U.S. Department
of Transportation
**Pipeline and
Hazardous Materials
Safety Administration**

East Building, PHH-23
1200 New Jersey Avenue Southeast
Washington, D.C. 20590

COMPETENT AUTHORITY CERTIFICATION FOR A TYPE B(U)F FISSILE RADIOACTIVE MATERIALS PACKAGE DESIGN CERTIFICATE USA/9250/B(U)F-85, REVISION 9

This certifies that the radioactive material package design described has been certified by the Competent Authority of the United States as meeting the regulatory requirements for a Type B(U)F packaging for fissile radioactive material as prescribed in the regulations of the International Atomic Energy Agency[1] and the United States of America[2].

1. Package Identification - 5X22.

2. Package Description and Authorized Radioactive Contents - as described in U.S. Nuclear Regulatory Commission Certificate of Compliance No. 9250, Revision 11 (attached).

3. Criticality - The minimum criticality safety index is as stated in NRC Certificate. The maximum number of packages per conveyance is determined in accordance with Table X of the IAEA regulations cited in this certificate.

4. General Conditions -

   a. Each user of this certificate must have in his possession a copy of this certificate and all documents necessary to properly prepare the package for transportation. The user shall prepare the package for shipment in accordance with the documentation and applicable regulations.

   b. Each user of this certificate, other than the original petitioner, shall register his identity in writing to the Office of Hazardous Materials Technology, (PHH-23), Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, Washington D.C. 20590-0001.

   c. This certificate does not relieve any consignor or carrier from compliance with any requirement of the Government of any country through or into which the package is to be transported.

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[1] "Regulations for the Safe Transport of Radioactive Material, 1996 Edition (Revised), No. TS-R-1 (ST-1, Revised)," published by the International Atomic Energy Agency(IAEA), Vienna, Austria.

[2] Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

d. Records of Quality Assurance activities required by Paragraph 310 of the IAEA regulations[1] shall be maintained and made available to the authorized officials for at least three years after the last shipment authorized by this certificate. Consignors in the United States exporting shipments under this certificate shall satisfy the applicable requirements of Subpart H of 10 CFR 71.

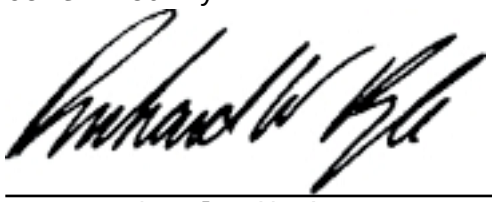
5. Special Condition - Transport by air is not authorized.

6. Marking and Labeling - The package shall bear the marking USA/9250/B(U)F-85 in addition to other required markings and labeling.

7. Expiration Date - This certificate expires on October 31, 2014.

This certificate is issued in accordance with paragraph 817 of the IAEA Regulations and Section 173.471 and 173.472 of Title 49 of the Code of Federal Regulations, in response to the November 25, 2009 petition by Babcock & Wilcox Nuclear Operations Group, Lynchburg, VA, and in consideration of other information on file in this Office.

Certified By:



Dec 08 2009

Dr. Magdy El-Sibaie (DATE)
Acting Associate Administrator for Hazardous Materials Safety

Revision 9 - Issued to endorse U.S. Nuclear Regulatory Commission Certificate of Compliance No. 9250, Revision 11, which revised name of certificate holder and extended the expiration date.

NRC FORM 618
U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
9250	11	71-9250	USA/9250/B(U)F-85	1 OF	4

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. THIS CERTIFICATE IS ISSUED ON THE BASIS OF A SAFETY ANALYSIS REPORT OF THE PACKAGE DESIGN OR APPLICATION

a. ISSUED TO (*Name and Address*)

Babcock and Wilcox
Nuclear Operations Group
P.O. Box 785
Lynchburg, VA 24505

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Babcock and Wilcox Nuclear Operations Group application dated June 13, 2005.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 5X22

(2) Description

A shipping container for unirradiated uranium of any enrichment. The outer packaging is a 16-gauge steel drum, approximately 22-1/2 inches in diameter and 34-3/4 inches high, with a heavy-duty clamp ring and forged lugs. The inner vessel (containment vessel) is a Schedule 40S stainless steel pipe with a welded bottom cap and a top weldneck flange. The inner vessel lid is a blind flange which is bolted to the weldneck flange with eight hex-head bolts. The closure includes double silicone O-ring seals and a leak-test port. The dimensions of the inner vessel are approximately 5 inches ID by 22 inches high. The inner vessel is centered within the outer drum by fiberboard and supported by plywood disks. The maximum weight of the package, including contents, is 300 pounds.

(3) Drawings

The packaging is constructed in accordance with Babcock and Wilcox, Drawing Nos. 1220276 E, Rev. 5, and 1220277 E, Rev. 9.

5.(b) Contents

Type and form of material, maximum quantity of material per package, and Criticality Safety Index.

The weight of the contents, including secondary containers, inserts, and other materials in the inner vessel, shall not exceed 50 pounds.

(1) Unirradiated uranium as solid compounds or alloys which do not decompose at temperatures up to 250 degrees Fahrenheit, and uranium oxides as powder or pellets. The uranium may be of any enrichment. Carbide compounds are not authorized. The maximum H/U must consider all sources of moderation in the inner vessel.

Fissile Material	Maximum H/U	Maximum Fissile Mass per Package (kg)	Criticality Safety Index
U-235	3	9.0	2.0
U-235	3	1.6	0.5
U-235	20	4.0	2.0
U-233	20	0.5	1.8

(2) Unirradiated solid uranyl nitrate in the form of uranyl nitrate dihydrate crystals, which may have small amounts of uranyl trihydrate crystals interspersed. The uranyl nitrate crystals shall have a uranium content that is from 52.5 to 56.0 percent by weight. The uranyl nitrate shall be packaged in Teflon primary containers that will not melt at temperatures up to 94 degrees Celsius. The uranium may be of any enrichment. The maximum H/U must consider all sources of moderation in the inner vessel.

Fissile Material	Maximum H/U	Maximum Fissile Mass per Package (kg)	Criticality Safety Index
U-235	3	9.0	2.0
U-235	3	1.6	0.5
U-235	20	4.0	2.0
U-233	20	0.5	1.8

5.(b) Contents (continued)

(3) Unirradiated uranium as solid metal. The uranium may be of any enrichment. The maximum H/U must consider all sources of moderation in the inner vessel.

Fissile Material	Maximum H/U	Maximum Fissile Mass per Package (kg)	Criticality Safety Index
U-235	3	9.0	2.5
U-235	3	1.6	0.5
U-235	20	4.0	2.0
U-233	20	0.5	1.8

(4) Unirradiated uranium as solid metal. The uranium may be of any enrichment. The packaging must include a solid aluminum disk insert positioned in the inner vessel, as shown on Babcock and Wilcox, Drawing No. 1220277 E, Rev. 9 (Part No. 6). The maximum H/U must consider all sources of moderation in the inner vessel.

Fissile Material	Maximum H/U	Maximum Fissile Mass per Package (kg)	Criticality Safety Index
U-235	3	9.0	2.0

(5) Unirradiated liquid uranyl nitrate solution in sealed glass containers or screw top plastic vials, each within one or more additional plastic vials with taped lids, and within a sealed product can or polyethylene bottle containing a sufficient amount of vermiculite to absorb twice the liquid contents present. The uranium may be of any enrichment. The quantity of uranyl nitrate shall not exceed 1000 mL of solution.

Fissile Material	Maximum H/U	Maximum Fissile Mass per Package (kg)	Criticality Safety Index
U-235	N/A	0.4	0.4

6. The vent holes on the outer steel drum shall be capped or taped closed during transport and storage to preclude entry of rain water into the packaging.

7. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) Each package shall be operated and prepared for shipment in accordance with Chapter 7 of the application, as supplemented.

   (b) Each package shall be acceptance tested and maintained in accordance with Chapter 8 of the application.

8. The package authorized by this certificate is hereby approved for use under the general license provisions of10 CFR 71.17.

9. 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.

10. Transport by air of fissile material is not authorized.

11. Expiration date: October 31, 2014.

REFERENCES

Babcock and Wilcox Nuclear Operations Group, application dated June 13, 2005

Supplements dated February 15, 2008; April 18, 2008; August 29, 2008; December 4, 2008; February 16, 2009; and July 30, 2009.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: September 11, 2009

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON D.C. 20555-0001

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

U.S. Department
of Transportation

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Hazardous Materials
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**East Building, PHH-23
1200 New Jersey Avenue SE
Washington, D.C. 20590**

CERTIFICATE NUMBER: USA/9250/B(U)F-85, Revision 9

ORIGINAL REGISTRANT(S):

Ms. Sandra J. Williams
Senior Transportation Administrator
Babcock & Wilcox Nuclear Operations Group
P.O. Box 785
Lynchburg, 24505
USA