

## RADIATION PROTECTION SERVICES, INC.

P.O. Box 2359, Darien CT. 06820

September 9, 1985

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Mr. Jack Davis  
Nuclear Materials Safety Section A  
Division of Radiation Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Region I  
631 Park Avenue  
King of Prussia, PA 19406

Re: License Application - Cs-137 Irradiator  
Radiation Protection Services, Inc. - Darien - CT

Mail Control No. 03454

Dear Mr. Davis:

We are in receipt of your letter dated 20 August 1985 in which additional information was requested in support of our initial license application. The additional information is as follows:

(1) With reference to calibrating GM-meters with scales less than 1.0 mR/hr, please note that we are currently licensed by the State of New Jersey to perform calibrations with Ra-226. These procedures have been reviewed by NRC staff and approved under specific client licenses. Our lowest activity source is 10 mg of Ra-226 with a calculated exposure rate of 0.41 mR/hr @ 14.7 feet (4.48 meters) and 0.25 mR/hr @ 18.9 feet (5.76) meters. If acceptable with NRC staff, we plan to continue to calibrate meters with scale less than 1.0 mR/hr with our Ra-226 standard.

With reference to high range meters, according to diagrams provided by J.L. Shephard, the source within the Model-10 has a diameter of  $\frac{1}{4}$ -inch (0.635 cm). Accordingly, this source can be considered a point source at a distance equal to seven (7) times the source diameter (ie- 4.4 cm). Source exposure rate @ a distance of 20 cm is equal to 800 mR/hr; whereas, source exposure rate at a distance slightly greater than point source specs. (ie- 5 cm) is equal to 12.8 R/hr. Therefore, we can meet one of the ANSI specifications concerning calibrations a 7-times the source diameter; however, source exposure rate decreases to under 1 R/hr at distances greater than 20 cm. We therefore feel that we will be able to calibrate certain high level detectors.

If this is unacceptable to the NRC, we will provide only for the calibrations of low and medium range survey meters.

(2) The main facility entry door will also be locked whenever calibrations are being performed.

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Please note, that high radiation area warning signs will be posted on the inner facility door.

(3) Concerning the probe of the Model-177 area monitor, the probe is located approx. 2-3 feet from the source and is not anticipated to be placed in the primary beam. We anticipate that scatter in the area when the source is "open" will activate the alarm. If this is not the case, the probe will be placed in the primary beam.

The warning light is part of the body of the unit (ie- scale and light) and is located approx. 20 feet from the probe by use of extra long cable supplied with the unit. It will be constantly activated.

Mr. Giel will be provided with a "chirper" unit (ie- Prima IIb monitor (or equivalent)). Since the "beep-rate" is a function of radiation intensity, this unit will respond in a more vigorous manner to primary beam radiation than to scatter. In this manner, Mr. Giel or future operators will be cautioned to remain outside of the primary beam.

(4) We do plan to bring all meters to within  $\pm 10\%$  (whenever possible), but we believe in providing maximum information to our clients concerning their survey instruments and we plan to post a calibration factor even when the meter is within  $\pm 10\%$  of the true source exposure rate.

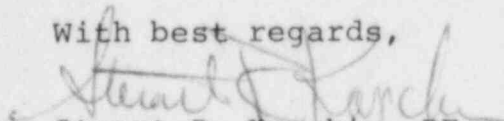
Attached to the bottom of the calibration certificate in our original license application was an orange colored sticker. This sticker is filled-out with client information and meter calibration factors for each scale that is calibrated. This sticker is attached to client meters. A sample of the completed calibration sticker is provided for reference.

Source activity (ie- Cs-137 - 100 mCi) with source measurement error (ie-  $\pm 5\%$ ) will be added to our calibration certificate.

(5) A step-by-step Cesium-137 calibration procedure is attached for reference.

If any additional information is required, please do not hesitate to contact our office.

With best regards,

  
Stuart R. Korchin, PE  
President

# **RADIATION PROTECTION SERVICES, INC.**

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## **SURVEY METER CALIBRATION PROCEDURES**

Radiation Protection Services, Inc.  
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I. Calibration source: Primary:	Cesium-137	Secondary:	Ra-226
activity :	100 mCi		5-10 mg (50)
manufacturer :	JL Shephard		Radium Chem.
tracibility :	$\pm 5\%$		$\pm 5\%$

## **II. Calibration Procedures:**

- 1) Instruments presented to Radiation Protection Services, Inc. (RPS) for calibration will be calibrated at two points on each scale, located at approximately  $1/3$  and  $2/3$  of full scale.

If the unit's minimum scale is below 1.0 mR/hr, the Ra-226 sources will be used to calibrate lower scales.

If the unit's scales are greater than 1.0 mR/hr, the Cs-137 irradiator will be used for unit calibration.

- 2) Instruments for calibration will be placed on a wheeled cart at a specific distance from the source (ie- 1-meter). The exact distance from the source is to be determined by the most sensitive scale of the unit in such a manner that the most sensitive scale will be calibrated first.

- 3) Once the unit is in place at the correct distance, the beam port will be opened by the calibration h.p. in such a manner that the h.p. is not in the primary beam of the irradiator.

The Model-17i area monitor is to constantly in the "on" position. Film badges and "beeper" (Prima IIB) unit are to worn and in the "on" position during calibrations.

When fully exposed, the reading on the instrument will be recorded.

- 4) The unit will then be rolled closer to the source, so that the reading at  $2/3$  of full scale can be made and recorded. This process will be repeated until readings on each scale are made at  $1/3$  and  $2/3$  of each scale.

Scale readings by the calibrating h.p. are to made with the h.p. standing outside of the primary beam and at a distance of at least 14-feet from the irradiator. In order to "read" the meter scales at this distance, a binocular system will be used by the calibrating h.p.

Calibration Procedure  
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- 5) If for any reason, a scale of the unit is not calibrated, a note to this fact will be attached to the calibration certificate.
- 6) The source's beam port will then be closed by the calibrating h.p. while remaining outside of the primary beam.
- 7) The measured exposure rate will then be compared to the expected source output at distance.
- 8) The unit's calibration factors, defined as the ratio of expected output to measured output will be calculated for each scale and at each specific distance from the irradiator.

Calibration factors will be posted on the unit by means of the RPS calibration sticker and recorded on the calibration certificate which is then presented to the owner of the survey unit.

A calibration factor will be posted in all instances. If a scale is in excess of  $\pm 20\%$  of expected output, the unit will be adjusted to within  $\pm 10\%$  of expected output and the owner of the unit will be informed of this adjustment on the calibration certificate.

SAMPLE OF COMPLETED CALIBRATION STICKER

CALIBRATION # 85-xxx

DATE: Sept. 9, 1985

TO: XYZ BY: RPS, Inc

DATE DUE: SEPTEMBER '86

RANGE	CORR. FACTOR	SN-	1234
1/3 scale		2/3 scale	
x 1	1.085	x 1	1.10
x 10	1.050	x 10	1.000
x 100	1.000	x 100	1.045