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71-6553
71-4909

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JAMES H. MILLER
VICE PRESIDENT, PRODUCTION

April 14, 1997

SERIAL: GDP 97-0065

Mr. Cass R. Chappell
Section Leader, Cask Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

United States Enrichment Corporation (USEC) - Paducah Gaseous Diffusion Plant - Docket No. 71-6553 - Request for Amendment to Certificate of Compliance # 6553, Rev. 11, and Other Affected Certificates

Dear Mr. Chappell:

This letter requests an amendment to Certificate of Compliance (CoC) No. 6553, Rev. 11, to allow the use of alternate tinning material, as described in the enclosure to this submittal, in addition to that specified in ANSI N14.1-1990 (Condition 6 in the CoC). Specifically, USEC requests that the CoC be amended to allow the use of UF_6 cylinder valves and plugs that are tinned with either solder alloys: ASTM B32, Sn50; ASTM B32, 50A; or a mixture of alloys Sn50 or 50A with alloy ASTM B32, 40A with a lower limit of 46% tin in the mix. Additionally, USEC requests that similar amendments be made to other affected CoCs (i.e., #9196, #9234, and #4909) that are not owned by USEC. These changes will allow us to return our UF_6 cylinders to service and resume shipping of product. We stopped shipping the affected cylinders when we discovered that the tinning process used does not meet the literal requirements of the ANSI standard, and, that a conflict exists within the standard as to which soldering alloy to use.

NTD 1/1

The UF_6 cylinder valves and plugs are required by ANSI N14.1-1990 to have the threads mate to the couplings on the UF_6 cylinders coated with a tinning solder. The purpose of this tinning is to lubricate and seal the threads. ANSI N14.1-1990 specifies that the tinning be done with ASTM B32, 50A solder. We recently discovered that our procurement specification requires that the tinning be done with ASTM B32, Sn50, and that our maintenance procedure requires a mixture of two parts ASTM B32, 50A (50/50 solder) to one part ASTM B32, 40A (40/60 solder). Therefore, many of our UF_6 cylinder valves and plugs have been lubricated with material that does not meet the verbatim ANSI N14.1-1990 requirements.

We also discovered that the 50A alloy is not listed in the ASTM B32-1983 standard. The 50A alloy was listed in B32-1976, the edition prior to 1983. This means that since ANSI N14.1-1990 specifies both ASTM B32-1983 and the 50A solder, it is not possible to comply with ANSI N14.1-1990.

We have performed an engineering evaluation on the impact of using different solders in our tinning process. We concluded that the present condition has no effect on the ability of the cylinder valve or plug to perform their safety function or on the ability of the packages to meet the requirements of 10CFR71. The basis for this conclusion is enclosed.

Based on the enclosed information and the conclusion that the use of alternate solders has no effect on the safety of the cylinder valve and plugs, USEC requests that the above listed CoCs be amended to allow the use of ASTM B32 alloys, as described in the enclosure, that differ from those required by ANSI N14.1-1990. There are no new commitments contained in this submittal. If you have any questions regarding this submittal, please call Beth Darrough at (301) 564-3422 or Russ Wells at (301) 564-3245.

Sincerely,

James H. Miller
Vice-President, Production

Enclosure: Engineering Evaluation of Solder Material

cc: NRC Region III Office
NRC Resident Inspector - PGDP

ENCLOSURE
ENGINEERING EVALUATION OF SOLDER MATERIAL

USEC performed equivalency evaluations comparing solder material specified in ASTM B32-1983 and B32-1976. B32-76 lists alloy grade 50A. B32-83 lists alloy grade Sn50 but no 50A. B32-83 combines two alloys listed in B32-76 (50A and 50B) into one alloy, Sn50. The material composition for both alloys is the same with the exception of antimony and other trace elements with values less than .025%. The antimony concentrations listed for Sn50 bound the percentage range of antimony from B32-76 for 50A and 50B. The Sn50 alloy allows .50% antimony while the 50A alloy only allows .12% antimony. The Sn50 alloy allows .001 cadmium while the 50A does not list cadmium at all. Therefore, the difference between ASTM B32 50A and ASTM B32 Sn50 is insignificant. There are only minor differences between the two alloys and they are basically equivalent.

The solder manufacturer was contacted and they stated that antimony in the levels allowed by either specification does not effect the properties of the alloy. Since the listing for the elements allowed in ASTM B32 Sn50 are listed as maximum percentages, it would be possible for ASTM B32 50A to be certified as ASTM B32 Sn50 and for low ranges of ASTM B32 Sn50 to be certified to ASTM B32 50A.

USEC also performed an additional material equivalency evaluation (i.e., the combination of two parts Sn50 and one part Sn40A, which is the same as 40A). This combination is referred to as the "mix" hereafter.

Between the ASTM B32 Sn50 and ASTM B32 40A , besides the tin and lead content, the Sn50 is allowed to have .005 % more arsenic than the 40A. The only appreciable difference in the chemical composition of the mix is the quantity of tin. The mix has a tin range of 46.2 to 48.2%. Sn50 has a range of 49.5 to 51.5%. The maximum difference is only 5.3% between the low end of the mix and the highest value of Sn50. In our evaluation we considered the difference to be 5.5% to set a lower limit of 46% tin.

ASTM B32-83 states in section A1.1.8 that alloy Sn40A "can be used for the same purposes as alloy Sn50, but it is not as workable in bit soldering or sweating." Workability for bit soldering and sweating is not an issue for a tinning operation.

Both Sn40A and Sn50 alloys have a solidus of 361°F, which is the highest temperature at which the material is completely solid, therefore the mix also has this solidus. The high temperature rating for UF_6 cylinder valves is 250°F, which is less that the solidus temperature. Therefore, the tinning alloys used are not the limiting factor for potential UF_6 releases due to high temperatures. Since the material composition for the mix can be within 5.3% of Sn50, low temperature performance is also judged to be unaffected.

Based on the above discussion, use of a mix of ASTM B32 alloys with nominal tin content from 40% to 50% to produce a mix with a tin range of between 46% to 51.5% (e.g., a mix of two parts B32 Sn50 (or 50A) and one part B32 Sn40A) is an acceptable practice and equivalent in service to use of only Sn50 or 50A for tinning operations of UF_6 cylinders and plugs.

Cylinder valves and plugs are installed according to a range of torque values stated in ANSI N14.1-1990. The intent of the torque specified is to assure a tight pressure resistant connection. The solder provides a thread lubricant and sealing method to prevent leakage of UF_6 along the thread spiral. The threads are tinned until they are approximately half full of solder. Small variations in the amount of solder will alter the torque required for installation. Therefore, thread engagement along with torque values are used to gauge proper installation. The valve insertion depths must meet acceptance criteria in ANSI N14.1 and are assured by inspections. Each cylinder is pressure tested after the valve and plug are installed. This test verifies that the installation torque and tinning alloy used are accomplishing the intended purpose of preventing leakage of UF_6 to the environment and/or in-leakage of water into the cylinder.

This tinning process has had no effect on the ability of the cylinder valves or plugs to perform their safety function, which is to prevent the leakage of UF_6 to the atmosphere and to prevent moisture or other foreign material from entering the cylinder. The tinning provides thread lubricant and sealant. Historical documents show that we have had valves and plugs tinned with various mixtures of solder, all very closely related. There is no record of this having a detrimental effect on the ability of the valve or the plug to tightly seal the cylinder. Every new cylinder is leak tested after valve and plug installation. Our documentation demonstrates that the combinations of solder perform well and meet their intended purpose.