

# ESF 10 INCIDENT ANNEX C

## EMERGENCY RESPONSE TO EVENTS INVOLVING RADIOLOGICAL MATERIALS - RADIOLOGICAL EVENT OPERATIONS

### *Primary Agency*

In compliance with Nuclear Regulatory Commission (NRC) requirements, the **Commonwealth of Kentucky** designates the **Cabinet for Health and Family Services (CHFS), Radiation Health Branch** as the **State Radiation Control Agency (KRS 211.842)**. As the Radiation Control Agency, the **Radiation Health Branch (RHB)** is the **primary state agency** for coordinating response to hazardous materials events involving radiological material.

- The **Radiation Health Branch** is the **Authority Having Jurisdiction (AHJ)**, as defined in **Proposed ASTM E54.02.05 – Practice Standard for Radiological Emergency Response**, for all radiological events **except** those involving improvised nuclear devices (IND) or nuclear weapons (outside the Standard's scope).
- RHB is also the primary state agency for events involving a release of radiological material from a **weapon of mass destruction (WMD)** or other **criminal/terrorist** act. RHB will coordinate with the appropriate **federal coordinating agency** when additional technical expertise is required or when state resources are exceeded. The **U.S. Department of Homeland Security (DHS)** is responsible for overall coordination of Federal emergency response. If an event initially believed non-terrorist is later determined to be terrorism, **notify DHS as soon as possible**.

**Note:** Radiological incidents at the **Paducah Gaseous Diffusion Plant (PGDP)** are addressed in the **Paducah Gaseous Diffusion Plant Incident Annex**.

**Definitions** for this Annex appear in **Appendix A**.

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### *Supporting Agencies*

- **CHFS – Department for Public Health (DPH)**, non-RHB personnel
- **EPPC – Department for Environmental Protection (DEP) – Environmental Response Team (ERT)**
- **Kentucky Department of Military Affairs – Division of Emergency Management (KyEM)**
- **Kentucky Army & Air National Guard**
- **Kentucky Community Crisis Response Board (KCCRB)**
- **Kentucky Transportation Cabinet (KYTC) – Department/Division of Highways**
- **Justice & Public Safety Cabinet (JPSC) – Kentucky State Police (KSP)**
- **JPSC – Department of Motor Vehicle Enforcement**
- **Kentucky Department of Agriculture**
- **Kentucky Office of Homeland Security (KOHS)**

- American Red Cross (ARC)
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### ***Purpose***

Provide a framework for coordinated and effective **state, local, federal, and private-sector** efforts to reduce or remove dangers to **public health, safety, and the environment** from hazardous materials events involving **radiological materials**.

This Annex is used **with ESF-10 (Oil & Hazardous Materials)** and **ASTM E54.02.05 (Proposed Radiological ER Standard)** to guide operations that (1) meet victim needs, (2) secure the scene, and (3) **limit responder dose to ALARA** and at or below the **recommended critical dose rate** in the proposed Standard.

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### ***Situation & Assumptions***

#### **Situations**

- Radiological events require **immediate** hazard area control and measures to prevent **unnecessary exposure** to ionizing radiation.
- Effective response demands **specialized knowledge, training, and equipment**.
- Releases may be **accidental** or **intentional**. Responses to IND/nuclear weapon detonations are **outside** the scope of the proposed Standard.
- WMD/terrorism-related radiological incidents are coordinated with **federal response agencies** when technical expertise is needed or state resources are exceeded; directives of the **Coordinating Federal Agency** supersede local policy.
- Widespread civilian use of radioactive sources creates accident potential, e.g.:
  - releases at **medical/research/construction** sites;
  - **transport** releases; package breach/mis-packaging/over-TI (transport index);
  - **fire-involved** packages; malfunctioning **radiography** sources;
  - incidents involving **radioactive waste**;
  - transport incidents involving **uranium hexafluoride (UF<sub>6</sub>)** or **uranium tetrafluoride (UF<sub>4</sub>)** associated with the **PGDP**.
- For **DoD** shipments: the **State EOC Duty Officer** shall notify the **U.S. Army Operations Center (703-697-0218, collect)** for incidents involving explosives/ammunition.
- Per the proposed Standard, the **IC/Unified Command (UC)** classifies the situation as an **Incident** (defensive ops; no immediate life/property/environmental protection required though potential exists) or an **Emergency** (life/property/environmental protection actions **are** required).
- For **PGDP** events, use the **PGDP Emergency Management Plan** per that Annex.

#### **Assumptions**

- **RHB/CHFS** is the **Primary Agency** for state coordination in radiological materials incidents (except where WMD/terrorism federal coordination governs).

- Transporters of radiological material above specified activity thresholds must notify the **Governor's Designated Representative (GDR)**. The **NRC** recognizes **RHB** as Kentucky's **State Radiation Control Agency**, and the **RHB Manager** is the **GDR**.
  - **RHB Emergency Response Teams** (Radiation Health Team) are available, trained, and equipped to assess/quantify radiological hazards.
  - Teams operate under the **RHB Radiological Incident Response Plan (Response Plan)**, compliant with the proposed Standard, detailing **Defensive** and **Offensive** operations, hot-zone actions, and responder/public safety.
  - **Site-specific** factors will be integrated into the Response Plan at the scene.
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### ***Concept of Operations***

- The **GDR (RHB Manager)** or designee will notify the **State EOC Operations Manager (1-800-255-2587)** of tracked/escorted conveyances required by NRC agreements/policies.
  - RHB provides the SEOC Operations Manager a **24/7 contact list** of RHB responders.
  - **Initial Responders:**
    - **Isolate and deny entry** to the suspected hazard area. **Do not enter** unless necessary for **life safety** and only with appropriate **PPE/monitoring**.
    - **Notify the State EOC Duty Officer (1-800-255-2587)** that a radiological event has occurred; the Duty Officer will notify RHB using the RHB contact list and **assign an incident number**.
    - **Hold potentially exposed persons** on site at a designated location until **RHB** can survey for contamination (unless immediate medical transport is critical).
    - If transport occurs before radiological personnel arrive, **inform EMS/receiving facility** of possible radiation exposure/contamination.
  - **ICS/NIMS** will be used. Establish **IC/UC**, control zones (**Hot/Warm/Cold**), and a **Site Safety Plan**. RHB integrates with IC/UC upon arrival and assumes **technical control** of radiological operations.
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### ***Task Assignments & Responsibilities***

#### ***Initial Responders (all agencies)***

##### **Before dose levels are determined:**

- Notify **State EOC Duty Officer (1-800-255-2587)** of the radiological event.
- Establish an **initial isolation perimeter** (reference **ERG**, placards/shipping papers/MSDS/licenses/manifests). The **ERG often recommends 1,000 ft** initial isolation for many radiological materials—confirm product-specific guidance.
- **Secure the perimeter**; deny entry to non-responders.
- If available info indicates **low exposure potential**, or if properly equipped with **positive-pressure SCBA** and **structural fire PPE**, you may **rescue** trapped/injured persons when life safety dictates.

- **Hold potentially exposed persons** in a designated on-site area until RHB clears them for release; if immediate transport is essential, notify EMS/receiving hospital of possible contamination/exposure.
- **Reroute** pedestrian/vehicular traffic away from the area.

#### Upon RHB arrival:

- RHB coordinates with **IC/UC** and assumes technical control of radiological operations if exposure hazards exist.
- RHB defines the **Hot Zone boundary** using **low and maximum dose rate/surface contamination** thresholds per the Response Plan.
- If **surface contamination** is present, stage IC/UC and defensive responders to **minimize contamination spread**.
- RHB oversees **decontamination corridor** setup per the Response Plan; **establish decon before hot-zone entry**.

#### Local Government

- Confirm the on-scene team has notified the **SEOC Duty Officer** and obtained an **incident number** (RHB dispatch requires an incident number).
- Implement **protective actions (shelter-in-place/evacuation)** as recommended by **RHB** or qualified medical authorities.
- Activate the **County EOC** as warranted and send agency representatives.
- Provide **assistance and support** to state/federal responders as requested.

#### State Government

##### *Primary – CHFS/DPH – Radiation Health Branch (RHB)*

- Serve as **AHJ** and **Primary Agency** for state coordination.
- Provide **technical expertise** and specialized equipment to quantify the radiological hazard.
- **Verify/adjust perimeters** to protect responders/public.
- Assess **public health/safety** impacts; determine **protective actions**.
- Prepare/update the **Site Safety Plan** to reflect actual hazards/dose rates.
- Oversee an **event-specific Response Plan** integrating incident conditions with the RHB Response Plan.
- Coordinate **decontamination equipment/personnel** and certify **containment** of contamination.
- Provide information to the **SEOC** for release via **KyEM PIO/JIC**.
- Act as **state liaison** to federal agencies for WMD/terrorism radiological incidents.
- Staff the **SEOC 24/7** as needed.

##### *Supporting – CHFS/DPH (Non-RHB)*

- Coordinate/assist with **EMS and medical services** for exposed/injured persons.
- Provide **public health guidance** on protective actions.
- With RHB and on-scene partners, develop a **Radiation Exposure Registry** for exposed persons.
- Staff the **SEOC** as needed.

*EPPC/DEP – Environmental Response Team*

- Address **non-radiological hazardous materials** to the extent actions do **not** expose DEP/contractor personnel to **elevated radiation**.
- For mixed incidents, coordinate **non-radiological** response with **RHB** and **OSFM**.
- Assign duties among state agencies (with OSFM/federal/local partners) to fulfill DEP roles.
- With RHB, establish procedures for **identifying/containing/removing/disposing** of materials impacted by radiological release.
- Assist with **equipment/supplies** for environmental protection and contractor support.
- Provide **air/water sampling** as needed.
- Staff the **SEOC** as needed.

*KyEM – Division of Emergency Management*

- With SEOC Ops Manager approval, **request dispatch of RHB Teams** via the RHB contact list.
- Maintain records of **tracked/escorted radiological shipments** (per info from RHB).
- Activate **SEOC** and request agency reps as needed.
- Provide senior personnel for **on-scene coordination** and act as **Liaison Officer(s)** between on-scene teams and SEOC.
- Notify the **Governor** if significant population impacts are likely.
- Liaise with the **KY Army/Air National Guard**.
- Provide **PIO/JIC** support; relay accurate, timely information.
- For WMD/terrorism radiological events, facilitate state/local coordination with **federal agencies** in consultation with RHB.

*Kentucky Army & Air National Guard*

- **41st WMD-CST** assists RHB with monitoring/ID/quantification.
- Provide **security/manpower** and **air support** as requested.
- Staff the **SEOC** as needed.
- Support **federal civilian/military** agencies during WMD/terrorism incidents.

*KCCRB*

- Provide **behavioral health** services for survivors/responders.
- SEOC liaison as needed.

*EPPC – Office of the State Fire Marshal (OSFM)*

- For mixed hazmat/radiological events, coordinate **non-radiological** product identification and fire suppression with **RHB** and **DEP**.
- Advise on **container integrity** (without exposing personnel to elevated radiation).
- Help coordinate **product recovery** from non-radiological containers.
- SEOC liaison as needed.

*KYTC – Division of Highways*

- With **KSP/IC**, implement **closures/detours**.
- Deploy **traffic control** devices and equipment.

- Assist with **debris removal** (non-cargo) after **RHB**/Safety Officer declare the area safe.
- SEOC liaison as needed.

*JPSC – Kentucky State Police (KSP) & Dept. of Motor Vehicle Enforcement*

- Perimeter/traffic control, evidence/security of samples.
- Assist with **warnings/evacuations**.
- SEOC liaison as needed.

*Department of Agriculture*

- Technical guidance on **animal/agricultural** impacts; coordinate treatment/disposition of affected animals/ag products.
- SEOC liaison as needed.

*Kentucky Office of Homeland Security*

- Assist/support state/local response for non-WMD radiological releases.
- Coordinate with **DHS** for WMD/terrorism radiological incidents.

### **Federal Government**

- Provide **coordination/oversight** for WMD/terrorism radiological incidents per law and as requested by RHB.
- Coordinate with state/local responders to protect public health/safety from radiological exposure.

### **Volunteer Organizations**

#### **American Red Cross (ARC)**

If requested by FEMA and accepted by ARC:

- Provide **shelter, feeding, and support services** to affected communities and responders.
- Operate **hotlines** for family inquiries.
- Provide **blood/blood products** and assist survivors in accessing resources.

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### **References & Authorities**

- **Radiation Health Branch – Radiological Incident Response Plan**
  - **10 CFR Parts 71, 73**
  - **49 CFR Part 107, 171–180**
  - **KRS 211.842–852**
  - **Proposed ASTM E54.02.05 – Practice Standard for Radiological Emergency Response**
  - **U.S. DOT Emergency Response Guidebook (ERG) (2004 or current)**
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**Appendix A – Definitions (from Proposed ASTM E54.02.05)**

**Action Levels** – Levels of concern at which a decision must be made.

**Accidental** – Failure of a containment system due to poor housekeeping/maintenance, or transport mishap.

**Analyze** – Identify the hazmat/WMD problem and predict behavior/harm within responder training/capabilities (NFPA 472).

**Authority Having Jurisdiction (AHJ)** – Organization/office/individual approving equipment/materials/installations/procedures (NFPA 472).

**ALARA** – “As Low As Reasonably Achievable” exposure to radiation, considering technology, economics, and public interest (10 CFR 20.1003).

**Critical Dose Rate** – Dose rate beyond which emergency response is not recommended except **time-limited, controlled** life-saving operations as determined by the IC.

**Decision Points** – Dose rate or dose levels guiding responder assessments/actions.

**Decontamination** – Reduce/remove radioactive contamination from structures/areas/objects/persons to limit adverse health effects.

**Defensive Operations** – Actions taken from a safe distance to **prevent exposure** or **contain** release without stopping it.

**Emergency** – Situation where the IC determines **protection of life, environment, or property is necessary**; may require **offensive** and **defensive** operations.

**Emergency Decontamination** – Hasty contaminant removal (e.g., quick hose-line washdown); life safety takes precedence over runoff containment.

**Emergency Operations Center (EOC)** – Facility coordinating information/resources to support incident management (NIMS).

**Emergency Responder** – Police, fire, EMS, EM, public health/works, clinical care, and other skilled support personnel (6 U.S.C. 101).

**Evaluation** – Assessing the effectiveness of operations within responder capabilities (NFPA 472).

**Event** – Accidental/intentional loss/release of radioactive material or malicious use of a radiation source; IC determines escalation to **Incident** or **Emergency**.

**Fixed Facility** – Any site/structure/vehicle/equipment, etc., where a hazardous substance is or has been located (OSHA 1910.120).

**Guidance** – Advisory/informational document with non-mandatory provisions (adapted from NFPA 1).

**Hot Zone** – Control zone immediately surrounding a hazmat incident; extends far enough to prevent adverse effects outside (NFPA 472).

**Hot Zone Boundary** – Demarcation line that may serve as a decision point at an actionable level.

**Incident** – Situation with **potential** for exposure/contamination but where the IC determines **no immediate life safety** issue exists; **defensive operations only**.

**Incident Commander (IC)** – Individual responsible for all incident activities, strategies/tactics, and resource ordering/release (NFPA 472).

**Intentional Release** – Criminal/unlawful act causing discharge of radiological material.

**Investigation** – Process to determine cause/responsible parties; includes evidence collection/preservation.

**Improvised Nuclear Device (IND)** – Device using weapons-grade uranium/plutonium capable of low-yield nuclear detonation.

**Jurisdiction** – Political/geographic/functional sphere of authority (NIMS).

**Low Dose Rate** – Maximum dose rate used to establish the **outer** Hot Zone boundary.

**Life Safety Operations** – Functions to bring the incident under control or remove victims from hazard to safeguard well-being.

**Multi-Agency Coordination System (MACS)** – Architecture supporting incident prioritization, critical resource allocation, comms integration, and information coordination (FEMA IS-701).

**Offensive Operations** – Actions, usually in the **Hot Zone**, to **reduce/minimize exposure** to radiation/radioactive material.

**On-Scene Indicators** – Clues of hazardous conditions (containers, placards, survey results, site assessment).

**Personal Protective Equipment (PPE)** – Protective clothing/respiratory devices/shields needed due to hazards.

**Planning** – Jurisdictional plan detailing actions for personnel expected to respond (NFPA 472-2008).

**Preservation of Evidence** – Protecting evidentiary items until documented/collected.

**Protective Action Measures** – Measures to minimize impacts to environment/public/responders.

**Protocol** – Operational procedure built from standard practice/guidance.

**Radiological Dispersal Device (RDD)** – Device intended to disperse radioactive material (often using conventional explosives).

**Radiological Exposure Device (RED)** – Device intended to expose persons to ionizing radiation (typically unshielded source).

**Radiological Incident** – Situation with **potential** exposure/contamination above background.

**Roentgen (R) / mR** – Unit of exposure to gamma/x-rays (NRC).

**R/hr** – Exposure rate per hour.

**REM** – Unit expressing biological effects of ionizing radiation: **rem = rad × Quality Factor**.

**Secondary Threats** – Devices/actions designed to harm responders or increase casualties (e.g., delayed explosives/incendiaries).

**Strategic Operations** – Long-term plan to achieve a specific goal (e.g., offensive vs. defensive posture).

**Tactical Operations** – Specific actions serving strategic goals (e.g., monitoring to define the Hot Zone).

**Technical Decontamination** – Deliberate contaminant removal for equipment/personnel (life safety may or may not be paramount).

**Termination** – End of life-safety and investigative operations; turnover to legitimate contractor for cleanup with hazard briefing.

**Tools** – Personnel, teams, facilities, equipment, supplies, processes, and systems needed to respond.

**TRACEM** – Additional hazards: **Toxic, Radiological, Asphyxiant, Chemical, Etiological, Mechanical**.

**Total Accumulated Dose** – Sum of dose accumulated during response (external/internal as estimated), excluding committed internal dose unless specified.

**Total Effective Dose Equivalent (TEDE)** – Deep-dose equivalent (external) + committed effective dose equivalent (internal).

**Zone** – Boundary designating areas for action levels, decision points, decon, staging, and/or entry work.

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### Contact/Notification Quick Reference

- **State EOC Duty Officer: 1-800-255-2587**
- **U.S. Army Operations Center (DoD shipments w/ explosives/ammo): 703-697-0218 (collect)**

