

January 16, 1989

Mr. Tom Rich
Office of Nuclear Material
Safety and Safeguards
Division of Fuel Cycle and Material Safety
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
U. S. A.

Dear Mr. Rich,

SUBJECT : REGISTRATION SHEET NUMBER : NR-169-S-151-S
FOR THE C-198 CAPSULE

Thank you for your letter of 1988 December 15th which had attached to it a copy of the subject registration sheet amended in its entirety and send to Mr. Barrie Jackson.

Upon review however, we would request that a number of small proprietary changes be made.

Please find attached a copy of this registration sheet on which I have taken the liberty of indicating the required changes.

We trust this will prove satisfactory and thank you for your attention to this matter.

Your sincerely,



J. Stirling
Regulatory Affairs

cc: B. Jackson

Encl.



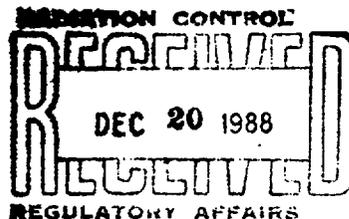


UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 15 1988

Nordion International Inc.
ATTN: Barry Jackson
Manager - Radiation Control
& Regulatory Affairs

447 413 March Road
P.O. Box 13500
Kanata, Ontario
Canada K2K1X8



Dear Mr. Jackson:

Based on the information and test data submitted in AECL's letter dated December 16, 1987, and succeeding correspondence, we continue to conclude that Model C-198 sealed source design is acceptable for specific licensing purposes in accordance with the conditions of the enclosed certificate of registration.

Please read over this certificate in its entirety and notify us immediately if there are any errors.

If you have any questions, please contact me or Steven Baggett. My FTS phone number is 492-0511.

Sincerely,


Tom Rich

Commercial Section
Medical, Academic, and Commercial
Use Safety Branch
Division of Industrial and Medical
Nuclear Safety
Office of Nuclear Material
Safety and Safegaurds

Enclosure: Registration Certificate NR-169-S-151-S

cc: Glenda Jackson w/encl.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE
(Amended in its Entirety)

Corrected Copy

NO.: NR-169-S-151-S DATE: DEC 15 1988

PAGE 1 OF 5

SEALED SOURCE TYPE: Gamma Irradiator Source

MODEL: C-198

MANUFACTURER/DISTRIBUTOR: * Nordion International Inc.
447 413 March Road
P.O. Box 13500
Kanata, Ontario
Canada K2K1X8

* Formerly - Atomic Energy of Canada
Radiochemical Company

ISOTOPE:

Cobalt-60

MAXIMUM ACTIVITY:

3,500 curies

LEAK TEST FREQUENCY: 6 Months

PRINCIPAL USE: (J) Gamma Irradiator, Category I

CUSTOM SOURCE: _____ YES x _____ NO

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NO.: NR-169-S-151-S DATE: DEC 15 1988

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SEALED SOURCE TYPE: Gamma Irradiator Source

DESCRIPTION:

The sealed source Model C-198 is a doubly encapsulated fusion welded source that is used in a Self-Contained, Dry Source Storage Gamma Irradiator (Category I). The maximum activity for each Model C-198 Cobalt-60 sealed source is 3,500 curies. The source capsule can contain either Co-60 slug or Co-60 pellets.

The Model C-198 is constructed of an outer stainless steel (316L) tube having an outside diameter of 0.383 inches, overall length of 8.265 inches and wall thickness of 0.050 inches. The ends of the tube are machined out to allow the endcaps to be inserted and fusion welded in order to hold the inner capsule in place and provide extra integrity of the source. The outer endcaps are 0.093 inches wide by 0.338 inches in diameter and have a wall thickness of 0.025 inches.

An inner stainless steel tube having an outside diameter of 0.320 inches and overall length (after weld) of 8.015 inches and wall thickness of 0.050 inches contains the Co-60 pellets or slugs. The inner tube has been machined out to allow endcaps to be inserted and fusion welded in place to hold the Co-60 material. The inner endcaps are 0.157 inches wide by 0.273 inches in diameter and have a wall thickness of 0.025 inches.

If Co-60 slugs are used, a 0.250 inch diameter by 0.375 inch long spacer is used on each side of the center slug. The active volume contains up to seven 1 inch long by 0.250 inches in diameter Co-60 slugs or 1 mm. by 1 mm. nickel plated right cylindrical Co-60 pellets. The slugs can be nickel plated or unplated.

DIAGRAM:

See attachment 1

LABELING:

2 → The C-198 is engraved on its outer surface with either "AECL" or
C → "NII", "Co-60", "C-198", and serial number. The inner capsule also has a serial number engraved on its outer surface.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE
(Amended in its Entirety)

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NO.: NR-169-S-151-S DATE: DEC 15 1988

PAGE 3 OF 5

SEALED SOURCE TYPE: Gamma Irradiator Source

CONDITIONS OF NORMAL USE:

SP The Model C-198 sealed source is intended to be used in Self-Contained, Dry Source Storage Gamma Irradiators (Category I) for the purpose of irradiating samples. The sealed source is shielded at all times and human access to the sealed source is not physically possible due to the design configurations of the gamma irradiator. The sealed sources are contained in devices which typically are used in areas having environments that are fit for human occupancy.

PROTOTYPE TESTING:

The manufacturer has tested sealed source Model C-198 in accordance with ANSI N542-1977 and the prototype sources achieved an ANSI N542 classification of 77E43323. In addition a bend test was performed to ANSI N433.1 Category I Gamma Irradiators and the prototype passed level 4 (static force = 1,000 N or 102 kilograms).

?

EXTERNAL RADIATION LEVELS:

The expected external radiation levels from an unshielded 3,500 curie C0-60 source are:

<u>Distance from the Source (cm.)</u>	<u>External radiation level (R/hr.)</u>
10	462,000
30	51,333
100	4,620

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SEALED SOURCE TYPE: Gamma Irradiator Source

QUALITY ASSURANCE AND CONTROL:

NORDION INTERNATIONAL

AECL has supplied an adequate quality assurance and control program. A copy of this program is on file with the Medical, Academic, and Commercial Use Safety Branch.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- o The source Model C-198 shall be distributed only to persons specifically licensed by the NRC or an Agreement State.
- o These sources shall be leak tested at 6 month intervals using techniques capable of detecting 0.005 microcurie of removable contamination.
- o Handling, Storage, Use, Transfer, and Disposal: To be determined by the licensing authority.
- o This registration sheet and the information contained with the references shall not be changed without the written consent of the NRC.

SAFETY ANALYSIS SUMMARY:

The sealed sources have an ANSI N542-1977 classification of 77E43323, and have passed a level 4 bend test according to ANS N433.1. This indicates that temperature, pressure, impact, vibration, and puncture stresses imposed during normal use are highly unlikely to cause breach of containment integrity of the capsules. Protection provided by the source housing (Irradiator) further assures radiation material containment in the event of an accident. Design and construction of the Category I Irradiators prevent human access to the source, and allow the source to be shielded at all times.

The sources are not expected to be subjected to severe environments since these sources are used in environments that are fit for human occupancy.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

(Amended in its Entirety)

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NO.: NR-169-S-151-S DATE: DEC 15 1988 PAGE 5 OF 5

SEALED SOURCE TYPE: Gamma Irradiator Source

SAFETY ANALYSIS SUMMARY (CONT.):

Model C-198 sealed source has been previously approved by the NRC in October 1977.

Based on our review of the information and test data cited below, we continue to conclude that AECL's sealed source Model C-198 is acceptable for licensing purposes. *THE NORDION INTERNATIONAL*

Furthermore, we continue to conclude that these sources would be expected to maintain their containment for normal conditions of use which might occur during the uses specified in this registration sheet.

REFERENCES:

The following supporting documents for Atomic Energy of Canada's Model C-198 gamma irradiator sources are hereby incorporated by reference and are made a part of this registry document. *THE NORDION INTERNATIONAL*

- o Atomic Energy of Canada Limited's letters dated August 17, 1988, January 27, 1988, December 16, 1987, and enclosures thereto.
- o *Nordain letter dated January 16, 1989, and enclosures thereto.*

ISSUING AGENCY:

U.S. Nuclear Regulatory Commission

Date: DEC 15 1988

Reviewer: *[Signature]*

Date: DEC 15 1988

Concurrence: *Stutzo W Bell*