REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE
(Amends In Its Entirety)

NO. : NC-646-D-128-S **DATE:** February 23, 2012 **PAGE:** Page 1 of 8

DEVICE TYPE: Asphalt Content Gauge

MODEL No.: 3241-C, **3241-D** & 3241-G

MANUFACTURER/DISTRIBUTOR: Troxler Electronic Laboratories, Inc.
P.O. Box 12057
3008 Cornwallis Road
Research Triangle Park, NC 27709

SEALED SOURCE MODEL DESIGNATION:	ISOTOPE:	MAXIMUM ACTIVITY:
Amersham Corporation Model No. AMNV.340 Capsule Type X.2105 Special Form Certificate No. GB/149/S	Am-241:Be	110 mCi (4.07 GBq)
Model No. AMNV.339 Capsule Type X.2105 Special Form Certificate No. GB/149/S	Am-241:Be	330 mCi (12.2 GBq)
AEA Technology/QSA, Inc. **Model No. AMN.V.997** **Capsule Type: X1** **Special Form Certificate # USA/0632/S**	Am-241:Be	44 mCi (1.63 GBq)
Isotope Product Laboratories **Model No. Am1.N02** **Special Form Certificate # CZ/1009/S-85**	Am-241:Be	44 mCi (1.63 GBq)
Model Nos. 3027 **Special Form Certificate No. USA/0462**	Am-241:Be	44 mCi (1.63 GBq)

LEAK TEST FREQUENCY: **12** months

PRINCIPAL USE: (G) Field Measurement of Asphalt Content

CUSTOM DEVICE: _____ YES **X** NO

DEVICE TYPE: Asphalt Content Gauge

DESCRIPTION:

The Models 3241-C, **3241-D** and 3241-G Asphalt Content Gauges are portable gauges designed to measure the asphaltic tar content in paving materials. The design of these devices is based on the principal of neutron thermalization via collisions with atoms of similar mass and incorporates a doubly-encapsulated neutron-emitting Americium 241: Beryllium radioactive source and a series of four (4) Helium-3 detector tubes. The Model 3241-C gauge utilizes either a 100 mCi (nominal) source (min. neutron yield: 2.2 to 3.2 x 10^5 neutrons/sec). The device operation can be described as follows: fast neutrons, emitted from the source, traverse the test sample that has been placed inside the enclosed test chamber and are subsequently slowed down (thermalized) by collisions with Hydrogen atoms in the test material. The thermal neutrons are then detected by the Helium-3 detectors and counted over a specified time period. Due to the inability of these detectors to detect fast neutrons, the number of thermalized neutrons counted is directly proportional to the number of hydrogen atoms present in the sample. The accompanying electronics then processes the count numbers and calculates the asphaltic tar content using operator-supplied information (i.e., mass of sample and calibration data).

The engineering of the devices is based on a sealed source composed of either a 100 mCi (nominal) or 300 mCi (nominal) mixed sample of Americium 241: Beryllium in "special form." The radioactive material is contained in a stainless steel cylindrical vessel (i.d. – 10.2 mm, wall thickness – 0.64 mm) which is capped and sealed by fusion welding. This capsule is then inserted into a second stainless steel cylindrical vessel (i.e. – 11.4 mm, wall thickness – 0.64 mm) which is then capped and sealed by fusion welding. The serial numbers are stamped or engraved on the bottom surface, while other data can be found engraved on the cylindrical surface. The encapsulated materials meet internationally-accepted specifications for special form certification and ANSI test criteria for classification as ANSI-77C65545. The sealed source is secured in a fixed, permanent position in the device with no "on-off" mechanism or source shutter. The overall outside dimensions of the device (excluding controller) measure 36 cm (length) x 28 cm (width) x 27 cm (height). **The Model 3241-D gauge design and shielding does not change from the 3241-C other than two smaller (40 mCi sources) that are installed in lieu of one larger source.**

DETAILS OF CONSTRUCTION:

General characteristics:

The models 3241-C, **3241-D**, and 3241-G are constructed from four (4) basic materials: aluminum, cadmium, high-density polyethylene and stainless steel. High density polyethylene is used in the construction of the source holder, the barrier surrounding the source housing in the top of the device, the sample chamber walls (thickness: 15.9 mm) and floor (thickness: 15.2 mm – 25.4 mm), and the base stand (thickness: 25.4 mm). Cadmium (thickness: 0.4 mm) is used to shield the outside of the polyethylene source housing barrier and to line the inside walls of the device in such a fashion that no neutron emitted from the sealed source could leave the device with out passing through at least one thickness of cadmium. Stainless steel (thickness: 1.2 mm) is used in the bottom of the sample chamber to cover the aluminum housing over the detectors, giving increased shielding in the direction of the emitted beam. Finally, aluminum is used as the main construction material in the fabrication of the rest of the

device. This includes the device walls, top, and bottom; sample chamber interior faces; and other similar structures exterior to the device. A circular hole (19.1 mm in diameter) is cut into the top interior face plate of the chamber to act as the neutron beam exit port. The overall design and construction of the devices render the source housing immovable and access to the radioactive materials highly restricted. The devices would have to be disassembled in entirety to gain access to the sealed source. Furthermore, the small sample chamber volume precludes an operator from inadvertently being exposed.

3241-C Specifics:
In this gauge model, the sealed source is inserted into a 5.72 cm long cylindrical aluminum source housing (o.d. – 2.54 cm & i.d. 1.59 cm) and the positioned in the housing by a polyethylene source holder that fills the void space. The source capsule is secured in the housing by means of a threaded plug/cap which is then covered with a "Caution –-Radioactive Material" label. Immediate source shielding is provided by a high-density polyethylene domed barrier wrapped with cadmium. The shielded source, holder, housing, and barrier are then attached to the internal aluminum structure of the device with two (2) #6 steel screws. The internal dimensions of the sample chamber measure 25.0 cm (length) x 19.4 cm (width) x 11.1 cm (height).

3241-D Specifics:
In this gauge model, the set of two sealed sources is inserted into a 5.72 cm long cylindrical stainless steel source housing (o.d. – 2.54 cm & i.d. - 1.74 cm) and positioned in the housing by a 4.1 cm long polyethylene source holder. The source capsule is secured in the stainless steel housing by means of a threaded plug/cap which is then covered with a "Caution –-Radioactive Material" label over each source. Immediate source shielding is provided by a high-density polyethylene domed barrier wrapped with cadmium. The shielded sources, holder, housing, and barrier are then attached to the internal aluminum structure of the device with two (2) #6 steel screws. The internal dimensions of the sample chamber measure 25.0 cm (length) x 19.4 cm (width) x 11.1 cm (height).

3241-G Specifics:
In this gauge model, the sealed source is inserted into a 4.45 cm long cylindrical aluminum source housing (o.d. – 2.54 cm & i.d. – 1.59 cm) and positioned in the housing by a 3.01 cm long polyethylene source holder. The source capsule is secured in the housing by means of a threaded plug/cap which is then covered with a “Caution – Radioactive Materials” label. Immediate source shielding is provided by a high-density polyethylene domed barrier wrapped with cadmium. The shielded source, holder, housing, and barrier are then attached to the internal aluminum structure of the device with two (2) #6 steel screws. The reduction in size of the source housing and barrier was engineered into the gauge to increase the internal counting volume of the sample chamber. The internal dimensions of the sample chamber measure 25.0 cm (length) x 19.4 cm (width) x 12.7 cm (height).

DEVICE TYPE: Asphalt Content Gauge

LABELING:

The devices are labeled in accordance with 15A NCAC 11 .0328 & .1626. The first radiation label is affixed by pressure sensitive adhesive backing to the source plug/cap located inside the top of the device and contains the following information:

a. isotope and activity,
b. source serial number,
c. output measurement date,
d. the radiation trefoil symbol, and
e. the wording "CAUTION – RADIOACTIVE MATERIAL"
f. **the 3241-D will have two separate source labels affixed as described above.**

A second radiation label is screwed to the left-hand side of the back of the device cover and contains the following information:

a. isotope and activity,
b. source serial number,
c. manufacturer's name and address,
d. the radiation trefoil symbol, and
e. the wording "CAUTION – RADIOACTIVE MATERIAL" and "DO NOT REMOVE"
f. the 3241-D will have two separate source labels affixed as described above.

A nameplate is attached with steel screws to the right-side of the back for the gauge cover and contains the following information:

a. gauge model, serial and version numbers;
b. manufacturer's name and address; and,
c. patent numbers

The Model 3241-C in the transport case qualifies as a "Yellow II" type package with the following transport indices (TI): TI = 0.4 (300 mCi source) and TI = 0.2 (100 mCi source). The model **3241-D &** 3241-G in the transport case qualifies as a "Yellow II" type package with a TI = 0.2 (**80 mCi source and** 100 mCi source **respectively**). The transport cases are thus labeled on two (2) opposing sides as such, along with the US DOT 7A Type "A" label and the manufacturer's label showing the name and address of the manufacturer, the device model and serial number**(s).**

DIAGRAM:

Attachment **1** of this registry certificate contain drawings of the 3241-C, **3241-D** and 3241-G and their Type A containers showing the approximate locations of the sources and the orientations used in the radiation profiles of the gauges.

DEVICE TYPE: Asphalt Content Gauge

CONDITIONS OF NORMAL USE:

All three of these gauge models are designed to be used by trained personnel to measure the asphaltic tar content of paving materials at the construction site. The user will normally be near the device only for the time period necessary to set up the gauge, load the samples into the gauge, perform the measurement, and unload the samples from the gauge. The frequency of this operation is dependent upon the number of samples to be examined and the number and length of the irradiation times. In addition, a six (6) foot interface cable is used to connect the control unit and sample chamber thus allowing the user to position the control unit several feet from the sample chamber. The source capsule has a recommended working life of fifteen years. The operator's controller does not have to be returned with the chamber as no calibration of the electronics is necessary.

Operating temperature	-10°C to 70°C ambient
Pressure	Atmospheric
Vibration	Ranges from zero to mild (tested @ a displacement of 0.1" @ 12.5 Hz)
Corrosion	Ranges from zero to corrosive
Fire	+125°C (to melt the source housing high density polyethylene barrier)

PROTOTYPE TESTING:

The Model 3241-C gauge underwent prototype testing for mechanical, structural and radiological integrity using measurement methodologies and testing procedures found in ANSI Standard N43.8 – 1979. This prototype testing included: stray radiation measurements of gamma dose rates at 5 cm, 30 cm, and 100 cm and neutron dose rates at 30 cm and 100 cm for the gauge in both the "on" and "off" configuration; testing of the gauges' safety features at room temperature, at an elevated use temperature of 105ºC, and at a decreased use temperature of -40ºC; a leak test of the radioactive source after the safety feature/temperature testing; and an engineering evaluation of the likelihood of source retention in the source housing following a severe accident involving fire. The results of the testing showed: (1) no safety feature failure or stray radiation increase over the range of temperatures tested; (2) no loss of radioactive materials from the sealed source; and (3) no loss of the sealed source from the source housing in the accidents where the gauge temperature does not exceed 125ºC. The results of the prototype testing support the assignment of an ANSI standard rating of ANDI-54-164-164-R1 for the Model 3241-C gauge. **The Model 3241-D and Model 3241-G are substantially the same and did not require additional testing.**

DEVICE TYPE: Asphalt Content Gauge

EXTERNAL RADIATION LEVELS:

See Attachment **2** for 3241-C (100 mCi) Radiation Profile
See Attachment **3** for 3241-C (300 mCi) Radiation Profile
See Attachment 4 for 3241-D (80 mCi) Radiation Profile
See Attachment **5** for 3241-G (100 mCi) Radiation Profile

QUALITY ASSURANCE AND CONTROL:

Troxler Electronic Laboratories maintains a quality assurance and control program which has been deemed acceptable for licensing purposes by the North Carolina Radiation Protection Section. A copy of the program is on file with the Radiation Protection Section.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

Distribution: These gauges will be distributed as a specifically licensed device in accordance with the requirements of section .0300 of 15A NCAC 11 and/or applicable regulations of the NRC or an Agreement State. This shall not preclude the exportation of this device to a foreign entity following the applicable regulations.

Installation and Removal: These gauge models are designed for simple installation and removal by radiologically trained personnel. The installation and removal of the device shall be performed following the applicable written instructions provided in the accompanying "Manual of Operation and Instruction." The device components (controller, chamber, and optional printer) shall be unpacked and placed in position and then connected together by their cables. Upon initial receipt of the gauge, the chamber lock and key shall be tested. The packing, shipping and radiological surveying of a device to be returned to the manufacturer or another specifically licensed recipient shall be carried out so as to be in compliance with the applicable regulations pursuant to 49 CFR 173.

Leak Testing: The device shall be leak tested by the user following the instructions in the "Manual of Operation and Instruction" at intervals not to exceed six months using techniques capable of detecting the presence of 0.005 microcurie of removable contamination. If the level of contamination exceeds this limit, the device shall be returned to Troxler Electronic Laboratories, Inc. for repair/disposal. Please note, Troxler maintains a customer leak test service.

Servicing: These gauge models contain no user-serviceable components. The controller, containing the scaler and associated data analysis electronics, will generally be returned to a Troxler Service Center for all servicing. Servicing of the sample chamber which holds the radioactive source, including but not limited to source replacement, general servicing, repair, and/or disposal, shall be done by the manufacturer or another appropriately licensed facility.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE
(Amends In Its Entirety)

DEVICE TYPE: Asphalt Content Gauge

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

Dosimetry: All authorized users of these gauges should wear personnel dosimetry (film badges or TLD) in accordance with NRC or Agreement State regulations. The dosimetry used should be developed and the results reported in accordance with statements and/or conditions in the licensee's specific license.

Operating and Safety Instructions: These devices shall be operated following the written operating and safety instructions given in the device manual, "Manual of Operation and Instruction."

Training: Use of these gauge models is limited to individuals who have completed the manufacturer's or equivalently approved training class in the basic principles of radiation safety and the proper use of these gauges.

Reviewer Note: This registration sheet and the information contained within the references shall not be changed without the written consent of the NC Radiation Protection Section, Radioactive Materials Branch.

DOCUMENTATION:

The documentation enclosed with the device upon shipment to the user shall include the following:

1. Manual of Operation and Instruction,
2. Special Form Certificate,
3. Type "A" package testing results,
4. a copy of the final leak test results made prior to packaging,
5. bill of lading,
6. an emergency response information sheet,
7 Troxler gauge certificate,
8. Troxler transportation guide.

SAFETY ANALYSIS SUMMARY:

The design of the Models 3241-C, **3241-D** and 3241-G make these gauges safe to operate by personnel trained in the proper use of these gauges and radiological safety. The inherent safety features of the devices include: (1) a sealed source, doubly encapsulated and welded closed; (2) the use of cadmium shielding throughout the device to absorb thermal neutrons; (3) small sample chamber; (4) a physically small beam port to limit the beam size and to decrease the likelihood of operator exposure; (5) high density polyethylene and aluminum barriers and walls; and (6) location of the operator controller away from the sample chamber containing the radioactive material. The radiation profile for the devices both in and out of the transport case show relatively low radiation levels that are acceptable per federal regulations for exposure (refer to radiation profile sections). Therefore, based on the information cited above and technical information provided in the application and its attachments, we conclude that the Troxler Models 3241-C, **3241-D** and 3241-G Asphalt Content Gauges meet and exceed the requirements to be manufactured and distributed as specifically licensed devices pursuant to applicable regulations listed in 15A NCAC 11.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE
(Amends In Its Entirety)

DEVICE TYPE: Asphalt Content Gauge

REFERENCES:

The following supporting documents are hereby incorporated by reference into this SS&D registry document:

1. Letter with attachments dated May 10, 1995 and letter with attachments dated January 07, 1997 from Troxler Electronic Laboratories, Inc.;
2. The operating and instruction manual for the 3241-C & 3241-G gauges;
3. Testing results for the classification of the Type "A" packages;
4. Test results from prototype testing carried out on the Models 3241-C & 3241-G;
5. Sealed Source & Device Registry Certificate No. NC-646-D-128-S originally issued on January 08, 1997;
6. Administrative review of the registration certificate file conducted May 17 & 18, 2004.
7. **Letter with attachments dated November 1, 2011 and electronic mail with attachments dated November 22, 2011 and February 16, 2012 from Troxler Electronic Laboratories, Inc.**

ISSUING AGENCY:

This Sealed Source & Device registry certificate is hereby amended **February 23, 2012**.

Principal Reviewer

Henry Barnes

Date: February 23, 2012

Henry E. Barnes, Health Physicist

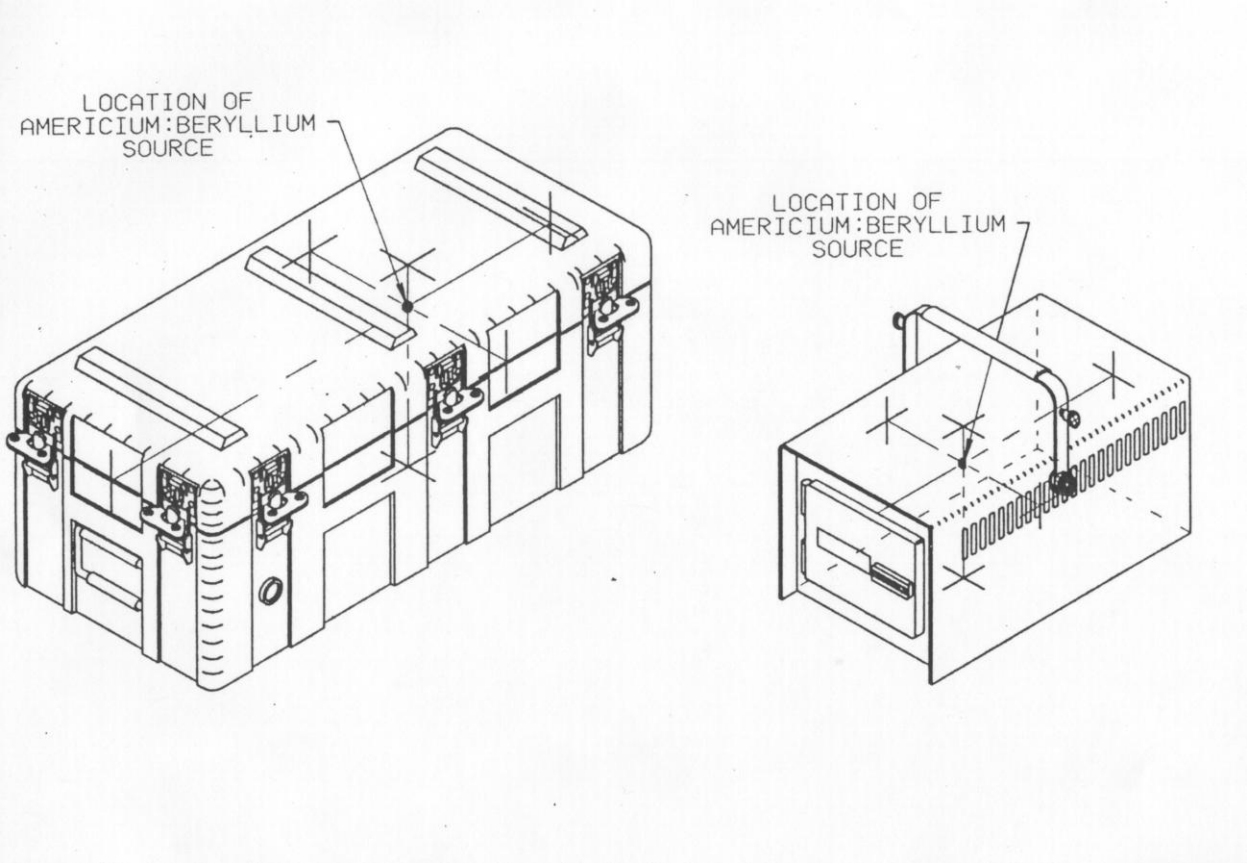
Concurrence Reviewer:

Randy D. Crowe

Date: February 23, 2012

Randy D. Crowe, Health Physicist

Attachment 1: Three Dimensional Views of the 3241-C, 3241-D and 3241-G Series Source Locations



Attachment 2: Radiation Profiles for 3241-C (100 mCi) Gauge and Gauge in Plastic Transport Case

Radiation Profile for 3241-C (100 mCi) Gauge

Location	Surface		10 cm		30 cm		1 meter	
	γ	η	γ	η	γ	η	γ	η
Top	3.5	N/A	2.0	N/A	0.15	1.5	<0.1	0.1
Bottom	0.45	N/A	0.35	N/A	<0.1	0.5	<0.1	0.15
Left	1.2	N/A	0.6	N/A	0.1	0.8	<0.1	0.15
Right	1.0	N/A	0.6	N/A	0.2	0.7	<0.1	0.15
Front	1.3	N/A	0.5	N/A	1.5	0.8	<0.1	0.15
Back	0.4	N/A	0.3	N/A	0.1	0.6	<0.1	0.1

Radiation Profile for 3241-C (100 mCi) Gauge in Plastic Transport Case

Location	Surface		10 cm		30 cm		1 meter	
	γ	η	γ	η	γ	η	γ	η
Top	0.6	N/A	0.5	N/A	0.2	0.85	<0.1	0.1
Bottom	0.35	N/A	0.30	N/A	0.15	0.45	<0.1	0.1
Left	<0.1	N/A	<0.1	N/A	<0.1	0.2	<0.1	<0.1
Right	0.4	N/A	0.25	N/A	0.15	0.4	<0.1	<0.1
Front	0.5	N/A	0.25	N/A	0.12	0.45	<0.1	<0.1
Back	0.55	N/A	0.30	N/A	0.1	0.5	<0.1	0.15

Notes:

1. Radiation measurements were for a gauge containing a nominal 100 millicurie Americium 241 source.
2. All radiation measurements are in millirems per hour.
3. Gamma (γ) measurements were obtained with a Ludlum 14C survey meter, calibrated April, 1996.
4. Neutron (η) measurements were obtained with a Nuclear Research Corp. Model NP-2 survey meter, calibrated December 1995
5. Orientation of the gauge in the transport case is as follows:
    a. Top of the gauge to top of case;
    b. Front of gauge to right side of case; and,
    c. Right side of gauge to front of case.

Attachment 3: Radiation Profiles for 3241-C (300 mCi) Gauge and Gauge in Plastic Transport Case

Radiation Profile for 3241-C (300 mCi) Gauge

Location	Surface		10 cm		30 cm		1 meter	
	γ	η	γ	η	γ	η	γ	η
Top	6	N/A	2.5	N/A	0.35	2.5	<0.1	0.45
Bottom	1.5	N/A	0.8	N/A	0.30	1.5	<0.1	0.30
Left	3.0	N/A	2.0	N/A	0.35	2.0	<0.1	0.30
Right	3.0	N/A	1.7	N/A	0.35	2.0	<0.1	0.35
Front	3.0	N/A	1.6	N/A	0.4	2.0	<0.1	0.30
Back	1.0	N/A	0.7	N/A	0.2	1.6	<0.1	0.25

Radiation Profile for 3241-C (300 mCi) Gauge in Plastic Transport Case

Location	Surface		10 cm		30 cm		1 meter	
	γ	η	γ	η	γ	η	γ	η
Top	1.6	N/A	1.2	N/A	0.3	2.0	0.1	0.3
Bottom	0.85	N/A	0.6	N/A	0.18	1.25	0.1	0.3
Left	0.18	N/A	0.15	N/A	0.15	0.4	<0.1	0.15
Right	1.2	N/A	1.0	N/A	0.2	1.1	0.1	0.3
Front	1.3	N/A	0.72	N/A	0.23	1.4	0.1	0.25
Back	1.2	N/A	0.95	N/A	0.2	1.6	0.1	0.3

Notes:

1. Radiation measurements were for a gauge containing a nominal 300 millicurie Americium 241 source.
2. All radiation measurements are in millirems per hour.
3. Gamma (γ) measurements were obtained with a Ludlum 14C survey meter, calibrated April, 1996.
4. Neutron (η) measurements were obtained with a Nuclear Research Corp. Model NP-2 survey meter, calibrated December 1995
5. Orientation of the gauge in the transport case is as follows:
   a. Top of the gauge to top of case;
   b. Front of gauge to right side of case; and,
   c. Right side of gauge to front of case.

Attachment 4: Radiation Profiles for 3241-D (80 mCi) Gauge and Gauge in Plastic Transport Case

Radiation Profile for 3241-D (80 mCi) Gauge

Location	Surface		30 cm		1 meter	
	γ	η	γ	η	γ	η
Top	1.1	3.8	0.1	1.8	<0.2	0.2
Bottom	0.2	1.4	0.1	0.6	<0.2	0.2
Left	0.3	1.8	0.1	0.8	<0.2	0.2
Right	0.3	2.6	0.1	0.6	<0.2	0.2
Front	0.2	2.6	0.1	0.8	<0.2	0.2
Back	0.2	1.2	*	0.8	<0.2	0.2

Radiation Profile for 3241-D (80 mCi) Gauge in Plastic Transport Case

Location	Surface		30 cm		1 meter	
	γ	η	γ	η	γ	η
Top	0.4	1.6	0.1	1.0	*	0.1
Bottom	0.1	1.0	*	0.8	*	0.1
Left	*	0.6	*	0.2	*	0.1
Right	0.1	1.0	*	0.4	*	0.1
Front	0.1	1.2	*	0.8	*	0.1
Back	0.1	0.8	0.1	0.6	*	0.1

Notes:

1. **Radiation measurements were for a gauge containing a nominal 80 millicurie Americium 241 source.**
2. **All radiation measurements are in millirems per hour.**
3. **Gamma (γ) measurements were obtained with a Bicron Micro-Rem survey meter, calibrated January 2011.**
4. **Neutron (η) measurements were obtained with a Ludlum 12-4 survey meter calibrated September, 2010.**
5. **Orientation of the gauge in the transport case is as follows:**
   a. **Top of the gauge to top of case;**
   b. **Front of gauge to right side of case; and,**
   c. **Right side of gauge to front of case.**
6. **"*" denotes less than 0.1 mrem/hr.**

Attachment 5: Radiation Profiles for 3241-G Gauge and Gauge in Plastic Transport Case

Radiation Profile for 3241-G (100 mCi) Gauge

Location	Surface		10 cm		30 cm		1 meter	
	γ	η	γ	η	γ	η	γ	η
Top	2.5	N/A	1.1	N/A	0.25	2.0	<0.1	0.25
Bottom	0.5	N/A	0.4	N/A	0.4	0.6	<0.1	0.10
Left	0.7	N/A	0.6	N/A	0.1	0.75	<0.1	0.15
Right	0.7	N/A	0.4	N/A	0.1	0.75	<0.1	0.15
Front	0.7	N/A	0.4	N/A	0.15	0.8	<0.1	0.15
Back	0.35	N/A	0.35	N/A	0.15	0.55	<0.1	0.15

Radiation Profile for 3241-G (100 mCi) Gauge in Plastic Transport Case

Location	Surface		10 cm		30 cm		1 meter	
	γ	η	γ	η	γ	η	γ	η
Top	0.5	N/A	0.35	N/A	0.1	0.8	0.1	0.15
Bottom	0.25	N/A	0.22	N/A	0.1	0.45	0.1	0.1
Left	<0.1	N/A	<0.1	N/A	<0.1	0.15	<0.1	<0.1
Right	0.35	N/A	0.25	N/A	<0.1	0.45	<0.1	0.1
Front	0.3	N/A	0.25	N/A	0.15	0.6	<0.1	0.1
Back	0.4	N/A	0.25	N/A	0.1	0.6	<0.1	0.1

Notes:

1. Radiation measurements were for a gauge containing a nominal 100 millicurie Americium 241 source.
2. All radiation measurements are in millirems per hour.
3. Gamma (γ) measurements were obtained with a Ludlum 14C survey meter, calibrated April, 1996.
4. Neutron (η) measurements were obtained with a Nuclear Research Corp. Model NP-2 survey meter, calibrated December 1995
5. Orientation of the gauge in the transport case is as follows:
   a. Top of the gauge to top of case;
   b. Front of gauge to right side of case; and,
   c. Right side of gauge to front of case.