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Your ref: Docket No. 71-9297
Our ref: LTR-LCPT-17-07

May 17, 2017

Subject: Amendment Request Application – SAR Rev 13 Change Pages - USA/9297/AF-96 for Model No. Traveller STD, XL, and VVER Packages

References: (1) LTR-LCPT-17-03 Rev. 1, Amendment Request Application USA/9297/AF-96 for Model No. Traveller STD, XL, and VVER Packages (Revision to enclosures), dated 20 March 2017

Dear Director,
As amendment to the application request submitted under Reference 1, the following enclosed are change pages to Revision 13 of the Safety Analysis Report (SAR):

- Page x: List of Effective Pages, revised page 3-4A revision number and date
- pages 2-245 and 2-246: Section 2.12.9, revised text to clarify table conclusions
- page 3-4A: Section 3.2.2, corrected ASTM “A240”
- page 8-4: Table 8-3, part name correction

The SAR Rev 13 change pages correct editorial errors and add clarifications; there is no revision to technical data or results. The packaging design has been neither changed nor been modified because of this amendment request.

<u>Request</u>
As discussed with the NRC Project Manager, Westinghouse requests Certificate of Compliance (CoC) revisions 7, 8, and 9 expirations be extended one year beyond the date of issuance of the new certificate. CoC Rev. 7 was the consolidated 5-year renewal, and is the basis for DOT CAC Rev. 5, and the Competent Authority approval for majority of international validations. CoC Rev. 8 and Rev. 9 were the Traveller VVER design approval and correction, and are the basis for DOT CAC Rev. 6 and Rev. 7, respectively, and the Competent Authority approval for required international validations of the Traveller VVER design. With an extended expiration for CoC Rev. 7, Rev. 8, and Rev. 9, we will align all international validations to a new single certificate, and are providing international Competent Authorities one year for review and approval of new validation requests. All original requests documented in Reference 1 are maintained.

Westinghouse has a quality assurance program, approved by the Commission that satisfies the provisions of Subpart H (Quality Assurance) of Part 71. Further, Westinghouse complies with the terms and conditions of the applicable requirements of Subparts A (General Provisions), G (Operating Controls and Procedures), and H (Quality Assurance) of Part 71.

One copy of the amendment application is submitted electronically via NRC Electronic Information Exchange (EIE) system and emailed to the Project Manager, Pierre Saverot. Additional electronic or hard copy submissions are available upon request. Should you have any questions, or require additional information, please contact me either by telephone at (301) 931-5301 or by email at sloma1t@westinghouse.com, or contact the Engineering & Regulatory Compliance Manager, Wes Stilwell, directly at (803) 647-3438 or by email at stilwewe@westinghouse.com.

Best regards,
*
Tanya Sloma
Licensing, Compliance and Package Technology
Nuclear Fuel Transport
Westinghouse Electric Company LLC

Enclosures:
Non-Proprietary Enclosure, LTR-LCPT-17-07-Rev0-NP Attachment:

- Page x: List of Effective Pages, revised page 3-4A revision number and date
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- page 3-4A: Section 3.2.2, corrected ASTM “A240”
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cc w/ enclosures:
P. Saverot, USNRC

cc w/o enclosures:
W. Stilwell, Westinghouse-USA
T. Grange, Westinghouse-UK
P. Kembler, Westinghouse-Sweden

*Electronically approved records are authenticated in the electronic document management system.

LTR-LCPT-17-07-Rev0-NP Attachment

Amendment Request Application – SAR Rev 13 Change Pages - USA/9297/AF-96 for
Model No. Traveller STD, XL, and VVER Packages

NRC Certificate of Compliance
USA/9297/AF-96
Docket 71-9297

Safety Analysis Report, Revision 13
Change Pages

TRAVELLER SAFETY ANALYSIS REPORT
LIST OF EFFECTIVE PAGES (cont.)

Page	Rev.	Date	Page	Rev.	Date	Page	Rev.	Date
2-217	9	11/2010	3-8	0	3/2004	3-46B	1	11/2004
2-218	9	11/2010	3-9	0	3/2004	3-47	0	3/2004
2-219	12	3/2015	3-10	10	9/2013	3-48	0	3/2004
2-220	12	3/2015	3-11	0	3/2004	3-49	10	9/2013
2-221	12	3/2015	3-12	0	3/2004	3-50	1	11/2004
2-222	12	3/2015	3-13	10	9/2013			
2-223	12	3/2015	3-14	10	9/2013	4-i	13	2/2017
2-224	12	3/2015	3-14A	9	11/2010	4-1	13	2/2017
2-225	12	3/2015	3-14B	9	11/2010			
2-226	12	3/2015	3-15	9	11/2010	5-i	13	2/2017
2-227	12	3/2015	3-15A	13	2/2017	5-1	13	2/2017
2-228	12	3/2015	3-15B	9	11/2010			
2-229	12	3/2015	3-16	10	9/2013	6-i - 6-vii	13	2/2017
2-230	12	3/2015	3-17	12	3/2015	6-1 - 6-149	13	2/2017
2-231	12	3/2015	3-18	1	11/2004			
2-232	12	3/2015	3-19	9	11/2010	7-i	13	2/2017
2-233	12	3/2015	3-20	0	3/2004	7-1 - 7-5	13	2/2017
2-234	12	3/2015	3-21	10	9/2013			
2-235	12	3/2015	3-22	0	3/2004	8-i - 8-ii	13	2/2017
2-236	12	3/2015	3-23	0	3/2004	8-1 - 8-9	13	2/2017
2-237	12	3/2015	3-24	0	3/2004			
2-238	12	3/2015	3-25	9	11/2010			
2-239	12	3/2015	3-26	10	9/2013			
2-240	13	2/2017	3-27	0	3/2004			
2-240A	13	2/2017	3-28	9	11/2010			
2-240B	13	2/2017	3-29	0	3/2004			
2-240C	13	2/2017	3-30	0	3/2004			
2-241	12	3/2015	3-31	9	11/2010			
2-242	12	3/2015	3-32	0	3/2004			
2-243	12	3/2015	3-33	9	11/2010			
2-244	12	3/2015	3-34	0	3/2004			
2-245	13	2/2017	3-35	10	9/2013			
2-246	13	2/2017	3-35A	1	11/2004			
			3-35B	10	9/2013			
3-i	12	3/2015	3-36	0	3/2004			
3-ii	13	2/2017	3-37	0	3/2004			
3-iii	9	11/2010	3-38	1	11/2004			
3-iv	9	11/2010	3-39	0	3/2004			
3-1	10	9/2013	3-40	10	9/2013			
3-2	9	11/2010	3-41	0	3/2004			
3-3	13	2/2017	3-42	1	11/2004			
3-4	13	2/2017	3-42A	1	11/2004			
3-4A	13	2/2017	3-42B	1	11/2004			
3-5	13	2/2017	3-43	0	3/2004			
3-5A	12	3/2015	3-44	0	3/2004			
3-5B	12	3/2015	3-45	0	3/2004			
3-6	0	3/2004	3-46	13	2/2017			
3-7	0	3/2004	3-46A	13	2/2017			

2.12.9 Zirconium Alloy Performance During Testing

The choice of zirconium alloys used during Traveller drop testing was based upon the energy absorbing capabilities of each fuel rod material used during the construction of the fuel assemblies. Table 2-61 compares the 6 standard fuel rod materials used during fuel assembly fabrication that include Standard Zirconium Alloy, Alloy 1, Alloy 2, Alloy 3, Alloy 4 and Alloy 5. The name is Alloy is a generic naming convention because of the proprietary nature of these materials. As Table 2-61 shows, Standard Zirconium Alloy is the least ductile of the six zirconium alloys considered and failure occurs at a much lower total strain energy than the other alloys. Although the specification minimum tensile yield and ultimate stresses, as well as resilience strain energy, are greatest for the Standard Zirconium Alloy, its elongation at fracture is less than the other alloys. By virtue of having less ductility at fracture compared to the other alloys, Standard Zirconium Alloy possesses less total energy absorption capability.

Table 2-61 Fuel Rod Strain Energy Absorption Using Minimum Tensile Mechanical Properties

Alloy	Minimum Strain Energy (psi – in/in)		
	Yield Strength	Resilience	**Failure**
Standard Zirconium Alloy	201	208	**263**
Alloy 1	177	162	**> 500**
Alloy 2	141	102	**> 1000**
Alloy 3	126	81	**> 1000**
Alloy 4	141	102	**> 1000**
Alloy 5	141	102	**> 1000**

To bound the material properties at elevated temperatures, the specification minimum yield and ultimate strengths were used during the prototype fuel bundle fabrication and during the accident conditions test sequence. Tables 2-62 and 2-63 provide the specification minimum yield and ultimate stresses at ambient, 20°C and 70°C temperatures for each of the zirconium alloys considered. For all alloys, the specification minimum mechanical properties bound 20°C and 70°C temperature mechanical properties. When considering specification minimum material properties (and elevated temperatures), including elongation behavior, Standard Zirconium Alloy bounds other alloys with respect to total energy absorption capability.

Table 2-62 Fuel Cladding Yield Stress Values vs Temperature

Alloy	Specification Minimum at Room Temperature (ksi)	Yield Stress at 68°F/20°C (ksi)	Yield Stress at 158°F/70°C (ksi)
Standard Zirconium Alloy	**77**	**87**	**82**
Alloy 1	68	73	69
Alloy 2	54	70	66
Alloy 3	48	56	53
Alloy 4	54	72	69
Alloy 5	54	70	66

Table 2-63 Fuel Cladding Ultimate Stress Values vs Temperature

Alloy	Specification Minimum Ultimate Stress at Room Temperature (ksi)	Ultimate Stress at 68°F/20°C (ksi)	Ultimate Stress at 158°F/70°C (ksi)
Standard Zirconium Alloy	**103**	**116**	**108**
Alloy 1	90	99	94
Alloy 2	80	83	79
Alloy 3	70	70	66
Alloy 4	80	84	80
Alloy 5	80	83	79

Table 3-3B Room Temperature Properties of Key VVER Fuel Assembly Materials				
Material	**Mass in FA**	**Melt Temp**	**Conductivity**	**Specific Heat**
304 Stainless Steel	47 kg 104 lb	1400-1455°C 2550-2650°F	14.2 W/m-K 8.2 BTU/hr-ft-F	0.5 J/g-°C 0.12 BTU/lb-°F
Inconel	5 kg 11 lb	1354-1413°C 2470-2580°F	14.9 W/m-K 8.6 BTU/hr-ft-F	0.44 J/g-°C 0.106 BTU/lb-°F
Zircalloy 4	152 kg 335 lb	1850°C 3360°F	21.5 W/m-K 12.4 BTU/hr-ft-F	0.285 J/g-°C 0.0681 BTU/lb-°F
Uranium dioxide	562 kg 1240 lb	2750°C 4982°F	5.86 W/m-K 3.39 BTU/hr-ft-F	0.237 J/g-°C 0.0565 BTU/lb-°F

3.2.2 Component Specifications

Stainless steel and aluminum materials are procured to ASTM A240 304 SS and ASTM B209/B221 respectively. Welding is performed in accordance with ASME Section IX and inspected per AWS D1.6. The polyurethane foam is poured in accordance with approved procedures and specifications.

cause the indicated thermocouple temperature to increase from ambient temperature to 1,475°F minimum on the exposed side.

6) Hold the sample at a minimum of 1,475°F for a minimum period of thirty (30) minutes.

Acceptance criteria shall be as follows:

During the period that heat is applied, the thermocouple on the non-exposed end of the sample shall not exceed 180°F. The thermocouple on the back side (away from the flame) shall be isolated from the sheet metal to prevent heat from radiating from the metal instead of traversing the foam core. The thermocouple can be isolated using a piece of Nomex cloth or approved equivalent.

8.1.5.1.4 Thermal Properties

The foam shall exhibit the following nominal thermal characteristics for the 6 pcf, 10 pcf, and 20 pcf nominal density pours, minimum of three specimens per qualification:

a) Thermal Conductivity

Table 8-3 Packaging Rigid Polyurethane Foam Thermal Conductivity Properties

Part	Thermal Conductivity (Test Method – ASTM C-177 at 75°F mean temperature)	Density (pcf)	k-factor (BTU/Hr-ft^2-F/inch)
Inner Pillow Impact Limiters	LAST-A-FOAM® FR-3706	6.0 +/- 1.0	0.240
Outerpack Package Body	LAST-A-FOAM® FR-3710	10.0 +/- 1.0	0.279
Endcap Impact Limiters	LAST-A-FOAM® FR-3720	20.0 +/- 2.0	0.376

b) Specific Heat

0.353 BTU/lb-°F (Test Method – ASTM E-1269)

8.1.5.1.5 Water Absorption Properties

The average water absorption by the foam observed through testing using ASTM D-2842, with the following testing exceptions, shall not be more than 5% by volume. The construction of the Traveller will further ensure that, in actual operation, significantly lower water absorption rate would be observed.

a) Length, width and thickness measurements shall be made with a digital or dial caliper.

b) Measurements shall be made and reported to the nearest 0.001 inches.

c) A single specimen of the qualifying material shall be molded to the density range as stated in the density chart above.

d) The specimen shall consist of a single 3.0 inches x 6.0 inches x 6.0 inches (tolerance on dimension is 0.5 inches) block of foam.

e) No correction shall be made for cut or open cells in the specimen's volume calculations.