

ILLINOIS STATE POLICE DIRECTIVE EQP-004, RADIATION DETECTION EQUIPMENT

RESCINDS: EQP-004, 2012-049, revised 07-10-2012.	REVISED: 09-14-2015 2015-071
RELATED DOCUMENTS: None	RELATED CALEA STANDARDS: 46.1.2, 46.3.1, 46.3.2, 46.3.4, 61.1.1, 61.1.5

I. POLICY

The Illinois State Police (ISP) will attempt to halt the unauthorized movement of radioactive materials through the state of Illinois.

II. AUTHORITY

- II.A. 20 ILCS 3310/1, et seq., the "Nuclear Safety Law of 2004"
- II.B. 420 ILCS 40/1, et seq., the "Illinois Radiation Protection Act of 1990"
- II.C. 430 ILCS 30/1, et seq., the "Illinois Hazardous Materials Transportation Act"
- II.D. 625 ILCS 5/18b-100, et seq., "The Illinois Motor Carrier Safety Law"
- II.E. Title 18, United States Code, Section 831: "Prohibited Transactions involving Nuclear Materials"

III. DEFINITIONS

- III.A. Department of Homeland Security (DHS) - the agency of the federal government that is responsible for anticipating, preempting, detecting, and deterring threats to the homeland, crucial infrastructure, property, and the economy from acts of terrorism, natural disasters, and other emergencies.
- III.B. Exposure – the total accumulated radiation dose received. The source of the radiation is not on or inside the person and, therefore, cannot be passed on to others. A person exposed to radiation is not radioactive and is not a hazard to himself/herself and others. Exposures should always be kept **As Low As Reasonably Achievable (ALARA)** using the principles of time, distance, and shielding.
- III.C. Exposure Rate – the amount of radiation measured at any moment usually expressed in "R per hour."
- III.D. Illinois Emergency Management Agency (IEMA) - the agency of state government responsible for developing a plan for training and coordination between law enforcement and fire personnel who will be assigned personal radiation detectors (PRD) for use in their daily or routine response activities.
- III.E. Personal Radiation Detector (PRD) - a small detection instrument mounted on the dash of an officer's squad car which directly measures the ionizing radiation exposure. The device may also be worn or carried by an officer during special details or when probable cause exists to warrant further investigation.
- III.F. Primary screening - the initial point of radiation detection and includes the first contact with the conveyance, individual, or shipment.
- III.G. Radiation or ionizing radiation – invisible energy emitted by the unstable atoms in radioactive materials. Examples of ionizing radiation include gamma rays and x-rays; alpha and beta particles; neutrons; protons; and other nuclear particles or electromagnetic radiation capable of producing ions directly or indirectly in their passage through matter; but does not include sound or radio waves or visible, infrared, or ultraviolet light.
- III.H. Radiation Isotope Identifier Device (RIID) - equipment that is used by ISP Commercial Vehicle Enforcement Officers and other non-ISP units to identify the specific radionuclide(s) present on a person or shipment undergoing radiation source identification. The isotope identifier is capable of transferring information to offsite technical experts employed by IEMA, the United States Department of Energy, the Department of Defense, or Argonne National Laboratory.

- III.I. Radiation Safety Zone – an area established in situations where the source of radiation cannot be determined and lifesaving activities are not required. Officers will secure a perimeter around the suspected source utilizing a two (2) milli-R per hour boundary.
- III.J. Radioactive material - any solid, liquid, or gaseous substance which emits radiation spontaneously.
NOTE: This definition does not supersede the definition of radioactive material contained in 49 CFR for radioactive materials transported in commerce.
- III.K. Radiological Duty Officer - the person assigned by the IEMA to provide twenty-four hour technical assistance regarding radiological/nuclear matters and PRD alarm adjudication issues.
- III.L. Secondary screening - examination conducted in a secure area where the source is identified using RIID equipment and/other search techniques. Other search techniques may include review of paperwork, i.e., radioactive material license, authorization documents and/or shipping papers, interviews, and possible examination of the radioactive source for manufacturer or serial numbers.

IV. PROCEDURES

- IV.A. Basis for making traffic stops or taking enforcement action
 - IV.A.1. Officers will base traffic stops, investigative detentions, arrests, and searches of personal or real property, or seizure on a standard of reasonable suspicion or probable cause as required by the Fourth Amendment of the United States Constitution, the Illinois Constitution, applicable statutes, or as otherwise permitted under current law.
 - IV.A.2. Officers must be able to articulate reasonable facts, circumstances, and conclusions that support probable cause or reasonable suspicion for a traffic stop, investigative detention, arrest, search of personal or real property, or seizure.
 - IV.A.3. The activation of an alarm is not cause for officers to detain and search individuals believed to be the cause of the alarm; however, it can assist the officer in gaining crucial information to develop the probable cause or reasonable suspicion to detain and search for the cause of the activation.
 - IV.A.3.a. Because an alert from a radiation detection device alone is not indicative of criminal activity, officers will not take enforcement action based solely upon that alert.
 - IV.A.3.b. Traffic stops based upon an alert from these devices may be made only when the officer has reasonable suspicion or probable cause to believe that the individual has committed, or is about to commit, a violation of the Illinois Vehicle Code or other criminal law.
 - IV.A.3.c. An alert, standing alone, will not provide an officer sufficient basis to initiate traffic stops, investigative detentions, arrests, searches of personal or real property, and/or seizures.
 - IV.A.4. However, an officer may use the PRD when he/she has a legitimate independent basis for stopping a vehicle or taking enforcement action. In such circumstances, officers should follow the procedures set forth in sections IV.B. and IV.C. of this directive.
- IV.B. Primary screening procedures (initial detection location) conducted by Group A personnel (PRD users).
 - IV.B.1. An officer's response should be dictated by the readings indicated on his/her PRD. For officers' safety the following guidelines are established:
 - IV.B.1.a. Greater than 25 micro-R per hour - Low exposure rate alarm. A source of radiation is in the vicinity, and investigation is warranted.
 - IV.B.1.b. Greater than two (2) milli-R per hour - High exposure rate alarm. If the situation is unknown, and no life-saving activities are necessary, secure the scene until assistance arrives.

- IV.B.1.c. Ten (10) R per hour - This is not a dangerous level of radiation provided the officer limits their time in the area.
- IV.B.1.d. Three (3) R - Dose alarm. An officer should leave the immediate area, and contact his or her chain-of-command for further instructions.

NOTE: This is a cumulative dose and not a rate. Officers will need to ensure the PRD is reading doses and is not in rate mode.

NOTE: To put these rates in perspective, in order to see any physiological changes due to radiation exposure, an individual would have to receive an acute (quick, one time) whole body exposure of approximately 50 R. Illinois subscribes to the US Environmental Protection Agency exposure guidelines that allow a whole body exposure of 25 R for life-saving activities.

EXAMPLE: In a 200 R per hour radiation field, an officer could work for 15 minutes before any physiological changes are likely to occur, or 7.5 minutes before exceeding EPA guidelines. Since these two standards do not take into account internal deposition, the ISP has chosen to go much safer than either of these limits with a 3 R dose alarm because law enforcement personnel are not likely to have respiratory protection. At a 3 R limit, an officer could take one minute to drag his partner or a citizen out of a radiation field of this magnitude without physiological change.

- IV.B.2. Once the officer has established probable cause to initiate an investigation, the officer will conduct primary screening as follows:
 - IV.B.2.a. The officer should, consistent with the guidelines set forth in section IV.B.1., determine the exact location of the initial indication of radioactive material in the conveyance, package, or person.
 - IV.B.2.b. In doing so, the officer should visually inspect and interview all persons associated with the alarm regarding the cause of the alert.
- IV.B.3. Utilizing the principles of ALARA, officers should make an effort, where practicable, to increase the distance between the source of the radiation, crowds, and critical infrastructure. If necessary, officers may, consistent with the guidelines set forth in paragraph IV.B.1., escort the person, vehicle, or conveyance to a secondary inspection location.
- IV.B.4. If possible, the officer should:
 - IV.B.4.a. Establish a single subject focus - separate the driver from the vehicle or the person from their belongings.
 - IV.B.4.b. Begin questioning of the individual to identify the possible cause of the alarm (medical treatment, professions, etc.; however, always be cognizant of officer safety per ALARA).
 - IV.B.4.c. If the officer cannot identify the source, the officer will set up a radiation safety zone - monitor the applicable radiation dosimeter to determine a safe distance from the source until the arrival of Group B personnel (PRD and RIID users).
- IV.B.5. The officer should release the person or vehicle and document the incident on a Preventive Radiological and Nuclear Detection form (available online at <http://tier2.iema.state.il.us/PRND/>) and enter the information into TraCS, if the radioactive source identified is consistent with:
 - IV.B.5.a. The list of Medical Isotopes and Industrial (Innocent) Radiation Sources (see Addendum 1)
 - IV.B.5.b. A product containing naturally occurring radioactive material - or no other isotopes are identified
 - IV.B.5.c. No inherent danger is suspected

IV.C. Secondary procedures (verification/location/identification) conducted by Group B personnel.

IV.C.1. If the cause of the alarm cannot be resolved through further investigation, or if a dose alarm reading of three (3) R appears on the PRD, the officer will contact their district supervisor. The district supervisor will contact the Commercial Vehicle Section at 217-782-6629 for the nearest Group B personnel. If after hours, contact the Springfield Communications Center at 217-786-6677.

IV.C.2. The officer should release the person or vehicle and document the incident on a Preventive Radiological and Nuclear Detection form and enter the information into TraCS, if the radioactive source identified is consistent with:

IV.C.2.a. The list of Medical Isotopes and Industrial (Innocent) Radiation Sources (see Addendum 1)

IV.C.2.b. A product containing naturally occurring radioactive material - or no other isotopes are identified

IV.C.2.c. No inherent danger is suspected

IV.C.3. Person

IV.C.3.a. If the source is a person, isolate the individual(s) and question him or her concerning previous medical treatments, areas visited, professions, etc., that would explain the radioactive emission.

IV.C.3.b. If the individual's answer corroborates the readings from the Isotope Identifier and the Industrial Radiation Sources (see Addendum 1), release the individual and document the incident on a Preventive Radiological and Nuclear Detection form and enter the information into TraCS.

IV.C.4. Vehicles

IV.C.4.a. If the source is within the vehicle, conduct a complete radiological survey of the vehicle to locate and identify the radiation.

IV.C.4.b. If the Isotope Identification is consistent with the Industrial Radiation Sources (see Addendum 1), and the level of distribution of the radioactivity correlates with the materials described in the shipping documents, release the vehicle and document the incident.

IV.C.4.c. If the Isotope Identification Equipment does not confirm the radioactive source, use all available resources to examine the entity (person or vehicle).

IV.C.4.d. If the cause of the alarm is found not to be an illicit threat, and no inherent danger is discovered, release the person or vehicle and document the incident on a Preventive Radiological and Nuclear Detection form and enter the information into TraCS.

IV.C.5. If the officer cannot explain a source of radiation, guidance may be obtained by contacting the Commercial Vehicle Section at 217-782-6629, or after hours, through Springfield Communications Center, at 217-786-6677. The Commercial Vehicle Section may contact IEMA for further assistance.

| Indicates new or revised items.

-End of Directive-

**ILLINOIS STATE POLICE DIRECTIVE
EQP-004, RADIATION DETECTION EQUIPMENT
ADDENDUM 1, COMMON INNOCENT RADIATION SOURCES AND MAJOR
ISOTOPES OF CONCERN**

RESCINDS: EQP-004, Addendum 1, 2012-049, revised 07-10-2012.	REVISED: 09-14-2015 2015-071
RELATED DOCUMENTS: None	RELATED CALEA STANDARDS: 46.1.2, 61.1.1, 61.1.5

- Medical Isotopes** – These may be in a person’s bloodstream or implanted as pellets. Someone who has received medical treatment within the past couple of weeks, or months for some treatments, may trigger a gamma radiation alarm. Some isotopes are shipped to and used in medical centers, but are not likely to be detected in patients (Mo-99, Xe-133). Other isotopes, such as Y-99, may be detected by the Radiation Isotope Identifier Device (RIID) or the Personal Radiation Detector (PRD) but not identified in a patient.

Common Medical Isotopes include:

Chromium-51 (Cr-51)	Iodine-125 (I-125)	Strontium-82 (Sr-82)
Flourine-18 (F-18)	Iodine-131 (I-131)	Strontium-85 (Sr-85)
Gadolinium-153 (Gd-153)	Iridium-192 (Ir-192)	Thallium-201 (TI-201)
Gallium-67 (Ga-67)	Lutetium-177 (Lu-177)	Technicium-99m (Tc-99m)
	Lutetium-177m (Lu-177m)	
Germanium-68 (Ge-68)	Molybdenum-99 (Mo-99)	Xenon-133 (Xe-133)
Indium-111 (In-111)	Palladium-103 (Pd-103)	Yttrium-90 (Y-90)
Iodine-123 (I-123)	Samarium-153 (Sm-153)	Zinc-65 (Zn-65)

- Items and products which may contain Naturally Occurring Radioactive Material (NORM)** – Usually bulk quantities (10’s to 100’s of pounds) of these items are required to trigger a gamma radiation alarm. Items listed usually contain one or more of these four NORM sources:

Potassium-40 (K-40)	Radium-226 (Ra-226)
Thorium-232 (Th-232)	Natural Uranium, Uranium-238 (U-238)

- Agricultural products (e.g., fruits and leafy vegetables; tobacco, marijuana, etc.)
- Antique items including: ceramic-glaze products in orange, red or yellow. Examples would include antique cups and plates, decorative floor tiles, jewelry, pottery, and Vaseline glass (emerald green glass used in some antique cups and plates).
- Bananas
- Camera lenses and any high-quality optical lens system.
- Cat litter (clay type).
- Ceramic tiles or items, especially those with colored glazes.
- Dental ceramics, porcelain dentures made before the mid-1980’s.
- Fertilizers.
- Irradiated gemstones, particularly blue topaz.
- Lantern mantles.
- Polishing powders.
- Propane tanker trucks, natural gas containers, and used pipes (from radioactive deposits on interior walls).
- Radio-Luminescent products: watches, clocks, and instrument gauges.
- Salt substitute, roadway ice melt, water softener pellets, potassium chloride salt.
- Smoke detectors.
- Television sets (thoriated tungsten in picture tube).
- Thoriated aluminum, nickel, or magnesium, aircraft and jet engine parts.
- Thoriated tungsten arc-welding electrodes (often labeled “thoriated welding rods”).
- Uranium ore samples.
- Building or construction materials including adobe, ceramic tiles, concrete, feldspar, colored glass, granite, marble, monazite sand, sandstone, and slate.

Addendum 1, Common Innocent Radiation Sources and Major Isotopes of Concern

NOTE: Many RIIDs may not distinguish between Natural Uranium and Depleted Uranium. Both are Uranium-238 (U-238). Depleted Uranium is categorized as an Isotope of Major Concern and requires further investigation.

3. **Common Sources used in Industry** - may be of **concern** if misused.

Americium-241 (Am-241)	Curium-244 (Cm-244)	Strontium-90 (Sr-90)
Barium-133 (Ba-133)	Iridium-192 (Ir-192)	Thorium-232 (Th-232)
Cesium-137 (Cs-137)	Promethium-147 (Pm-147)	Thulium-170 (Tm-170)
Cobalt-57 (Co-57)	Radium-226 (Ra-226)	Ytterbium-169 (Yb-169)
Cobalt-60 (Co-60)	Selenium-75 (Se-75)	

4. **Common Commercial Neutron Sources and Isotopes** – These sources are commonly found in moisture density gauges, soil density gauges, nuclear gauges, and well logging sources.

Californium-252 (Cf-252)	Americium/Beryllium (Am/Be or Am-241:Be)
Plutonium/Beryllium (Pu/Be or Pu-238:Be)	Polonium/Beryllium (Po/Be or Po-210:Be)

5. **Nuclear Weapons, Special Nuclear Material, or Isotopes That May Be Mixed with Special Nuclear Material** – These **sources** may emit both gamma and neutron radiation. It is important to note that the RIID provided to Group B responders is not equipped with a neutron detector.

Plutonium-239 (Pu-239)	Uranium-232 (U-232)
Enriched Uranium, Uranium-235 (U-235)	Depleted Uranium, Uranium-238 (U-238)
Uranium-233 (U-233)	Plutonium-240 (Pu-240)
Neptunium-237 (Np-237)	Americium-241 (Am-241)

NOTE: Some legitimate industrial items may contain Depleted Uranium (U-238) or Americium-241 (Am-241).

-End of Addendum-