



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

JUL 27 1989

Mr. Joe Stirling
Regulatory Affairs
Nordion International Inc.
447 March Road
Kanata, Ontario, CA K2K1X8

Dear Mr. Stirling:

Based on the information submitted in your letter dated January 16, 1989 we have corrected your Certificate Of Registration. We continue to conclude that Model C-198 Gamma Irradiator sources are acceptable for specific licensing purposes in accordance with the conditions of the enclosed certificate of registration.

Please read over the 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 phone number is (301) 492-0511.

Sincerely,

A handwritten signature in cursive script that reads "Thomas W. Rich".

Thomas W. Rich
Commercial Section
Medical, Academic, and Commercial
Use Safety Branch
Division of Industrial and Medical
Nuclear Safety, NMSS

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

cc: Glenda Jackson w/encl.

Handwritten initials "A/17" in a simple, blocky font.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE
(CORRECTED COPY)

NO.: NR-169-S-151-S DATE: JUL 27 1989

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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 a 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

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE
(CORRECTED COPY)

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SEALED SOURCE TYPE: Gamma Irradiator Source

LABELING:

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

* "AECL" or Atomic Energy of Canada is now "NII" or Noridon International Inc.

CONDITIONS OF NORMAL USE:

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 Co-60 source are:

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

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE
(CORRECTED COPY)

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SEALED SOURCE TYPE: Gamma Irradiator Source

QUALITY ASSURANCE AND CONTROL:

Nordion International 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
(CORRECTED COPY)

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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 the Nordion International sealed source Model C-198 is acceptable for licensing purposes.

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:

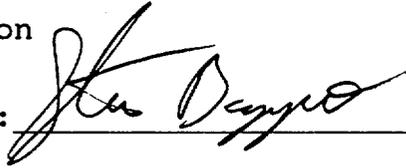
The following supporting documents for the Nordion International Model C-198 gamma irradiator sources are hereby incorporated by reference and are made a part of this registry document.

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

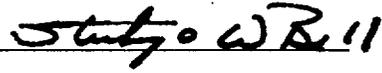
ISSUING AGENCY:

U.S. Nuclear Regulatory Commission

Date: JUL 27 1989

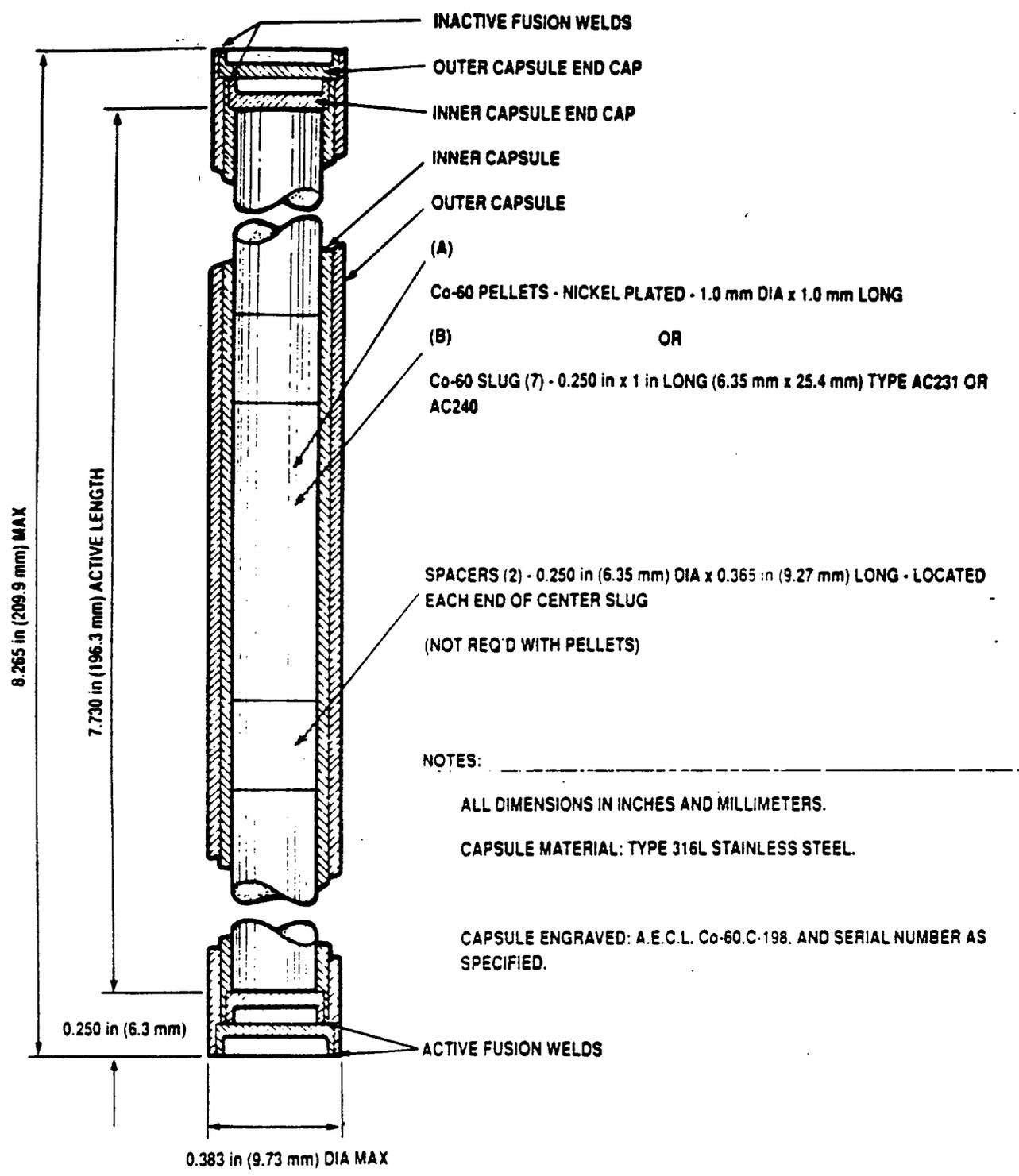
Reviewer: 

Date: JUL 27 1989

Concurrence: 

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

NO.: NR-169-S-151-U **DATE:** JUL 27 1989 **ATTACHMENT 1**



NOTES: _____

ALL DIMENSIONS IN INCHES AND MILLIMETERS.

CAPSULE MATERIAL: TYPE 316L STAINLESS STEEL.

CAPSULE ENGRAVED: A.E.C.L. Co-60.C-198. AND SERIAL NUMBER AS SPECIFIED.