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

May 25, 2004

Scott Seaman, President
Seaman Nuclear Corporation
7315 South First Street
Oak Creek, WI 53154

RE: REQUEST TO AMEND REGISTRATION CERTIFICATE NR-0584-D-104-S

Dear Mr. Seaman,

Based on the information submitted in your letters dated March 30, 2004, and subsequent correspondence, requesting amendment to registration certificate NR-0584-D-104-S, we have completed your request. A copy of the registration certificate is enclosed.

Please read over the registration certificate in its entirety and notify us immediately of any errors or omissions.

You are obligated to notify us promptly in writing should you decide to no longer manufacture or offer service support for the product.

If you have any questions, please contact me at (301) 415-7637.

Sincerely,

Nima Ashkeboussi

Nima Ashkeboussi, Mechanical Engineer
Materials Safety and Inspection Branch
Division of Industrial and
Medical Nuclear Safety
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE
(AMENDED IN ITS ENTIRETY)

NO.: NR-0587-D-104-S DATE: May 25, 2004

DEVICE TYPE: Portable Moisture and Density Gauge

MODEL: C-100, C-200, **C-300 Series**

MANUFACTURER/DISTRIBUTOR: Seaman Nuclear Corporation
7315 South First Street
Oak Creek, WI 53154

SEALED SOURCE MODEL DESIGNATION:

For Models C-100 and C-200:
AEA Technology (formerly Amersham): CDC.804, CDC.805, AMN.6002, AMN.Q1954
Du Pont Merck: NER-550
3M: 4P6M
Nuclear Sources and Services: AN-HPG, AN-HP, GT-GHP

For C-300 Series:
AEA Technology: CDC.800, AMN.PE5, AMN.V997, RAN.C1
Gammatron: GT-GHP, AN-HP
Isotopes Products Laboratory: HEG-137, AM1.NO2
Radium Chemical Company: Drawing 21.94

ISOTOPE:	MAXIMUM ACTIVITY:
Cesium-137	10 mCi (370 MBq)
Americium-241/Be	50 mCi (1.85 GBq)
Radium-226/Be	**5.5 mCi (203.5 MBq)**

LEAK TEST FREQUENCY: 6 Months

PRINCIPAL USE: (G) Portable Moisture Density Gauges

CUSTOM DEVICE: _____ YES __X__ NO

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DEVICE TYPE: Portable Moisture and Density Gauge

DESCRIPTION:

The C-300 **Series** is a portable single piece unit, weighing about 37 pounds (16.8 kg), whereas the Models C-100 and C-200 are weighing about 45 pounds (20.4 kg). When facing the gauge, the physical dimensions of C-100, C-200, and C-300 **Series** are:

	External Dimensions	
Model	C-100/C-200 inches	C-300 **Series** inches
Width	17	17
Depth (with optional Probe)	11.5	9.5 (11)
Height of gauge (with handle)	13 (15)	10.5 (13)

Models C-100 and C-200 incorporate a 50 mCi (1.85 GBq) americium-241:beryllium sealed neutron source and an 10 mCi (370 MBq) Cesium-137 sealed gamma source enabling inspection of materials for moisture content and density. The Cesium-137 source is housed in a lead shield within the device and is rotated 180° between its On and Off position. The source remains in the device at all times. The lead shield for the Cesium-137 source is held to the base of the meter with four stainless steel studs and tamper resistant nuts. For additional strength, a plate is fastened with screws to the top of the shield and to the flange of the base.

The C-300 Series consists of five models with different source combinations. The following table delineates the combinations of sources that will be used:

Model	Source Arm	Main Shield
C-300-00	Cs-137	Am-241:Be
C-300-01	CS-137	-
C-300-02	-	Am-241:Be
C-300-03	Ra-226:Be	Am-241:Be
C-300-04	Ra-226:Be	-

In the Models C-100 and C-200, the lead shield is secured to the base with an aluminum bracket. The bracket is secured to the base with four machine screws, and the lead is secured to the

DEVICE TYPE: Portable Moisture and Density Gauge

DESCRIPTION (Cont'd):

bracket with three self tapping screws. For all Models, the On-Off mechanism, whose status is indicated by the position of the carrying handle, moves the Cesium-137 source holder within its stationary shield inside the gauge. The On-Off mechanism incorporates a 2 to 1 gear ratio which means that turning the handle 90° will rotate the source 180°. When the gauge is not in use, the source holder rests in the shielded position surrounded by lead. There is no shutter for source fixed at the gauge bottom in the main lead casting.

In the optional direct transmission mode, the source remains protected in the instrument housing and only the detector is placed in a probe external to the gauge.

The C-100, C-200, and C-300 **Series** gauges are designed so that the source positioning mechanism must be in the Off position for the gauge to be transported. To accomplish this, the shielding mechanism is returned to the Off condition by lifting the handle from either of its two operating positions. Approximately 3 ft-pounds (0.41 m-kg) of torque is required to overcome the positioning detent in the On condition. Lifting the gauge by its handle, which is horizontal in the on condition, applies 27 ft-pounds (3.73 m-kg) of torque. Lifting of the gauge by the handle will return the gauge to the Off condition.

Epoxy is used to retain the sources within their holders. This epoxy is insoluble in water and most common solvents. Seaman has indicated there have been no epoxy failures in either the 20 year history of this type of gauge nor in the 35 years of Seaman Nuclear products. The source holders must be heated to 600°F (316°C), a temperature that melts the lead in the source holder, to release the source. Seaman has demonstrated that the epoxy will withstand exposure to radiation experienced during the life of the device. However, even if the epoxy were to fail, the sources would remain in the housing due to the design of the shielding for the sources.

The Models C-100 and C-200 are of similar design to the Model

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DEVICE TYPE: Portable Moisture and Density Gauge

DESCRIPTION (Cont'd):

C-300 **Series**. The only differences between the devices are overall dimensions, dimensions of some parts, and other minor differences internal to the device.

LABELING:

The device is labeled in accordance with **10 CFR 20.1904**. Specifically, a label is adhered to the front of the lower section of the device and includes the device model number, serial, isotopes, activities, dates of assay, the trefoil symbol, and the words "Caution - Radioactive Material." In addition, the device labeling identifies Seaman Nuclear.

When the top portion of the device (electronics) is removed, the statement "DO NOT DISASSEMBLE BEYOND THIS POINT." is labeled on all Models.

The On and Off position of the Cesium-137 source is indicated by the position of the handle. For the Model C-300 **Series**, there are also figures next to the device read out that indicate the source condition based on the position of the handle.

DIAGRAM:

See Attachments 1 **through 6.**

CONDITIONS OF NORMAL USE:

The devices are designed for use under conventional field construction and testing conditions, including environmental ranges from 0 to 100% relative humidity, ambient temperatures -20 to 60°C (-4 to 140°F), and with the base in contact with material up to 191°C (376°F).

DEVICE TYPE: Portable Moisture and Density Gauge

PROTOTYPE TESTING:

A prototype of the Model C-300 Series was subjected to and passed the following tests.

Cold Cycle: Eight hours at -12°C (10.4°F).

Hot Cycle: Eight hours at 63°C (145°F).

Thermal Shock: Hot (63°C [145°F]) and cold (-12°C [10.4°F]) environments were established. The device was subjected to the hot environment for 4 hour and then transferred to the cold environment for 1 hour. Then, the device was subjected to the cold environment for 4 hour and then transferred to the hot environment for 1 hour.

Hot Surface: A 191°C (376°F) surface was established. The device was placed on the surface for 20 minutes and then allowed to cool to ambient (20°C [68°F]). The device was then cycled, 6 times, between the 191°C (376°F) surface for 5 minutes and an ambient surface for 5 minutes.

Vibration: Device was fastened to a vibratory test fixture for 24 hours. The frequency was 12.5 Hz and the amplitude was 0.125" (0.3 cm) in one direction and 0.018" (0.46 mm) in the other direction. The device was rotated after 12 hours.

Drop Test: Dropped onto an asphalt surface from 1 m (3.3'). Also dropped 5 times onto a 1" (2.54 cm) diameter steel ball from a height of 1' (30.5 cm).

Based on design similarities, it is expected that the Models C-100 and C-200 would withstand the same testing.

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EXTERNAL RADIATION LEVELS:

The table in Attachment 2 **through** 6 includes the maximum combined gamma and neutron dose rates for the Model C-300 **Series.** Dose rates for the Models C-100 and C-200 would be a maximum of 10 percent higher in some cases than those listed in the Attachments according to the manufacturer.

QUALITY ASSURANCE AND CONTROL:

Seaman Nuclear Corporation maintains a quality assurance and control program which has been deemed acceptable for licensing purposes by NRC. A copy of the program is on file with NRC.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- The devices shall be distributed to specific licensees of the NRC or Agreement States.
- The device shall be leak tested at intervals not to exceed 6 months using techniques capable of detecting 0.005 mCi (185 Bq) of removable contamination.
- Handling, storage, use, transfer, and disposal: To be determined by the licensing authority.
- This registration sheet and the information contained within the references shall not be changed without the written consent of the NRC.

SAFETY ANALYSIS SUMMARY:

Based on review of the Models C-100, C-200, and C-300 **Series** and the information and test data cited below, we conclude that the devices are acceptable for licensing purposes.

Furthermore, we conclude that the devices would be expected to maintain their integrity for normal conditions of use and accidental conditions which might occur during uses specified in this certificate.

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DEVICE TYPE: Portable Moisture and Density Gauge

REFERENCES:

The following documents for the Models C-100, C-200, and C-300 **Series** portable moisture density gauges are hereby incorporated by reference and are made a part of this registration certificate:

- Seaman Nuclear Corporation's letters dated May 26, 1999, March 31, 1999, March 30,, 1999, October 8, 1998, September 16, 1998, July 31, 1998, June 1, 1998, December 30, 1997, and December 23, 1997, with enclosures thereto.

- **Seaman Nuclear Corporation letter dated March 30, 2004, with enclosures thereto..**

- **Seaman Nuclear Corporation letter dated April 29, 2004, and electronic mail dated May 19, 2004.**

ISSUING AGENCY:

U.S. Nuclear Regulatory Commission

Date: May 25, 2004 Reviewer: John P. Jankovich

Date: May 25, 2004 Concurrence: Xiaosong Yin

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SAFETY EVALUATION OF DEVICE
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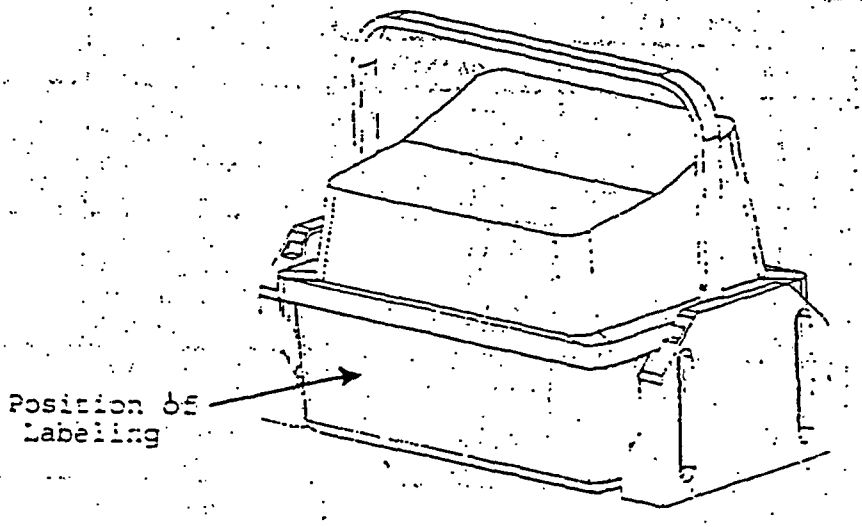
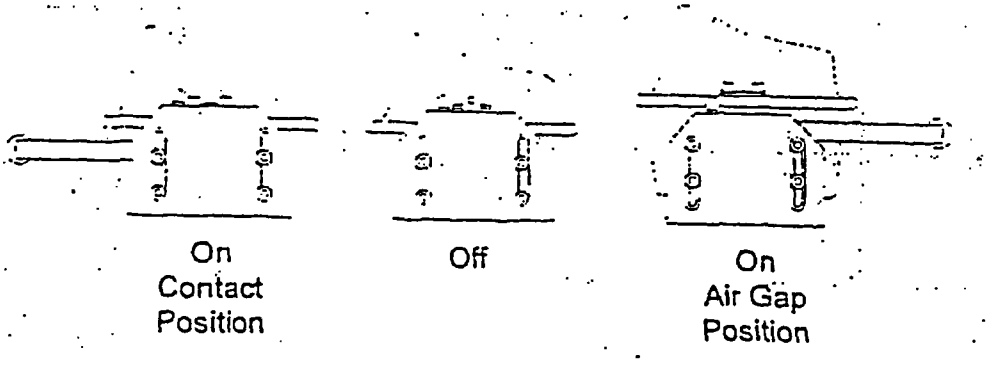
NO.: NR-0587-D-104-S DATE: May 25, 2004 ATTACHMENT 1

DEVICE TYPE: Portable Moisture and Density Gauge



Models C-100, C-200, and C-300



Operating Positions

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE
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NO.: NR-0587-D-104-S DATE: May 25, 2004 ATTACHMENT 2

DEVICE TYPE: Portable Moisture and Density Gauge

Dose Rate for Model C-300-00

Condition		OFF	ON
Area	Distance (cm)	mrem/hr	mrem/hr
Front	contact	8.2	9.1
	30	1.6	1.9
	100	0.3	0.5
Back	contact	7.7	8.7
	30	1.4	1.9
	100	0.3	0.3
Right	contact	9.6	12.5
	30	1.3	2.7
	100	0.2	0.4
Left	contact	1.1	0.9
	30	0.6	0.4
	100	0.2	0.2
Top	contact	5.2	1.5
	30	1.2	0.5
	100	0.3	0.2
Bottom	contact	16.0	>1000.0
	30	2.0	22.9
	100	0.5	2.6

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NO.: NR-0587-D-104-S DATE: May 25, 2004 ATTACHMENT 3

DEVICE TYPE: Portable Moisture and Density Gauge

Dose Rate for Model C-300-01

Condition		OFF	ON
Area	Distance (cm)	mrem/hr	mrem/hr
Front	contact	7.2	7.8
	30	1.0	1.4
	100	0.1	0.3
Back	contact	6.5	7.0
	30	0.9	1.4
	100	0.2	0.3
Right	contact	8.0	10.5
	30	0.6	1.8
	100	0.1	0.3
Left	contact	0.7	0.6
	30	0.3	0.2
	100	0.1	0.1
Top	contact	4.5	1.0
	30	0.9	0.3
	100	0.2	0.1
Bottom	contact	11.5	>1000.0
	30	1.1	22.0
	100	0.2	2.5

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NO.: NR-0587-D-104-S DATE: May 25, 2004 ATTACHMENT 4

DEVICE TYPE: Portable Moisture and Density Gauge

Dose Rate for Model C-300-02

Condition		OFF	ON
Area	Distance (cm)	mrem/hr	mrem/hr
Front	contact	1.0	1.3
	30	0.6	0.5
	100	0.2	0.2
Back	contact	1.2	1.7
	30	0.5	0.5
	100	0.1	0.2
Right	contact	1.6	2.0
	30	0.7	0.9
	100	0.1	0.1
Left	contact	0.4	0.3
	30	0.3	0.2
	100	0.1	0.1
Top	contact	0.7	0.5
	30	0.3	0.2
	100	0.1	0.1
Bottom	contact	4.5	5.0
	30	0.9	0.9
	100	0.3	0.1

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NO.: NR-0587-D-104-S DATE: May 25, 2004 ATTACHMENT 5

DEVICE TYPE: Portable Moisture and Density Gauge

Dose Rate for Model C-300-03

Condition		OFF	ON
Area	Distance (cm)	mrem/hr	mrem/hr
Front	contact	42.2	37.1
	30	6.3	6.5
	100	1.3	1.2
Back	contact	47.2	42.7
	30	7.3	7.8
	100	1.2	1.2
Right	contact	67.9	58.0
	30	8.6	8.4
	100	0.9	1.3
Left	contact	7.7	3.6
	30	1.8	1.1
	100	0.5	0.3
Top	contact	23.5	7.6
	30	6.6	1.7
	100	1.2	0.5
Bottom	contact	45.5	>1000.0
	30	7.7	49.9
	100	1.3	5.5

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NO.: NR-0587-D-104-S DATE: May 25, 2004 ATTACHMENT 6

DEVICE TYPE: Portable Moisture and Density Gauge

Dose Rate for Model C-300-04

Condition		OFF	ON
Area	Distance (cm)	mrem/hr	mrem/hr
Front	contact	41.2	35.8
	30	5.7	6.0
	100	1.1	1.0
Back	contact	46.0	41.0
	30	6.8	7.3
	100	1.1	1.1
Right	contact	66.3	56.0
	30	7.9	7.5
	100	0.8	1.2
Left	contact	7.3	3.3
	30	1.5	0.9
	100	0.4	0.2
Top	contact	22.8	7.1
	30	6.3	1.5
	100	1.1	0.4
Bottom	contact	41.0	>1000.0
	30	6.8	49.0
	100	1.0	5.4