



# Texas Department of State Health Services Radiation Safety Licensing Branch

## *Regulatory Guide 5.2*

### GUIDE FOR THE PREPARATION OF SURVEY INSTRUMENT CALIBRATION APPLICATIONS

#### **I. Introduction.**

This guide describes the information the Radiation Safety Licensing Branch staff needs to evaluate applications of persons to calibrate their own gamma radiation survey instruments or those of customers. Title 25 Texas Administrative Code (TAC) Section (§) 289.202(p) specifies that instruments and equipment used for quantitative radiation measurements shall be calibrated by persons licensed or registered by the Agency, another Agreement State, a Licensing State, or the U.S. Nuclear Regulatory Commission to perform such services.

#### **II. Fees.**

A fee is not required to amend a license or registration, in most cases, unless the amendment changes the category and type of license or registration. If there are any questions, the Agency staff will clarify the fees upon approval of authorization to conduct survey instrument calibrations.

#### **III. Instructions for the Amendment Request**

##### **A. Request Format**

The Radiation Safety Officer should provide a signed and dated request in duplicate, for authorization to calibrate your own survey instruments or those of customers in accordance with 25 TAC §289.202(p). The radioactive material license number(s) and the correct licensee name should be referenced. The request should be accompanied by implementation procedures and explanations as explained below. Write the procedures as directives for authorized users indicating what shall be performed. Avoid wording the requirements as recommendations that may be performed. These procedures need to be compatible with, and referenced as necessary, appropriate sections of the existing radiation safety procedures of the facility.

Regulatory Guides are issued to assist applicants and licensees/registrants in developing operational procedures acceptable to the Department of State Health Services, Radiation Safety Licensing Branch (agency), that are compliant with specific sections of Title 25 Texas Administrative Code Chapter 289. Regulatory Guides are NOT substitutes for regulations and compliance with them is not required. Methods for compliance with regulations different from those set out in guides will be acceptable if they are considered by agency staff to provide for public health and safety and demonstrate compliance with regulations.

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## **B. Calibration Procedures**

### **1) Equipment and Facilities**

- i) Describe the type of survey instruments to which calibration will be restricted; and the type of detector(s) and energy range of the radiation(s) to be detected should also be specified. The authorization for calibration of survey instruments will be restricted to specific equipment and procedures (i.e., if you propose to calibrate survey instruments for a specific energy, calibration of other survey instruments at the same energy may not be appropriate).
- ii) Provide a description of the source(s) of radiation to be used to produce the appropriate radiation fields.
- iii) Provide the range of field intensities over which survey meters will be calibrated. Sources of sufficient intensity must be available to provide adequate fields to calibrate the highest scales. Sources appropriate for calibration are cesium-137, cobalt-60, or radium-226.

If the inverse square law is used with a standard source, the standard source calibration should be traceable to a national standard. The inverse square law will not apply if significant scattered radiation from shielding material contributes to the radiation fields along the calibration range. Hence, a calibrated condenser R-meter or other appropriate device would be required to determine such fields. Indicate that the source of radiation used for calibration shall be National Institute of Science and Technology (formerly National Bureau of Standards) traceable.

- iv) Furnish a schematic drawing of the calibration arrangement, room, and adjacent areas. Provide a description of how and where within your facility the calibration sources of radiation shall be stored. Indicate on the schematic drawing where the calibration source of radiation will be positioned and in what direction the primary beam will be directing during calibration operations.

Provide information on how your calibration facility will address such problems as obtaining charged particle equilibrium (applicable to ion chamber calibration only), scattered and/or unwanted radiations from the source of radiation and ambient background radiation corrections.

Indicate how the radiation user shall maintain control of the restricted area during calibration operations. Address appropriate postings and where these signs will be posted during calibration operations.

- v) Describe the device or mechanism that will be used to expose the survey instrument to radiation, and in the case of radioactive material, to shield the source when not in use. Provide a description of any shielding to be used to reduce the radiation exposure to individuals performing survey instrument calibration. Calculated estimates of the highest fields expected in the operator's position and in the nearest unrestricted area should be provided.

Describe the routine maintenance and inspections to be performed on the equipment used for survey instrument calibration.

## **B. Calibration Procedures (Continued)**

Indicate what equipment will be inspected, at what specific intervals and how these inspections and results shall be documented.

### **2) Precalibration Inspections**

- i) The following pre-calibration check should be performed on each radiation survey instrument in order to verify that internal components have not become damaged, worn or out-of-specifications. Describe in detail how your operations will conduct inspections for:
  - a) range, sensitivity, linearity, detection limit, and response to overload conditions;
  - b) accuracy and reproducibility;
  - c) energy dependence; and
  - d) temperature and pressure dependence.
- ii) Prior to exposing a survey instrument to the calibration source of radiation, please detail how your operations will perform the following pre-calibration inspections:
  - a) survey instrument is free of significant radioactive contamination, if applicable;
  - b) survey instrument shall be adjusted to zero or the point specified by the manufacturer using the adjustment provided, if applicable;
  - c) batteries or power supply shall comply with the survey instrument manufacturer's specification;
  - d) survey instrument shall be turned-on and allowed to warm-up for the time period specified by the manufacturer;
  - e) electronic adjustments such as high voltage shall be set, as applicable, to the manufacturer's specifications; and
  - f) geotropism (change in instrument response with change in instrument position) shall be known for orientation of the instrument in the three mutually perpendicular planes, and this effect shall be taken into account during calibration and performance testing.

### **3) Primary Calibration Procedures**

If using a calibration range, describe the method of accurately determining the fields at the various distances from the source of radiation.

If calibrating with radioactive material, the isotope decay is a factor, this should be covered in the determination of fields.

## **B. Calibration Procedures (Continued)**

If using a beam calibrator equipped with retractable attenuators, describe how the desired radiation field intensities will be verified.

(Note: Instruments should be calibrated in fields that are approximately uniform throughout the detector volume. Hence, they should be calibrated at distances greater than about 10 times the thickness of the detector.)

Describe in detail the step-by-step procedures to be followed in calibrating the radiation survey instruments.

(Note: All ranges must be calibrated at two points, near 30% and 70% full scale, except that those ranges where the full scale reading is equal to or less than 0.5 mR/hr may be calibrated at just one point, near midrange. If the survey instrument cannot be adjusted to read within "20% of any correct value, it must be repaired.)

If the need should require, provide procedures for determining and providing energy dependence curves for use of radiation survey meters in radiation fields of differing energies.

### **4) Records**

Submit a copy of the calibration report, and an example energy curve if applicable, to be provided to the customer and a sample of the tag to be placed on the radiation survey instrument to indicate when the meter was calibrated and by whom. The report should specify what radiation field strengths were used and what the instrument indicated in those fields. Also, describe the records of each calibration to be maintained for inspection by the Agency. A copy of the customer's report will suffice for this.

Indicate how your operations will report to the customer if a radiation survey instrument fails any of the inspection tests or does not calibrate within "20% of the correct value.

### **5) Personnel**

Describe the qualifications of the person(s) who will perform the instrument calibration operation. This individual should have experience in general health physics and radiation protection, the handling of sources or radiation, and the use and maintenance of the survey meters to be calibrated.