CRITERIA FOR RADIATION INSTRUMENTS FOR USE BY THE GENERAL PUBLIC

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As a supplement to organized Federal, State, and local monitoring systems, instruments for measuring gamma radiation exposure rates (dose rates) and total exposure (dose) can provide valuable on-the-spot information for the citizen following a nuclear explosion. Where, through choice or necessity, one provides a private shelter for the protection of himself and family, knowledge of the radiation situation within the shelter, the home, and, under some circumstances, in surrounding areas, can be used as a basis for determining appropriate courses of action. Instruments designed for measurement of gamma radiation dose rate (rate meters) and instruments for measurement of accumulated gamma radiation dose (dosimeters) can be of value for home use.

To meet the needs of an individual or household for measurement of gamma radiation following a nuclear attack, instruments manufactured for sale to the general public must meet minimum criteria, and it will be the responsibility of the manufacturer to assure that his instruments do meet these criteria in all material respects, if they are to be advertised as being adequate for this purpose. The following criteria are essential:

A. Criteria common to both rate meters and dosimeters:

1. The instrument must be of such design and construction that reliable performance can be expected following a storage period of at least five years (batteries excluded, if used). Use of components subject to significant change in characteristics affecting the performance of the instrument is not acceptable.

2. The instrument must be easy to operate and interpret.

3. The energy dependence of the instrument should be less than plus or minus 25 per cent for energies between 80 kev and 1.2 mev.

4. The temperature dependence of the instrument should be less than plus or minus 30 per cent between $0^{\circ}F$ and $110^{\circ}F$.

5. The instrument, without batteries, should withstand 72-hour storage at a temperature of minus $30^{\circ}F$ and 72 hours at plus $150^{\circ}F$. At the conclusion of these exposures and return to room temperature, the instrument must meet the over-all accuracy requirements.

6. The effect of humidity on the over-all accuracy should be less than plus or minus 20 per cent. Some of the instruments will be positioned in underground shelters where humidity may be high and, with change of temperature, there could be condensation. Instruments should be designed for operation after prolonged storage under such conditions.

7. The instrument should satisfactorily withstand atmospheric pressure changes likely to result from shipment by air.

8. The instrument should meet the accuracy specifications from sea level to the equivalent pressure of an altitude of 6,000 feet.

9. The batteries, if used in the instrument or auxiliary equipment, should be standard "D" type flashlight cells.

10. The instrument should be constructed for moderately rugged use, and for outdoor use during inclement weather.

11. The instrument, and any auxiliary equipment, should be designed for simple maintenance by commercial radio and television service organizations.

12. Representations, pictures, seals, insignia, trade or brand names, or any other term or symbol which would imply any Government connection, approval, or any other form of Government endorsement, shall not be used on instruments for the general public. Further, although instruments for the general public may be any color, it is recommended that use of civil defense yellow be restricted to official civil defense monitoring instruments.

B. Rate meter criteria (in addition to the above):

1. The instrument must indicate gamma radiation dose rates from 1 to 100 r/hr with an over-all accuracy better than plus or minus 35 per cent, referenced to cobalt 60, at all dose rates within the prescribed range of the instrument.

2. The detector must be shielded against beta radiation with a minimum of 1,000 mg/cm^2.

3. The indicator must be calibrated in r/hr and may not be dependent upon the subjective interpretation of varying tones, varying brightness, varying loudness, etc.

4. The instrument must read off-scale or give some other positive indication when dose rates exceed an indicated 100 r/hr. This must apply for all dose rates between that radiation rate and 1,000 r/hr.

5. A means must be provided for checking positive operation of any electronic circuit used.

6. The batteries, if used, must operate the instrument for a reasonable period of time. (When the instrument is indicating 50 r/hr, or more, the battery must operate the instrument continuously for at least 50 hours.)

7. The instrument response shall be such that the difference in the indication for radiation incident normal to the front and that for radiation incident normal to the bottom does not exceed 15 per cent over the photon energy range of 80 kev to 1.2 mev.

8. A dosimeter type instrument, to be exposed for a timed interval for determining dose rate and reading in roentgens

per hour, is permissible provided that the timed interval is greater then five seconds and does not exceed one minute for an indication of 100 r/hr.

9. An instrument using an electronic circuit should respond so that after warm up 95 per cent of the final indication of all dose rates measured is reached in no more than ten seconds.

10. Any circuit instability and meter fluctuation should be less than five per cent of full-scale.

C. Dosimeter criteria (in addition to general specifications in A, "Criteria common to both rate meters and dosimeters"):

1. The indicator must be calibrated in roentgens and may not be dependent upon subjective interpretation of varying color or varying transmission or reflection of light, etc.

2. It must be feasible to read the instrument in the field without destruction of its capability to indicate additional increments of radiation exposure or loss of past exposure indication.

3. The instrument must indicate the gamma radiation dose, within the prescribed limits of true gamma radiation dose, in the presence of beta radiation fields likely to be present in a fallout radiation field.

4. The range preferably should be 0-600 r, but not be less than 0-200 r with an over-all accuracy better than plus or minus 25 per cent, reference to cobalt 60, at all doses within the prescribed range of the instrument.

5. If the instrument is an electrostatic, self-reading type it must conform to the following criteria:

   a. Be capable of being recharged (reset to 0) with either a built-in or an auxiliary charger.

   b. After standing charged for 48 hours electrical leakage shall not exceed two per cent of full-scale in four days.

6. An instrument or device which is not designed to be reset to zero must meet the following criteria:

   a. Have a range of 0-600 r.

   b. After a storage period of five years, the accuracy of radiation dose indication must still be within the limits of the criteria prescribed in C, 4.

7. The instrument must read off-scale or give other positive indication when the total dose exceeds the range of the instrument.

8. The physical size, shape, and weight shall be such as to allow field use without serious interference with performance of necessary tasks.