



February 9, 2009

ATTN: Document Control Desk
Director, Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: AMENDMENT FOR THE AUTHORIZATION FOR LIMITED SHIPMENTS IN
THE MODEL NO. 5979 PACKAGE, CERTIFICATE OF COMPLIANCE NO.
5979, DATED OCTOBER 21, 2008.

Dear Mr. Brach:

Alpha-Omega Services, Inc. (AOS) hereby submits a request to amend the referenced document. AOS has developed a new set of drawings to reflect the current conditions of the 5979 Package as follows:

1. *AOS DRAWING 0094, "DOT-SP 14772, GENERAL ARRANGEMENT – CONTAINER," REVISION 0.*
2. *AOS DRAWING 0095, "DOT-SP 14772, CONTAINER / TRANSFER CASK, DETAILS," REVISION 0.*
3. *AOS DRAWING 0096, "DOT-SP 14772, DETAILS-INSERTS (TURRET) & END CAPS-CONTAIN/TRAS," REVISION 0.*
4. *AOS DRAWING 0097, "DOT-SP 14772, DETAILS-OVERPACK PALLET – SHIP/TRANS. CASK," REVISION 0.*

In addition, AOS will operate only two (2) packages; Serial No's. AOS I and AOS II Cask/IIIA Overpack and Pallet with revised Operating and Maintenance procedures.

Changes to the drawings are the result of AOS's effort to bring these packages into compliance with the drawings cited in the referenced Authorization. However, not all drawings requirements presently could be met. The new drawings account for these changes. To retain the originality of the drawings, changes were incorporated into the drawings on file, but those features no longer applicable are shown in low tone ink.

We have attached to this letter: (A) copies of the new drawings; (B) list of drawing changes and their justification; (C) revised copy of AOS PR9100, Operating Procedure, Revision E; and (D) revised copy of PR9101 Maintenance Inspection Procedure, Revision C.

If you or your staff has any questions concerning this request, please contact me on (526) 804-0606, ext. 41.

Sincerely,

A handwritten signature in black ink, appearing to read 'Bob A. Robnett', with a horizontal line extending to the right across the signature.

Bob A. Robnett
Director Regulatory Affairs & Quality
Alpha-Omega Services, Inc.
9156 Rose Street
Bellflower, CA 90706

ATTACHMENT A

- 1) *AOS DRAWING 0094, "DOT-SP 14772, GENERAL ARRANGEMENT – CONTAINER," REVISION 0.*
- 2) *AOS DRAWING 0095, "DOT-SP 14772, CONTAINER / TRANSFER CASK, DETAILS," REVISION 0.*
- 3) *AOS DRAWING 0096, "DOT-SP 14772, DETAILS-INSERTS (TURRET) & END CAPS-CONTAIN/TRAS," REVISION 0.*
- 4) *AOS DRAWING 0097, "DOT-SP 14772, DETAILS-OVERPACK PALLET – SHIP/TRANS. CASK," REVISION 0.*

DRAWINGS WITHHELD UNDER 10 CFR 2.390

ATTACHMENT B

LIST OF CHANGES AND THEIR TECHNICAL JUSTIFICATION.

1. *CHANGES ON AOS DRAWING 0094, "DOT-SP 14772, GENERAL ARRANGEMENT – CONTAINER," REVISION 0.*
2. *CHANGES AOS DRAWING 0095, "DOT-SP 14772, CONTAINER / TRANSFER CASK, DETAILS," REVISION 0.*
3. *CHANGES ON AOS DRAWING 0096, "DOT-SP 14772, DETAILS-INSERTS (TURRET) & END CAPS-CONTAIN/TRAS," REVISION 0.*
4. *CHANGES ON AOS DRAWING 0097, "DOT-SP 14772, DETAILS-OVERPACK PALLET – SHIP/TRANS. CASK," REVISION 0.*

CHANGES TO AOS DRAWING 0094, "DOT-SP 14772, GENERAL ARRANGEMENT – CONTAINER," REVISION 0.

ZONE A1. Changed the "3/4-10 x 2..." callout to include "... 38 or 40 REQD."

An analysis was performed following the methodology given in NUREG-CR6007, "STRESS ANALYSIS OF CLOSURE BOLTS FOR SHIPPING CASK," January 1993. Hypothetical cases, forty (40) and a thirty eight (38) bolt patterns, were analyzed with all the other parameters being the same in both cases. The resulting Bolt Stresses were compared. See Table below:

Total Bolt Stresses	40 Bolt Pattern	38 Bolt Pattern	% Diff.
Total Bolt Direct Stress (+MC/I)	-2,01520E+02	-2,00580E+02	0,5
Total Bolt Direct Stress (-MC/I)	2,11720E+02	2,12270E+02	0,3
Ave, Bolt Direct Stress	5,10050E+00	5,84510E+00	14,6
Total Bolt Shear Stress	7,73520E+03	7,97003E+03	3,0
Ave Bolt Shear Stress	6,10100E+03	6,33610E+03	3,9

Based on the % Difference shown in the Table and the magnitude of the stresses, it can be concluded that the effect of having 38 vs. 40 bolts is negligible.

Input and output parameters from the analyses are attached at the end of this section

ZONE A4: Updated the packaging weights to reflect actual. Notice that the "APPROX. MAX. SHIPPING WT," was kept the same. However the Cask weight was increase to a maximum value of 3500 lbs, when the tolerance is added. A review of the Safety Analysis Report (SAR) for the 5979 Packaging, submitted in 1980, shows the cask weight to be 4000 lbs. Therefore, the value of 3500 lbs is covered by the SAR analysis.

ZONE B2: Added "SEE NOTE 8." This note was added to indicate the location of the Security Seal.

ZONE B3: Added as an OPTION, the use of carbon steel flat bar to the bottom surface of the Skid component for addition bearing surface.

ZONE C2: Changed the location of the 2 x 2 redwood crush strip on the inside surfaces of the Overpack. The reposition of these strips was needed on the Packaging Serial No. AOS I, because there was not room to install them on the location indicated in the drawing, however the new location is still closed to the cask body. May not be the same for Overpack IIIA since there are more room between the inside surface of the Overpack and the Cask.

ZONE D1. Added the following Notes.

NOTE 7: LOW TONE INK IMAGERIES DO NOT APPLY. THEY ARE PRESENT TO PRESERVE DRAWING ORIGINALITY.

NOTE 8: AT LEAST ONE Φ 1/8 HOLE THRU FOR INSTALLATION OF SECURITY SEAL.

NOTE 9: IN-SERVICE PACKAGING SERIAL NUMBERS:

1. AOS I
2. IIIA OVERPACK/PALLET & AOS II CASK.

ZONE D3: Changed NOTE 3 to update the length of the Pallet Attachment bolts to 7 1/2" and NOTE 4 to require the gasket for all the shipments.

CASKBOLT.OUT

ANALYSIS FOR ACCIDENT CONDITION - 30 FT DROP - SIDE ORIENTATION -025 CONFIGURAT

***** INPUT DATA *****

NUMBER OF BOLTS	(NB)	40
LID DIAMETER AT BOLT CIRCLE	(DLB)	0.44560E+02
LID DIAMETER AT GASKET	(DLG)	0.44560E+02
NOMINAL BOLT DIAMETER	(DB)	0.75000E+00
LID DIAMETER AT INNER EDGE	(DLI)	0.42560E+02
LID DIAMETER AT OUTER EDGE	(DLO)	0.46560E+02
THICKNESS OF LID	(TL)	0.25000E+00
THICKNESS OF LID FLANGE	(TLF)	0.25000E+00
THICKNESS OF CASK WALL	(TC)	0.45000E+01
BOLT LENGTH	(BL)	0.20000E+01
BOLT MOMENT OF INERTIA / CIR	(XIB)	0.41420E-01
YOUNG'S MODULUS FOR LID	(EL)	0.28300E+08
YOUNG'S MODULUS FOR LID FLANGE	(ELF)	0.28300E+08
YOUNG'S MODULUS FOR CASK	(EC)	0.28300E+08
YOUNG'S MODULUS FOR BOLT	(EB)	0.28500E+08
POISSON'S RATIO FOR LID	(XNUL)	0.30000E+00
POISSON'S RATIO FOR CASK	(XNUC)	0.30000E+00
LID THERMAL EXPANSION COEFF	(AL)	0.80300E-05
BOLT THERMAL EXPANSION COEFF	(AB)	0.59000E-05
WALL THERMAL EXPANSION COEFF	(AC)	0.80300E-05
FLANGE COEFFICIENT OF FRICTION	(FCF)	0.90000E+00
INSIDE PRESSURE AT LID	(PLI)	0.15000E+02
OUTSIDE PRESSURE AT LID	(PLO)	0.15000E+02
INSIDE PRESSURE AT CASK WALL	(PCI)	0.15000E+02
OUTSIDE PRESSURE AT CASK WALL	(PCO)	0.15000E+02
TEMPERATURE CHG ACROSS LID	(TEMPL)	0.20000E+01
TEMPERATURE CHG ACROSS BOLT	(TEMPB)	0.20000E+01
TEMPERATURE CHG ACROSS WALL	(TEMPC)	0.80000E+01
TEMPERATURE AT OUTSIDE OF LID	(TEMPLO)	0.28300E+03
TEMPERATURE AT INSIDE OF LID	(TEMPLI)	0.28500E+03
WEIGHT OF CASK CONTENTS	(WC)	0.14000E+02
WEIGHT OF CASK LID	(WL)	0.20000E+01
DROP ANGLE OF IMPACT, deg	(XI_DROP)	0.00000E+00
CG/CORNER IMPACT ACCEL, g	(ACCI)	0.76600E+03
DYNAMIC LOAD FACTOR	(DYLF)	0.10000E+01
PUNCTURE LOAD	(PUNC)	0.00000E+00
PUNCTURE ANGLE OF IMPACT, deg ...	(XI_PUNC)	0.45000E+02
AXIAL VIBRATION ACCELERATION	(AVA)	0.00000E+00
TRANSVERSE VIBRATION ACCELERATION ...	(AVT)	0.00000E+00
VIBRATION TRANSMISSIBILITY FACTOR ...	(VTR)	0.10000E+01
PRELOAD TORQUE	(Q)	0.42000E+03
NUT FACTOR FOR PRELOAD TORQUE	(QK)	0.15000E+00
GASKET SEATING WIDTH	(GB)	0.10000E+01
GASKET SEATING STRESS	(GY)	0.91400E+03
GASKET FACTOR	(GM)	0.15230E+02
Sm STRESS	(SM)	0.76700E+02
Sy STRESS	(SY)	0.11500E+03
Su STRESS	(SU)	0.14000E+03
CODE EVALUATION TYPE.....	(CET)	2
OPERATING FATIGUE STRESS (ksi)	(FSO)	0.11500E+03
VIBRATION FATIGUE STRESS (ksi)	(FSV)	0.13000E+02
NUMBER OF BOLT THREADS / INCH	(NTI)	16

CASKBOLT.OUT

***** BOLT LOADS & STRESSES *****

BOLT FORCES DUE TO PRESSURE, TABLE 4.3

AXIAL LOAD DUE TO PRESSURE.....	0.00000E+00
SHEAR LOAD DUE TO PRESSURE.....	0.00000E+00
EDGE LOAD DUE TO PRESSURE.....	0.00000E+00
EDGE MOMENT DUE TO PRESSURE.....	0.00000E+00

BOLT FORCES DUE TO TEMPERATURE, TABLE 4.4

AXIAL LOAD DUE TO TEMPERATURE.....	0.53637E+02
SHEAR LOAD DUE TO TEMPERATURE.....	-0.17042E+04
EDGE LOAD DUE TO TEMPERATURE.....	0.00000E+00
EDGE MOMENT DUE TEMPERATURE.....	-0.33817E+01

BOLT FORCES DUE TO IMPACT, TABLE 4.5

AXIAL LOAD DUE TO IMPACT.....	0.00000E+00
SHEAR LOAD DUE TO IMPACT.....	0.38300E+02
EDGE LOAD DUE TO IMPACT.....	0.00000E+00
EDGE MOMENT DUE IMPACT.....	0.00000E+00

BOLT FORCES DUE TO PUNCTURE, TABLE 4.7

AXIAL LOAD DUE TO PUNCTURE.....	0.00000E+00
SHEAR LOAD DUE TO PUNCTURE.....	0.00000E+00
EDGE LOAD DUE TO PUNCTURE.....	0.00000E+00
EDGE MOMENT DUE PUNCTURE.....	0.00000E+00

BOLT FORCES DUE TO VIBRATION, TABLE 4.8

AXIAL LOAD DUE TO VIBRATION.....	0.00000E+00
SHEAR LOAD DUE TO VIBRATION.....	0.00000E+00
EDGE LOAD DUE TO VIBRATION.....	0.00000E+00
EDGE MOMENT DUE VIBRATION.....	0.00000E+00

BOLT FORCES DUE TO PRELOAD, TABLE 4.1, 4.2

AXIAL LOAD DUE TO PRELOAD.....	0.37333E+04
AXIAL LOAD DUE TO GASKET SEATING....	0.31988E+04
AXIAL LOAD DUE TO GASKET OPERATION..	0.00000E+00
TORQUE DUE TO PRELOAD.....	0.21000E+03
TORQUE DUE TO GASKET	0.17993E+03

TOTAL NON-PRYING BOLT FORCES, TABLE 4.9

TOTAL NON-PRYING AXIAL LOAD.....	0.37870E+04
TEMP & PRELOAD NON-PRYING AXIAL LD..	0.37870E+04
AXIAL LOAD LESS TEMP & PRELOAD.....	0.00000E+00
TOTAL EDGE LOAD.....	0.00000E+00
TOTAL EDGE MOMENT.....	-0.33817E+01

CASKBOLT.OUT

PRYING ACTION FORCES, TABLE 2.1 & 2.2

AXIAL LOAD DUE TO PRYING..... -0.37851E+04
BENDING MOMENT DUE TO PRYING..... -0.32563E+01

TOTAL BOLT FORCES

TOTAL BOLT AXIAL LOAD..... 0.19023E+01
TOTAL BOLT SHEAR LOAD..... -0.16659E+04
TOTAL BOLT BENDING MOMENT..... -0.66380E+01
TOTAL BOLT TORSIONAL MOMENT..... 0.21000E+03

TOTAL BOLT STRESSES

TOTAL BOLT DIRECT STRESS (+MC/I) ... -0.20152E+03
TOTAL BOLT DIRECT STRESS (-MC/I) ... 0.21172E+03
AVE BOLT DIRECT STRESS 0.51005E+01
TOTAL BOLT SHEAR STRESS 0.77352E+04
AVE BOLT SHEAR STRESS 0.61010E+04

CODE EVALUAT. FOR ACCIDENT COND, TABLE 6.3

ALLOWABLE TENSILE STRESS (sa) 0.98000E+05
ALLOWABLE SHEAR STRESS (Ta) 0.58800E+05
Rt (AVE AXIAL STRESS/sa) 0.52046E-04
Rs (AVE SHEAR STRESS/Ta) 0.10376E+00
Rty+Rsy 0.10766E-01

FLANGE SEPARATION EVALUATION

BOLT CLAMPING FORCE -0.19023E+01
DISPLACEMENT ACROSS BOLT -0.35793E-06
ALLOWABLE FLANGE SEPARATION 0.30000E-02
FLANGE FRICTION FORCE -0.17121E+01
TOTAL BOLT SHEAR FORCE -0.16659E+04

CASKBOLT.OUT

ANALYSIS FOR ACCIDENT CONDITION - 30 FT DROP - SIDE ORIENTATION -025 CONFIGURAT

***** INPUT DATA *****

NUMBER OF BOLTS	(NB)	38
LID DIAMETER AT BOLT CIRCLE	(DLB)	0.44560E+02
LID DIAMETER AT GASKET	(DLG)	0.44560E+02
NOMINAL BOLT DIAMETER	(DB)	0.75000E+00
LID DIAMETER AT INNER EDGE	(DLI)	0.42560E+02
LID DIAMETER AT OUTER EDGE	(DLO)	0.46560E+02
THICKNESS OF LID	(TL)	0.25000E+00
THICKNESS OF LID FLANGE	(TLF)	0.25000E+00
THICKNESS OF CASK WALL	(TC)	0.45000E+01
BOLT LENGTH	(BL)	0.20000E+01
BOLT MOMENT OF INERTIA / CIR	(XIB)	0.41420E-01
YOUNG'S MODULUS FOR LID	(EL)	0.28300E+08
YOUNG'S MODULUS FOR LID FLANGE	(ELF)	0.28300E+08
YOUNG'S MODULUS FOR CASK	(EC)	0.28300E+08
YOUNG'S MODULUS FOR BOLT	(EB)	0.28500E+08
POISSON'S RATIO FOR LID	(XNUL)	0.30000E+00
POISSON'S RATIO FOR CASK	(XNUC)	0.30000E+00
LID THERMAL EXPANSION COEFF	(AL)	0.80300E-05
BOLT THERMAL EXPANSION COEFF	(AB)	0.59000E-05
WALL THERMAL EXPANSION COEFF	(AC)	0.80300E-05
FLANGE COEFFICIENT OF FRICTION	(FCF)	0.90000E+00
INSIDE PRESSURE AT LID	(PLI)	0.15000E+02
OUTSIDE PRESSURE AT LID	(PLO)	0.15000E+02
INSIDE PRESSURE AT CASK WALL	(PCI)	0.15000E+02
OUTSIDE PRESSURE AT CASK WALL	(PCO)	0.15000E+02
TEMPERATURE CHG ACROSS LID	(TEMPL)	0.20000E+01
TEMPERATURE CHG ACROSS BOLT	(TEMPB)	0.20000E+01
TEMPERATURE CHG ACROSS WALL	(TEMPC)	0.80000E+01
TEMPERATURE AT OUTSIDE OF LID	(TEMPLO)	0.28300E+03
TEMPERATURE AT INSIDE OF LID	(TEMPLI)	0.28500E+03
WEIGHT OF CASK CONTENTS	(WC)	0.14000E+02
WEIGHT OF CASK LID	(WL)	0.20000E+01
DROP ANGLE OF IMPACT, deg	(XI_DROP)	0.00000E+00
CG/CORNER IMPACT ACCEL, g	(ACCI)	0.76600E+03
DYNAMIC LOAD FACTOR	(DYLF)	0.10000E+01
PUNCTURE LOAD	(PUNC)	0.00000E+00
PUNCTURE ANGLE OF IMPACT, deg ...	(XI_PUNC)	0.45000E+02
AXIAL VIBRATION ACCELERATION	(AVA)	0.00000E+00
TRANSVERSE VIBRATION ACCELERATION ...	(AVT)	0.00000E+00
VIBRATION TRANSMISSIBILITY FACTOR ...	(VTR)	0.10000E+01
PRELOAD TORQUE	(Q)	0.42000E+03
NUT FACTOR FOR PRELOAD TORQUE	(QK)	0.15000E+00
GASKET SEATING WIDTH	(GB)	0.10000E+01
GASKET SEATING STRESS	(GY)	0.91400E+03
GASKET FACTOR	(GM)	0.15230E+02
Sm STRESS	(SM)	0.76700E+02
Sy STRESS	(SY)	0.11500E+03
Su STRESS	(SU)	0.14000E+03
CODE EVALUATION TYPE.....	(CET)	2
OPERATING FATIGUE STRESS (ksi)	(FSO)	0.11500E+03
VIBRATION FATIGUE STRESS (ksi)	(FSV)	0.13000E+02
NUMBER OF BOLT THREADS / INCH	(NTI)	16

CASKBOLT.OUT

***** BOLT LOADS & STRESSES *****

BOLT FORCES DUE TO PRESSURE, TABLE 4.3

AXIAL LOAD DUE TO PRESSURE.....	0.00000E+00
SHEAR LOAD DUE TO PRESSURE.....	0.00000E+00
EDGE LOAD DUE TO PRESSURE.....	0.00000E+00
EDGE MOMENT DUE TO PRESSURE.....	0.00000E+00

BOLT FORCES DUE TO TEMPERATURE, TABLE 4.4

AXIAL LOAD DUE TO TEMPERATURE.....	0.53637E+02
SHEAR LOAD DUE TO TEMPERATURE.....	-0.17939E+04
EDGE LOAD DUE TO TEMPERATURE.....	0.00000E+00
EDGE MOMENT DUE TEMPERATURE.....	-0.33817E+01

BOLT FORCES DUE TO IMPACT, TABLE 4.5

AXIAL LOAD DUE TO IMPACT.....	0.00000E+00
SHEAR LOAD DUE TO IMPACT.....	0.40316E+02
EDGE LOAD DUE TO IMPACT.....	0.00000E+00
EDGE MOMENT DUE IMPACT.....	0.00000E+00

BOLT FORCES DUE TO PUNCTURE, TABLE 4.7

AXIAL LOAD DUE TO PUNCTURE.....	0.00000E+00
SHEAR LOAD DUE TO PUNCTURE.....	0.00000E+00
EDGE LOAD DUE TO PUNCTURE.....	0.00000E+00
EDGE MOMENT DUE PUNCTURE.....	0.00000E+00

BOLT FORCES DUE TO VIBRATION, TABLE 4.8

AXIAL LOAD DUE TO VIBRATION.....	0.00000E+00
SHEAR LOAD DUE TO VIBRATION.....	0.00000E+00
EDGE LOAD DUE TO VIBRATION.....	0.00000E+00
EDGE MOMENT DUE VIBRATION.....	0.00000E+00

BOLT FORCES DUE TO PRELOAD, TABLE 4.1, 4.2

AXIAL LOAD DUE TO PRELOAD.....	0.37333E+04
AXIAL LOAD DUE TO GASKET SEATING...	0.33671E+04
AXIAL LOAD DUE TO GASKET OPERATION..	0.00000E+00
TORQUE DUE TO PRELOAD.....	0.21000E+03
TORQUE DUE TO GASKET	0.18940E+03

TOTAL NON-PRYING BOLT FORCES, TABLE 4.9

TOTAL NON-PRYING AXIAL LOAD.....	0.37870E+04
TEMP & PRELOAD NON-PRYING AXIAL LD..	0.37870E+04
AXIAL LOAD LESS TEMP & PRELOAD.....	0.00000E+00
TOTAL EDGE LOAD.....	0.00000E+00
TOTAL EDGE MOMENT.....	-0.33817E+01

CASKBOLT.OUT

PRying ACTION FORCES, TABLE 2.1 & 2.2

AXIAL LOAD DUE TO PRying..... -0.37848E+04
BENDING MOMENT DUE TO PRying..... -0.32500E+01

TOTAL BOLT FORCES

TOTAL BOLT AXIAL LOAD..... 0.21800E+01
TOTAL BOLT SHEAR LOAD..... -0.17536E+04
TOTAL BOLT BENDING MOMENT..... -0.66317E+01
TOTAL BOLT TORSIONAL MOMENT..... 0.21000E+03

TOTAL BOLT STRESSES

TOTAL BOLT DIRECT STRESS (+MC/I) ... -0.20058E+03
TOTAL BOLT DIRECT STRESS (-MC/I) ... 0.21227E+03
AVE BOLT DIRECT STRESS 0.58451E+01
TOTAL BOLT SHEAR STRESS 0.79703E+04
AVE BOLT SHEAR STRESS 0.63361E+04

CODE EVALUAT. FOR ACCIDENT COND, TABLE 6.3

ALLOWABLE TENSILE STRESS (Sa) 0.98000E+05
ALLOWABLE SHEAR STRESS (Ta) 0.58800E+05
Rt (AVE AXIAL STRESS/Sa) 0.59644E-04
Rs (AVE SHEAR_STRESS/Ta) 0.10776E+00
Rt γ +Rs γ 0.11611E-01

FLANGE SEPARATION EVALUATION

BOLT CLAMPING FORCE -0.21800E+01
DISPLACEMENT ACROSS BOLT -0.41018E-06
ALLOWABLE FLANGE SEPARATION 0.30000E-02
FLANGE FRICTION FORCE -0.19620E+01
TOTAL BOLT SHEAR FORCE -0.17536E+04

**AOS DRAWING 0095, "DOT-SP 14772, CONTAINER / TRANSFER CASK, DETAILS,"
REVISION 0.**

ZONE B3: Added SECTION B-B with the following note: "REPAIRED WORK UP TO 4 HOLES PER SIDE MAX OF 3 SIDES." This note was added to indicate the location of a four (4) bolts pattern not shown on the previous drawing. These threaded holes were plugged with threaded rod, welded and grinded flush on the outside surface.

ZONE D2: Added the following notes:

NOTE 1: LOW TONE INK IMAGERIES DO NOT APPLY. THEY ARE PRESENT TO PRESERVE DRAWING ORIGINALITY.

NOTE 2: REPAIR OF CASK SUPPORT STRUCTURE IS ALLOWED IF TOTAL AREA IN NEED OF REPAIRING DOES NOT EXCEED 0.01% OF TOTAL AREA OF PANEL.

NOTE 2 are added to limit the amount of repair on the structure. Using the stress formula, P/A , the stress variation because an area reduction of 10 %, produces a stress increase of ~12 %. This increase is well within engineering analysis capabilities. However, those holes found now, are plugged as shown on SECTION B-B of the drawing, therefore there is not an area reduction on those panels. This NOTE is to cover any future event.

ZONE D4: Added an optional Tie-down bracket. The optional bracket design seems to be stronger than the original design. This statement can be prove by using Table X, Case 45, Roark, R. J., "Formulas for Stress and Strain," 4th Edition. The β factors are found to be 2.6 for the original design and 1.632 for the optional one, based on their dimension between two (2) consecutive ribs, long edges and their width, short edge. Using the formula given for the maximum stress at center of the short edges, a comparison between designs can be made.

$$\sigma = \beta(wb^2) / t^2 .$$

Since this equation is used for comparison and the values of w and t are the same on both cases, the equation reduces to:

$$\sigma = \beta(b^2).$$

The value of b is 7.0 in for the original design and 3.5 in for the optional one. Therefore,

$$\sigma_{\text{original}} = 127.0 \text{ and } \sigma_{\text{optional}} = 20.0.$$

Using these values, it can be concluded that the stresses on the optional design are 16 % of the original design.

CHANGES ON AOS DRAWING 0096, "DOT-SP 14772, DETAILS-INSERTS (TURRET) & END CAPS-CONTAIN/TRAS," REVISION 0.

ZONE D1: Added the following notes:

NOTE 1: LOW TONE INK IMAGERIES DO NOT APPLY. THEY ARE PRESENT TO PRESERVE DRAWING ORIGINALITY.

NOTE 2: A WOOD DISK MAY BE INSTALLED FOR SHORING.

CHANGES ON AOS DRAWING 0097, "DOT-SP 14772, DETAILS-OVERPACK PALLET – SHIP/TRANS. CASK," REVISION 0.

ZONE A3 & 4: Added the following notes:

NOTE 3: LOW TONE INK IMAGERIES DO NOT APPLY. THEY ARE PRESENT TO PRESERVE DRAWING ORIGINALITY.

NOTE 4: REPAIR OF HOLES ON SHEATHING & PALLET PANEL IS ALLOWED AS LONG AS THE TOTAL AREA OF HOLES DOES NOT EXCEED 0.01 % OF TOTAL AREA OF THE PANEL.

NOTE 5: PALLET PANEL MAY CONTAIN UP TO 14 REPAIRED PATCHES. SEE SEC. F-F FOR SHEATHING REPAIRED PATCH AND SEC. G-G FOR PALLET PANEL.

NOTE 6: Φ 3/8 THRU HOLE MAY BE PRESENT FOR DRAINAGE MAX. OF 25 HOLES.

Added the following notation: "HOLES MAY BE PRESENT ALL AROUND."

ZONE B1: Added to notation "1/8" x 36 1/2" x 48..." the following"

"SEE NOTES 1, 4, 5 & 6."

Added to notation "6 LAYERS OF 3/4" EXTERIOR...-FORMALDEHYDE..." the following: "-FORMALDEHYDE OR WEST SYSTEM SIX10 EPOXY ADHESIVE- TYP. 6 SIDES."

ZONE B4: Changed the weld callout to a welding symbol.

Added the following notation to identify the bolt size used to attach the Cask Attachment to the Pallet: "BOLT HOLE FOR 3/4-10 X 6" LG. BOLT. TYP."

ZONE C1: Added holes for 3/4" bolts to the vertical side of the base angle and Section E-E to provide a typical cross section across the hole.

Changed angle notation to provide range of 7" thru 10 1/2" in length for the reinforcement angle component.

ZONE C2: Added Section F-F, the repaired patch notation and the size of the patch disk.

Added **NOTE 2:** "SMALL HOLES \leq 1/4" IF PRESENT MAY BE FILLED BY WELDING."

Repositioned the 2" x 2" redwood crush strip.

Showed a leading chamfer on the redwood crush strips.

ZONE C4: Provided alternative dimensions at VIEW AT DD.

Added under FINISH, WOOD – "ONE COAT FIBERGLAS RESIN ON THE PALLET WOOD."

ZONE D1: Added SECTION E-E and SECTION F-F.

ZONE D2: Deleted the use of the TOOL BOX.

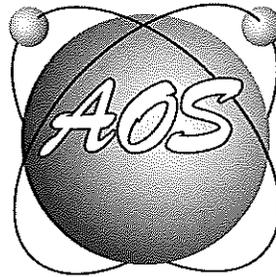
ZONE D3: Added SECTION G-G.

ZONE D4: Added a reinforcement plate, as an OPTION. Plate was used to reinforce the Overpack sheathing to support the TOOL BOX.

ATTACHMENT C

AOS PR9100, OPERATING PROCEDURE, REVISION E

Alpha-Omega Services, Inc.



PR9100

AOS Model 5979 Container Operating Procedures

AOS Model 5979 Container Operating Procedures

1.0 PURPOSE

- 1.1 This procedure provides instructions for operating the Alpha-Omega Services (AOS) 5979 Package for the transportation of Cobalt-60 sealed sources shown to be special form, in accordance with Department of Transportation (DOT) Special Permit No. 14772 [Ref. 7.1].
- 1.2 "Package" or "transport package" refers to the entire shipping container including cask, casket, overpack, pallet and its radioactive material content.
- 1.3 Procedure addresses package receipt on-site, preparation of the cask for loading/unloading, inserting/removing radioactive material into the cask, and preparation of the cask and package for off-site shipment.
- 1.4 Section 5.0, Procedure Sections, has been divided into the following sub-sections:
 - 5.1 Moving the 5979
 - 5.2 Removing the Overpack
 - 5.3 Removing the Cask from the Pallet
 - 5.4 Loading/Unloading the Cask
 - 5.5 Assembling the 5979
 - 5.6 Performing the Pre-shipment Inspection
 - 5.7 Preparing the 5979 for Shipment

1.5 Table of Procedure Participants.

NOTE: All activities under this procedure are subject to 10CFR21 [Ref. 7.2] regulation.

	Name	Initial	Date
1			
2			
3			
4			
5			
6			
7			
8			

2.0 TOOLS AND EQUIPMENT

NOTES: The tools and equipment listed below are recommended for use in the performance of this procedure and may be substituted with equivalent items with the approval of the Field Engineer or Job Supervisor.

Calibrated test equipment accuracy shall be equal to or greater than accuracy specified.

2.1 Tools

2.1.1 Set of socket, closed and/or open wrenches for bolt sizes $\frac{1}{2}$ - $\frac{3}{4}$.

2.1.2 Miscellaneous wrenches like screwdrivers, flat and Phillips, Allen set, etc.

2.2 Rigging equipment

2.2.1 Use slings, shackles, eye bolts, etc suitable to handling the following weights:

Table 1 – AOS 5979 Handling Information			
Description	Maximum gross mass	Size (Nominal)	Comments
5979 Package.	5400 lbs.	A box, 37 ½" x 49 5/16" x 43 ½" height envelop.	Lift by fork truck only. Lifting lugs on overpack are not to lift the Package. See Reference [7.3].
5979 Overpack	1250 lbs.	A box, 37 ½" x 49 5/16" x 50" height envelop	Lift by lifting points on upper sides of overpack. There are 2 or 4 lifting lugs on the AOS I and AOS IIIA overpack, respectively. See Reference [7.4].
5979 Container/Transfer Cask	3500 lbs.	A cylindrical structure encased in rectangular box; 24" x 28 5/16" x 30 ¼" envelop.	Lift by the 2 lifting lugs. See Reference [7.5].
5979 Container/Transfer Cask End Cap	220 lbs.	A 12 3/4" diameter cylinder, 4 ¼" thick with a 15 ½" diameter flange at one end, ¼" thick.	Lift by its lifting lug. See Reference [7.6].
5979 Turret End Plug	60 lbs.	A 4 5/8" diameter cylinder, 7" height.	Requires the installation of a 3/8"-16 eye bolt on the front face. See Reference [7.6].
5979 Pallet	420 lbs.	Rectangular plate with 4" x 6" tubing as skids; 41 ½" x 53 5/16" foot print	Lift by fork truck or by slings. See Reference [7.4].

2.3 Consumables

2.3.1 End Cap Gasket; 1/16" thick, Vellumoid sheet packaging. See Note 4, Reference [7.3].

2.4 Bolting.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 The radioactive contents shall be shown to be special form;

- 3.2 This packaging is subjected to the preloading checks specified in this procedure;
- 3.3 This packaging is loaded and shipped in accordance with this procedure;
- 3.4 This packaging is subjected to maintenance as specified in AOS PR9101, latest revision, [Ref.7.7].
- 3.5 Do not attempt to lift the Package or Packaging by the lifting lugs on the Overpack component. Also, do not uses these lugs as tie-down devices.
- 3.6 This procedure only applies for dry loading operation of the cask.
- 3.7 **No modification, repair or component replacement to the 5979 Package or its components can be made without authorization from AOS.**
- 3.8 Responsibility

3.8.1 A Registered user must have in its possession a copy of following documentation, before operating the Package:

	Document	Revision	Oper	Verif.
1	DOT-SP 14772 Permit & Authorization Letter			
2	AOS Drawing 0094			
3	AOS Drawing 0095			
4	AOS Drawing 0096			
5	AOS Drawing 0097			
6	AOS Procedure PM9100			
7	AOS Procedure PM9101			
8	Model 5979 Maintenance Inspection Checklist			

- 3.8.2 AOS must retain all record pertaining to demonstrate compliance and Quality Assurance for the use of this package for at least three (3) years from the last shipment under the Competent Authority Certificate of this package.
- 3.8.3 Shipments or operations conducted under this special permit are subject to the Hazardous Materials Incident Reporting requirements specified in 49 CFR §§ 171.15 B Immediate notice of certain hazardous materials incidents, and 171.16 B Detailed hazardous materials incident reports. In addition, the grantee(s) of this special permit must notify the Associate Administrator for Hazardous Materials Safety, in writing, of any incident involving a package, shipment or operation conducted under terms of this special permit.

3.9 General requirements

3.9.1 Ensure that HAZMAT training is current for all employees involved in Package operations under the Special Permit, including Function-specific training.

3.9.2 Assure that the Annual required maintenance per PM9101, Reference [7.7] has been performed before the first Special Permit shipment and every twelve (12) months thereafter.

3.9.3 Shipment must be by truck as "exclusive" use shipment. For quantities greater than Type A (11 Ci) the shipment must be subject to continuous and active monitoring.

4.0 PRE-SHIPMENT EVALUATION

4.1 This section is based on the applicable requirements given in 49CFR173.475, [Ref. 7.8]. COMPLETE this section prior to conveying the package for transportation.

ACTION	AUTHORIZATION / CRITERIA		
Content: Isotope, _____ Form, _____ Mass, _____ Activity, _____ Decay Heat, _____	Co-60 Special form 7,000 Ci 110 watts	Ir-192 Special form NONE	Cs-137 Special form NONE
Physical Condition, Package: Satisfactory, YES NO	Complete sub-section 5.6 of this Procedure.		
Closure Device Condition, Installation and Secured: Satisfactory, YES NO	Complete sub-section 5.7 of this Procedure.		
Packaging Preparation for Shipment: Satisfactory, YES NO	Complete sub-section 5.7 of this Procedure.		
Internal Pressure: Satisfactory, YES NO	Verify payload activity is $\leq 7,000$ Ci. See Appendix A for pressure calculation for 7,000 Ci payloads. Decay Heat = Activity, Ci / 64.88 = _____ watts.		

External Radiation:	
@ contact:	≤ 2 mSv/h (200 mrem/h) @ ant point on external surface of the package.
Open/Closed	≤ 10 mSv/h (1000 mrem/h) in closed transport vehicle.
@ 2 m(80 in):	≤ 0.1 mSv/h (10 mrem/h) @ any point 2 m (80 in) from external surface.
@ truck cabin:	≤ 0.02 mSv/h (2mrem/h) in any normally occupied space.
	Above values obtained from 10CFR71.47 [Ref. 7.9]

5.0 PROCEDURE

NOTE: Steps within this section may be performed in parallel or out of sequence at the discretion of Field Engineer.

5.1 Moving the 5979.

5.1.1 MOVE the 5979 only by a forklift or crane.

5.1.2 PERFORM wipe survey of overpack.

5.1.3 VERIFY that the overpack is bolted down to the pallet before moving it.
All bolts shall be installed.

5.1.4 ENSURE that the lifting clevises on the overpack are not used for lifting the assembled package.

5.1.4.1 VERIFY that the lifting clevises are covered, to prevent their use for lifting.

5.1.4.2 USE clevis only for moving the Overpack along.

5.1.5 RECORD completion of sub-section. Opr: _____ Ver: _____

5.2 .Removing the Overpack.

5.2.1 PLACE package in an area free of radioactive contamination.

5.2.2 REMOVE security seal(s), if present and anti-tie-down devices from lifting clevises.

5.2.3 REMOVE all bolts (38 or 40) from overpack/pallet joint.

5.2.4 ATTACH shackles/slings to lifting clevises and fork truck or crane. (1,250 lbs max.)

5.2.5 LIFT overpack from pallet.

5.2.6 MONITOR radiation dose rate with an appropriate instrument as the overpack is raised.

- 5.2.7** OBSERVE whether any of the wood panels from the overpack interior slide down. If this occurs, PERFORM the following steps:
- 5.2.7.1** Partially LIFT overpack, just enough to allow the installation of the cinching straps.
 - 5.2.7.2** INSTALL four (4) cinching straps around the overpack (2) located one at each end, and (2) located one at each side to secure the wood panel inside the overpack while removing the overpack from the pallet. The straps shall be tightened with the ratchet until taut – without damaging the panels or overpack.

NOTE: It might be necessary to pry up some of the wood panels, to allow installation of the cinching straps.

- 5.2.8** REMOVE overpack and STORE it on a safe place.
- 5.2.9** MONITOR radiation dose rate and/or contamination with an appropriate instrument.
- 5.2.10** RECORD monitoring results.

NOTE: Monitoring at AOS facility record results on the FM9009, Ref. [7.11].

- 5.2.11** NOTIFY Field Engineer or Job Supervisor of any unusual readings.

- 5.2.12** RECORD completion of sub-section. Opr: _____ Ver: _____

5.3 Removing the Cask from the Pallet.

- 5.3.1** PERFORM a wipe survey the cask.
- 5.3.2** REMOVE tie-down bolts (6) Container to Pallet.
- 5.3.3** ATTACH shackles/slings to lifting clevises and fork truck or crane. (3,500 lbs max.).
- 5.3.4** REMOVE cask from the pallet.
- 5.3.5** TRANSFER cask to the loading/unloading area.
- 5.3.6** RECORD completion of sub-sections. Opr: _____ Ver: _____

5.4 Loading/Unloading the Cask.

- 5.4.1** POSITION cask to be loaded or unloaded.
- 5.4.2** REMOVE bolts (6) from front end cap.
- 5.4.3** REMOVE end cap using a steel bar or proper handling device.

5.4.4 INSTALL 3/8-16 eye bolt on the turret plug.

5.4.5 REMOVE turret plug.

5.4.6 INSTALL/REMOVE radioactive content.

5.4.7 REVERSE steps 5.4.5 thru 5.4.2.

5.4.8 TRANSFER cask to assembly area.

5.4.9 RECORD completion of sub-section. Opr: _____ Verf: _____

5.5 Assembling the 5979 Package.

5.5.1 ASSEMBLY packaging by reversing steps in Sub-sections 5.3 and 5.2

5.5.2 RECORD completion of sub-section. Opr: _____ Verf: _____

5.6 Performing Pre-shipment Inspection.

5.6.1 PERFORM Pre-shipment inspection as follow:

5.6.1.1 INSPECT metal surfaces for indication of damage like punctures, holes, or other surfaces defects.

5.6.1.2 INSPECT bolts and mating threads for deformed or stripped threads, cracked or deformed hexes on bolt heads elongated or scored grip length area, and severe rusting or corrosion pitting.

5.6.1.3 INSPECT that the nameplate information is legible, not covered or otherwise obliterated, and securely attached.

5.6.1.4 RECORD any findings below and NOTIFY Field Engineer or Job Supervisor.

NOTE: Inspection at AOS facility must record finding on FM9101, Ref. [7.12].

Opr: _____ Verf: _____

5.6.2 SURVEY the Model 5979 using a survey meter.

5.6.3 RECORD data on the FM9009, Ref. [7.9].

NOTE: Radiation limit limitations are given in Ref. [7.12].

5.6.4 RECORD completion of sub-section. Opr: _____ Verf: _____

5.7 Preparing the 5979 for shipping.

5.7.1 INCLUDE the following information on shipping documents:

Hazardous Materials Description			
For Non Fissile or Fissile-Excepted Radioactive Material			
Proper Shipping Name	Hazard Class/ Division	Identification Number	Packing Group
Radioactive material, transported under special arrangement, non fissile or fissile-excepted	7	UN2919	N/A

5.7.2 INCLUDE in Shipment documents the notation "DOT-SP 14772" close to the shipment description.

5.7.3 PROVIDE to the truck driver a copy of the DOT Special Permit and of the Authorization letter.

5.7.4 VERIFY that the outer surface of the package is marked with "DOT-SP 14772," at a visible location. Marking shall be durably painted.

5.7.5 AFFIX Security Seals.

5.7.6 VERIFY all labels are properly filled out.

5.7.7 VERIFY that the lifting clevis of the overpack is covered.

5.7.8 RECORD completion of sub-section. Opr: _____ Verf: _____

6.0 RETURN TO NORMAL

6.1 ENSURE the following:

6.1.1 All tools AND equipment are returned to designated storage location AND work area is clean.

6.1.2 Name AND initials of each person who initialed procedure steps are entered on Table of Initials, sub-section 1.7 of this procedure.

6.1.3 Procedure is complete AND attached to Job Binder.
Field Engineer _____

7.0 REFERENCE

- 7.1** U.S. Department of Transport (DOT) Special Permit No. 14772 for a Type B, AOS Package, USA/5979/B(), Revision latest.
- 7.2** Title 10, Code of Federal Regulations, Part 21 (10CFR21), "Reporting of Defects and Noncompliance," Revision latest.
- 7.3** AOS Drawing 0094, Revision 0, "DOT-SP 14772, "GENERAL ARRANGEMENT – CONTAINER."
- 7.4** AOS Drawing 0097, Revision 0, "DOT-SP 14772, "DETAILS – OVERPACK PALLET – SHIP/TRANS. CASK."
- 7.5** AOS Drawing 0095, Revision 0, "DOT-SP 14772, "CONTAINER/TRANSFER CASK, DETAILS."
- 7.6** AOS Drawing 0096, Revision 0, "DOT-SP 14772, "DETAILS – INSERTS (TURRET) & END CAPS – CONTAIN/TRAS."
- 7.7** AOS Procedure PR9101, Revision C, "AOS Model 5979 Maintenance Inspection Procedure."
- 7.8** Title 49, Code of Federal Regulations, Part 173, Paragraph 475 (49CFR173.475), "Quality control requirements prior to each shipment of Class 7 (radioactive) materials," Revision latest.
- 7.9** 10CFR71.47, "External radiation standards for all packages." Revision latest.
- 7.10** AOS Form FM9009, "Container Survey."
- 7.11** AOS Form FM9101, "Model 5979 Maintenance Inspection Checklist."
- 7.12** 49CFR173.441, "Radiation level limitations and exclusive use provision," Revision latest.

8.0 APPENDICES**8.1 Appendix A – Cavity Pressure Calculation**

This calculation assumes that 90% of the cavity volume is occupied by the content, therefore only 10% of the volume is occupied by air, that the Ideal Gas Law applies, and that the temperature in the cavity after loading is 250 °F. Direct temperature reading of the loaded cavity has shown a temperature of 230 °F.

$$V_{\text{CAVITY}} = \pi r^2 \times h, \text{ where } r = 1.75 \text{ in and } h = 6 \text{ in};$$

$$V_{\text{CAVITY}} = \pi(1.75)^2 \times 6 = 57.73 \text{ in}^3 \quad \Delta \quad V_{\text{AIR}} = 5.77 \text{ in}^3;$$

$$P_{\text{initial}} = 15 \text{ psia}; \quad T_{\text{initial}} = 78 \text{ }^\circ\text{F} \text{ and } T_{\text{final}} = 250 \text{ }^\circ\text{F}$$

$$P_{\text{final}} = P_{\text{initial}} \times (T_{\text{final}} / T_{\text{initial}})$$

$$P_{\text{final}} = 15 \text{ psia} \times \{(250 + 460) / (78 + 460)\}$$

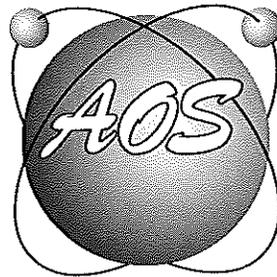
$$P_{\text{final}} = 20 \text{ psia} = \underline{5.5 \text{ psig}}$$

This change of 5.5 psig is not conducive to damage the cask.

ATTACHMENT D

AOS PR9100, MAINTENANCE INSPECTION PROCEDURE, REVISION C

Alpha-Omega Services, Inc.



PR9101

AOS Model 5979 Maintenance Inspection Procedure

AOS Model 5979 Maintenance Inspection Procedure

1.0 SCOPE

This document outlines the procedures to provide the required maintenance to the Alpha-Omega Services, Inc. Model 5979 Package under DOT Special Permit No. 14772.

2.0 INSPECTION PROCEDURE

2.1 Type of Inspection

- 2.1.1** Pre-shipment or Routine inspection shall be performed before each shipment regardless is the cask is full or empty.
- 2.1.2** Annual or Periodical inspection is performed before the first shipment of the package under the Special Permit and or every twelve (12) months thereafter.

2.2 Pre-shipment Inspection

- 2.2.1** INSPECT all metal surfaces of the Overpack, Cask, and Pallet for indication of damage like punctures, holes, crack on welds or other surfaces defects.
- 2.2.2** INSPECT bolts and mating threads for deformed or stripped threads, cracked or deformed hexes on bolt heads elongated or scored grip length area, and severe rusting or corrosion pitting.
- 2.2.3** INSPECT that the nameplate information is legible, not covered or otherwise obliterated, and securely attached.
- 2.2.4** RECORD any findings on FM9101, "AOS Model 5979 Maintenance Inspection Checksheet."
NOTE: Damage nuts and bolts are to be replaced
- 2.2.5** NOTIFY QA of any finding.

2.3 Annual inspection

2.3.1 PERFORM the Pre-shipment inspection as above.

2.3.2 INSPECT all bolts and nuts with Go/No Go gauges.

NOTE: Nonconformance nuts and bolts are to be replaced.

2.3.3 REMOVE End Cap seal.

2.3.4 CLEAN sealing surface to accept a new seal.

2.3.5 INSTALL End Cap seal.

2.3.6 REMOVE all old labels.

2.3.7 PAINT painted surfaces if needed.

2.3.8 MARK the outer surface of the Overpack with **DOT-SP 14772** at a visible location. If the Overpack is already marked, VERIFY that is still visible and PAINT it, if needed.

2.3.9 RECORD any findings on FM9101, "AOS Model 5979 Maintenance Inspection Checksheet."

2.3.10 NOTIFY QA of any finding.

3.0 Reporting to Users the Completion of the Annual Inspection

NOTE: This Sub-section is to be completed by the QA organization.

3.1 DOCUMENT in a letter that the Annual Inspection has been completed.

3.2 ATTACH letter to the Package's Documentation.