

SOUTH PORTLAND FIRE DEPARTMENT

STANDARD OPERATING GUIDELINES

SOG #:	6.641	Effective Date:	2/20/2022
Title:	Radiological Emergency Response	# of pages:	7
Category:	Hazardous Materials Response	Classification:	Red

1. **PURPOSE:** This Standard Operating Guideline (SOG) defines and describes how the South Portland Fire Department (SPFD) will use its equipment and training to conduct radiological response operations, including monitoring, scene isolation, and decontamination, during a WMD or hazmat event that may involve radiological or nuclear materials
2. **PROCEDURES:** The Fire Department responsibilities during radiological emergencies include rescue, treatment, fire control/extinguishment, control of contamination spread and alerting responsible experts/agencies. Actual clean-up and overhaul operations will not normally be a Fire Department responsibility, although the Fire Department will be responsible for seeing that such operations are completed. Shippers and/or manufacturers of radiological materials will normally be responsible for clean-up operations using trained clean-up personnel and equipment.

Precautions:

RRT personnel should remember the acronym ALARA, which means keep your exposure to radiation “As Low as Reasonably Achievable” by reducing time, distance and shielding.

Wear protective clothing with double gloves in a potential radioactive environment, wear SCBA if in a potential airborne radiation area, and wear dosimeters,

Turn back values are set at **10 REM total dose** and **10 R/hr dose rates**.

Turn back values for **life saving** activities **25 REM total does** and **200R/hr does rates**.

Dispatch:

The Dispatch Center will dispatch either a Level 1 or Level 2 assignment per SPFD Hazmat response SOGs. Dispatch will advise responding units of the prevailing wind direction.

When a radiological incident is confirmed, Dispatch will notify:

- Fire Chief (if not already responding)
- MEMA
- Cumberland County EMA Director
- State Radiation Control Program team (page out through State Police -624-7076)
- MeARNG 11th WMD CST (page out through State Police Augusta-624-7076).
- State DEP hazmat team with radiation meters

Tactical Considerations:

Incidents with Fire:

- Initiate normal tactical firefighting operations.

- Always approach from upwind.
- Do not ventilate.
- Minimize the use of water.
- Control water runoff-impound for disposal.
- Minimize exposure of personnel.
- Use full protective clothing with SCBA.

Rescue/EMS Incidents:

- Remove patients quickly.
- Treat patients for medical problems/injuries.
- Alert hospitals to prepare for contaminated patients.
- Use full protective clothing and SCBA.
- Decontaminate vehicles used to Transport.

Site Operations:

At the scene, Command must consider both direct radiation exposure and contamination. If there is no life hazard, rescue situation or fire, there is no reason to risk exposure of Fire Department personnel. First arriving units should secure a perimeter, evaluate the situation and wait for the arrival of the HM-402 with our specialized equipment.

If the immediate commitment of personnel is necessary, Limited Access Zone procedures shall be implemented to minimize the exposure and contain the spread of contamination. Never refuse or delay medical treatment because the patient may be or is contaminated. Life safety always comes first.

The entry of personnel shall be limited to the absolute minimum number and time required for the urgent situation. These personnel will use full protective clothing and SCBA.

Any commitment of personnel to the Limited Access Zone (for Rescue Only) shall include:

- Turnout Gear (Including Hood) and gloves taped to PPE
- SCBA
- 4 Gas Meter/PID
- Radiation pager or GammaRAE

Set up incident command **1000+ feet UPWIND** of the event location/ground zero.

Carefully survey the area by responders dressed in appropriate PPE:

- Level B suit
- SCBA
- Double gloves, with one set of gloves taped to the suit
- Dosimetry

Establish zones follow the survey instructions included with this procedure. Draw a map of the scene, annotating the map with radiation readings observed.

- Check dosimeter readings every **15** minutes, unless told otherwise.

- Report any dosimeter dosage readings to the Safety Officer that are at or near **1 REM**.
- Evacuate everyone from the affected area and exclude non-essential personnel from the hot zone.

Establishment of Access Controls and Safety Zones

Hot Zone –use radiation pagers or Ludlum meters to find where dose levels are **5 mR/hr**. Barricade the **5 mR/hr** line using barricades, police or fire tape, etc. This area becomes the hot zone.

The hot zone may end up looking like a **keyhole** – with a certain circular distance around the scene (e.g. 1,000 feet around ground zero) and with a rectangular shape going downwind from the 1000 foot circle.

Warm Zone (Decontamination Area) – The area between **background** radiation levels and the **5 mR/hr** zone line. All personnel and equipment leaving the Hot Zone must be checked for radioactive contamination by qualified personnel. All persons or items must go through the Decontamination Area before leaving the Hot Zone. (See Decontamination)

Patients requiring treatment, who cannot immediately be decontaminated, must be placed in an isolated Treatment Area, away from other patients inside the Hot Zone.

Cold Zone- The area where **background** radiation levels are found.

Use of department monitoring equipment

Use the Ludlum Model 3 meters to survey an area, with the probe covered by a plastic baggie. If you are looking for contamination (radioactive material where it is not supposed to be, like on a person), then use the counts per minute (CPM) scale. If you are looking for dose rates in an area, to establish zones; hot, warm and cold zones, then use the mR/hr scale of the meter.

To locate a specific source of radioactivity, use the Ludlum Model 2241 with the “hotdog” probe in combination with one or more Radiation Pagers.

Radiation pagers can also be used to determine the location of hot, warm and cold zones, and to find sources of radioactive material. Radiation pagers look for gamma radiation (which may be an indicator of a dirty bomb), and look for neutron radiation (which may be an indicator of an atomic fission bomb).

Use of department dosimetry

The department maintains two kinds of dosimetry, including: Self-Reading Dosimeters (SRD) and pocket sized Electronic Dosimeters (ED). All SPFD dosimetry reads out in mR/hour or REM per hour.

Dosimetry must be worn on the upper torso, on the outside of clothing, but not outside PPE. Normal use will be in conjunction with the radio harnesses or they may be clipped to the breast pocket, or to the department's ID lanyard.

Dosimetry should be read every **15** minutes, until the event stabilizes. Once dose rates are determined and workers become more comfortable working in assigned areas, dosimeters may be read at intervals of 15 minutes, 30 minutes, 1 hour or 4 hours, as determined by radiation experts and the Safety Officer.

SRDs should be re-zeroed prior to use, by using a dosimeter charger. SRDs can be passed from one person to another after use. Electronic dosimeters should be worn by one person and should not be passed from one person to another without permission from the Safety Officer.

Nuclear Weapons:

The radiological hazard of nuclear weapons in transit is similar to other radioactive materials and can be handled with similar tactics.

These weapons however, contain considerable amounts of high explosives which may be shock sensitive and can detonate very easily. They are especially dangerous when the weapon has broken up and the high explosive is scattered about. If a nuclear weapon involves fire, evacuate the area of 2,000 feet, in all directions, immediately. All downwind areas must be checked for contamination.

Treatment of Contaminated Patients:

Do not delay field treatment of injuries. Radiological contamination, itself, is not a medical emergency. Treatment of contaminated patients should proceed with the following precautions:

- All contaminated patients should be placed in one Treatment Area--separate from non-contaminated patients--within the Hot Zone perimeter, but beyond the 5 MR/hr exposure distance.
- All treatment personnel should use SCBA or dust-filtering type masks, long sleeve shirts or coats, gloves and Nomex hoods.
- A mask or other airway filtering means should be used on the patient to limit Inhalation/ingestion of airborne contamination.
- Bandage all open wounds as quickly as possible to prevent wound contamination.
- Carefully peeling or cutting of outer clothing from the patient's body will remove most of the contamination.
- Removed clothing, watches, wallets, etc., must be placed in plastic bags or other appropriate containers, sealed and properly identified.
- A clean plastic bag or other clothing should be placed over the patient's scalp hair to minimize the spread of contamination. Do not cover face.
- Much of the contamination on a patient's skin can be removed by wiping with a moist cloth or tape (put in plastic bag afterwards).
- Hot spots of contamination on the patient's body that cannot be removed by wiping, etc., should be marked with ink outline or tape.

- Before transporting, all contaminated patients must be wrapped in blankets or sheets to completely cover them in order to limit the spread of contamination. Only the face should be left exposed.
- Hospitals and rescues must be alerted early and before patient transportation is initiated so they can prepare to receive radioactive contaminated patients.
- All contaminated patients should be sent to a single hospital or to as few as possible. Once contaminated, these hospitals could be out-of-service for some time.
- Where there are large numbers of contaminated patients, place as many patients as possible in each rescue to minimize contamination spread to other rescues.
- Reuse of contaminated rescues for contaminated patient transportation should be considered. If all available rescues become contaminated, these vehicles can be out-of-service for long periods of time until they can be decontaminated.
- Before treatment personnel can be released from the scene, they must be checked for contamination and decontaminated. All equipment used in patient treatment must also be checked and decontaminated. This evaluation will be conducted in the Decontamination Area.

3. REFERENCES:

- State of Maine, “Radiological/Nuclear Incident Notification Protocol”. State of Me. Dept. of Health and Human Services, Radiation Control Program procedure # 2.01.
- South Portland Fire Department SOG “Hazardous Materials/Weapons of Mass Destruction” procedure.
- US Coast Guard Commandant Instruction 16600.2, “Guidance for Actions When Encountering Radioactive Materials During Vessel Boarding, Cargo Inspections and Other Activities”.
- US Environmental Protection Agency document “Manual of Protective Actions” EPA 400
- Phoenix Fire Department SOG M.P. 204.03 Radiological Hazards

By Order Of:



James P. Wilson
Fire Chief

Attachment 1**Radiological Conversion Table for use with Military style ED**

Federal and state radiation standards are given in REM (R) or MilliREM (mR). However military style monitoring equipment reads out in microgray (uGy). Use the table below to convert from what military reading in uGy is to what the federal and state limits are in R or mR.

Gray (Gy)	REM (R)	MilliREM (mR)
1	100	100,000
.1	10	10,000
.01 (centagram)	1	1,000
.001	.1	100
.0001	.01	10
.00001	.001	1
.000001 (microgray)(uGy)	.0001	.1

Attachment 2

Protective Action Guidelines (PAG) for emergency workers

The US Environmental Protection Agency (USEPA) has established PAG for the protection of the public and for protection of emergency workers. The PAG are listed in Appendix 2

Emergency workers should read their dosimetry periodically, as requested by the radiological supervisor. Readings must be recorded on the SPFD Dosimetry Log (See Response Forms).

DOSE RATE Recommendations	Actual Values	Exercise Values
Contaminated (Persons)	2 x Background Reading (cpm or μ R/hr or mR/hr)	2 x Background Reading (cpm or μ R/hr or mR/hr)
HOT LINE	1 – 5 mR/hr (0.001 – 0.005 R/hr)	100 μ R/hr (0.1 mR/hr)
WORK IN HOT ZONE	1 mR/hr – 10 R/hr (0.001 R/hr – 10 R/hr)	100 μ R/hr – 1000 μ R/hr (0.1 mR/hr - 1 mR/hr)
TURN BACK DOSE RATE (Except for Life-Saving)	10 R/hr	1 mR/hr
TURN BACK DOSE RATE (Even for Life-Saving)	200 R/HR	4 mR/hr

EPA Emergency Action Dose Guidelines (Actual):

Dose limit (whole body)	Emergency Action Dose Guidelines Activity performed
5 rem	All activities.
10 rem	Protecting major property.
25 rem	Lifesaving or protection of large populations.
>25 rem	Lifesaving or protection of large populations, Only by volunteers who understand the risks.

Stay Time Table:

Gamma-ray Dose Rate			Stay Time to Receive This Dose						
RATE / HR	Rate / min	Rate / sec	1 rem	5 rem	10 rem	25 rem	100 rem	300 rem	500 rem
1 mR/hr	17 μ R/min	0.3 μ R/sec	6 week	30 week	1 year				
5 mR/hr	83 μ R/min	1.4 μ R/sec	200 hr	6 week	12 week	30 week	2 year		
100 mR/hr	1.7 mR/min	27 μ R/sec	10 hr	50 hr	100 hr	250 hr	6 week	18 week	30 week
1 R/hr	17 mR/min	270 μ R/sec	1 hr	5 hr	10 hr	25 hr	100 hr	300 hr	500 hr
10 R/hr	170 mR/min	2.7 mR/sec	6 min	30 min	1 hr	2.5 hr	10 hr	30 hr	50 hr
100 R/hr	1.7 R/min	27 mR/sec	36 sec	3 min	6 min	15 min	1 hr	3 hr	5 hr
200 R/hr	3.3 R/min	56 mR/sec	18 sec	90 sec	3 min	7.5 min	30 min	1.5 hr	2.5 hr
500 R/hr	8.3 R/min	140 mR/sec	7 sec	36 sec	72 sec	3 min	12 min	36 min	1 hr