TEST

DOCUMENT

#3

71-9234

May 15, 1997

Mr. Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office, NMSS
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852

RE: Request for Amendment of Certificate of Compliance No. USA/9234/B(U)F
Docket No. 71-9234

Dear Mr. Chappell,

This letter is written to request an amendment to the Certificate of Compliance No. USA/9234/B(U)F to authorize shipment of Model No. NCI-21PF-1 packages. We request that the certificate be amended to allow the aluminum components of the valve protection device to be fabricated using an alternate material, specifically ASTM B26 Alloy 356 T6 Aluminum Alloy with a specified minimum elongation of 5%. Enclosure 1 provides a technical analysis which forms the basis of this request.

Valve protection devices, fabricated from ASTM B26 modified Alloy 514 Aluminum, were successfully tested and showed that the NCI-21PF-1 package meets the requirements of 10 CFR Part 71. The current certificate requires that the valve protection devices fabricated from this modified alloy 514 be used after May 31, 1997. To meet this requirement, an extensive procurement effort to select potential fabricators was initiated in December 1996. All but one of the potential fabricators contacted responded that the modified alloy 514 was not available. The only manufacture able or willing to supply the modified alloy refused to do so without contractual clauses that are unreasonable. Enclosure 2 describes the background of this procurement effort.

On the basis of discussions with fabricators, reviews of alternative materials were performed. ASTM B26 alloy 356 T6 was selected and was included as an alternative material in Revision 1 of the drawings provided in the February 1997 submittal of the Safety Analysis Report. A comparison of the mechanical and thermal properties of both the modified alloy 514 and the alloy 356 T6 are provided in Enclosure 1.

220063 MU3091020S

125 Iodent Way • Elizabethton, TN 37643 • 800-221-2465 • (423) 543-4211 • Fax (423) 543-6007 • Email: info@ecopak.com

Alloy 356 T6 has a higher tensile and yield strength over the modified alloy 514. The thermal properties of alloy 514 and alloy 356 T6 are similar. The minimum elongation properties vary between the two alloys. ASTM B26 lists a minimum elongation of 3% for alloy 356 T6. Discussions with fabricators have led to a guarantee of a minimum elongation of 5% for the alloy 356 T6, which is a more conservative specification than that of ASTM B26.

Therefore, given the inability to procure the alloy 514 meeting the specifications and the fact that the alloy 356 T6, with characteristics specified in the Safety Analysis Report, is equivalent or superior to the alloy 514, use of the alloy 356 T6 is appropriate.

Very truly yours,

William M. Arnold

William M. Arnold
President

WMA/hl

Enclosures (2)

Enclosure 2 - Background of Procurement Effort

In attempts to procure the aluminum components of the valve protection device (VPD), USEC researched lists of potential vendors, e.g., the Buyers Guide published by the American Nuclear Society and the lists of companies with NRC-approved QA plans published in NUREG 0383, Rev. 3. USEC also used informal networks of colleagues in the nuclear industry to identify foundries from their approved vendor lists. After numerous telephone contacts were made, the list was narrowed to ten companies. USEC then sent formal letters to these companies, asking for bids based on the VPD drawings with specifications for the enhanced alloy 514 aluminum used in the prototype. All but two of the companies chose not to submit a bid.

One foundry, the manufacturer of the protoype aluminum components, did submit a bid but refused to agree to a contract without a statement that the foundry would be exempt from any liability to USEC, its contractors or customers, arising from the aluminum components, occurring after delivery of the components, regardless of any negligence on the part of the foundry. USEC could not accept such a clause because it implied indemnification and obligations prohibited by the Anti-Deficiency Act. Instead of securing nuclear liability insurance, the foundry also wanted USEC to provide assurances about nuclear protection that USEC was unable to give. After several weeks of negotiating, USEC was unable to overcome this barrier and, therefore, terminated discussions with this company.

The other foundry submitting a bid recommended using the alloy 356 T6 instead of the 514 alloy because it provides casting with properties in excess of the properties that are possible with alloy 514. This recommendation was reinforced by statements from foundries in Sweden and the United Kingdom, indicating that the alloy 356 T6 was preferable to the 514 alloy.

Therefore, given the inability to procure the alloy 514 meeting the specifications and the fact that the alloy 356 T6, with characteristics specified in the Safety Analysis Report, is equivalent or superior to the alloy 514, the purchase of the alloy 356 T6 is appropriate.

Conclusion

A valve protection device fabricated using "modified" Alloy 356 T6 is an acceptable alternative to the "modified" Alloy 514 aluminum.

Enclosure 1 - Comparison of Aluminum Alloys

Comparison of Properties

A comparison of the mechanical and thermal properties of both "modified" Alloy 514 and Alloy 356 T6 are provided in the following table.

Mechanical and Thermal Properties of Valve Protection Device Aluminum Alloys

Item	Prototype Test	Production
ASTM Alloy	B26, "Modified" Alloy 514[2]	B26, "Modified" Alloy 356 T6[1]
Mechanical Properties (at 75°F, minimum values)		
Tensile Strength(ksi)	25.0	30.0
Yield Strength (ksi)	20.0	20.0
Elongation (%)	4	5[3]
Thermal Properties (typical, not minimum)		
Specific Heat (Btu/lb °F at 212°F)	0.230	0.230
Thermal Conductivity (Btu/ft h °F at 77°F)	84.6	92

Table Notes:

1. Minimum mechanical property values are specified in ASTM B26/26M - 96 "Standard Specification for Aluminum Alloy Sand Castings." Thermal properties are from Metals Handbook - Tenth Edition, Volume 2: Properties and Selection: Nonferrous Alloys and Special Purpose Materials, 1990, ASM International.
2. Minimum mechanical property values are specified in NCI letter to NRC dated November 19,1996. Subject: "Request for Amendment to Certificate of Compliance No. USA/9234/B(U)F." Thermal properties are from Metals Handbook - Tenth Edition, Volume 2: Properties and Selection: Nonferrous Alloys and Special Purpose Materials, 1990, ASM International.
3. "Safety Analysis Report for the NCI-21PF-1 Protective Shipping Package," Revision 2, dated March 1997, the minimum elongation requirement for Alloy 356 T6 is greater than that specified in ASTM B26/26M.

Mechanical Properties

As shown in the table above, the "modified" Alloy 356 T6 has a higher tensile and yield strength over the "modified" Alloy 514. The drop testing of the valve protection device was conducted at low temperatures.

The table provided below shows that the mechanical properties of Alloy 356 T6 does not change between 75°F and -18°F. Low temperature data for Alloy 514 was not available. However, a comparison of the mechanical properties of other cast aluminum alloys shows that the mechanical properties typically do not change substantially between 75°F and -18°F. This comparison is provided in the table below.

The data provided below is taken from the Metals Handbook - Tenth Edition, Volume 2, Properties and Selection: Nonferrous Alloys and Special-Purpose Materials, ASM International, 1990.

Aluminum Alloy	S_U at 75°F	S_U at -18°F	S_Y at 75°F	S_Y at -18°F	% elong at 75°F	% elong at -18°F
356.0-T6	38	39	27	27	5	5
242.0-T77	30	32	23	23	2	2
336.0-T551	36	38	28	31	0.5	1
354.0-T61	55	58	41	42	6	5
355.0-T71	36	38	31	33	3	2.5
355.0-T51	30	31	24	24	2	1.5
356.0-T7	32	34	24	25	6	6
A357.0-T62	52	54	42	44	8	6
380.0	48	49	24	24	3	3
413.0	43	44	21	21	2.5	2

Elongation Properties

The worst deformation to the valve protection device occurred from the 13.5° from vertical drop testing of the NCI-21PF-1 package. The valve protective device "bridge" height permanently deformed by 0.146 inches toward the 30B cylinder valve. (Reported in Section 2.7, SAR, Rev 2.)

The valve protection device "bridge" varies in thickness. Its thinnest portion is 0.375 inches for a span of approximately 1.5 inches. Based on this worst case deformation, the "modified" Alloy 514 valve protection device sustained a maximum 2% plastic strain. Therefore, Alloy 356 T6 with a specified minimum elongation of 5% has sufficient ductility to survive the worst case drop test with a factor of safety of 2.5.

Thermal Properties

The thermal performance of the 30B cylinder is unaffected by changing the material of the valve protection device from Alloy 514 to Alloy 356 T6. There are several reasons this change in material is unimportant in a thermal sense. They are:

1. The specific heat of the two grades of aluminum is identical. The valve protection device will absorb the same amount of energy during the hypothetical accident condition regardless of which material its is fabricated from.

2. The thermal "mass" of the valve protection device is negligible compared to the thermal "mass" of the 30B cylinder, the UF_6, and the overpack. The valve protection device is not expected to have a significant impact on the ability of the 30B cylinder to withstand the hypothetical thermal accident condition.

3. The thermal conductivities of the materials are very similar.