

June 3, 2004

Mr. Marc-André Charette  
Regulatory Affairs Senior Associate  
MDS Nordion  
447 March Road  
Ottawa, ON K2K 1X8  
Canada

SUBJECT: MODEL NO. NO. F-294 PACKAGE

Dear Mr. Charette:

As requested by your application dated August 1, 2003, as supplemented March 12, April 20, and May 20, 2004, enclosed is Certificate of Compliance No. 9258, Revision No. 2, for the Model No. F-294 package. This certificate supersedes, in its entirety, Certificate of Compliance No. 9258, Revision No. 1, dated October 17, 2003. Changes made to the enclosed certificate are indicated by vertical lines in the margin. The staff's Safety Evaluation Report is also enclosed.

MDS Nordion has been registered as a user of the package under the general license provisions of 10 CFR 71.12 or under the provisions of 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 or Julia M. Barto of my staff at (301) 415-8500.

Sincerely,

/RA/

John D. Monninger, Chief  
Licensing Section  
Spent Fuel Project Office  
Office of Nuclear Material Safety  
and Safeguards

Docket No. 71-9258  
TAC No. L23633

Enclosures: 1. CoC. No. 9258, Rev. 2  
2. Safety Evaluation Report

cc w/encl: R. Boyle, Department of Transportation  
James M. Shuler, Department of Energy  
RAMCERTS

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SAFETY EVALUATION REPORT  
Docket No. 71-9258  
Model No. F-294 Package  
Certificate of Compliance No. 9258  
Revision No. 2

## SUMMARY

By application dated August 1, 2003, as supplemented March 12, April 20, and May 20, 2004, MDS Nordion requested an amendment to Certificate of Compliance No. 9258, for the Model No. F-294 package. MDS Nordion requested that the certificate be modified to: (1) include the F-457 as an alternative source carrier; (2) revise the drawings to specify fiber cement thermal insulation materials CS-85, and Transite 1000; and (3) add a "-96" designation to the package identification number. MDS Nordion provided a consolidated application for the package. Based on the statements and representations in the application, the staff finds that the changes do not affect the ability of the package to meet the requirements of 10 CFR Part 71. Furthermore, the staff has concluded, based on this same information, that the package will also meet the requirements of the revised 10 CFR Part 71.

### 1.0 GENERAL INFORMATION

MDS Nordion requested an amendment to Certificate of Compliance No. 9258, for the Model No. F-294 package by application dated August 1, 2003, as supplemented March 12, April 20, and May 20, 2004. MDS Nordion requested to include the F-457 as an alternative source carrier to the F-313 source carrier. The F-457 source carrier is a stainless steel basket designed to hold eighty special form sources in two concentric circular rows. The F-457 source carrier holds the same level of activity as the F-313 source carrier; 360,000 curies of special form Co-60 sources. The safety features of the F-457 source carrier are described in MDS Nordion Drawing No. F645701-001, Rev. A.

The applicant provided updated drawings of the F-294 package design. The drawings were revised to show alternative types of fiber cement insulation, CS-85, and Transite 1000. The revised MDS Nordion drawings are as follows:

F629401-001, Sheet 1, Rev. F,  
F629401-001, Sheet 2, Rev. F,  
F629401-001, Sheet 3, Rev. D,  
F629401-001, Sheet 4, Rev. F, and  
F629401-001, Sheet 5, Rev. F.

The drawings also include the weight of the F-457 source carrier. The content weight that can be held in the F-457 source carrier is 40 lb. The overall weight of the package

has not changed and remains at 21,000 lb. The drawing which describes the F-313 source carrier, MDS Nordion Drawing No. F631301-001, Rev. B, did not change. The staff reviewed the drawings, and determined that the changes do not affect the performance of the package under normal conditions of transport or hypothetical accident conditions.

The applicant provided a consolidated application as specified in 10 CFR 71.38(c). The application meets the requirements of 10 CFR Part 71. The staff reviewed the documents referenced in the certificate and determined that the required documentation was available and complete.

## 2.0 STRUCTURAL EVALUATION

The applicant analyzed the structural properties of the F-294 package when loaded with a F-457 source carrier. The inclusion of this source carrier increases the weight of the F-294 transport package by 23 lb for a total package weight of 20,838 lb. This weight is below the design weight of 21,000 lb that was used in previous analyses.

The applicant performed a finite element analysis to determine the stresses in the tie down lug and components. Results of the analysis showed these stresses to be reduced by a factor of two from the previous analysis. The applicant stated that in previous hand calculations, the vertical component of the inertial forces was inadvertently double counted, thereby doubling the tie down forces and component stresses. The higher tie down forces and associated stresses calculated in the previous analyses were below the yield stresses for the materials. Therefore, the previous analysis is a conservative, bounding case. Additionally, NRC staff performed confirmatory calculations to further demonstrate that the tie down lug and components are adequate to resist the applied inertia loads.

Based on review of the statements and representations in the application, the staff concludes that the structural design has been adequately described and evaluated and that the package has adequate structural integrity to meet the requirements of 10 CFR Part 71.

## 3.0 THERMAL

The applicant analyzed the thermal properties of the F-294 package when loaded with a F-457 source carrier. The total activity of the contents remains the same for the F-457 alternative source carrier. Therefore, the heat load is the same for both the F-313 and F-457 source carriers. However, in the F-457, the number of sources is increased, and the sources are configured differently, i.e., held in two concentric circular rows.

The applicant first performed a steady state thermal measurement. The F-294 was loaded with a F-457 source carrier filled with eighty Co-60 special form sources totaling 376,000 curies. Temperature measurements were recorded from thermocouples placed in various areas around the package.

The applicant developed a two dimensional ANSYS finite element method model using the measured temperature data. The computer model was developed to determine the

allowable loading configurations for the F-457 double-row carrier design. The applicant used the model to simulate various loading combinations in the carrier to ensure temperatures in the cavity remain sufficiently low and evenly distributed.

As a result, the applicant proposed the following loading criteria for the F-457: (1) the outer ring is to be filled first, and (2) the inner ring loading pattern is to be determined by an equation developed for the purposes of evenly distributing the temperature load around the inner ring. The applicant noted that when the F-294/F-457 is loaded in the aforementioned arrangement, that the permissible maximum temperatures will be the same as that of the F-294/F-313 configuration. Therefore, the 30-minute hypothetical accident condition fire test is bounded by the previous analysis. The applicant included the loading criteria in the operating procedures for the package.

The applicant also specified two new types of thermal insulation, CS-85 and Transite 1000. The applicant performed analyses to show that the CS-85 and Transite 1000 materials are bounded by the previous thermal analysis.

Based on the review of the statements and representations in the application, the staff concludes that the thermal design has been adequately described and evaluated, and that the thermal performance of the package meets the thermal requirements of 10 CFR Part 71.

## 5.0 SHIELDING

The applicant addressed the shielding properties of the F-294 loaded with the F-457 source carrier. The applicant stated that when the activity is distributed in eighty special form sources in a double ring formation, as in the F-457 source carrier, the shielding evaluation results can be assumed to be the same. Staff agrees that this is a conservative assumption based on the fact that the radiation fields from the forty sources on the inner ring of the double ring carrier will be partially shielded by the forty sources on the outer ring.

Based on review of the statements and representations in the application, the staff concludes that the shielding design has been adequately described and evaluated and that the package meets the external radiation requirements of 10 CFR Part 71.

## 7.0 OPERATING PROCEDURES

The applicant revised their operating procedures to add incremental steps for operating the package with the F-457 source carrier.

Based on 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 PROGRAM

The applicant revised the maintenance procedures to include the F-457 source carrier. In addition, the applicant has included a drawing of the F-457 source carrier.

Based on 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.

### REVISED 10 CFR PART 71

The applicant requested that the package identification number be revised to USA/9258/B(U)-96 to indicate that the package meets the requirements of the revised 10 CFR Part 71 regulations that become effective October 1, 2004, (69 FR 3698). The staff reviewed the application for compliance with the requirements of the revised 10 CFR Part 71.

Based on the statements and representations in the application, the staff concludes that the design has been adequately described and evaluated and the package meets the requirements of the revised 10 CFR Part 71.

### CONCLUSION

The Certificate of Compliance (CoC) has been revised to include the F-457 source carrier including engineering drawings, and the weight of the contents. The CoC has also been revised to include the latest revisions to the packaging drawings.

Condition No. 7 of the certificate clarifies that the package is approved for use under the general license provisions of 10 CFR 71.12, until October 1, 2004, and under provisions of 10 CFR 71.17 thereafter. This change is due to a revision in the numbering of the sections in the revised regulations that become effective on October 1, 2004 (69 FR 3698).

Condition No. 8 of the certificate allows the packaging to be marked with the previous Package Identification Number, USA/9258/B(U)-85 until October 1, 2005. This is to allow time to replace the packaging nameplate that shows the revised Package Identification Number, USA/9258/B(U)-96.

The package identification number has been revised to USA/9258/B(U)-96 to indicate that the package meets the requirements of the revised 10 CFR Part 71 regulations that become effective October 1, 2004, (69 FR 3698).

Based on the statements and representations in the application, the staff agrees that the changes do not affect the ability of the package to meet the requirements of 10 CFR Part 71. Furthermore, the staff has concluded, based on this same information, that the package will also meet the requirements of the revised 10 CFR Part 71.

Issued with Certificate of Compliance No. 9258, Revision No. 2, on June 3, 2004.