East Building, PHH-23
1200 New Jersey Ave, SE
Washington, D.C. 20590

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

COMPETENT AUTHORITY CERTIFICATION FOR A TYPE B(U) RADIOACTIVE MATERIALS PACKAGE DESIGN CERTIFICATE USA/0444/B(U)-96, REVISION 20

REVALIDATION OF CANADIAN COMPETENT AUTHORITY CERTIFICATE CDN/2051/B(U)-96

The Competent Authority of the United States certifies that the radioactive material package design described in this certificate satisfies the regulatory requirements for a Type B(U) package as prescribed in the regulations of the International Atomic Energy Agency[1] and the United States of America[2] The package design is approved for use within the United States for import and export shipments made in accordance with applicable international and domestic transport regulations.

1. Package Identification - F-271 Transport Package.

2. Package Description and Authorized Radioactive Contents - as described in Canadian Certificate of Competent Authority CDN/2051/B(U)-96, Revision 17 (attached).

3. 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 Engineering and Research, (PHH-23), Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, Washington D.C. 20590-0001.

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[1] "Regulations for the Safe Transport of Radioactive Material, 2012 Edition, No. SSR-6" published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

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

CERTIFICATE USA/0444/B(U)-96, REVISION 20

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.

d. Records of Management System activities required by Paragraph 306 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.

4. Marking and Labeling - The package shall bear the marking USA/0444/B(U)-96 in addition to other required markings and labeling.

5. Expiration Date - This certificate expires on January 31, 2026. Previous editions which have not reached their expiration date may continue to be used.

This certificate is issued in accordance with paragraph(s) 810 of the IAEA Regulations and Section 173.473 of Title 49 of the Code of Federal Regulations, in response to the July 9, 2021 petition by BWXT Medical Ltd, Ottawa, Ontario, and in consideration of other information on file in this Office.

Certified By:

William Schoonover
Associate Administrator for Hazardous Materials Safety

July 22, 2021
(DATE)

Revision 20 - Issued to endorse Canadian Certificate for Transport Package Design No. CDN/2051/B(U)-96, Revision 17.

Canadian Certificate No.: **CDN/2051/B(U)-96 (Rev. 17)**
Issue Date: **Jun-18-2021**
Expiry Date: **Jan-31-2026**
CNSC File: **30-B5-1-0**

Certificate

CDN/2051/B(U)-96 (Rev. 17)

Transport Package Design

The transport package design identified below is certified by the Canadian Nuclear Safety Commission pursuant to paragraph 21(1)(h) of the *Nuclear Safety and Control Act* and Subsection 10(1) of the *Packaging and Transport of Nuclear Substances Regulations*, 2015 and to the IAEA's *Regulations for the Safe Transport of Radioactive Material*, 2012 Edition.

REGISTRATION OF USE OF PACKAGES

All users of this authorization shall register their identity in writing with the Canadian Nuclear Safety Commission prior to the first use of this authorization and shall certify that they possess the instructions necessary for preparation of the package for shipment.

PACKAGE IDENTIFICATION

Designer:	**BWXT Medical Ltd.**
Make/Model:	**F-271 Transport Package**
Mode of Transport:	**Air, Sea, Road, Rail**

IDENTIFICATION MARK

The package shall bear the competent authority identification mark **"CDN/2051/B(U)-96".**

PACKAGE DESCRIPTION

The packaging as shown on drawing No. F627101-001 (Issue C) consists of an inner container and a crush and fire shield outer assembly. The inner container consists of a lead-filled, stainless steel encased cylinder and removable plug. The removable plug is secured with eight 1/2"-13 UNC socket head cap screws with minimum tensile strength of 1,200 MPa and sealed with a silicone "O" ring. There are drain lines through the plug and inner container cavity to permit pool loading. The drain lines are capped with brass pipe plugs and internal stainless steel filters to prevent migration of material from the cavity. The outer crush and fire shield consists of a conical, finned, insulated mild steel shell with a skid attached by eight 1-8 hex head grade BD bolts. The 25.4 mm thick thermal insulation is sandwiched between protective mild steel plates. The containment system consists of the capsules or the leak proof insert and inner container cavity.

An illustration of the package is shown on attached Specification Sheet No. F-271 (1996) (Issue 3).

Any modification to the package design must be submitted to the Canadian Nuclear Safety Commission for

approval prior to implementation.

The configuration of the package is as follows:

Shape:	**Cylindrical**	Shielding:	**Lead**
Mass:	**1640 kg**	Outer Casing:	**Mild steel**
Length:	**n/a**	Height:	**1173 mm**
Width:	**n/a**	Diameter:	**1100 mm**

AUTHORIZED RADIOACTIVE CONTENTS

This package is authorized to contain not more than:

a) the maximum activity corresponding to each isotope (in solid form) listed in Appendix A. If more than one isotope is transported, the activity of each isotope divided by the authorized maximum activity, when summed, shall not exceed one. The isotope shall be contained in one of the following aluminium capsules: AC-103, AC-139 or AC-150. The maximum decay heat of the contents and impurities shall not exceed 290 watts;

b) 11 TBq total of Strontium 82, Strontium 85, Rubidium 82, Rubidium 83, Niobium 92m, Chromium 51, Cobalt 58, Vanadium 48, Cobalt 56, Zirconium 88, Yttrium 88, Niobium 95, Yttrium 91, Zirconium 89, Yttrium 89 and small amounts of other radionuclides contained in proton irradiated molybdenum powder and associated stainless steel target shells all contained within the F-455 insert. These are shipped four days or later after the end of proton bombardment;

c) 11 TBq total of Strontium 82, Strontium 83, Strontium 85, Rubidium 82, Rubidium 83, Rubidium 84, Cobalt 55, Vanadium 48, Manganese 52 and other radionuclides contained in proton irradiated rubidium based target material and associated target shells all contained within the F-455 insert; or

d) 111 TBq of fission produced Iodine 131 and associated impurities contained within the F-455 leakproof insert.

MANAGEMENT SYSTEM

The management system for the design, manufacture, testing, documentation, use, maintenance and inspection of the package shall be in accordance with:

- BWXT Document No. IS/DS 2048 F271 (4) "Design, Manufacturing and Operating Specification for the F-271 Transport Package"
- BWXT document No. IS/QA 2663 Z000 (3)* "Radioactive Material Transport Package Quality Plan"
- Packaging and Transport of Nuclear Substances Regulations, 2015
- * or latest current revision

SHIPMENT

The preparation for shipment of the package shall be in accordance with:

- BWXT Document No. IS/DS 2048 F271 (4) "Design, Manufacturing and Operating Specification for the F-271 Transport Package"
- Packaging and Transport of Nuclear Substances Regulations, 2015

This certificate does not relieve the consignor from compliance with any requirement of the government of any country through or into which the package will be transported.

R. Garg
Designated Officer pursuant to paragraph 37(2)(a)
of the Nuclear Safety and Control Act

Appendix A

Maximum Activities for BWXT Model F-271 Transport Package

Isotope Product	Activity (TBq)
Na 24	0.18
P 32	20.00
S 35	100.00
Cl 36	0.40
K 42	10.00
Ca 45	13.80
Sc 46	20.00
Cr 51	37.00
Fe 55	88.00
Fe 59	8.00
Co 60	4.50
Ni 63	100.00
Cu 64	18.00
Zn 65	4.00
As 76	7.40
Se 75	80.00
Br 82	8.50
Rb 86	4.00
Sr 85	25.00
Y 90	18.00
Zr 95	3.70
Mo 99	40.00
Pd 103	200.00
Ag 110m	7.40
Cd 109	10.00
Cd 115m	20.00
Sn 113	20.00
Sn 119m	25.00
Sb 124	2.00
I 131	50.00
Cs 131	1.20
Cs 134	0.80
Cs 137	80.00
Ba 131	100.00
Ba 133	10.00
La 140	2.00
Ce 141	0.40
Eu 152	16.00
Eu 154	1.20
Gd 153	12.00
Tm 170	20.00
Yb 169	40.00
Ta 182	20.00
W 185	1.00
Ir 192	1700.00
Au 198	20.00
Hg 197	300.00
Tl 204	20.00
Po 210	3.70

* All other isotopes with atomic number 1 to 81 limited to the lesser of 10 x A_2 or 4 TBq.

Annexe A

Activités maximales pour le modèle de colis F-271 de BWXT

Produit Isotope	Activité (TBq)
Na 24	0.18
P 32	20.00
S 35	100.00
Cl 36	0.40
K 42	10.00
Ca 45	13.80
Sc 46	20.00
Cr 51	37.00
Fe 55	88.00
Fe 59	8.00
Co 60	4.50
Ni 63	100.00
Cu 64	18.00
Zn 65	4.00
As 76	7.40
Se 75	80.00
Br 82	8.50
Rb 86	4.00
Sr 85	25.00
Y 90	18.00
Zr 95	3.70
Mo 99	40.00
Pd 103	200.00
Ag 110m	7.40
Cd 109	10.00
Cd 115m	20.00
Sn 113	20.00
Sn 119m	25.00
Sb 124	2.00
I 131	50.00
Cs 131	1.20
Cs 134	0.80
Cs 137	80.00
Ba 131	100.00
Ba 133	10.00
La 140	2.00
Ce 141	0.40
Eu 152	16.00
Eu 154	1.20
Gd 153	12.00
Tm 170	20.00
Yb 169	40.00
Ta 182	20.00
W 185	1.00
Ir 192	1700.00
Au 198	20.00
Hg 197	300.00
Tl 204	20.00
Po 210	3.70

* Tous les autres isotopes dont le numéro atomique est inférieur à 81 inclusivement sont limités à la valeur la plus faible des deux valeurs suivantes, 10 x A_2 ou 4 TBq.

NOTES

Revision 14: December 9, 2015. Certificate revised. Removal of the F-341 insert.

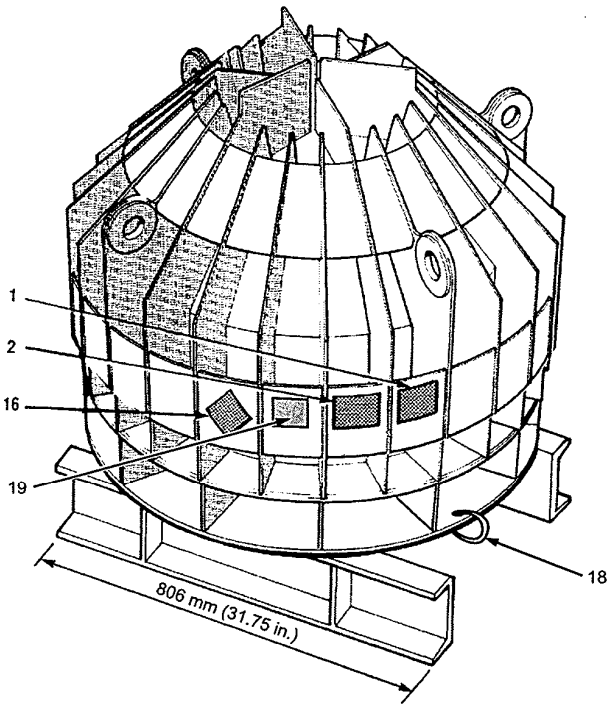
Revision 15: May 31, 2019. Certificate revised. Designer changed from Nordion to BWXT, Document No. IS/DS 2048 F271 revised and addition of BWXT Document No. IS/QA 2663 Z000.

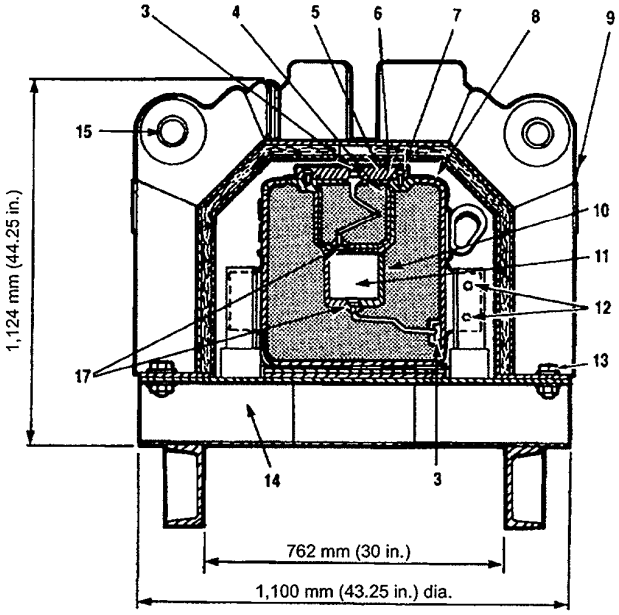
Revision 16: December 23, 2020. Certificate renewed.

Revision 17: June 18, 2021. Designer changed from BWXT ITG Canada Inc. to BWXT Medical Ltd.

Notes

1. CNSC Certification No. CDN/2051/B(U)-96
2. Weight (estimated):
   Total: 1,640 kg (3,615 lb.)
   Flask proper: 829 kg (1,825 lb.)
   Plug: 57 kg (125 lb.)
   Fire/crush shield: 748 kg (1,650 lb.)
3. Floor loading (based on projected floor area): 2,310 kg/m^2 (472 lb./ft^2)
4. This packaging must be prepared for shipment in accordance with MDS Nordion Specification IN/PP 1577 F271.





Parts List

1. MDS Nordion identification plate (2)
2. Radiation caution plate (2)
3. Brass or stainless steel pipe plugs, 1/2 in. NPT (2)
4. Removable shielding plug -steel encased lead
5. Removable containment cap
6. Silicone rubber "O" ring seal
7. Socket head cap screws 1/2 - 13 UNC x 1-1/4 in. long (8)
8. Flask proper - steel encased lead 162 mm (6-3/8 in.) thick
9. Removable fire/crush shield (top)
10. Internal cavity, I.D. 127 mm x 129 mm (5.0 in. x 5.1 in.)
11. Radioactive contents
12. Flask bolts 3/4 -10 UNC x 3 in. long heavy hex head ASTM A490 Type 1 or A354 GRADE BD (8)
13. Fire/crush shield bolts 1-8 UNC x 3 in. long hex head ASTM A490 Type 1 or A354 GRADE BD (8)
14. Removable fire/crush shield assembly (bottom)
15. Lifting eyes (4)
16. Label, Radioactive Category I,II or III (2)
17. Stainless steel filters (2)
18. Security seal
19. UN Number Labels (2): one next to each of the two radioactive category labels

MDS Nordion
447 March Road, P.O. Box 13500
Kanata, Ontario, Canada, K2K 1X8
Tel: (613) 592-2790 · Fax. (613) 592-6937

TITLE

F-271 Transport Packaging (To 1996 IAEA Regulations)

REF. IN/SS 1667 F271(96) F127101-001	REVISED Mar 04	DCN A1944-D-46B
DATE July 2000	No. F-271(1996)	ISSUE 3
DRAWN BW / CHECKED VE / APPROVED MK	SHEET 1 OF 1	

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1200 New Jersey Ave, SE
Washington, D.C. 20590

U.S. Department of
Transportation

**Pipeline and
Hazardous Materials
Safety Administration**

CERTIFICATE NUMBER: USA/0444/B(U)-96

ORIGINAL REGISTRANT(S):

BWXT Medical Ltd
447 March Road
Ottawa, Ontario, K2K 1X8
CANADA