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25 August 2010

Mr. Pierre Saverot
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
11555 Rockville Pike, Mailstop: EBB-3D-02M
One White Flint
Rockville, MD 20852

RE: Pending Renewal for USA/9269/B(U)-96 (Current Revision 5)

Dear Mr. Saverot:

Enclosed please find page 3-6 of the 650L SAR Revision 8. This page corrects typographical errors in the equations for H_{os} and Q_{os} as identified in your email dated 24 August 2010. Also enclosed is a copy of the updated List of Affected Pages for the SAR. There are no other changes to the submission/approval at this time. Should you have any additional questions or wish to discuss this submission after receipt please feel free to contact me.

Sincerely,

Lori Podolak
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Enclosures:

- SAR List of Affected Pages
- Page 3-6 or Revision 8 to the SAR

List of Affected Pages	
Revision 1, 19 November, 1999	Replacement of Appendix A Index; Added Drawing R65006, Revision F to Appendix A.
Revision 2, 31 October, 2000	Replacement of Appendix A Index; Added Drawing R65006, Revision G to Appendix A.
Revision 3, 31 October 2005	Reformatting of the SAR to cover compliance to IAEA TS-R-1 and NRC guidance format. Addition of Se-75 as authorized nuclide.
Revision 4, 6 June 2006	Changes to Sections 1, 2, 5, 7 and 8 to address NRC RAI dated 31 May 2006
Revision 5, 29 June 2006	Changes to pages 5-1, 5-2, 5-5, 5-6 and 7-1.
Revision 6, 14 July 2006	Changes to pages 1-1, 5-1 and 5-2.
Revision 7, April 2010	SAR updated to reflect compliance to NUREG 1886 (Final Report – March 2009).
Revision 8, August 2010	Correction of typographical errors on page 3-6 of the SAR.

$Q_{LS} = H_{LS}A_{LS}(T_W - T_A)$

Where $A_{LS} = 0.118\ m^2$ (total surface area of lid sides) and
H_{LS} = the free convection coefficient for a vertical surface.

For a heated plate, the free convection coefficient for laminar flow is:

$$H_{LS} = [0.68 + 0.67[(g\ \beta\ (T_W - T_A)\ L^3\ ) / (\nu\ \alpha\ )]^{0.25} / \{1 + (0.492\ \alpha/\nu)^{9/16}\}^{4/9}]\ (K / L)$$

(Reference: Fundamentals of Heat and Mass Transfer, F.P. Incropera, 4th Edition, 1996, Ch. 9)

Where: L = 0.056 m (area/perimeter). Therefore:

$$H_{LS} = 0.346 + 2.67\ (T_W - 38)^{0.25}$$

Substituting this into the convection equation for the lid side surface produces:

$$Q_{LS} = 0.041\ (T_W - 38) + 0.315\ (T_W - 38)^{1.25}$$

Outer shell surface convection (Q_{OS}):

$$Q_{OS} = H_{OS}A_{OS}\ (T_W - T_A)$$

Where $A_{OS} = 0.124\ m^2$ (total surface area of the outer shell) and
H_{OS} = the free convection coefficient for a vertical surface.

For a vertical plate the free convection coefficient for laminar flow is:

$$H_{OS} = [0.68 + 0.67[(g\ \beta\ (T_W - T_A)\ L^3\ ) / (\nu\ \alpha\ )]^{0.25} / \{1 + (0.492\ \alpha/\nu)^{9/16}\}^{4/9}]\ (K / L)$$

(Reference: Fundamentals of Heat and Mass Transfer, F.P. Incropera, 4th Edition, 1996, Ch. 9)

Where L = 0.077 m (area/perimeter). Therefore:

$$H_{OS} = 0.194 + 2.47\ (T_W - 38)^{0.25}$$

Substituting and solving for Q_{OS} produces

$$Q_{OS} = 0.024(T_W - 38) + 0.306\ (T_W - 38)^{1.25}$$

As stated above, $Q_{IN} = \alpha(Q_{IT} + Q_{ILS} + Q_{IOS}) + Q_{DT} = 120.4$ W, and $Q_{OUT} = Q_R + Q_{LT} + Q_{LS} + Q_{OS}$. Setting $Q_{IN} = Q_{OUT}$ and substituting produces:

$$120.4\ W = [1.34 \times 10^{-8}\{(T_W + 273)^4 - 9.35 \times 10^9\}] + [0.148\ (T_W - 38)^{1.25}] + [0.041\ (T_W - 38) + 0.315\ (T_W - 38)^{1.25}] + [0.024\ (T_W - 38) + 0.306\ (T_W - 38)^{1.25}]$$

Which when reduced produces: