



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

June 28, 2011

Ms. Lori Podolak  
Senior Regulatory Affairs Specialist  
Regulatory Affairs Department  
QSA Global, Inc.  
40 North Avenue  
Burlington, MA 01803

SUBJECT: REVISION NO. 8 OF CERTIFICATE OF COMPLIANCE NO. 9296 FOR THE  
MODEL NO. 880 SERIES OF PACKAGES

Dear Ms. Podolak:

As requested by your application dated November 22, 2010, supplemented February 8 and April 11, 2011, enclosed is Certificate of Compliance No. 9296, Revision No. 8, for the Model No. 880 series of packages. Changes made to the enclosed certificate are indicated by vertical lines in the margin. The staff's Safety Evaluation Report is also enclosed.

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. 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.

If you have any questions regarding this certificate, please contact Pierre Saverot of my staff at (301) 492-3408.

Sincerely,

Michael D. Waters, Chief  
Licensing Branch  
Division of Spent Fuel Storage and Transportation  
Office of Nuclear Material Safety  
and Safeguards

Docket No. 71-9296  
TAC Nos. L24489, L24490

Enclosures:           1. Certificate of Compliance  
                              No. 9296, Rev. No. 8  
                              2. Safety Evaluation Report  
                              3. Registered Users

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

**CERTIFICATE OF COMPLIANCE  
FOR RADIOACTIVE MATERIAL PACKAGES**

1.	a. CERTIFICATE NUMBER 9296	b. REVISION NUMBER 8	c. DOCKET NUMBER 71-9296	d. PACKAGE IDENTIFICATION NUMBER USA/9296/B(U)-96	PAGE 1	PAGES 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*)  
QSA Global, Inc.  
40 North Avenue  
Burlington, MA 01803
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION  
QSA Global, Inc., consolidated application,  
Revision No. 8, dated April 11, 2011.

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. 880 Series Packages
- (2) Description

The Model No. 880 series packages are designed for use as a radiography exposure device and a transport package for Type B quantities of radioactive material in special form. The Model No. 880 series packages have three versions called the 880 Delta, 880 Sigma and the 880 Elite. The 880 Delta has a maximum capacity of 150 Curies of Iridium-192 or 150 Curies of Selenium-75, the 880 Sigma has a maximum capacity of 130 Curies of Iridium-192 or 150 Curies of Selenium-75, and the 880 Elite has a maximum capacity of 50 Curies of Iridium-192 or 150 Curies of Selenium-75. The Delta and Sigma versions are identical and the Elite has a lighter weight depleted uranium shield. An optional jacket can be placed on the package to facilitate its use as an industrial radiography exposure device or a transport package. There are two versions of the jacket.

All versions of the package, without the jacket, are cylindrical in shape with a diameter of 5 inches (127 mm) and a length of 13 5/16 inches (338 mm). With the first version of the jacket, the shape of the package is an extruded triangle 9 inches (229 mm) high, 7 1/2 inches (191 mm) wide, and 13 5/16 (343 mm) inches long. With the second version of the jacket, the package measures 13 1/2 inches (343 mm) long by 6 inches (152 mm) wide by 11.33 inches (288 mm) tall.

**CERTIFICATE OF COMPLIANCE  
FOR RADIOACTIVE MATERIAL PACKAGES**

1.	a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
	9296	8	71-9296	USA/9296/B(U)-96	2 OF	4

5.(a) (2) Description (continued)

The weight of the Delta and Sigma versions is 46 pounds (21 kg) without the jacket, 52 pounds (24 kg) with version 1 of the jacket and 55 pounds (25 kg) with version 2 of the jacket. The weight of the Elite version is 37 pounds (17 kg) without the jacket, 42 pounds (19 kg) with version 1 of the jacket, and 45 pounds (20 kg) with version 2 of the jacket.

The major components of the packages consist of a welded stainless steel cylindrical body, a depleted uranium shield, a stainless steel rear plate with a locking assembly, a stainless steel front plate with a shielded port, and optional jackets.

The welded cylindrical body consists of a 5 inch (127 mm) diameter, 0.06 inch (1.5 mm) wall tube shell with 0.12 inch (3 mm) end-plates. A U-bracket is welded to each end-plate and is located on the inside cavity of the shell tube. The depleted uranium shield is centrally located within the welded body between the end-plate and is fastened to each U-bracket by a 0.37 inch (9.5 mm) diameter titanium shield pin. A U-shaped copper spacer fills the gap between the shield and the U-bracket. An S-shaped titanium source tube is cast into the center of the shield to provide a cavity for the source wire assembly to travel through during use.

The front and rear plates are attached to the welded body with four tamperproof screws through rivnuts assembled into end-plates. The rear plate assembly consists of a source locking mechanism fastened to the rear plate. The front plate assembly consists of a shielded port mechanism contained within the front plate.

An optional polyurethane jacket covers the package cylinder, provides a handle and a stable base, and is attached to the shell cylinder by screws located outside the shield cavity area. Version 1 of the jacket has a handle section that contains a wire molded in for additional reinforcement. Version 2 of the jacket incorporates wheels on the base to facilitate movement during use as a radiography exposure device.

(3) Drawings

The packaging is constructed in accordance with the QSA Global, Inc., drawings R88000, Rev. R, sheets 1-6, and R88095, Rev. A, sheets 1-2.

(b) Contents

(1) Type and form of material

Iridium-192 as a sealed source which meets the requirements of special form radioactive material.

Selenium-75 as a sealed source which meets the requirements of special form radioactive material.

**CERTIFICATE OF COMPLIANCE  
FOR RADIOACTIVE MATERIAL PACKAGES**

1.	a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
	9296	8	71-9296	USA/9296/B(U)-96	3	OF 4

5. (b) (2) Contents (continued)

(2) Maximum quantity of material per package

150 Curies (5.55 TBq) (output) Ir-192 for the Model No. 880 Delta.  
150 Curies (5.55 TBq) (output) Se-75 for the Model No. 880 Delta.

130 Curies (4.81 TBq) (output) Ir-192 for the Model No. 880 Sigma.  
150 Curies (5.55 TBq) (output) Se-75 for the Model No. 880 Sigma.

50 Curies (1.85 TBq) (output) Ir-192 for the Model No. 880 Elite.  
150 Curies (5.55 TBq) (output) Se-75 for the Model No. 880 Elite.

Output curies are determined by measuring the source output at 1 meter and expressing its activity in curies derived from the following: 0.48 R/hr - Ci Iridium-192 at 1 meter and 0.20 R/hr - Ci Selenium-75 at 1 meter. (Ref: Radiological Health Handbook, rev. ed., U.S. Public Health Service, Bureau of Radiological Health, Rockville, MD, 1970.)

(3) Maximum weight: 18 grams.

(4) Maximum decay heat: 3 Watts.

6. The source shall be secured in the shielded position of the packaging by the source assembly lock, lock cap and safety plug assembly. The safety plug assembly, lock cap and source assembly must be fabricated of materials capable of resisting a 1475° F fire environment for one-half hour and maintaining their positioning function. The locking ball of the source assembly must engage the locking device. The flexible cable of the source assembly and safety plug assembly must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

7. The name plate must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility.

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

(a) The package must meet the Acceptance Tests and Maintenance Program of Chapter 8.0 of the application; and,

(b) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7.0 of the application.

9. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.

**CERTIFICATE OF COMPLIANCE  
FOR RADIOACTIVE MATERIAL PACKAGES**

1.	a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
	9296	8	71-9296	USA/9296/B(U)-96	4 OF	4

10. Revision No. 7 of this certificate may be used until June 30, 2012.

11. Expiration date: June 30, 2016.

REFERENCES

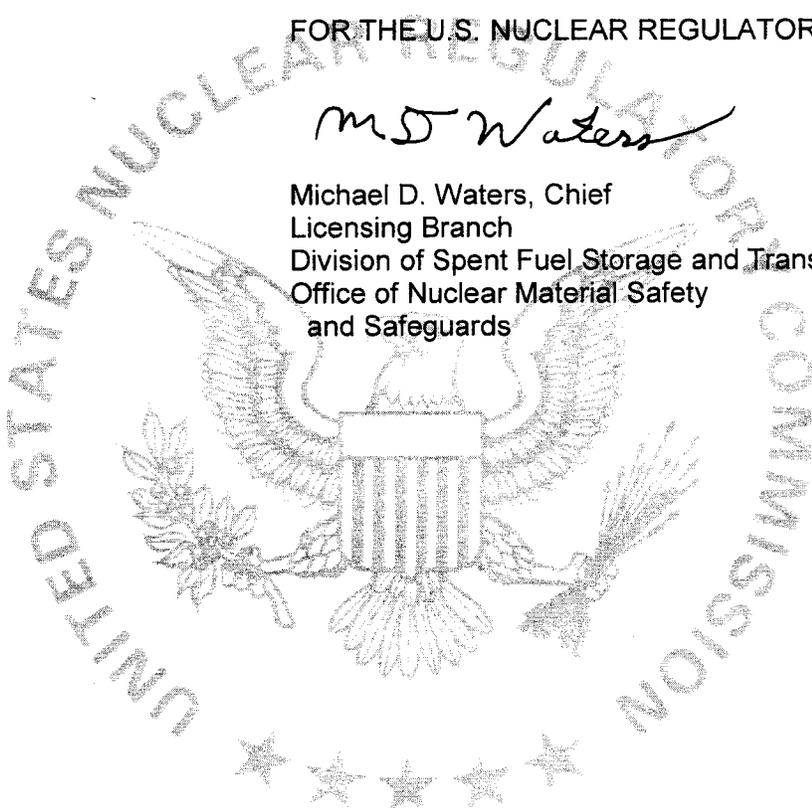
QSA Global, Inc., consolidated application, Revision No. 8, dated April 11, 2011.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

*M. D. Waters*

Michael D. Waters, Chief  
Licensing Branch  
Division of Spent Fuel Storage and Transportation  
Office of Nuclear Material Safety  
and Safeguards

Date: June 28, 2011





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

SAFETY EVALUATION REPORT  
Model No. 880 Series Packages  
Certificate of Compliance No. 9296  
Revision No. 8

## SUMMARY

By application dated November 22, 2010, and supplemented February 8 and April 11, 2011, QSA Global, Inc. (QSA) requested renewal of the Certificate of Compliance (CoC) No. 9296. QSA also submitted an amendment request for the Model No. 880 Series Packages to add a new version of the optional handling jacket. QSA submitted a consolidated application and requested that the package application review include consideration of NUREG-1886, "Joint Canada-United States Guide for Approval of Type B(U) and Fissile Material Transportation Packages."

NRC staff reviewed the application using the guidance in NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Material" and NUREG-1886. Based on the statements and representation in the application, as supplemented, and the conditions listed below, the staff concludes that these changes do not affect the ability of the package to meet the requirements of 10 CFR Part 71. Staff reviewed the application against NUREG-1886, and found that the highlighted areas of emphasis have been appropriately addressed.

## EVALUATION

By application dated November 22, 2010, supplemented February 8 and April 11, 2011, QSA submitted a renewal and an amendment request for CoC No. 9296 for the Model No. 880 Series Packages. QSA provided a consolidated application, as specified in 10 CFR 71.38(c), and requested approval of the package under the auspices of NUREG-1886.

### 1.0 GENERAL INFORMATION

The Model No. 880 Series Packages is designed for use as an industrial radiography exposure device and a transport package of special form radioactive material in Type B quantities. The Model No. 880 Series Packages have three versions called Delta, Sigma, and Elite respectively. Physical construction of the Delta and the Sigma versions of the package (including construction of the depleted uranium (DU) shield) is identical. However, due to the natural variability in the shield consistency created from the DU pouring/cooling process, the shields can vary in Ir-192 unit capacity from 150 Curies (Ci) for the Delta version to 130 Ci for the Sigma version of the package.

Except for the shield assembly (source tube-Titanium and shield-DU), fill foam (polyurethane- $\geq 8$  PCF), some of the lock assembly components, lock cover (Aluminum/Stainless Steel), shield pin (Titanium), source wire assembly (source capsule, stop ball, connector and flexible wire-carbon steel) and optional jackets (polyurethane), all material of construction of the package are stainless steel. The keyed lock assembly mount and the lock cover can be either stainless or aluminum.

The major components of the package, i.e., the welded cylindrical body, the depleted uranium shield, the rear plate with locking assembly, the front plate with the shield port assembly, have not fundamentally changed from previously approved versions of the package. The main difference is that the package cylinder can now be modified to include an optional polyurethane jacket in two different versions. Both versions of the jacket provide a handle, a stable base and are attached to the shell cylinder by screws located outside the shield cavity area. Version 1 of the jacket has a handle section that contains a wire molded in for additional reinforcement. The other version of the jacket incorporates wheels on the base to facilitate movement during use as a radiography exposure device. Both jackets include a cutout to allow permanent labeling to be attached directly to the shell cylinder.

The applicant has (i) specified the material used for spacers as copper, i.e., C101 or C110, and (ii) provided the material specifications for the aluminum used in the lock mount and cover as well as for the brass in the ball detent, knob shaft, and slider. The applicant also stated a requirement that the shield material used in the package will be a minimum of 99% depleted uranium.

The staff reviewed the drawing revisions included in the amendment request and determined that the design of the Model No. 880 Series Packages has been adequately described and that there is no safety significance associated with such corrections.

## **2.0 STRUCTURAL EVALUATION**

### **2.1 STRUCTURAL REVIEW**

The only change of possible structural significance is the addition of the option of a second handling jacket design, while the package itself remains structurally unchanged.

Although the handling jacket does not perform a safety function, compliance with lifting and tie-down requirements of 10 CFR 71.45, as well as the effect on package performance under the drop and puncture tests of 10 CFR 71.73(c)(1) and (3), were evaluated by tests. Based on the results presented in the test reports included in the consolidated application, the staff finds the addition of the jacket acceptable from a structural point of view.

### **2.2 CHEMICAL, GALVANIC OR OTHER REACTIONS**

Chemical, galvanic or other reactions are discussed in Section No. 2.2.2 of the application. The non-safety related materials are aluminum, brass, and polyurethane. Aluminum and brass alloy 485 are more susceptible to corrosion and chemical reaction than the safety materials, but pose no threat to safety or containment.

The safety related materials used in the construction of the Model No. 880 Series Packages are DU metal, stainless steel, Titanium, tungsten, and copper alloy C101 or C110. There are no significant chemical or galvanic action between any of these components.

To prevent the possible formation of an eutectic alloy from steel and DU during the hypothetical accident conditions (HAC) thermal scenario, defined by 10 CFR 71.73(c)(4), copper separators are used at all stainless steel-depleted uranium interfaces. With this construction, there will be no significant chemical or galvanic reaction between package's components during normal conditions of transport (NCT) or hypothetical accident conditions (HAC).

Staff finds that the galvanic potential difference between copper and DU is low enough to prevent any galvanic corrosion of the shield and that the requirements of 10 CFR 71.43(d) regarding galvanic, chemical, and other reactions are satisfied.

The staff finds that the QSA Model No. 880 Series Packages meet regulatory requirements for preventing or mitigating galvanic or chemical reactions, are unaffected by cold temperatures, and are constructed with materials and processes in accordance with acceptable industry codes and standards.

Based on a review of the statements and representations in the application, the staff concludes that the design of the Model No. 880 Series Packages has been adequately described and evaluated and that the package continues to meet the structural requirements of 10 CFR Part 71.

### **3.0 THERMAL EVALUATION**

Not applicable. There is no significant change from the previously approved evaluation.

### **4.0 CONTAINMENT EVALUATION**

The radioactive material of these source assemblies is sealed in a special form source capsule. The source capsule, stop ball, and connector are swaged to a flexible steel wire to form the source wire assembly.

The staff finds that the description of the package provided by the applicant is adequate and satisfies the requirements of 10 CFR 71.31(a)(1), 10 CFR 71.33(a), and 10 CFR 71.43(a). In addition, the staff reviewed the materials selected, and Table No. 2.2.A of the application, and determined that they are acceptable.

Based on a review of the statements and representations in the application, the staff concludes that the package continues to meet the containment requirements of 10 CFR Part 71.

### **5.0 SHIELDING EVALUATION**

The amendment request revised the maximum DU shielding weights from 34 to 34.4 pounds based on the current configuration of the Delta 880 and Sigma 880 models. This provides additional shielding. The amendment request also adds an optional jacket to facilitate handling, one with a stable base and one with wheels. These jackets do not adversely affect the shielding properties of the Model No. 880 Series Packages. The maximum activity per package is 150 Ci of Iridium-192 in a special form capsule for the Model Delta 880, 130 Ci for the Model Sigma 880, and 50 Ci for the Model Elite 880 under both exclusive and non-exclusive use. For the Selenium-75 special form capsules, the maximum activity per package for all three package variations is 150 Ci. These values are unchanged from the previously approved evaluation.

In order to evaluate the package's shielding adequacy, the applicant performed direct radiation measurements both before and after the Test Plans 108 and 186 (under Section No. 2.12 of the application). An Iridium-192 test source was used for the dose measurements and the measured dose rates were then extrapolated to the maximum 150 Ci source. This testing is unchanged from the previous analysis. The maximum extrapolated dose rates for the Model No. 880 package during NCT were 183 mrem/hr at the surface and 1.7 mrem/hr at a distance of

one meter, in compliance with the requirements of 10 CFR 71.47(a). Under HAC conditions, the maximum dose rates measured were 1.7 mrem/hr at a distance of one meter, which meets the requirements of 10 CFR 71.51(a)(2).

Based on a review of the statements and representations in the application, the staff concludes that the design of the Model No. 880 Series Packages has been adequately described and evaluated and that the package continues to meet the shielding requirements of 10 CFR Part 71.

## **6.0 CRITICALITY EVALUATION**

Not applicable.

## **7.0 PACKAGE OPERATIONS**

Approved isotopes, in special form source capsules, and maximum package activity limits are shown in Table No. 7.1.A of the application. Loading operations apply to "dry" loading only. None of the shield configurations for the Model No. 880 Series Packages are approved for wet loading. Prior to loading, the visible external surfaces of the bolts and fasteners are examined for any signs of fatigue cracking and bolts and fasteners must be replaced if they are no longer fit for use, e.g., if the threads are stripped.

The staff reviewed the instructions for package operation in Chapter No. 7 of the application. The procedures include preparation of the package for loading, including visual inspection of the packaging components prior to loading. Additionally, Chapter No. 7 includes procedures for unloading the package and preparing an empty package for transport.

It is noted that the package will be prepared for transport and operated according to site-specific written procedures which will be consistent with the procedures in Chapter No. 7. The certificate has been conditioned to specify that the package must be prepared for shipment and operated in accordance with Chapter No. 7.

Based on review of the statements and representations in the application, the staff concludes that the operating procedures meet the requirements of 10 CFR Part 71 and that these procedures are adequate to assure the package will be operated in a manner consistent with its evaluation for approval.

## **8.0 ACCEPTANCE TESTS AND MAINTENANCE**

The staff reviewed Chapter No. 8 of the application, including the acceptance tests and maintenance program. Failure of a radiation profile survey, extrapolated to the rated capacity of the package, prevents the use of the package as a Type B(U) package.

The certificate has been conditioned to specify that the package must meet the acceptance tests and be maintained in accordance with Chapter No. 8. Based on review of the statements and representations in the application, the staff concludes that the acceptance tests for the packaging meet the requirements of 10 CFR Part 71 and that the maintenance program is adequate to assure packaging performance during its service life.

The staff reviewed the consolidated application, as supplemented, and determined that the required documentation is available and complete.

Changes to Certificate of Compliance

The following changes have been made to the Certificate:

Condition No. 3.b was updated to include the newly consolidated application dated April 11, 2011.

Condition No. 5(a)(2) was rewritten to clarify the description of the package, include dimensions in SI units, and revise the overall assembled package dimensions and weights with the two versions of the jacket.

Condition No. 5(a)(3) was updated to include Revision R of Drawing No. R 88000 and Revision A of Drawing No. R88095.

Condition No. 5(b)(3) was added to include the maximum weight of the contents.

Condition No. 5(b)(4) was added to include the maximum decay heat of the contents.

Condition No. 10 was modified to authorize use of the previous revision of the certificate for a period of approximately one year.

Condition No. 11 was modified to include the new expiration date of the certificate.

The April 11, 2011, Revision No. 8, submittal supersedes all previous revisions of the application and was included in the References Section.

**CONCLUSION**

Based on the statements and representations contained in the application, as supplemented, and the conditions listed above, the staff concludes that the design of the Model No. 880 Series Packages has been adequately described and evaluated. The staff concludes that the changes indicated do not affect the ability of the package to meet the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9296, Revision No. 8,  
on June 28, 2011.