

September 11, 2009

Mr. Barry L. Cole
Manager, Licensing and Safety Analysis
Babcock and Wilcox Nuclear Operations Group
P.O. Box 785
Lynchburg, VA 24505-0785

SUBJECT: CERTIFICATE OF COMPLIANCE NO. 9250 FOR THE MODEL NO. 5X22
PACKAGE

Dear Mr. Cole:

As requested by your application dated February 15, 2008, and July 30, 2009, enclosed is Certificate of Compliance No. 9250, Revision No. 11, for your Model No. 5X22 package. This certificate supersedes, in its entirety, Certificate of Compliance No. 9250, Revision No. 10. Changes made to the enclosed certificate are indicated by vertical lines in the margin. The staff's Safety Evaluation Report is also enclosed.

Babcock and Wilcox Nuclear Operations Group, formally known as BWXT, Nuclear Operations Division, is a registered user of the package under the general license provisions of 49 CFR §173.471. Those on the attached list have been registered as users of the package under the general license provisions of 10 CFR 71.17 or 49 CFR 173.471. The approval constitutes authority to use the package for shipment of radioactive material and for the package to be shipped in accordance with the provisions of 49 CFR §173.471. If you have any questions regarding this certificate, please contact me at (301) 492-3294 or Chris Staab of my staff at (301) 492-3321.

Sincerely,

/RA/

Eric J. Benner, Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9250

Enclosures: 1. Certificate of Compliance
No. 9250, Rev. No. 11
2. Safety Evaluation Report
3. Registered Users

cc w/ encls 1 & 2: R. Boyle, Department of Transportation
J. Schuler, Department of Energy
Registered Users

September 11, 2009

Mr. Barry L. Cole
Manager, Licensing and Safety Analysis
Babcock and Wilcox Nuclear Operations Group
P.O. Box 785
Lynchburg, VA 24505-0785

SUBJECT: CERTIFICATE OF COMPLIANCE NO. 9250 FOR THE MODEL NO. 5X22
PACKAGE

Dear Mr. Cole:

As requested by your application dated February 15, 2008, and July 30, 2009, enclosed is Certificate of Compliance No. 9250, Revision No. 11, for your Model No. 5X22 package. This certificate supersedes, in its entirety, Certificate of Compliance No. 9250, Revision No. 10. Changes made to the enclosed certificate are indicated by vertical lines in the margin. The staff's Safety Evaluation Report is also enclosed.

Babcock and Wilcox Nuclear Operations Group, formally known as BWXT, Nuclear Operations Division, is a registered user of the package under the general license provisions of 49 CFR §173.471. Those on the attached list have been registered as users of the package under the general license provisions of 10 CFR 71.17 or 49 CFR 173.471. The approval constitutes authority to use the package for shipment of radioactive material and for the package to be shipped in accordance with the provisions of 49 CFR §173.471. If you have any questions regarding this certificate, please contact me at (301) 492-3294 or Chris Staab of my staff at (301) 492-3321.

Sincerely,

/RA/

Eric J. Benner, Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9250

- Enclosures: 1. Certificate of Compliance
No. 9250, Rev. No. 11
2. Safety Evaluation Report
3. Registered Users

cc w/ enclosures 1 & 2: R. Boyle, Department of Transportation
J. Schuler, Department of Energy

DISTRIBUTION: SFST r/f Closes L24187 and L24275

G:\SFST\Staab\BWXT\SER 5x22.doc

G:\SFST\PART 71 CASEWORK\9250.R11.doc

ADAMS Package No.: ML092590685

OFC	SFST		SFST		SFST		SFST		SFST		SFST	
NAME	CStaab		DTang		MCall		LCampbell		CRegan		MDeBose	
DATE	9/8/2009		9/8/2009		9/9/2009		9/9/2009		9/10/09		9/10/09	
OFC	SFST		SFST		SFST		SFST		SFST			
NAME	EBenner											
DATE	9/11/09											

C=Without attachment/enclosure

E=With attachment/enclosure

N=No copy

OFFICIAL RECORD COPY

SAFETY EVALUATION REPORT
Docket No. 71-9250
Model No. 5X22
Certificate of Compliance No. 9250
Revision No. 11

Summary

By applications dated February 15, 2008, and July 30, 2009, Babcock and Wilcox Nuclear Operations Group requested renewal of Certificate of Compliance No. 9250 for the Model No. 5X22 package and successfully evaluated a 30-foot drop test at a shallow angle orientation for the effect of lid separation and the ability of the package to meet the requirements of 10 CFR Part 71.

Based on the statements and representations in the applications, the Certificate of Compliance has been renewed and will expire on October 31, 2014. There have been no changes to the packaging design or contents.

Structural Evaluation

To evaluate effects of the 30-foot shallow-angle, free drop accident on potential lid separation, Babcock & Wilcox Nuclear Operations Group performed a series of free-drop tests on a single 5X22 shipping container. The series consists of three tests in the order of: (1) 4-foot, normal condition of transport drop, (2) 30-foot, shallow-angle, hypothetical accident condition drop, and (3) 40-inch, puncture pin drop. The sequential application of the tests to demonstrate cumulative damage effects on the package meets the 10 CFR 71.73(a) requirements on test procedures.

Section 2.7.1.1 of the application recognizes the 30-foot shallow-angle, free drop as an addition to those associated with the previously tested end-, side-, and corner-drop orientations. As presented in Section 2.10.2, the acceptance criteria for the previous tests include: (1) the drum lid and band must always stay attached to the drum; (2) the leakage rate of the inner containment vessel must be less than 10^{-3} atm cc/sec; and (3) the deformations of the drum and inner packing must be no greater than the deformation assumptions used in the criticality analyses. These criteria are adopted also for the shallow-angle drop series except that no explicit deformation limits were set forth for the drum and inner packing.

Section 2.11 of the application presents the test report summarizing the test conduct and results for the shallow-angle drop series. The report notes that the drop series was conducted at the ambient air temperature of 84° F and, for the 30-foot drop, the test article was positioned at an angle 18° from horizontal. The drop angle at 18° is essentially identical to the 17.5° reported in NUREG/CR-6818, "Drop Test Results for the Combustion Engineering Model No. ABB-2901 Fuel Pellet Shipping Package," for determining if bolted-ring drum closure could fail during shallow-angle drops. To conduct testing at an ambient air temperature, as opposed to both the regulatory temperature cold (-20° F) and hot (+100° F) conditions, is also consistent with that of NUREG/CR-6818. This is acceptable in that, within the temperature range of interest, the drum lid separation failure, which would mostly be associated with the lid buckling strength, is deemed insensitive to slight changes of modulus of elasticity of the steels for the lid and bolt-ring assembly.

Sections 8.3 through 8.5 of the test report present test conduct and result details for the three free drops. The 4-foot, top-end, C.G.-over-corner drop test was conducted at a drop angle of 56.5 degree from horizontal. It caused slight changes of the overall height and diameter at selected measurement locations but there were no tears or opening to the drum surface. For the 30-foot, 18-degree, shallow-angle drop, the package was positioned so that the bolt of the closure ring was opposite the initial impact point and the bottom end of the drum making contact as the second impact point. The test resulted in localized damages, including buckling and folding of the upper outer drum wall over a gap created at the lid to drum interface. Additional changes in the drum dimensions were observed, but the test caused no tearing of the outer drum surface or broken weld. For the 40-inch, C.G.-over-corner, puncture drop, the puncture pin hit the most damaged area produced during the shallow-angle drop. It resulted in increased length and depth of drum indentations as well as additional changes in drum diameter and height.

Section 8.6 of the test report summarizes the post-test evaluation and inspection of the test article at the conclusion of the test series. This includes the torque measurement for the drum ring closure bolt and inner containment vessel bolts, the leak test of the containment O-ring seal, and the visual inspection on signs of damage to the inner containment vessel. For the overall change in drum configuration, the section provides a table listing the post-test diameter and height measurements. As an assessment of the inner packing deformation, the report notes that, upon opening the test article, the insulation was found in good condition in that it remained in tact with its individual board and only minor crushing exists on the impact side over an area that measured 1-1/2 inches by 6 inches in length.

On the basis of the above evaluation, the staff concludes that the shallow-angle test series has met the primary objective of demonstrating the capability of the drum lid for retaining the payload vessel without loss of seal. The staff also agrees with the applicant's conclusion that there was no shift beyond normal of the inner vessel. There is, therefore, reasonable assurance that the resulting deformations of the drum and inner packing from the shallow-angle drop are within the deformation assumptions used in the criticality analyses.

Criticality Evaluation

The applicant performed additional free-drop tests to evaluate the effects of a 9-meter shallow-angle free-drop on potential lid separation. Lid separation from the package would allow for potential configurations not analyzed in the current criticality analysis. In Section 6.3.1.2 of the application, the applicant indicated that the shallow-angle drop test resulted in less damage to the container than the original drop test and therefore the current criticality evaluation did not require revision. The results of the series of drop tests that included the shallow-angle test were evaluated by the staff in the structural evaluation section above. Based upon the structural evaluation and the associated findings, the staff finds reasonable assurance that the current criticality analysis remains valid and acceptable within the limits of applicability set forth in previous Safety Evaluation Reports for the Model No. 5X22 package and that the package meets the criticality safety requirements of 10 CFR Part 71.

Conclusions

The Certificate of Compliance has been renewed as requested by the applicant and will expire October 31, 2014.

Condition 9 was added to clarify that the package is subject to the provisions of 10 CFR 71.19(c), which requires that all fabrication of this packaging must have been completed by December 31, 2006.

Condition 10 was added to state transport by air of fissile material is not authorized.

These changes do not affect the ability of the package to meet the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9250,
Revision No. 11, on September 11, 2009.