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THREE MILE ISLAND NUCLEAR STATION
STATION HEALTH PHYSICS PROCEDURE 1762

OPERATION AND CALIBRATION OF THE RO-2

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Approval J E Conaughlin Date 18 DEC 1975
Cognizant Dept. Head

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Unit 1 PORC Recommends Approval

Date
Chairman of PORC

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Quality Assurance

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Station Superintendent /
Unit Superintendent

THREE MILE ISLAND NUCLEAR STATION

STATION HEALTH PHYSICS PROCEDURE 1762

OPERATION AND CALIBRATION OF THE RO-2

1.0 PURPOSE

1.1 The purpose of this procedure is to explain the operation and calibration of the RO-2.

2.0 DISCUSSION

2.1 The RO-2 is a portable beta, gamma and X-Ray detection instrument utilizing an air operated ion chamber which is vented to atmospheric pressure. The effective center of the ion chamber is marked by dimples at the front and sides of the instrument case.

2.2 There is a movable beta shield on the base of the instrument which is moved by depressing the friction release button on the left side of the case and manually moving the shield.

3.0 REFERENCES

3.1 Eberline RO-2 Tech Manual

3.2 H.P.P. 1635

3.3 H.P.P. 1636

3.4 H.P.P. 1602

4.0 EQUIPMENT

4.1 Eberline RO-2

4.2 High Range calibrator and associated equipment.

4.3 Low Range calibrator.

4.4 Small screw driver.

5.0 OPERATING INSTRUCTIONS

5.1 Operational Check

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5.1.1 Turn the function switch, located on the top of the instrument, to the Batt 1 then Batt 2 position. In both cases the meter needle should indicate within the Batt range on the meter face. If it does not read in the Batt range refer to the instrument instruction manual.

5.1.2 Turn the function switch to the zero position. Ensure that the meter reads zero. If it does not, rotate the zero knob until the meter reads zero.

NOTE: The zero setting of the instrument may be checked in any radiation field by merely selecting the Zero position.

5.1.3 Set the function switch to the desired range of operation. The switch position selected is the full scale reading of that range.

NOTE: When selecting the most sensitive range (5mR/hr.) switching transient noise may cause a temporary deflection of the meter. This can be avoided by first selecting 50 mR/hr., letting the needle settle, and then switching to 5 mR/hr.

5.1.4 The instrument can now be considered operational and may now be used per H.P.P. 1602.

5.2 Calibration with a Gamma Source

NOTE: Ensure that a constant geometry is used throughout the calibration with the high range calibrator (i.e. the instrument is placed in the same position in the calibrator with the effective center of the ion chamber exposed to the source).

5.2.1 Perform steps 5.1.1 and 5.1.3.

5.2.2 Set up the high range calibrator per H.P.P. 1635 for a dose rate of 4000 mR/hr. or approximately 3/4 scale on the 5000 mR/hr. range. Set the function switch on the instrument to 5000 and expose it to the source. If adjustments are necessary, turn the calibration pot marked 5000 (located on top of the RO-2) until the proper reading is obtained.

5.2.3 Set up the low range calibrator, on the calibration table per H.P.P. 1634. Select a distance from the source that will produce a dose rate of 400 mR/hr. or approximately 3/4 scale on the 500 mR/hr. range. Set the function switch on the instrument to 500 and expose it to the source. If adjustments are necessary, turn the calibration pot marked 500 (located on top of the RO-2) until the proper reading is obtained.

5.2.4 Using the low range calibrator, select a distance from the source that will produce a dose rate of 40 mR/hr. or approximately 3/4 scale on the 50 mR/hr. range. Set the function switch on the instrument to 50 and expose it to the source. If adjustments are necessary, turn the calibration pot marked 50 (located on top of the RO-2) until the proper reading is obtained.

5.2.5 Using the low range calibrator, select a distance from the source that will produce a dose rate of 4 mR/hr. or approximately 3/4 scale on the 5 mR/hr. range. Set the function switch on the instrument to 5 and expose it to the source. If adjustments are necessary, turn the calibration pot marked 5 (located on top of the RO-2) until the proper reading is obtained.

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5.2.6 When the RO-2 is calibrated, place a calibration sticker on the instrument including: initials, date calibrated, and date that the next calibration is due. Record this information in the instrument log book, located in the Health Physics Lab.

5.3 Beta Source Check

5.3.1 Perform steps 5.1.1 through 5.1.3.

5.3.2 Set the function switch on the instrument to 500 and open the sliding beta shield on the bottom of the case.

NOTE: To open or close the beta shield, depress the friction release button on the left side of the case and manually move the slide, or let it fall due to gravity. When the shield is open protect the thin face against damage by puncture.

5.3.3 Using the depleted Uranium source, (Met-Ed #200) expose the effective center of the ion chamber with the shield open on contact with the source. Note the meter reading.

5.3.4 Close the shield and again using the depleted Uranium source (Met-Ed #200), expose the effective center of the ion chamber with the shield closed on contact with the source. Note the meter reading.

5.3.5 Subtract the reading obtained in step 5.3.4, closed shield reading, from the reading obtained in step 5.3.3, open shield reading.

5.3.6 Determine the beta correction factor by dividing the number obtained in step 5.3.5 into 224 mR/hr. (224 mR/hr. is the calibrated beta dose rate for the source.)

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5.3.7 Record the beta correction factor on the side of the instrument.

6.0 EXAMPLE

6.1 Beta Correction Factor Determination

105 mR/hr. = Contact reading with depleted uranium source (beta shield open).

35 mR/hr. = Contact reading with depleted uranium source (beta shield closed).

70 mR/hr. = Beta shield open reading minus the beta shield closed reading.

224 mR/hr. = Calibrated beta dose rate for the uranium source.

Beta Correction Factor = 105 mR/hr. - 35 mR/hr. = 70 mR/hr.

$$\frac{224 \text{ mR/hr.}}{70 \text{ mR/hr.}} = 3.2$$

TMI DOCUMENTS

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