



State of Ohio
First Responder
Radiological Equipment
Recommendations



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Applicable Equipment Standards


- Nuclear power plant accident response
 - FEMA REP 21 – Portal Monitors
 - **FEMA REP 22 – Hand-held Meters**
 - Available at <http://www.fema.gov/doc/rrr/rep/policy.shtm>
- Terrorist radiological incident response
 - ANSI N42.32 – Alarming Personal Detectors
 - **ANSI N42.33 – Radiation Detection Instrumentation**
 - **ANSI N42.34 – Radioisotope Identification Instrument**
 - ANSI N42.35 – Radiation Detection Portal Monitors
 - Available at http://www.dhs.gov/dhspublic/interapp/editorial/editorial_0420.xml

Three Tiers of Equipment based on Responder Training

- Awareness: Electronic, alarming dosimeter
 - Alarm at low gamma dose rate to alert responder to presence of gamma radiation.
 - Serves as alarming dosimeter at reaching dose limit.
- Operations: Hand-held contamination detector & electronic, alarming dosimeter
 - Establish perimeter for scene isolation.
 - Determine presence of contamination.
- Technician: Multi-purpose dose rate meter / contamination detector & electronic, alarming dosimeter
 - Entry Team.

Civil Defense Equipment

- Request, as many as needed: CDV-777-1 detection sets.
 - Dosimeters
 - Dose rate meter
 - Contamination detector
- Hazmat Teams: CDV-718 and other equipment, as available.



Electronic Alarming Dosimeter

Electronic Alarming Dosimeter

- Current USEPA Emergency Responder Dose Limits adopted by Ohio:
 - EPA 400-R-92-001 May 1992 (Table 2-2)
 - Available at <http://www.epa.gov/radiation/rert/pags.htm>
 - 5 rem: all activities
 - 10 rem: protecting valuable property
 - 25 rem: lifesaving or protection of large populations
 - >25 rem: lifesaving - volunteer, aware of risks

Electronic Alarming Dosimeter

- Dose limits are Total Effective Dose Equivalent (TEDE) values:
 - Sum of external **AND** internal doses.
 - Largest internal dose pathway – inhalation.
 - Dosimeters only indicate **EXTERNAL** gamma exposure component, therefore:
 - If not wearing SCBA during response, reduce dose limits by factor of 5 to account for inhalation.
 - 25 rem = 5 R, 10 rem = 2 R, 5 rem = 1 R.
 - Leave area when dosimeter indicates the above.
 - Note: if alpha radiation emitters are present (Plutonium, Uranium, Americium, etc.), use respiratory protection. A reduction factor of 5 may not be big enough.

Electronic Alarming Dosimeter

- **Dose Alarm:** set to either 1 R, 2 R, or 5 R if no SCBA, otherwise 5 R, 10 R, or 25 R.
- **Pre-Dose Alarm:** (if available), set to warning value below the dose limit, e.g. 0.75 R for 1 R, 1.75 R for 2 R, 4.75 R for 5 R. to allow time for egress and inaccuracy.
- **Dose Rate Alarm 1:** set for 100 μ R/hr (0.0001 R/hr). Investigate cause of alarm. Use a survey meter.
- **Dose Rate Alarm 2:** set at 2 mR/hr (0.002 R/hr). Establish perimeter. A survey meter would be better.
- **Dose Rate Alarm 3:** set for 1 R/hr. Unless saving lives, leave area at 1 R/hr.
 - If dosimeter has only one rate alarm, user should be able to reset it from 100 μ R/hr to 2 mR/hr to 1 R/hr.

Electronic Alarming Dosimeter

- State-recommended device:
 - SAIC PD-10i
 - Available at:
 - <http://www.saic.com/products/security/pd10i/pd10i.html>
 - State can set up and calibrate periodically at greatly reduced price.
 - EQUIVALENT electronic alarming dosimeters from other mfgs. are available.



Electronic Alarming Dosimeter

- Wear as part of your uniform.
- Or place on dashboard of vehicle representing all onboard.
- If alarms at 100 μ R/hr, investigate.
 - Notify
 - Use survey meter



Hand-Held Contamination Detector

Hand-Held Contamination Detector

1. Determine presence of contamination on people exiting scene.
 - Current FEMA contamination limits:
 - FEMA REP-22 October 2002 (Table 2)
 - 300 cpm above background for beta/gamma emitters from nuclear power plant accidents
 - Open window detector 1 inch above surface
 - As measured in a background less than 0.1 mR/hr
 - EPA 400-R-92-001 (Table 7-7) limits:
 - 2 \times background (Ohio background varies between 20 to 100 cpm)

Hand-Held Contamination Detector

2. Establish perimeter for scene isolation.

- Two parameters:
 - Outside of hot zone: should be less than 2 mR/hr (gamma).
 - Use either a CDV-700 or equivalent meter.
 - Outside of hot zone: no contamination on ground (alpha, beta, or gamma emitters)
 - Hold probe 1/2 to 1 inch above surface (1/2 for alpha)
 - Open-window detector needed

Hand-Held Contamination Detector

- State-recommended device:
 - Ludlum 14c (202-608 meter face) with 44-9 detector, 1 microcurie Cesium-137 check source mounted to side, carrying strap, instrument case
 - Available at <http://www.LACOonline.com/index.html>
 - State can set up and calibrate periodically at greatly reduced price.
 - Many EQUIVALENT contamination detection meters from other mfgs. are available.



Multi-Purpose Dose Rate Meter / Contamination Detector

Multi-Purpose Dose Rate Meter / Contamination Detector

- Technician-level personnel entering Hot Zone:
 - Dose rate meter for low level detection (~100 μ R/hr), up to high-levels (~100 R/hr) gamma.
 - Contamination detector to establish hot zone perimeter, detect contamination on exiting personnel, and detect contamination inside hot zone (alpha, beta, and gamma).

Multi-Purpose Dose Rate Meter / Contamination Detector

- State-recommended device:
 - Ludlum 2241-3RK with 44-9 (alpha, beta, gamma contamination detector), 44-2 (0.1 mR/hr – 25 mR/hr gamma dose rate detector), 133-7 (25 mR/hr – 100 R/hr gamma dose rate detector), 1 microcurie Cesium-137 check source mounted to side, carrying strap, instrument case.
 - Available at <http://www.LACOonline.com/index.html>
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