



Recommendations on the Selection of PPE for Radiological Incidents

FACT SHEET 26-014-1116

Purpose: To provide U.S. Army medical treatment facility (MTF) personnel and emergency responders with recommendations for the selection of personal protective equipment (PPE) when engaged in the extraction, triage, transport, and initial treatment of casualties of a radiological incident.

How might I be exposed to radiation?

Radiation exposure routes can be external and/or internal.

1. **External.** External radiation is emitted by sources outside of the human body.
2. **Internal.** Internal radiation is emitted by sources inside the human body resulting from inhalation, ingestion, sources entering through open wounds, or from radioactive material embedded in the body (examples: bomb fragments, debris, shrapnel, etc.).

What PPE is appropriate for me?

The correct PPE when properly used will prevent internal exposure to radionuclides, prevent external exposure to alpha particles and most beta particles, and also reduce the spread of contamination. PPE will not protect personnel from external exposure to gamma and neutron radiation. The appropriate use of PPE should not introduce additional unnecessary risk to the conduct of duties. A complete risk assessment should be conducted before implementing these recommendations.

Contamination Zone Responders: In response to a radiological incident (no other hazards), Level C PPE or Mission Oriented Protective Posture (MOPP) 4 (such as the Joint Service Lightweight Integrated Suit Technology (JSLIST)) provides adequate protection during first response, search and rescue, and decontamination (see Table 1). Level A with a self-contained breathing apparatus (SCBA) should be worn if the hazards are unknown.

In the presence of chemical hazards, biological hazards, recent fire, or low-oxygen areas, Level A or Level B PPE may be appropriate. For rescues involving fire, structural firefighting gear should be worn, including helmet, SCBA, and turnout gear (thermally insulated coat, pants, and boots).

While Transporting Contaminated Patients to MTF: Appropriate PPE includes: disposable gloves; a National Institute for Occupational Safety and Health (NIOSH) N-95/99/100 respiratory or mask; eye protection or face shield; waterproof disposable shoe covers; and a disposable gown. Other ventilation devices should be used as an alternative to mouth-to-mouth resuscitation. The risk of radiation injury or illness from transporting contaminated patients is extremely low. Appropriate PPE should not restrict movement unnecessarily or increase the risk of an accident when transporting patients. Other factors and universal precautions will most likely dictate the appropriate PPE.





Pre-MTF Triage Procedures and Perimeter Security PPE: Those performing initial triage and perimeter security that may come in contact with contaminated patients should wear a minimum of Level C PPE.

Initial MTF Precautions: Emergency treatment or lifesaving measures performed outside the MTF should not be delayed for radiological decontamination of casualties/patients. All casualties/patients entering a MTF that are potential victims of a radiological/nuclear incident should be considered contaminated unless proven otherwise. Standard hospital barrier clothing as used in universal precautions is adequate for emergency treatment of radiological contaminated casualties. If cross contamination occurs, it may be necessary to declare an area of the MTF as contaminated and to screen any medical personnel leaving that area for contamination. If patients have been adequately decontaminated before entering the MTF, there are no additional PPE requirements for care of the patient inside the MTF.

How should I remove potentially contaminated PPE?

Remove potentially contaminated PPE in the following order: outer gloves, dosimeter, tape at ankles/wrists, coveralls, head cover, respiratory protection, shoe covers, and inner gloves. Removed PPE should be bagged separately from non-contaminated equipment and waste.

Table 1. Descriptions of PPE Levels

	 Level A	 Level B	 Level C	 JSLIST
Air Supply	Self-contained breathing apparatus or Supplied Air Respirator; commercial NIOSH CBRN approved	Self-contained breathing apparatus or Supplied Air Respirator; commercial NIOSH CBRN approved	Tight-fitting full-face piece air-purifying respirator with P-100 filter; organic vapor and acid gas cartridges /canister	M-40 or M-50 mask with air purifying cartridges/canister
Suit	Fully encapsulating chemical resistant suit and duct tape to seal seams	Non-gas-tight encapsulating suit	Tyvek or equivalent garments and duct tape to seal seams	MOPP 4 JSLIST
Gloves/Boots	Chemical resistant over-gloves and boot covers	Chemical resistant over-gloves and boot covers	Double gloves and boot covers	Double gloves and overboots
Situations for Use	Environments that are immediately dangerous to life and health; working with substances that can be absorbed by or are hazardous to skin	Environments that are immediately dangerous to life and health; only if substances cannot be absorbed by or are not hazardous to skin	First response, search and rescue, and decontamination	First response, search and rescue, and decontamination

Note: A complete risk assessment should be conducted before implementing these recommendations.
 Pictures: Reference 4 (http://www.remm.nlm.gov/radiation_ppe.htm#imagegallery; PPE Image Galleries)

References

1. USACHPPM Technical Guide 244, *The Medical NBC Battlebook*, October 2008 <http://usaphcapps.amedd.army.mil/HIOShoppingCart/ViewItem.aspx?id=277>
2. U.S. Agency for Toxic Substances and Disease Registry (ATSDR), *Managing Hazardous Material Incidents, Volume 1: Emergency Medical Services*, March 2001 <http://www.atsdr.cdc.gov/MHMI/index.asp>
3. *Medical Management of Radiological Casualties Handbook*, Fourth Edition, Armed Forces Radiobiology Research Institute, July 2013 <https://www.usuhs.mil/sites/default/files/media/afrrri/pdf/4edmmrhandbook.pdf>

4. USDHHS Radiation Emergency Medical Management website <http://www.remm.nlm.gov>
5. National Council on Radiation Protection and Measurements Report No. 161 - *Management of Persons Contaminated With Radionuclides*, 20 December 2008
6. National Council on Radiation Protection and Measurements Report No. 138, *Management of Terrorist Events Involving Radioactive Material*, 24 October 2001