provided. It is unclear from the application whether or not the use of screws is a standard configuration for securing the seals.

This information is needed to determine compliance with 10 CFR 71.31(b) and 71.51.

4-5: A description of the test provided for the seals in Appendix 4.5 should be provided along with a demonstration that the seals installed on the AOS-165 package meet the ANSI N14.5 leaktight criteria.

It is not clear how the test flange used in the helium leak test is indicative of the AOS-165 package design closure, and if the seals tested are indicative of the seals that will be utilized for the AOS-165 package.

This information is needed to determine compliance with 10 CFR 71.31(b) and 71.51.

4-6: Differences between the metallic seal temperature limits provided in Table 3-4 of the application for the AOS-165A and the AOS-165B packages (see pages 3-11 and 3-12 respectively) should be explained.

The lid seal listed in drawing 105E9708 is Garlock Helicoflex Part No. H-309352 with a temperature limit of 842°F, while Table 3-4 states that the limit is 800°F for the Model No. AOS-165A and 400°F for the Model No. AOS-165B.

These apparent discrepancies do not provide confidence that thermal performance limits of the containment seals have been appropriately considered to ensure containment performance during HAC conditions.

This information is needed to determine compliance with 10 CFR 71.71 and 71.73.

Chapter 5: Shielding Evaluation

5-1: Values in Table 1.6 should be verified for use in the shielding evaluations as well as for the determination of the decay heat for each nuclide. The maximum radioactivity of radioactive constituents should be identified.

The activity values for TBq and Curies (Ci) are not equivalent in Table 1.6 when using the conversion factor 3.7×10^{10} Bq/Ci. The staff notes also that if the values are converted to equivalent units, then the values listed for Ci are higher than those for TBq.

This information is needed to determine compliance with 10 CFR 71.33(b)(1).

5-2: The use of the point source method for shielding calculations should be justified for the AOS-165 package. The limiting dimensions for the source material should be provided

The staff notes that there can be deficiencies associated with using a point source method. These are discussed in NUREG/CR-6802 "Recommendations for Shielding Evaluations for Transport and Storage Packages."

The staff does not have any information about the geometry of the source material and therefore cannot determine if the distance between the point source and the detector points is sufficient to justify a point source approximation.

This information is needed to determine compliance with 10 CFR 71.33(b)(3) and 71.47(a).

5-3: The dimensions for the cask cavity, cask cavity shell, and radial and axial shields along with tolerances should be included in the AOS-165 package drawings. Drawings must include appropriate dimensions and acceptance criteria for all design parameters.

This information is needed to determine compliance with 10 CFR 71.7(a) and 71.111.

5-4: A clear documentation to indicate that the impact limiter and the personnel barrier will remain intact for NCT should be provided. The application should justify and clarify if the dose points at the personnel barrier are appropriate for NCT.

This information is needed to determine compliance with 10 CFR 71.33.

5-5: The inconsistency between the Drawing in Figure 5-4 with the description in Section 5.4.4.2 in the application should be reviewed and clarified.

Figure 5-4 shows the dose points at the personnel barrier surface and at 1 meter from the personnel barrier surface. Section 5.4.4.2 states that the dose points used are at the personnel barrier and 1 meter from the cask surface.

This information is needed to determine compliance with 10 CFR 71.7 and 71.33.

Chapter 7 – Package Operations Evaluation

7-1: Key steps of the leakage tests performed on the AOS packages should be provided in the Operating Procedures.

This information is needed to determine compliance with 10 CFR 71.71.

Chapter 8 – Acceptance Tests and Maintenance Program Evaluation

8-1: Additional explanations on the placement and installation of the seals during maintenance operations should be included in this Chapter.

This information is needed to determine compliance with 10 CFR 71.31(b).