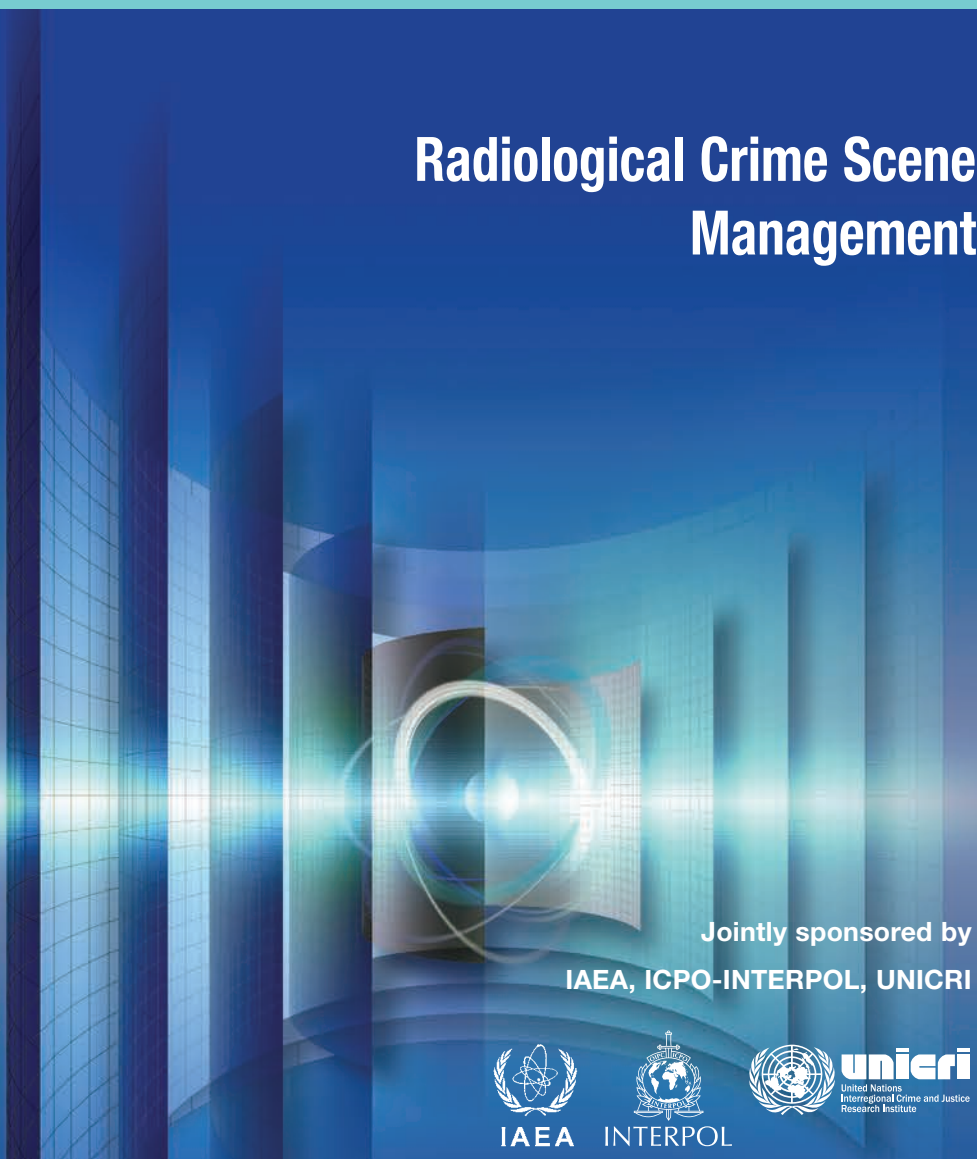
IAEA Nuclear Security Series No. 22–G

Implementing Guide

Radiological Crime Scene Management



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Publications in the IAEA Nuclear Security Series are issued in the following categories:

- **Nuclear Security Fundamentals** specify the objective of a State's nuclear security regime and the essential elements of such a regime. They provide the basis for the Nuclear Security Recommendations.
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DRAFTING AND REVIEW

The preparation and review of Nuclear Security Series publications involves the IAEA Secretariat, experts from Member States (who assist the Secretariat in drafting the publications) and the Nuclear Security Guidance Committee (NSGC), which reviews and approves draft publications. Where appropriate, open-ended technical meetings are also held during drafting to provide an opportunity for specialists from Member States and relevant international organizations to review and discuss the draft text. In addition, to ensure a high level of international review and consensus, the Secretariat submits the draft texts to all Member States for a period of 120 days for formal review.

For each publication, the Secretariat prepares the following, which the NSGC approves at successive stages in the preparation and review process:

- An outline and work plan describing the intended new or revised publication, its intended purpose, scope and content;
- A draft publication for submission to Member States for comment during the 120 day consultation period;
- A final draft publication taking account of Member States' comments.

The process for drafting and reviewing publications in the IAEA Nuclear Security Series takes account of confidentiality considerations and recognizes that nuclear security is inseparably linked with general and specific national security concerns.

An underlying consideration is that related IAEA safety standards and safeguards activities should be taken into account in the technical content of the publications. In particular, Nuclear Security Series publications addressing areas in which there are interfaces with safety — known as interface documents — are reviewed at each of the stages set out above by relevant Safety Standards Committees as well as by the NSGC.

RADIOLOGICAL CRIME SCENE MANAGEMENT

IMPLEMENTING GUIDE

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The Agency's Statute was approved on 23 October 1956 by the Conference on the Statute of the IAEA held at United Nations Headquarters, New York; it entered into force on 29 July 1957. The Headquarters of the Agency are situated in Vienna. Its principal objective is "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world''.

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RADIOLOGICAL CRIME SCENE MANAGEMENT

IMPLEMENTING GUIDE

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FOREWORD

by Yukiya Amano
Director General

The IAEA's principal objective under its Statute is "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world." Our work involves both preventing the spread of nuclear weapons and ensuring that nuclear technology is made available for peaceful purposes in areas such as health and agriculture. It is essential that all nuclear and other radioactive materials, and the facilities at which they are held, are managed in a safe manner and properly protected against criminal or intentional unauthorized acts.

Nuclear security is the responsibility of each individual State, but international cooperation is vital to support States in establishing and maintaining effective nuclear security regimes. The central role of the IAEA in facilitating such cooperation and providing assistance to States is well recognized. The IAEA's role reflects its broad membership, its mandate, its unique expertise and its long experience of providing technical assistance and specialist, practical guidance to States.

Since 2006, the IAEA has issued Nuclear Security Series publications to help States to establish effective national nuclear security regimes. These publications complement international legal instruments on nuclear security, such as the Convention on the Physical Protection of Nuclear Material and its Amendment, the International Convention for the Suppression of Acts of Nuclear Terrorism, United Nations Security Council resolutions 1373 and 1540, and the Code of Conduct on the Safety and Security of Radioactive Sources.

Guidance is developed with the active involvement of experts from IAEA Member States, which ensures that it reflects a consensus on good practices in nuclear security. The IAEA Nuclear Security Guidance Committee, established in March 2012 and made up of Member States' representatives, reviews and approves draft publications in the Nuclear Security Series as they are developed.

The IAEA will continue to work with its Member States to ensure that the benefits of peaceful nuclear technology are made available to improve the health, well-being and prosperity of people worldwide.

EDITORIAL NOTE

Guidance issued in the IAEA Nuclear Security Series is not binding on States, but States may use the guidance to assist them in meeting their obligations under international legal instruments and in discharging their responsibility for nuclear security within the State. Guidance expressed as 'should' statements is intended to present international good practices and to indicate an international consensus that it is necessary for States to take the measures recommended or equivalent alternative measures.

Security related terms are to be understood as defined in the publication in which they appear, or in the higher level guidance that the publication supports. Otherwise, words are used with their commonly understood meanings.

An appendix is considered to form an integral part of the publication. Material in an appendix has the same status as the body text. Annexes are used to provide practical examples or additional information or explanation. Annexes are not integral parts of the main text.

Although great care has been taken to maintain the accuracy of information contained in this publication, neither the IAEA nor its Member States assume any responsibility for consequences which may arise from its use.

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CONTENTS

1. INTRODUCTION

BACKGROUND

1.1. A site associated with a nuclear security event may contain trace evidence of activities believed, or alleged, to have included a criminal or intentional unauthorized act involving nuclear or other radioactive material. Such a site is, in the context of this publication, called a radiological crime scene. It is essential to ensure that all actions at the radiological crime scene are carried out in a way that maintains the integrity of the criminal investigation and that all relevant criminal investigative procedures are applied through effective radiological crime scene management.

1.2. Radiological crime scene management is the process used to ensure safe, secure, effective and efficient operations at a crime scene where nuclear or other radioactive material are known, or suspected, to be present. These operations are similar to those used to manage a conventional crime scene (i.e. a crime scene without the presence of nuclear or other radioactive material). However, the conduct of operations at a radiological crime scene differs from the conduct of operations at most other crime scenes with respect to the need to control:

(a) Time spent in the hazard control areas;
(b) Distance between the evidence contaminated with radionuclides and the individual collecting the evidence;
(c) Radiation shielding between the evidence and the individual collecting the evidence;
(d) Radionuclide contamination;
(e) Individual radiation exposure.

The degree to which each of these factors will apply depends on the radioactive material present, as detailed in Section 4.

1.3. Management of a crime scene includes the process of ensuring the orderly, accurate and effective collection and preservation of evidence so that it may be used in the context of legal proceedings. It is assumed in this guidance on radiological crime scene management that intentional unauthorized acts involving nuclear or other radioactive material out of regulatory control have been criminalized [1–3]. In the absence of laws criminalizing such acts, the unauthorized acts involving these materials might not themselves constitute crimes requiring investigation, although other crimes may have occurred.

1.4. There are interfaces between nuclear security, radiation safety and nuclear or radiological emergency response that need to be considered for the management of a radiological crime scene. In particular, law enforcement operations, radiation protection procedures and emergency response activities should be applied simultaneously and in a coordinated manner at a radiological crime scene.

OBJECTIVE

1.5. The objective of this publication is to provide law enforcement officials, national policy makers, decision makers, local authorities and technical support personnel with guidance on the framework and the main functional elements for radiological crime scene management so that they may be adopted or adapted to meet the needs of the various jurisdictions and competent authorities within each State.

SCOPE

1.6. This publication focuses on the framework and functional elements for managing a radiological crime scene that are distinct from any other crime scene. It assumes that States have a capability for managing conventional crime scenes. States needing guidance on conventional crime scene operations are encouraged to take advantage of published resources, such as in Refs [4–7].

1.7. The scope of this Implementing Guide is limited to radiological crime scene management. It addresses the actions needed at a radiological crime scene in order to collect and preserve evidence, but does not cover other aspects of a criminal investigation. This publication provides guidance on the interface of criminal investigation with the detection of nuclear and other radioactive material, and the use of nuclear forensic examination in support of investigations, but does not address any of these topics in detail. This publication does not address the legal framework that supports the management of a radiological crime scene, nor does it address the nuclear security detection architecture [8] or the nuclear forensic characterization of nuclear and other radioactive material [9]. It also does not address detailed aspects of radiation protection and emergency response in radiological crime scene management. These aspects are covered in other IAEA publications [10–24].

1.8. This publication does not provide specific guidance on procedures for dealing with casualties at a radiological crime scene or for the collection and

disposition of human remains. General guidance on best practices for collecting human remains is provided by the International Committee of the Red Cross [25]. States needing guidance on disposition of evidence contaminated with radionuclides or radioactive material from a radiological crime scene are encouraged to consult other relevant IAEA publications [9, 17, 18].

STRUCTURE

1.9. Following this introduction, Section 2 presents an overview of the process for investigating a nuclear security event. Section 3 addresses the framework for radiological crime scene management, describing roles and responsibilities of an integrated command and control structure and on-scene operational personnel. Section 4 describes the conduct of operations at a radiological crime scene. Section 5 presents the general responsibilities associated with preparedness needed to manage a radiological crime scene. Section 6 discusses international cooperation and assistance. Appendix I provides samples of the types of forms that might be used in radiological crime scene management and Appendix II outlines examples of hazards that might be encountered at crime scenes. Annex I discusses types of detection, protective and other equipment that might be used at a radiological crime scene, and Annex II provides some details of International Criminal Police Organization – INTERPOL programmes relevant to the subject of this publication.

2. OVERVIEW OF INVESTIGATIONS INTO A NUCLEAR SECURITY EVENT

GENERAL

2.1. Managing a radiological crime scene is a key part of responding to a nuclear security event. Evidence collection at radiological crime scenes may share a wide range of characteristics with that of conventional crime scenes, such as evidence search patterns, geographical scene modelling and evidence recording (see Section 3), whether or not explosives are involved.

2.2. A radiological crime scene may contain nuclear or other radioactive material that is either intact or dispersed. Scenarios in which nuclear or other radioactive material may be intact include, for example:

(a) Radioactive material or a radiological dispersal device (RDD) involving explosives or any other dispersal mechanism that has not functioned;
(b) A radiation exposure device (RED) that is shielded or has been inactivated;
(c) Nuclear material or an improvised nuclear device (IND) that has not functioned;
(d) Nuclear or other radioactive material out of regulatory control that is being illicitly trafficked;
(e) Acts of sabotage of nuclear and other radioactive material, associated facilities or associated activities that have not dispersed the material.

2.3. Scenarios in which the nuclear or other radioactive material may be dispersed include, for example:

(a) Dispersion of radioactive material by an RDD using explosives or any other dispersal mechanism;
(b) An unshielded and activated RED;
(c) Explosion of an IND;
(d) Radionuclide contamination of a food chain, a water supply network, cosmetic or pharmaceutical products or other consumables;
(e) Acts of sabotage causing dispersion of nuclear or other radioactive material.

2.4. The effective management of these scenarios requires a national response system for managing a nuclear security event to be in place.[1] A national response system for managing a nuclear security event is an essential part of a State's nuclear security infrastructure. Managing the radiological crime scene is also an integral part of law enforcement investigations needed to support any future legal proceedings in relation to the nuclear security event.

2.5. Response systems are integrated sets of response measures, which are intended to assess an instrument alarm or an information alert and to respond to a nuclear security event [3]. A national framework for managing nuclear security events should take into account and be coordinated with the national arrangements for preparedness and response for natural and technological disasters, including nuclear or radiological emergencies [13]. The response system of a State should ideally be documented in a national response plan for managing nuclear security

[1] In this context, 'response' refers to those security related actions that might be needed to respond to the nuclear security event itself (e.g. recovering material, disabling a device, collecting and analysing evidence or pursuing perpetrators), as distinct from consequence management response actions (e.g. lifesaving, evacuation, decontamination, embargo of areas, population monitoring and registration).

events [3]. The response to nuclear security events comprises two phases: assessment and management (see Fig. 1). The first phase is a continuation of the initial assessment of an instrument alarm or an information alert if that initial assessment is inconclusive. The second phase of the response is the management of the nuclear security event through the execution of the national plan. This execution comprises:

(a) Notification of the nuclear security event;
(b) Activation of the response system;
(c) Radiological crime scene management;
(d) Forensic examination.

2.6. Figure 1 illustrates a generic flow of actions to be implemented in response to a nuclear security event.

NOTIFICATION AND RESPONSE SYSTEM ACTIVATION

2.7. Upon detection of nuclear or other radioactive material through an instrument alarm or an information alert, the relevant competent authority should initiate procedures with the objective of interrupting the potential criminal or intentional unauthorized act that has nuclear security implications [3]. In parallel,

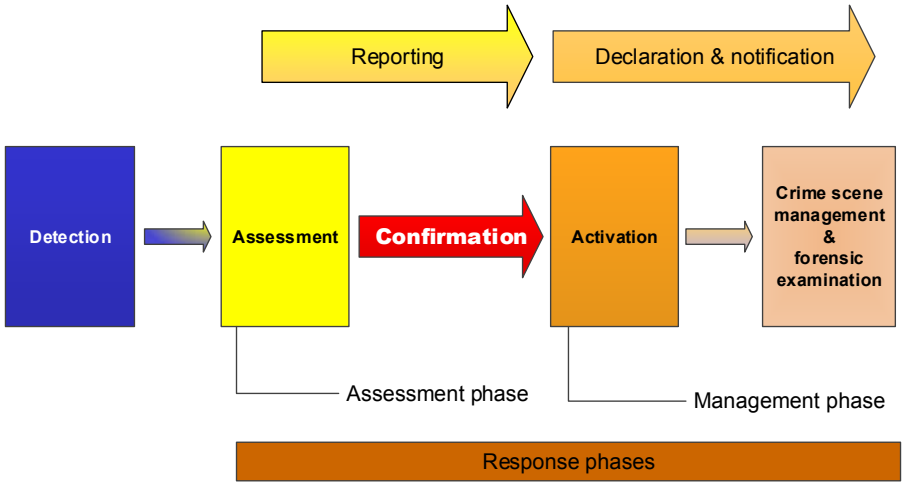

FIG. 1. Two phases of response to a nuclear security event.

a law enforcement investigation into the act(s) should also commence. Figure 2 illustrates a generic scheme of actions for investigation of a nuclear security event, from the time of detection of an instrument alarm or information alert until the forensic examination, which may lead to the institution of legal proceedings.

2.8. An instrument alarm or an information alert should lead to an initial assessment, the results of which may determine whether or not a nuclear security event has occurred. If the initial assessment is inconclusive, then a detailed assessment should be carried out to arrive at a definite conclusion. The outcome of the assessment process could be the determination that a nuclear security event has occurred, or the instrument alarm may be determined to have been innocent or false, or the information alert may be determined to be false.

2.9. The outcome of the initial assessment should be reported to the competent authority designated for this purpose in the national plan for managing nuclear security events, for example a national operations and analysis centre [8]. Upon a conclusive assessment, the designated competent authority should initiate the management phase of the response by declaring the occurrence of the nuclear security event, notifying relevant authorities and activating appropriate plans and procedures. This activation includes using a graded approach [3] in which the appropriate level of response is activated.

2.10. If a nuclear security event is declared, scene control procedures (see paras 4.3–4.7) should immediately be established by first responders and, as applicable, by other competent authorities. As in any natural disaster, crime, or other event, traces are left at the scene. Owing to the transient and fragile nature of those traces, their reliability and the preservation of their physical integrity depend to a very large extent on initial actions at the scene [4].

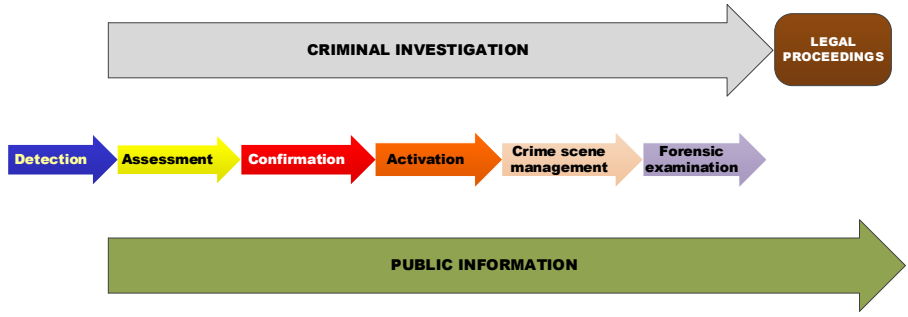

FIG. 2. Generic scheme of actions for responding to a nuclear security event involving radiological crime scene management, from detection to possible legal proceedings.

2.11. Upon notification, the relevant competent authorities (such as local or national response organizations) should promptly initiate pre-planned and coordinated actions appropriate to the nuclear security event in accordance with the national plan for managing nuclear security events.

2.12. In summary, upon a conclusive assessment that a nuclear security event has occurred, the following immediate actions should be undertaken:

(a) Establishment (by the first responders) of perimeter control procedures in parallel to other immediate actions at the scene;
(b) Reporting (by the first responders) of the possible occurrence of a nuclear security event to the relevant competent authority;
(c) Declaration of a nuclear security event by the designated competent authority;
(d) Activation of the response system by notification of relevant competent authorities;
(e) Initiation of pre-planned and coordinated actions at the radiological crime scene and other places in connection with the nuclear security event.

RADIOLOGICAL CRIME SCENE MANAGEMENT

2.13. The primary goals of a crime scene investigation are to establish what has happened (crime scene reconstruction), to collect and examine evidence in a timely manner in order to develop investigative leads to prevent potential additional crimes, and to identify and prosecute those involved or suspected. This is done by carefully documenting the conditions at a crime scene and recognizing all relevant physical evidence. The ability to recognize and properly collect physical evidence is crucial to both solving crimes and prosecuting perpetrators.

2.14. At its most basic level, a radiological crime scene is a location where either a criminal act involving nuclear or other radioactive material has taken place or is suspected to have taken place, or it is a location where traces or evidence related to such an act have been found. The act, the subject of the radiological crime scene, may be an unauthorized possession of nuclear or other radioactive material. However, the scene may be made more complex by other factors such as the detonation of explosives with the intention of deliberately dispersing nuclear or other radioactive material in a populated area.

2.15. A nuclear security event should be managed in such a way that:

(a) All subsequent actions at the scene are conducted so as to ensure the integrity of the criminal investigations.
(b) All relevant criminal investigative procedures are applied.
(c) The safety and security of all personnel involved and the general public takes precedence over the integrity of evidence and preservation of its later admissibility in a courtroom setting.

Special attention should be paid to the importance of securing the crime scene in order to prevent any destruction or cross-contamination[2] of physical evidence as well as for protection of responding personnel and other individuals. In addition, the radiological crime scene should be managed in a way that takes into account the possible presence of multiple hazards (see Appendix II).

2.16. Figure 3 illustrates a set of pre-planned and coordinated actions to be conducted from the identification and notification of a nuclear security event, to the submission of evidence and subsequent release of the scene.

FORENSIC EXAMINATION

2.17. Nuclear forensics is one element of the broader investigation into a nuclear security event. It is an iterative process that aims to answer questions regarding the nature, history and origin of nuclear and other radioactive material involved in a nuclear security event. Nuclear forensic examinations, when combined with other aspects of the investigation, may provide information that links the material to people, places or events. Detailed information on nuclear forensic examinations in support of investigations can be found in another publication (see Ref. [9]). It is imperative that all responders are aware of the need for forensic examinations, just as they would be aware of this need at any other crime scene.

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[2] In this publication, the term ‘cross-contamination’ is used to refer to the direct or indirect transfer of extraneous material to a forensic sample or crime scene, which may reduce the evidentiary value of the sample or of other evidence at the scene. The terms ‘contamination with radionuclides’ and ‘radionuclide contamination’ are used to refer to radionuclides on surfaces or within solids, liquids or gases (including the human body), where their presence is unintended or undesirable. These terms can also refer to the process that brought about the presence of radionuclides in such places, which may be of concern for radiological safety (and may also affect the evidentiary value of the material that has been contaminated).

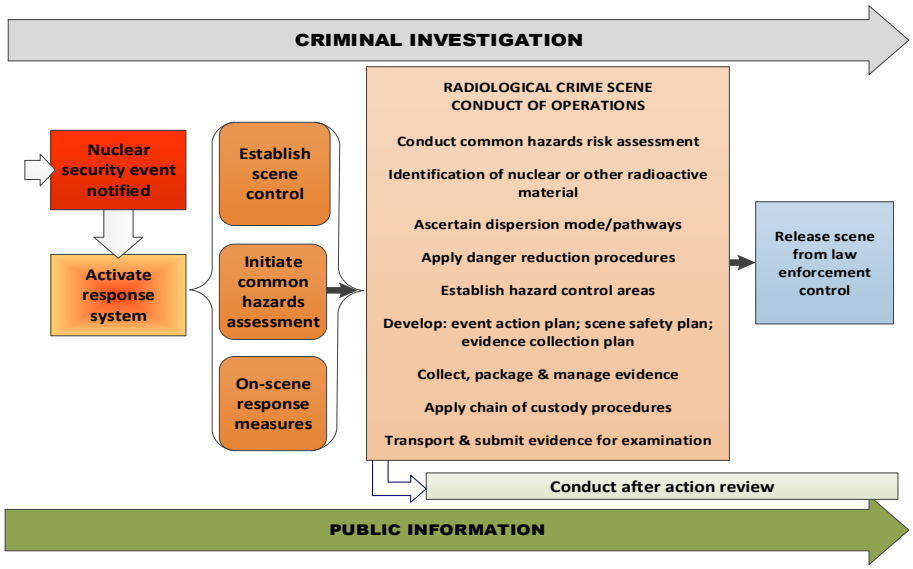

FIG. 3. Radiological crime scene conduct of operations.

For this reason, care should be taken to preserve the crime scene and protect the integrity of evidence.

INVESTIGATIVE ACTIVITIES

2.18. An investigation into a nuclear security event extends beyond the radiological crime scene itself. Investigative activities of the types described below should be conducted close to, but outside, the radiological crime scene as near to the time of the nuclear security event as possible. Such activities are normally the responsibility of law enforcement agencies and their personnel.

Routine investigative activities

2.19. Routine investigative activities include collecting items of potential evidentiary value or other items that might yield information useful to the investigation, noting that the perpetrators may have used residences, vehicles and possibly assembly sites in preparing for the act. Examples include recording devices that might help identify individuals or vehicles entering or exiting the scene and that might help in reconstructing the path taken by the nuclear or other radioactive material. Examples of potential sources of digital evidence include: desktop, laptop and tablet computers (as well as data storage devices associated

with these computers), cell phones, global positioning system (GPS) devices, security and surveillance cameras, traffic cameras, portable media players and digital cameras.

2.20. Appropriate personnel should also take statements and pursue other investigative activities aimed at obtaining evidence, in accordance with national procedures for criminal investigations, from individuals in the vicinity of the radiological crime scene who may have witnessed events leading up to, during or immediately following the nuclear security event.

Investigative activities requiring assistance from nuclear or radiation specialists

2.21. Most investigative activities are essentially the same as those for other crime scenes and are not unique to the investigation of a nuclear security event. A unique factor may, however, be the need for specialist knowledge of the chemical, physical and isotopic properties of nuclear and other radioactive materials. Such expertise might be beyond that possessed by many law enforcement agencies, but could be obtained from national resources such as nuclear regulatory bodies, other government agencies, universities, industries and laboratories involving nuclear or other radioactive material, or through international cooperation and assistance (see Section 6). The expertise might help investigators to formulate questions for prospective witnesses, and understand the relevance of the responses that are received.

2.22. Specialists in nuclear forensics or radiation protection might brief investigators on the value of ascertaining whether witnesses noticed:

(a) A radiation warning trefoil placard or similar hazard warning displayed on any items;
(b) Instruments, such as Geiger–Müller radiation detectors, or dosimeters associated with a person or persons;
(c) Protective gloves, boots, suits or respirators in use or being acquired for potential use;
(d) Specialized containers, such as those used for transport or storage of radioactive material;
(e) Unusual occurrences of illness or injury suggestive of radiation exposure, such as skin reddening, blisters or vomiting;
(f) Any material emitting heat or radioluminescence in the absence of external heat or a light source.

2.23. Specialists might also assist law enforcement personnel and other investigators by assembling images, such as those of typical or representative radiation symbols, detectors, protective equipment and transport and storage containers, so that these images might be shown to prospective witnesses. Such images can be collected in advance of any nuclear security event and incorporated into the national plan.

Investigative activities for determining national and international security implications

2.24. In order to analyse the nuclear security implications of a nuclear security event, it is essential that relevant data be collected and provided in a timely fashion to the responsible competent authorities. The data could include:

(a) Description of the radiological crime scene and the causes, impacts and possible longer term consequences of the nuclear security event;
(b) Information on the suspected perpetrators;
(c) Data on the identification of the nuclear or other radioactive material involved.

2.25. Based upon the above data, investigative activities should be performed to determine the nuclear security implications for the State and other States, and the application of relevant procedures for notification of interested international intergovernmental organizations.

PUBLIC INFORMATION

2.26. A nuclear security event is likely to be of keen interest to national governments and local authorities. If news of an event is disseminated by the media, there will also be heightened public interest [26]. Effective, timely and clear communication within the government and with news media outlets and the public is essential and should be performed as part of the management of a radiological crime scene [3].

2.27. Prior to the occurrence of a nuclear security event, effective communication should be established among the various ministries and relevant competent authorities of the national governments and local authorities, as well as for news media outlets and the general public. Spokesperson(s) for communication with news media outlets and the general public need(s) to be

designated. A communications team should be in place, with well defined roles and responsibilities.

3. FRAMEWORK FOR RADIOLOGICAL CRIME SCENE MANAGEMENT

GENERAL

3.1. The management of a radiological crime scene needs an integrated command structure (also referred to as an integrated command, control, coordination and communication system) with clear responsibilities for decision making at different levels. While such a command structure would be largely similar to that for conventional crime scene management, it should provide for additional considerations to ensure that:

(a) The safety of the public and of all persons associated with the crime scene is ensured in a manner that reduces the risks associated with radiation hazards to the extent reasonably achievable [13, 23, 24].
(b) The collection of evidence in the presence of nuclear or other radioactive material is done safely and securely in a manner that, whenever possible, avoids compromising the investigative value of the evidence.
(c) Seized nuclear or other radioactive material is placed under regulatory control or is otherwise managed to guard against any further unauthorized activities in relation to that material.
(d) Wherever possible, actions in the crime scene are oriented in a way that prioritizes the removal of the radioactive material.

3.2. The integrated command structure needs to be understood by all involved personnel and periodically exercised.

3.3. Managing radiological crime scenes is complex, involves multiple competent authorities and may extend across local and national jurisdictions. There may also be an international component resulting from a State's obligations under relevant international legal instruments. Depending on the size and magnitude of the nuclear security event, there may be multiple crime scenes linked to the event. Therefore, an integrated command structure needs to include national, local and on-scene levels of command.

ROLES AND RESPONSIBILITIES OF THE INTEGRATED COMMAND STRUCTURE

3.4. The adoption of an integrated command structure is essential for achieving effective radiological crime scene management. The structure is likely to be most effective if implemented in a flexible manner, while maintaining its efficiency and its multidirectional flow of information.

3.5. The structure will typically have three levels associated with radiological crime scene management:

(a) National/strategic command level;
(b) Local/tactical command level;
(c) On-scene/operational command level.

This design allows for the flow of information from one level to the next through a designated primary point of contact at each level. This design also allows for horizontal communication within each level.

3.6. Effective management of a crime scene involving radioactive material demands coordination at the strategic, tactical and operational levels ensuring that all parties understand their roles and responsibilities and are kept advised of developments. Figure 4 shows a diagram of the functional relationships of these levels as they relate to a radiological crime scene.

National/strategic command level

3.7. The national response plan for managing nuclear security events (referred to below as ‘the national response plan’) should establish three levels of command. The first level is the national/strategic command level. The following roles and responsibilities should be assigned to this level of command:

(a) Ensuring the strategic and political management of the nuclear security event in accordance with the national response plan.
(b) Establishing the strategy that will assist and provide direction to the local/tactical command level, including national/strategic priorities for radiological crime scene management.
(c) Establishing a mechanism to manage requests for, coordination of and assessment of additional information pertaining to the nuclear security event received from other departments and agencies.

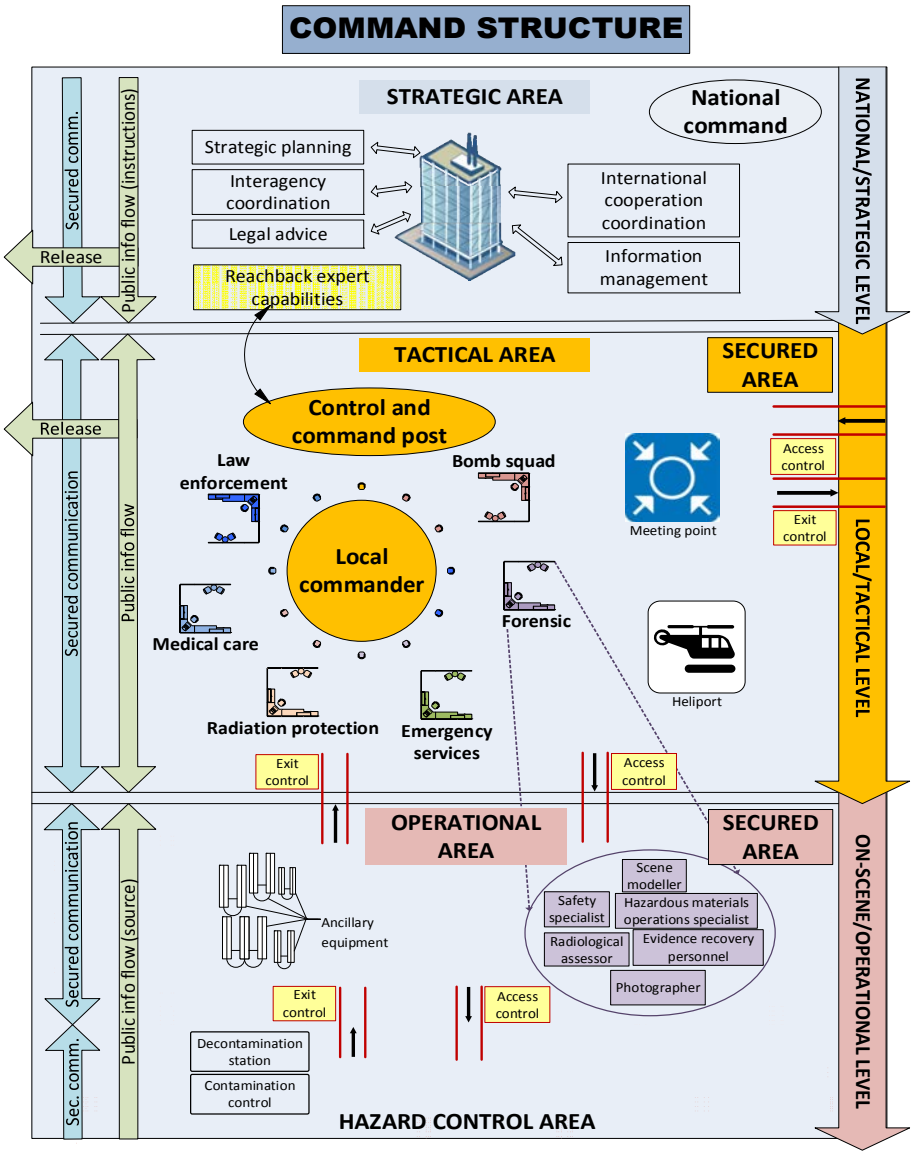

FIG. 4. The integrated command structure for radiological crime scene management.

(d) Establishing a briefing process to ensure that senior government officials are regularly informed on the progress and magnitude of the nuclear security event and its effect on the affected population and local infrastructure. These regular communications might be conducted on a pre-determined, periodic basis according to a schedule established in the national response plan.

(e) Providing expert legal advice to the local/tactical and on-scene/operational levels to ensure compliance with applicable legal requirements concerning crime scene operations and the collection of evidence.
(f) Determining the need for and the coordination of international cooperation and assistance.
(g) Managing public information and provision of guidance to the local/tactical command level.
(h) Securing personnel and financial resources as well as logistical support.

3.8. The national/strategic command level may include senior personnel from competent authorities and support organizations that have a vested interest in any particular nuclear security event.

Local/tactical command level

3.9. The next level in the national response plan for managing a nuclear security event should be the local/tactical command level. The following roles and responsibilities should be assigned to this level of command:

(a) Implementing the relevant measures of the national response plan selected by the national/strategic command level;
(b) Establishing tactical directions for on-scene/operational command level, such as local/tactical priorities for radiological crime scene management;
(c) Establishing the mechanism for ensuring that the national/strategic command level is regularly informed on the progress and magnitude of the nuclear security event and its effect on the affected population and local infrastructure;
(d) Establishing a decision making structure to ensure that directions received from the national/strategic command level with respect to managing public information are followed;
(e) Allocating resources for crime scene and ancillary operations;
(f) Requesting additional support for operations, as needed.

3.10. The local/tactical command level includes personnel from the competent authorities and support organizations that have been designated roles and responsibilities in relation to the nuclear security event.

On-scene/operational command level

3.11. The third level in the national response plan for managing nuclear security events is the on-scene/operational command level. The following roles and responsibilities should be assigned to this level of command:

(a) Providing on-scene/operational direction to the personnel responding to the nuclear security event in a manner that is compliant with recognized health and safety practices;
(b) Ensuring that the local/tactical command level is regularly informed on the progress and magnitude of the nuclear security event and its effect on the affected population and local infrastructure;
(c) Executing directions received from the local/tactical command level with regard to radiological crime scene management;
(d) Ensuring that information relevant to the developing criminal investigation is reported in a timely manner to the relevant law enforcement agencies.

3.12. The on-scene/operational command level includes personnel from the competent authorities and support organizations that have been designated roles and responsibilities in relation to the nuclear security event.

ROLES AND RESPONSIBILITIES OF ON-SCENE/ OPERATIONAL PERSONNEL

3.13. The roles and responsibilities of personnel operating at or near a radiological crime scene are similar to those of personnel operating at or near any other crime scene. The inherently hazardous nature of a crime scene involving radioactive material is likely to necessitate additional knowledge, equipment and conditions for certain personnel. All on-scene/operational personnel fulfilling their roles and responsibilities at a crime scene involving radioactive material should be protected in accordance with the requirements of IAEA Safety Standards Series No. GSR Part 3, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards [15]. However, if a nuclear or radiological emergency is declared, the responding personnel should be regarded as emergency workers and protected in accordance with Refs [14, 23]. Additional specialized personnel would be needed to address the hazards associated with the nuclear or other radioactive material.

3.14. Essential functions for radiological crime scene management related to on-scene/operational personnel are described on the following pages.

3.15. Particular functions of on-scene/operational personnel are often fulfilled by one person, such as the on-scene/operational commander or the hazardous materials operations specialist, but a group or team of specialists might assume a particular role and responsibility. The number of people needed to fulfil particular roles and responsibilities will be dictated by scene specific factors, such as the expected duration of operations, the physical area to be searched for evidence and the complexity of the tasks to be performed. Sample forms for use by these personnel are presented in Appendix I.

On-scene/operational commander

3.16. The most senior official with decision making authority at the scene automatically assumes the role of the on-scene/operational commander until confirmed or replaced as such by the local/tactical commander.

3.17. The roles and responsibilities of the on-scene/operational commander for a radiological crime scene are essentially the same as those for any other crime scene. He or she is designated as the lead official for all on-scene activities and, as such, is empowered to make decisions that ensure the safety and security of the general public as well as crime scene personnel. The roles and responsibilities typically associated with the on-scene/operational commander include:

(a) Assuming overall responsibility for the coordination of response at the scene;
(b) Ensuring the safety and security of personnel and the public, including designating an individual or a team of qualified personnel to address the threat posed by unexploded ordnance and by individuals at or near the scene (these human based threats might arise from individuals having malicious intent or from victims of the criminal event who, as a consequence, may be acting irrationally);
(c) Ensuring the overall security at the scene;
(d) Determining the search pattern to be used within the crime scene;
(e) Ensuring that access to the scene is controlled, including designating an individual to log everyone entering or exiting the scene;
(f) Establishing and supervising the operational control area, recognizing that the operational control area needs to be sufficiently large for management of the crime scene (and the hazard control area(s) within it);
(g) Coordinating activities with other competent authorities having a role with regard to the scene;
(h) Providing a continuous flow of information to the local/tactical commander;

(i) Notifying the local/tactical commander of needs for resources and personnel;
(j) Ensuring a cooperative spirit is maintained;
(k) Ensuring effective and efficient exchange of information among all responding personnel;
(l) Continually re-evaluating the efficiency of on-scene operations throughout the operation;
(m) Ensuring that appropriate measures are taken to ensure that chain of custody of all evidence is maintained and documented in compliance with all relevant legal obligations;
(n) Releasing the scene to an identified competent authority in accordance with national and local practices after a final survey and inventory of evidence is completed.

3.18. The on-scene/operational commander should establish and maintain an administrative worksheet to maintain awareness of on-scene activities. Such a document is described in Appendix I, and sample generic administrative worksheets are given in Figs 5, 6 and 7.

3.19. In addition, the roles and responsibilities of the on-scene/operational commander that apply specifically to a radiological crime scene should include:

(a) Ensuring that any nuclear or other radioactive material at the scene is placed under proper control by a relevant competent authority.
(b) Recognizing the need for examination of items collected at the scene. These items include both nuclear or other radioactive material and any items of possible value to the investigation.
(c) Notifying relevant organizations and laboratories of the pending delivery of items of evidence collected from the scene and of the possible or known presence of radionuclides associated with these items.
(d) Ensuring that special attention is paid to the safety of personnel and the public on the scene considering the actual or suspected presence of radioactive material.

Hazardous materials operations specialist

3.20. The roles and responsibilities of a hazardous materials operations specialist are similar to those at any other crime scene where hazardous materials are known, or suspected, to be present. However, the exact nature of the duties of the hazardous materials operations specialist will differ according to the nature of the

hazardous material. The roles and responsibilities typically associated with the hazardous materials operations specialist include:

(a) Identifying hazardous materials and monitoring the scene for the presence of hazardous situations and conditions;
(b) Coordinating with the safety specialist (see paras 3.22 and 3.23) on developing and implementing mitigation techniques for dealing with these same hazardous situations and conditions, and planning and supervising the initial entry into the crime scene (see paras 4.16–4.23);
(c) Coordinating with the on-scene/operational commander to ensure that all personnel on the scene are informed of the presence of these hazardous situations and conditions and of appropriate ways of managing them.

3.21. In addition, the roles and responsibilities of the hazardous materials operations specialist that apply specifically to a radiological crime scene should include:

(a) Establishing and supervising hazard control areas;
(b) Ensuring the conduct of radiation monitoring at the scene;
(c) Establishing safety objectives for personnel conducting operations in areas where nuclear or other radioactive material is present or suspected, and ensuring that all personnel have the understanding and capability to fulfil their roles to meet these objectives and that they have the appropriate equipment;
(d) Ensuring that all operations in the hazard control areas and the operational control area are coordinated with the on-scene/operational commander to ensure that goals are being met.

Safety specialist

3.22. The roles and responsibilities of the safety specialist for a radiological crime scene are essentially the same as those for any other crime scene. The presence of nuclear or other radioactive material will influence some of the tasks performed by the safety specialist, but the safety specialist remains the primary advisor to the on-scene/operational commander on matters of safety of all on-scene personnel. The roles and responsibilities typically associated with the safety specialist include:

(a) Coordinating with the hazardous materials operations specialist to identify hazardous conditions and situations to plan and supervise the initial entry

into the crime scene (see paras 4.16–4.23) and to develop a plan for mitigating these conditions and situations;

(b) Ensuring the availability of medical care for injuries, illnesses and stress on the part of on-scene personnel, including the availability and administration of drugs and other medications needed to deal with these injuries, illnesses and stress;

(c) Implementing a plan for monitoring the general physical health of on-scene personnel;

(d) Coordinating with local and national medical care centres to arrange specialized treatment of injuries for on-scene personnel, including arranging for the transport of personnel in need of such care.

3.23. The additional roles and responsibilities for the safety specialist that apply specifically to a radiological crime scene should include:

(a) Advising the hazardous materials operations specialist of all aspects of health and safety, including work–rest cycles for teams working in hazard control areas and the selection of appropriate personal protective equipment (PPE);

(b) Ensuring the protection of all personnel operating in hazard control areas from exposure to all physical, chemical and environmental hazards;

(c) Coordinating with the radiological assessor (see para. 3.24) to provide insight and advice regarding the application of the time–distance–shielding paradigm related to the radiation safety of those personnel operating at or near an environment where radiation is detected above background levels (as measured off-scene);

(d) Identifying and monitoring personnel operating within hazard control areas, including documenting and confirming both ‘stay times’ (e.g. the time using an air supply or in an area of higher radiation exposure) and ‘work times’ (time within a hazard control area performing work);

(e) Ensuring that appropriate decontamination (the term decontamination is used in this publication to refer to the removal of radionuclide contamination) facilities are operational for on-scene decontamination of personnel, equipment, evidence and other items as necessary.

Radiological assessor

3.24. The known, or suspected, presence of nuclear or other radioactive material at a crime scene necessitates the addition of a radiological assessor to the roster of crime scene personnel. The roles and responsibilities of the radiological assessor apply uniquely to a crime scene involving radioactive material. The

radiological assessor should be suitably qualified and experienced to advise the on-scene/operational commander on all aspects of radiation protection. The roles and responsibilities of the radiological assessor should include:

(a) Advising the hazardous materials operations specialist and the safety specialist on the development of hazard risk assessment and the selection of PPE, taking into consideration scene specific factors (such as geography, presence of debris and weather) and that these factors could change over time.
(b) Briefing on-scene personnel on the radiological situation and necessary protection measures.
(c) Measuring air-borne and surface radionuclide contamination and monitoring for the presence of nuclear and other radioactive material.
(d) Identification of any radioactive material present.
(e) Measuring external dose rates.
(f) Arranging for effective radionuclide contamination control.
(g) Assisting the hazardous materials operation specialist and the safety specialist in the establishment of hazard control areas based on potential radiation exposure.
(h) Calculating the permissible or recommended times (stay times) for personnel who are operating in any hazard control area.
(i) Conducting and interpreting radiation surveys in close coordination with evidence recovery personnel in order to protect the integrity of forensic evidence at the scene. A form used for this purpose is described in Appendix I, and a generic radiation survey map is given in Fig. 8. Radiation detection instruments and other tools that might be used in conducting the radiation survey are presented in Annex I.
(j) Assisting the hazardous materials operations specialist and evidence recovery personnel with surveying evidence as it is brought out of a hazard control area.
(k) Coordinating with the safety specialist (see paras 3.22 and 3.23) to provide insight and advice regarding the application of the time–distance–shielding paradigm related to the radiation safety of those personnel operating at or near an environment where radiation is detected above background levels (as measured off-scene).
(l) Ensuring that personal external radiation monitoring logs and records are maintained for all team members (a form used for this purpose is described in Appendix I, and a generic personal external radiation monitoring log sheet is given in Fig. 9).

(m) Identifying appropriate procedures for decontamination of personnel, equipment and evidence removed from the scene and conducting supporting measurements.
(n) Ensuring, in coordination with the safety specialist, the appropriate use of decontamination facilities, whenever needed.
(o) Assisting in planning the collection, packaging, labelling, storage and transport of items of evidence.
(p) Advising on the on-scene radionuclide contamination control measures and decontamination of personnel, if needed.
(q) Ensuring that any waste items (e.g. used PPE contaminated with radionuclides) produced at the scene are recorded and managed in accordance with national guidelines.

Scene modeller

3.25. The roles and responsibilities of the scene modeller at a radiological crime scene are essentially the same as those at any other crime scene. The roles and responsibilities typically associated with the scene modeller include:

(a) Preparing a diagram of the crime scene, establishing a scale for the diagram and geographically orienting the sketch with respect to north. A form used for this purpose is described in Appendix I, and a generic scene diagram form is given in Fig. 10.
(b) Marking on the diagram the locations of major items of evidence.
(c) Coordinating the naming convention used for each item of evidence with evidence recovery personnel and the evidence recorder/custodian to ensure consistency in the naming of such items.
(d) Annotating the diagram to indicate such things as adjacent buildings, rooms, furniture, etc., as needed.
(e) Designating and labelling areas to be searched and advising the on-scene/operational commander and evidence recovery personnel of appropriate naming conventions for designated areas.
(f) Obtaining appropriate assistance for taking measurements and listing each method of measurement selected on the diagram.
(g) Ensuring that necessary information, such as a scale (or a disclaimer indicating the diagram is not drawn to scale), is recorded on each sketch prepared of the crime scene.
(h) Preparing all documents related to the scene in a manner suitable for use in any subsequent legal proceedings.

3.26. Fulfilling these roles and responsibilities at a radiological crime scene is likely to be more challenging than would be the case for conventional crime scenes. This is in part owing to the need for the scene modeller to wear appropriate PPE while working within the hazard control areas.

Evidence recovery personnel

3.27. The roles and responsibilities of evidence recovery personnel for a radiological crime scene are essentially the same as those for any other crime scene. The roles and responsibilities typically associated with evidence recovery personnel include:

(a) Planning for the identification, collection, packaging, storage and transport of items of evidence, with advice from the hazardous materials operations specialist.
(b) Ensuring that items of evidence deemed to be significant are photographed in place, with and without scale, before they are collected, thereby assisting with reconstruction of the crime scene.
(c) Keeping the on-scene/operational commander informed whenever items of evidence deemed to be significant are found.
(d) Initialling and dating evidence (typically on the bag or other container used for collecting evidence), noting where the item was found (typically by reference to the sketch of the crime scene), and then releasing it to the evidence recorder/custodian. This action is the first entry into a chain of custody log for the particular item of evidence that has been collected. A form used for this purpose is described in Appendix I, and a generic chain of custody form is given in Fig. 11).
(e) Coordinating the naming conventions used for items of evidence with the evidence recorder/custodian and the scene modeller to ensure consistency in naming such items.
(f) Ensuring that all appropriate safety measures, as detailed in the site safety plan, are adhered to, especially with respect to proper use of PPE.

3.28. Fulfilling these roles and responsibilities at a radiological crime scene is likely to be more challenging than would be the case for conventional crime scenes. This is in part owing to the fact that evidence recovery personnel need to wear appropriate PPE while working within hazard control areas.

3.29. In addition to these roles and responsibilities, evidence recovery personnel take on two additional duties at a radiological crime scene:

(a) Coordinating with the radiological assessor and the hazardous materials operations specialist to ensure that each item of evidence is surveyed to determine whether it is contaminated with radionuclides or whether radiation is detected above background levels (as measured off-scene). The resulting information can be used to ensure that all personnel potentially coming into proximity with the evidence or with the packaging associated with the evidence are alerted to any radiation hazard.
(b) Ensuring that each item of evidence is secured in a manner that will enable it to pass through the control measures on exiting the hazard control area, and the radionuclide contamination control station, with the minimum likelihood of its potential evidentiary value being lost. This may, for example, necessitate evidence contaminated with radionuclides being placed into a double bag or wrapped in appropriate material prior to being processed through the contamination control station.

3.30. Evidence recovery personnel are typically organized into teams, with each team having a team leader. The evidence recovery team leader is responsible for preparing the evidence collection plan (see paras 4.29–4.36). Additional information on forensic evidence management is given in paras 4.25–4.54.

Photographer

3.31. The roles and responsibilities of the photographer for a radiological crime scene are essentially the same as those for any other crime scene. However, fulfilling these roles and responsibilities at a radiological crime scene is likely to be more challenging than would be the case for conventional crime scenes. This is in part owing to the fact that the photographer may need to wear appropriate PPE while within hazard control areas.

3.32. The roles and responsibilities typically associated with the photographer should include recording images (using still photography, video recording, or a combination of both) of:

(a) The entire scene prior to the collection of any evidence. This step is vital to faithful reconstruction of the crime scene. Such reconstruction will most likely be needed as part of the investigation.
(b) Victims (including body parts, in the event there has been an explosion or other event that has resulted in dismembering of victims), the public and any vehicles on-scene or near to the scene.
(c) Major evidence items prior to their recovery or to their being moved for any reason.

(d) Fingerprints, other impressions (such as shoe prints or tyre tread marks), and blueprints, maps or any other documents visible at the scene.

3.33. The photographer will also typically seek to obtain any photographic images available of the scene that were taken prior to the event that is being investigated. Finally, the photographer is responsible for preparing a log detailing each photographic image and sketching where that image was taken (a form used for this purpose is described in Appendix I, and a generic photographic log sheet is given in Fig. 12). As far as possible, this sketch should be coordinated with that prepared by the scene modeller.

Evidence recorder/custodian

3.34. The roles and responsibilities of the evidence recorder/custodian for a radiological crime scene are essentially the same as those for any other crime scene. The roles and responsibilities typically associated with the evidence recorder/custodian should include:

(a) Preparing the evidence recovery log (the evidence recovery log used with a conventional crime scene is augmented by the inclusion of radiation survey results for each item of evidence). A form used for this purpose is described in Appendix I, and a generic evidence recovery log is given in Figs 13 and 14.
(b) Coordinating the preservation and packaging of evidence.
(c) Coordinating with the scene modeller and evidence recovery personnel regarding the naming conventions used to describe each item of evidence.
(d) Receiving and recording all evidence.
(e) Maintaining custody and control of all evidence.
(f) Maintaining chain of custody in relation to all evidence.
(g) Coordinating transmittal of all evidence to the case investigator or to a qualified laboratory, in accordance with relevant guidelines [9].

3.35. An additional duty of the evidence recorder/custodian at a radiological crime scene should be to ensure that warnings regarding any radiation hazard associated with the evidence are properly affixed and displayed. This step ensures that all personnel transporting, receiving or otherwise handling the evidence are made aware of the presence of radiation and any radiation hazards associated with transporting, receiving or otherwise handling the evidence.

SPECIALIZED PERSONNEL

3.36. The composition of teams needed for managing a crime scene involving radioactive material is dependent on the nature, magnitude, location and complexity of the scene. These resources should be managed and organized at the national/strategic, local/tactical and on-scene/operational levels.

3.37. At the national/strategic command level, these resources should comprise senior officials from ministries, agencies and relevant authorities. At the local/tactical command level these resources should comprise officials from the judicial, law enforcement and other emergency services, public health, military and scientific and technical support agencies. The resources at the on-scene/operational command level should be similar to those for the local/tactical command level.

3.38. These resources, organized into command levels, will take into account the following functions, which are relevant to radiological crime scenes:

(a) Conduct of site surveys and assessment of radiation hazards;
(b) Establishment, maintenance and control of hazard control areas;
(c) Protection of personnel against radiation hazards;
(d) Radiation risk reduction;
(e) Identification, collection, packaging, storage and transport of items of evidence containing nuclear or other radioactive material to the forensic laboratories;
(f) Monitoring and decontamination of personnel, equipment and areas, as needed;
(g) Decontamination of evidence contaminated with radionuclides in a manner that avoids compromising its value to the associated criminal investigation;
(h) Containment and treatment of waste liquids, such as decontaminating solutions, in a manner that minimizes any release to the environment;
(i) Clean-up of the site, including the containment and treatment of any waste materials;
(j) Proper disposal of contaminated waste items in accordance with national guidelines.

3.39. Effective management and organization of these resources should ensure their availability at the needed location in a timely manner.

4. CONDUCT OF OPERATIONS

GENERAL

4.1. The conduct of operations at a radiological crime scene has several elements in common with the conduct of operations at any other crime scene. The need to protect response personnel and the public is critical and will, therefore, take priority over collecting evidence, interviewing witnesses, taking photographic images and preparing written records of the scene. However, the conduct of operations at a radiological crime scene differs from the conduct of operations at other crime scenes with respect to:

(a) Time spent in hazard control areas: Personnel at a radiological crime scene may need to limit the time spent within designated areas where nuclear or other radioactive material is known, or suspected, to be present. Limiting time within such areas is necessary to protect the health and safety of all on-scene personnel, regardless of their on-scene role. However, an exception exists for scenes where toxic chemicals or biological pathogens are known, or suspected, to be present. For those types of scenes, there may be a need to limit the time spent on-scene to minimize the possibility of accidental exposure to the chemicals or pathogens.

(b) Distance between the evidence and the individual collecting that evidence: To the extent reasonably possible, personnel conducting operations at a radiological crime scene should maintain a distance from any evidence contaminated with radionuclides and/or from the nuclear or other radioactive material itself. This is necessary in order to limit personnel exposure to radiation.

(c) Radiation shielding between the evidence and the individual collecting that evidence: Personnel at a radiological crime scene may need to be shielded from radiation associated with nuclear or other radioactive material or radionuclide contamination. Such shielding may impair the relevant personnel's view of items to be sketched, photographed, collected or inventoried. At some radiological crime scenes, such shielding may need to be within PPE worn by relevant personnel, and may restrict their mobility, reduce their manual dexterity and inhibit their ability to communicate. Nonetheless, radiation protection requirements need to be met by all personnel at all times at a crime scene involving radioactive material.

(d) Radionuclide contamination control (surface activity concentration)[3]: Measures to minimize the dispersal (or further dispersal) of radioactive material should be implemented. These may include, but are not limited to, the erection of barriers, damping down of particulates, access control and decontamination lines. Continuous checking of the efficacy of these measures is important and should include:
  (i) Monitoring of air-borne radionuclides;
  (ii) Monitoring of personnel and equipment entering and exiting the scene and hazard control areas within the scene;
  (iii) Monitoring the crime scene for changes in location of radiation hazards;
  (iv) Monitoring of evidence and other items removed from the scene.

(e) Personnel entering a radiological crime scene should be aware of the potential for, and trained in measures to avoid as far as possible:
  (i) Intake of radionuclides;
  (ii) Radionuclide contamination of PPE surfaces;
  (iii) Contamination of evidence with radionuclides;
  (iv) Further dispersal of radionuclides.

(f) Personnel, equipment, evidence and other items leaving the scene of a hazard control area should be monitored in a radionuclide contamination control station and, if needed, decontaminated in a decontamination station.

(g) Individual radiation exposure control: It is necessary to reduce, to the extent reasonably achievable, the risk to personnel who may be exposed to radiation or any associated chemical toxicity [15]. This may involve trade-offs, for example, between the number of personnel involved and the dose each may receive.

4.2. The degree to which each of these factors will apply depends on the radioactive material present, as determined by the common hazards risk assessment (see paras 4.8–4.14). Operations at the radiological crime scene should be adapted to the level of the hazard(s). Generalized guidance for conducting operations at any scene where nuclear or other radioactive material might be present is given in Ref. [13].

[3] A similar requirement for decontamination might exist for other crime scenes, such as a scene where blood-borne pathogens might be present, but the extent to which decontamination is applied and the manner in which it is managed differ for a radiological crime scene.

SCENE CONTROL

4.3. Scene control involves all those activities undertaken to manage access into, within and out of a radiological crime scene. The overarching goals in controlling such a scene should be:

(a) To reduce any radiation hazard and other hazards posed by a nuclear security event to the general public and to those personnel who need to gain access to the scene for legitimate purposes, such as evidence collection and scene security;
(b) To establish and maintain effective control over the nuclear or other radioactive material associated with the radiological crime scene;
(c) To preserve items of potential evidentiary value, both those that contain nuclear or other radioactive material and those not containing such material (which may be contaminated with dispersed radionuclides).

4.4. The primary activities undertaken for scene control are perimeter security, traffic control and access control. In most regards, these activities are essentially the same as those activities undertaken for other crime scenes. The important distinction, however, is that the known, or suspected, presence of nuclear or other radioactive material demands special attention to ensure the protection of the public and of response personnel as well as the need to secure the nuclear or other radioactive material.

Perimeter security

4.5. An initial step in scene control is to secure the perimeter of the crime scene. Perimeter security is often under the jurisdiction of law enforcement personnel, who are authorized to stop pedestrians and vehicles from entering or exiting the scene and who can take appropriate action against those individuals or groups who fail to obey a lawful order to stop. Perimeter security personnel need to be integrated into the command structure, previously described.

Traffic control

4.6. Control of traffic entering, exiting and moving around a radiological crime scene can be accomplished either in concert with establishing perimeter security or immediately following establishment of perimeter security. As with perimeter security, traffic control is often under the jurisdiction of law enforcement personnel. In addition to control of surface traffic, at some scenes traffic control

might need to be extended to include control of air, maritime or subsurface traffic, through the national/strategic command level or the local/tactical command level.

Scene access control

4.7. The procedures for scene access control include ensuring that anyone entering the scene needs to pass a designated official who will determine whether the individual can be granted access. This determination is often made by direct consultation with the on-scene/operational commander or designated representative or is based on a written list of personnel who are authorized to have access to the scene (either by name or by position). Once it is determined that scene access can be granted, the designated official will record the date and time of entry, the name of the individual for whom access was granted, and the purpose associated with access (e.g. evidence collection, preparing a sketch of the scene or delivery of supplies). Similarly, the date and time are recorded when the individual leaves the scene. In this way, an accurate log is maintained that documents who had scene access, for what purpose and for how long. A form used for this purpose is described in Appendix I, and a portion of a generic crime scene entry log is given in Fig. 15.

COMMON HAZARDS RISK ASSESSMENT

4.8. The initial phase of operations at a radiological crime scene should include an assessment of the risks associated with hazards that might be encountered at the scene. This assessment encompasses commonly encountered hazards that might pose a risk to the health and safety of the public or personnel conducting operations at the scene (e.g. debris, exposed utilities or severe weather). This assessment is known as a common hazards risk assessment and is essentially the same as the assessment that would be performed for other crime scenes. However, the conduct of common hazards risk assessment at a radiological crime scene differs from an assessment at other crime scenes in that:

(a) Owing to the known, or suspected, presence of nuclear or other radioactive material, material identification should be performed as part of the common hazards risk assessment.
(b) The hazards need to be assessed not only for the risks they might pose to routine operations at the scene, but also for the risks they might pose:
    (i) To personnel wearing equipment to protect themselves from radiation while at the scene;

(ii) Of causing uncontrolled dispersal of nuclear or other radioactive material;
(iii) To ancillary equipment used to support operations at a radiological crime scene.

4.9. Additionally, attention needs to be paid to the possibility of unexploded ordnance, secondary devices and access denial devices (booby traps) as well as any explosives associated with the nuclear or other radioactive material (e.g. as in the case of an RDD). The tasks of locating and rendering safe any such items are routinely performed for crime scenes by an individual or a team of specialists designated for this task by the on-scene commander, as noted in paras 3.36–3.39. Examples of common hazards are described in Appendix II.

4.10. The common hazards risk assessment should be used when preparing operational plans. These plans should take into account the nature of these hazards as well as the actions to be taken to mitigate them. Two such plans are described below, namely the event action plan and the scene safety plan.

Event action plan

4.11. The event action plan concisely defines the actions to be taken during the operational period. The on-scene/operational commander is responsible for preparing the event action plan, which should specify:

(a) The overall objective of on-scene operations;
(b) Goals associated with meeting this objective;
(c) Strategies and tactics to be used to meet each goal;
(d) Task assignments;
(e) Relevant safety and medical guidance.

Scene safety plan

4.12. The scene safety plan describes the scene specific hazards as well as the risk reduction measures to be used. The safety specialist is responsible for preparing the scene safety plan. The scene safety plan typically specifies:

(a) Key safety issues for all personnel at the scene[4];
(b) Scene safety goals;
(c) The safety command structure.

4.13. Scene safety goals specific to a radiological crime scene include:

(a) Minimizing the number of personnel operating in any area where nuclear or other radioactive material is present;
(b) Avoiding physical contact with items contaminated with radionuclides or, where such avoidance is impossible owing to the work being performed, limiting such contact through the use of appropriate tools;
(c) Avoiding or otherwise limiting passage through areas where nuclear or other radioactive material is present;
(d) Avoiding radionuclide contamination of persons and equipment (e.g. not placing equipment on surfaces contaminated with radionuclides);
(e) Using the ALARA[5] principle and the concepts of minimizing time, maximizing distance and employing shielding to reduce exposure to radiation.

4.14. Additional aspects of scene safety include:

(a) Ensuring that all personnel operating at the scene are briefed on the scene safety plan and policies;
(b) Establishing an escape route and emergency evacuation signals;
(c) Briefing personnel on all of their tasks and responsibilities prior to entry into the hazard control areas;
(d) Maintaining radio communications among the entry team, backup team and the safety specialist;
(e) Prohibiting drinking, eating, smoking and elimination of body wastes until after personnel have left the scene through the radionuclide contamination control station and, if needed, through the decontamination station.

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[4] All personnel entering the hazard control areas and backup personnel who might enter the hazard control areas need to be formed into teams having a minimum of two members. This condition ensures that a 'buddy' system can be implemented, in which each person entering the hazard control area is paired with one other person (a buddy). Each individual is directed to look after the safety of the other person, including observing the person's PPE for rips, tears or other openings and watching the actions of the other person (especially the posture, walk and speech) for signs of fatigue or heat stress.

[5] ALARA stands for 'as low as reasonably achievable', economic and social factors being taken into account, and is the guiding principle for the optimization of radiation protection.

RISK REDUCTION PROCEDURES

General

4.15. Most hazards at a radiological crime scene will be essentially the same as those found at other crime scenes. Therefore, the risk reduction procedures will be essentially the same. An additional risk reduction procedure at a radiological crime scene is the implementation of radiation protection measures. These measures include monitoring and documenting the individual radiation doses received by crime scene personnel. Results of this monitoring will be used in accordance with the requirements in Refs [13, 14], including comparing individual doses to relevant dose limits. Activities conducted at a radiological crime scene need to adhere to the relevant requirements specified in Ref. [15].

Control areas

4.16. The establishment of an operational control area and a hazard control area will assist with the application of command and control within those areas, and access control to those areas. The perimeters of the operational and hazard control areas need to be established and marked to facilitate perimeter security and scene access control.

4.17. The establishment of a hazard control area will delineate the area in which there is intact radioactive material or contamination with radionuclides from the rest of the operational control area. The extent and configuration of the hazard control area will depend upon the specific situation at the scene, such as radiation level, precipitation and wind speed and direction, and may need to be altered if the situation changes.

4.18. Before a hazard control area can be established within a radiological crime scene, there must be an initial entry, conducted in a controlled manner, into the areas where nuclear or other radioactive material is, or is suspected to be, present. When establishing a hazard control area, guidance on radiation safety perimeters provided in Ref. [27] should be considered. This initial entry is conducted by personnel whose actions are coordinated with the hazardous materials operations specialist (paras 3.20–3.21), safety specialist (paras 3.22 and 3.23) and radiological assessor (para. 3.24), and such personnel need to wear suitable personal dosimeters and PPE (see Annex I). The tasks to be carried out during the initial entry should include:

(a) Measuring oxygen and contaminant levels in the air to help determine whether supplemental oxygen or respiratory protection is needed;
(b) Detecting the presence of air-borne and surface contamination to help determine suitable protective measures;
(c) Measuring levels of gases and vapours in relation to their explosive range in air to help determine whether additional safety measures will be necessary;
(d) Measuring external dose rates in the operational and hazard control areas to help determine permissible stay times for team personnel as well as to have an understanding of the locations with high radiation levels[6];
(e) Identifying the radioactive material to help to evaluate the risks associated with the material for first responders, law enforcement personnel and the public;
(f) Obtaining spectral data to help identify radionuclide(s) and to increase confidence in the material identification process (detection instruments useful for this purpose are listed in Annex I).

4.19. At the time the initial entry is conducted, knowledge of the actual radiation hazards and of any other hazards within the scene will be incomplete. Therefore, this initial entry should be made cautiously, and the actions of the personnel conducting the entry should be monitored closely.

4.20. The results of the initial entry are used by the hazardous materials operations specialist, the safety specialist and the radiological assessor to determine:

(a) The geographical limits to the hazard control area;
(b) The types of PPE, including personal respiratory equipment, to be worn during subsequent entries;
(c) Permitted stay times and action levels for personnel entering the hazard control area;
(d) The presence of common hazards and mitigation techniques appropriate for these hazards (a discussion of common hazards is given in Appendix II);
(e) The need for specialized equipment to assist in evidence collection (e.g. to remove debris to enable access to evidence).

4.21. Further entries into hazard control areas should be made only by personnel wearing the PPE, including personal respiratory equipment, determined to be

[6] Areas having high radiation levels are to be avoided to the maximum extent practical. If avoidance is impossible or impractical, then specific procedures will need to be implemented to minimize time spent in such areas, to consider distance from the nuclear or other radioactive material or to incorporate the use of shielding.

appropriate to the situation and for the use of which personnel have been trained and deemed competent.

4.22. Any individual making routine entry into a hazard control area should receive a pre-entry safety briefing and vital signs assessment. This assessment should include taking the individual's temperature, pulse rate, respiration rate and blood pressure. The safety specialist, radiological assessor and hazardous materials operations specialist will collaborate on the preparation of the briefing. All relevant personnel will acknowledge in writing having received the briefing. Backup teams need to be ready and available to assist. The radionuclide contamination control station and the decontamination station will be established prior to any entry and personnel will be informed of its location prior to entry. Upon exit from any hazard control area and any decontamination station, a post-entry vital signs assessment should be performed on each team member.

4.23. The entry team provides a briefing to the on-scene/operational commander or delegate regarding the operations that they performed and the conditions that they witnessed or measured.

Material identification

4.24. The main radionuclides in intact radioactive material or in radionuclide contamination can usually be identified quickly and this information will help in evaluating the risks associated with the material for first responders, law enforcement personnel and the public [3]. This information may also help to determine whether laws covering the unauthorized use or possession of radioactive material may have been broken, thereby forming the basis for a continued investigation. In some cases, material identification may lead to a determination that no further investigation is warranted. Examples of commonly used techniques and methods for identification are described in Annex I.

FORENSIC EVIDENCE MANAGEMENT

General

4.25. Collection of items of potential evidentiary value at a radiological crime scene should take place following the completion of the common hazards risk assessment and the implementation of risk reduction procedures. Forensic evidence management at a radiological crime scene is essentially the same as it is at other crime scenes. However, it differs in two important respects:

(a) The known, or suspected, presence of nuclear or other radioactive material means that all evidence should be checked for contamination with radionuclides.
(b) Nuclear or other radioactive material present at the scene should be collected to contribute both to evidence gathering and to risk reduction.

4.26. Two types of items of potential evidentiary value might also represent radiological hazards:

(a) Intact nuclear or other radioactive material itself;
(b) Other items warranting further examination using traditional or nuclear forensic science disciplines, which are contaminated with radionuclides (traditional forensic science disciplines include analysis of fingerprints, DNA, explosives, fibres, paints, tool marks and digitally recorded data).

A more comprehensive discussion of these and other forensic science disciplines can be found in Ref. [9].

4.27. Such items will need special consideration in both collection and subsequent handling. All items seized as potential evidence from the radiological crime scene or from any other scene of interest to the investigation should:

(a) Be recorded in an evidence recovery log;
(b) Carry a unique identifier;
(c) Be placed under chain of custody at the time of collection;
(d) Remain under chain of custody until it is no longer needed and is, at that point, disposed of according to law as applicable.

4.28. An essential element in the effective management of forensic evidence is the need to identify the forensic laboratory or laboratories to which evidence should be submitted for examination. These laboratories should be designated in advance, as described in Ref. [9].

Evidence collection plan

4.29. The evidence collection plan details the priorities for collecting items of evidence or other samples, specifying:

(a) What is to be collected;
(b) How it is to be collected;
(c) By whom it is to be collected;

(d) What packaging is necessary for the collected evidence;
(e) Where and how the collected evidence is to be transported.

4.30. This plan should be based upon, among other things, the images of the scene taken by the photographer, or otherwise made available to the team, as well as any reconnaissance that has been conducted.

4.31. The evidence recovery team leader prepares the evidence collection plan, assisted by personnel with knowledge of the scene or of the goals of evidence collection at the scene. For a radiological crime scene, the radiological assessor provides assistance in preparing the evidence collection plan. In particular, the radiological assessor assists with those elements of the evidence collection plan related to the nature of the nuclear or other radioactive material known, or suspected, to be present at the scene.

4.32. Before starting evidence collection, the evidence recovery team leader should also consult with specialists from the laboratory to which the evidence will be transported. This consultation should aid the development of the evidence collection plan by providing information regarding markings, labels, packaging or similar attributes associated with nuclear or other radioactive material that might otherwise be unfamiliar to the evidence recovery team leader, but might be useful in identifying promising items at the scene for collection. Examples of such potentially useful information include the use of the trefoil symbol to designate radioactive material and the use of high-density packaging materials to shield radioactive material, such as lead-lined storage containers.

4.33. This consultation with laboratory specialists during the development of the evidence recovery plan may serve additional purposes. For instance, the consultation will alert laboratory personnel to expect evidence requiring analysis, allowing them to make the necessary preparations so that the evidence might be processed and analysed as rapidly as possible. The consultation should also allow the laboratory specialists to provide guidance on any laboratory specific requirements for labelling, packaging or shipment of evidence, such as periods when the laboratory might be unavailable to receive shipments.

4.34. Information obtained during the first entry into the hazard control area will assist in the development of an evidence collection plan. This information also assists in the identification of any special engineering techniques that will be needed to facilitate the collection of evidence, such as the removal of debris or the conduct of operations in confined spaces. Such necessary actions should be part of the evidence collection plan. Any special requirements for packaging or

transport of evidence (e.g. transport of large items) will also be included. The plan should identify any special techniques needed, such as underwater operations or the handling of human remains.

4.35. The evidence collection plan and the briefings given to evidence collection team members should emphasize items of evidence expected to be of special interest for purposes of the investigation, if any. Examples include written or printed materials that might be used to identify persons, places or things that could be linked to the events associated with the discovery of nuclear or other radioactive material out of regulatory control or that could indicate plans regarding the future disposition of such material. Such material should be a priority for investigative purposes because it could allow perpetrators to be identified or steps to be taken to prevent further losses of nuclear or other radioactive material.

4.36. Collecting items of evidence at a radiological crime scene may involve using specialized equipment that is unfamiliar to evidence recovery team personnel. Even if they are familiar with the equipment, it may be more difficult to use while wearing PPE. Support from technical experts may, therefore, be needed.

Procedures for collection of nuclear or other radioactive material and evidence contaminated with radionuclides

4.37. The number of personnel needed in an evidence recovery team will depend upon the specific situation. However, there are defined roles that need to be filled in such a team. It is important that all personnel within the team know their own roles and responsibilities and those of the other team members before they enter any hazard control area. This would normally be ensured through a team briefing, carried out when the evidence collection plan is in place (paras 4.29–4.36), but preferably before personnel are dressed in PPE.

4.38. All personnel entering a hazard control area should wear two pairs of gloves in order that the outer pair can be disposed of and replaced when needed, without leaving the hand exposed.

4.39. The evidence recovery team leader should take responsibility for the effective reconnaissance of the scene, concentrating on planning for the collection of items of evidence. The team leader should, in line with the evidence collection plan and with the aid of any images, maps, plans or drawings that have been produced, determine the sequence of evidence collection and discuss with the

team the best equipment and packaging to use for the collection of evidence or other samples within the time available.

4.40. Specific team roles and responsibilities are assigned to the primary evidence collector and to the assistant evidence collector. They both follow techniques to avoid inadvertent transfer of radionuclides during the evidence collection process.

(a) The primary evidence collector is responsible for gathering evidence and placing it into a bag or other receptacle.
(b) The assistant evidence collector is assigned the role of opening and holding a bag or other receptacle known to be free of radionuclide contamination. This person works closely in support of the primary evidence collector.

4.41. On entering the hazard control area, the assistant evidence collector prepares a clean workspace on which to place items of evidence by placing a clean cloth or similar covering over an appropriate area. This provides a working surface area that is free of radionuclides and other possible contaminants. The container holding the empty evidence collection bags is placed onto the covered workspace.

4.42. A waste container is placed within the workspace. This container is used for the disposal of gloves, discarded packaging materials and other wastes associated with the evidence collection process. A record should be maintained of the contents of this container to assist with their disposal, which should be conducted in accordance with national regulations or international guidelines [17].

4.43. Once the workspace is prepared, the assistant evidence collector should prepare the bag into which the primary evidence collector will place each item of evidence. The primary evidence collector should then place the item of evidence directly into the bag, avoiding touching the exterior of the bag and possibly transferring radionuclide contamination to this exterior surface.

4.44. The assistant evidence collector then seals the packaging, taking care to avoid cross-contamination, and labels it, ensuring that the same description is written on the bag as is recorded by the scene modeller and photographer. This first bag is then placed into another clean bag or other receptacle in the covered workspace.

4.45. A swipe sample of the outer bag is taken and measured with a portable contamination monitor. If the surface activity concentration (radionuclide contamination) is above background levels, the item is placed into yet another clean bag (i.e. a third bag) or other receptacle. Personnel need to avoid cleaning or decontaminating the outer bag because such actions might compromise the evidence.

4.46. A dose rate survey of the bagged item then needs to be conducted in a low background area. The survey results should be noted on the radioactive material label (see Appendix I and Fig. 16).

4.47. Once an item of evidence has been collected, the evidence collectors should change their outer pair of gloves, disposing of the gloves as contaminated waste and using a fresh pair of gloves to continue with evidence collection, before collecting the next item of evidence. This step minimizes the possibility of cross-contamination. The PPE of the evidence collectors should be checked regularly for integrity, fit and contamination with radionuclides.

4.48. The clean packaged evidence is then placed in a suitable container, which will be placed on the covered workspace (or another cloth or covering if space permits) to prevent the packaging from being externally contaminated. The assistant evidence collector should carry the packaged evidence through the radionuclide contamination control station and, if needed, through the decontamination station.

Initial forensic examination at the scene

4.49. If the criminal investigation calls for an immediate initial evaluation by forensic examiners of evidence contaminated with radionuclides (e.g. mobile telephones, paper notebooks or items with latent fingerprints), then this initial examination could be carried out in a mobile glove box or in a designated hazard control area at or near the radiological crime scene. These initial examinations should be conducted under the supervision of the evidence recorder/custodian, the safety specialist and the radiological assessor. After the initial examinations are completed, the evidence should be re-packaged for transport and submitted to the designated laboratory, as described in Ref. [9].

Evidence packaging, transport and submission

4.50. All evidence from a radiological crime scene should be collected, packaged and submitted in accordance with the evidence collection plan. The practice of using a collector and assistant will be applied during packaging of the evidence. This applies to all three types of evidence:

(a) The nuclear or other radioactive material itself;
(b) Other items of potential evidentiary value contaminated with radionuclides;
(c) Uncontaminated items of potential evidentiary value.

4.51. All packaged items of nuclear or other radioactive material will be marked to identify them as a radiological hazard. Solid evidence (e.g. a closed container or a sealed source) may need to be imaged using X ray radiography to understand the nature of the evidence and to confirm the absence of hidden explosives or other dangers within the container. The label will also indicate all data that are known concerning the material and associated hazard (e.g. dose rate, isotopes present, activity and types of radiation). A form used for this purpose is described in Appendix I, and a generic radioactive material label is given in Fig. 16. Items should be transported in accordance with national transport guidelines [10] or recognized exceptions.

4.52. Evidence contaminated with radionuclides and emitting radiation at or above recommended safety levels [15] should be packaged, labelled, stored and transported in accordance with relevant national regulations and international standards, such as those given in IAEA Safety Standards Series No. TS-R-1, Regulations for the Safe Transport of Radioactive Material [10], including the use of special arrangements for transport of nuclear and other radioactive material. Evidence contaminated with radionuclides, but determined not to be of concern for safety, should be packaged, labelled, stored, transported and examined in the same manner as that used for other evidence.

Interim storage site for evidence

4.53. At some radiological crime scenes, it will be necessary to safely and securely store evidence at an interim location, known as the interim storage site for evidence, prior to its further transport to the designated laboratory. This may be necessary to ensure national regulations and laboratory procedures are followed, or simply to facilitate arrangements with the receiving laboratory, particularly in cases where international assistance is needed. This interim storage site needs to have security measures in place to prevent tampering with evidence, while also having the appropriate radiation safety, chemical or safeguards permits necessary to store the quantity of nuclear or other radioactive material present. The interim storage site for evidence should operate in accordance with the applicable rules of evidence, including maintaining the chain of custody for handling of evidence.

4.54. If material identification was not performed at the scene, it should be performed at the interim storage site for evidence before transport to the designated laboratories. Even if material identification was performed at the scene, it may be useful to confirm the identification, for example by using more sensitive instrumentation. This confirmation can provide further information, and can be used to evaluate the efficacy of the on-scene identification. All material

identification measurements need to be recorded in writing and be communicated to the designated laboratories.

RELEASE OF SCENE

4.55. Once collection of evidence has been completed, the scene may be released from law enforcement control. However, any decision to release the scene for unrestricted use should take account of radiological criteria as required by the relevant competent authority. The mechanism for release of any radiological crime scene to relevant competent authorities should be addressed in the national response plan consistent with relevant laws and regulations.

AFTER-ACTION REVIEW

4.56. After operations have concluded at a radiological crime scene, it may be useful to conduct an after-action review. The intent of this review is to determine those actions that met or exceeded expectations and those that failed to meet some or all expectations. The after-action review represents an important opportunity to learn from experience and feed that learning back into the planning process. The results of the after-action review should be communicated to all personnel having responsibilities for radiological crime scene operations as well as to other agencies that are supported by or that support these operations. The results should be incorporated into plans and procedures as applicable.

4.57. The after-action review should be conducted by, or be at the direction of, the on-scene/operational commander and should include input from all personnel who participated in radiological crime scene operations. After-action review is often an iterative process, with input to the review being provided while radiological crime scene operations are under way. Additional input should be provided by operational personnel outside the radiological crime scene, such as the designated laboratories that received the evidence and law enforcement personnel and prosecutors who used information from the radiological crime scene to support investigation and prosecution.

4.58. Those actions at the radiological crime scene that met or exceeded expectations merit further consideration to identify the measures that contributed to their success. For example, additional consideration might identify the extent to which success might be attributed to some combination of proper planning, effective training and frequent exercising of the operations at a radiological crime

scene. Alternatively, additional consideration might identify the availability of international assistance as a key element of successful radiological crime scene operation. Such information might prove useful to reinforce those measures that contributed to success as part of preparations for operations at future radiological crime scenes, and can be used to augment applicable sections of the national plan for managing nuclear security events.

4.59. Those actions at the radiological crime scene that fell short of expectations merit further consideration to identify the cause(s) of the shortcomings. The review should identify measures to improve operations at any future radiological crime scene. Such measures may include enhanced training, development of new tools, acquisition of additional or improved equipment and clarification of roles and responsibilities.

5. PREPAREDNESS

GENERAL

5.1. Preparedness for radiological crime scene operations is essential to building confidence that the mobilization of resources can be managed, controlled and coordinated effectively in a multidisciplinary environment. The practical goal of preparedness is to ensure that arrangements are in place for a timely, managed, controlled, coordinated and effective mobilization of resources at the national/strategic command level, the local/tactical command level and the on-scene/operational command level.

5.2. Each competent authority involved with managing radiological crime scenes should establish and maintain a preparedness programme commensurate with its roles and responsibilities, including implementing national requirements for trustworthiness of personnel [3]. Such programmes are necessary to ensure that competent authorities have identified the necessary resources and have made preparations and arrangements to deal with any kind of radiological crime scene. This planning and preparation may result in a competent authority selecting and acquiring appropriate PPE and tools for use at radiological crime scenes. These preparations should define the actions that need to be taken before, during and after a radiological crime scene operation by all competent authorities involved in managing the radiological crime scene.

5.3. Competent authorities should also ensure that appropriate training is provided for all personnel involved in the management of and operations at a radiological crime scene. The necessary capabilities for all levels of command should be exercised periodically.

BASIS FOR PREPAREDNESS

5.4. Consideration should be given to treating the management of operations at a radiological crime scene as an extension of managing operations at a conventional crime scene. Additional considerations specific to managing crime scenes involving nuclear and other radioactive material should be included, with regard to the national/strategic, local/tactical and on-scene/operational levels. Once the capability for managing a radiological crime scene is established, it should be exercised at time intervals in accordance with the national plan.

5.5. Competent authorities should ensure the preparedness of the specialized resources for radiological crime scene operations and ensure that appropriate procedures are in place for such situations. Consideration should be given to the possible need to manage, simultaneously or nearly simultaneously, multiple radiological crime scenes or a combination of crimes involving nuclear or other radioactive material and other high priority criminal acts.

5.6. All necessary arrangements should be in place to ensure the availability of personnel needed for radiological crime scene management, including those personnel who are remote from the scene itself but who support scene operations. The various competent authorities with roles and responsibilities for response should ensure that they have appropriate arrangements in place for selecting and equipping personnel. These arrangements should include provisions for periodic refresher training on an appropriate schedule.

5.7. Attention should be given to the training of appropriate personnel in:

(a) Procedures to be followed at a radiological crime scene;
(b) Conduct of site surveys for and identification of radiation hazards;
(c) Establishment, maintenance and control of hazard control areas;
(d) Protection of personnel against radiation hazards;
(e) Radiological risk reduction;
(f) Radionuclide contamination control;
(g) Decontamination of personnel and equipment;

(h) Decontamination of evidence in a manner that avoids compromising its value to the associated criminal investigation;
(i) Containment and treatment of liquids, such as decontaminating solutions, in a manner that minimizes pollution;
(j) Proper disposal of contaminated waste items in accordance with national guidelines and international standards;
(k) Use of radiation detection instruments and PPE;
(l) Forensic evidence management;
(m) Command, control, coordination and communication;
(n) Safety of personnel;
(o) Procedures for communicating to and maintaining effective relations with the various levels of local authorities and national government, the news media and the general public.

PLANS AND PROCEDURES

National response plan for managing nuclear security events

5.8. In order to facilitate the management of a radiological crime scene, a comprehensive national response plan to manage nuclear security events is needed. This plan should have clear interface with, among other things, the national and local level plans for response to conventional and/or nuclear or radiological emergencies [3, 19]. The national plan should serve as:

(a) A basis for establishing compatible operational tools needed for prompt and effective radiological crime scene management;
(b) A guide for the competent authorities who need to ensure that all necessary tasks are given the appropriate resources and support.

5.9. The national response plan, which outlines the various response measures and standard operating procedures, is typically developed and implemented coherently by the competent authorities involved, and ideally coordinated by the national coordinating body or mechanism [3, 19].

Inter-agency arrangements

5.10. Arrangements should be made on an inter-agency basis for an integrated command structure to facilitate the management of a radiological crime scene. These arrangements should cover, as a minimum, functions, responsibilities and authorities, allocation of resources, coordination of activities, priorities and

interoperability, logistic support and facilities, plans and procedures and training, drills and exercises. Arrangements should also be in place for notifying other States and relevant international intergovernmental organizations in accordance with international agreements or national policy.

Procedures for radiological crime scene operations

5.11. Each relevant competent authority should develop procedures in accordance with their roles as specified in the national response plan. Procedures for managing a radiological crime scene should be updated as necessary. Such procedures should contain provisions for:

(a) Integrated command, control, coordination and communication.
(b) Interoperability.
(c) Scene safety.
(d) Physical and operational security of the scene, examples of operational security include:
    (i) Refraining from discussing the nature of the operation outside of the scene in public;
    (ii) Using encrypted means of communication for both voice and data;
    (iii) Disposing of all written materials associated with the crime scene in a secure manner;
    (iv) Shrouding sensitive operations.
(e) Reduction of radiological and other risks posed by a nuclear security event to the general public and to those personnel who need to gain access to the radiological crime scene for legitimate purposes.
(f) Establishment and maintenance of effective control over the nuclear or other radioactive material.
(g) Identification and rendering safe of explosives, explosive devices and booby traps.
(h) Preservation of items of potential evidentiary value, those that contain nuclear or other radioactive material, those contaminated with radionuclides and those with no radionuclides.
(i) Decontamination of personnel, radiation detection instruments and evidence, among other things.
(j) Incorporation of mechanisms for requesting assistance, both domestically and internationally, when necessary.
(k) Arrangements for informing the local and national levels of government, news media and the general public, as appropriate, in a coordinated, accurate, clear and consistent manner.

(l) Maintenance of capabilities for radiological crime scene operations, including:
    (i) Periodic testing of these capabilities;
    (ii) Replacement of lost personnel;
    (iii) Refresher training of all personnel and resupply of equipment and instrumentation that have reached the end of their service life or are otherwise no longer suitable for use.
(m) Periodic exercising of all procedures, personnel and equipment.

5.12. Relevant personnel from a competent authority should be trained in the procedures for managing a radiological crime scene and be subjected to periodic drills and exercises.

EQUIPMENT

General

5.13. Planning for the acquisition of equipment for use at a radiological crime scene should be guided by technical specifications that reflect the concepts of operations at such scenes. These specifications should adhere to national or international standards. In determining the technical specifications, account should be taken of the nature of the scenes and types of radiation that are expected to be encountered, as well as functional requirements such as:

(a) Ability to withstand exposure to environmental factors, such as a suitable range of temperatures, humidity and adverse weather conditions;
(b) Ease of installation, use, decontamination and removal under expected conditions of deployment;
(c) Ease of training personnel in use, calibration and maintenance;
(d) Ability to be sustained (e.g. ease of maintenance, availability of consumables and spare parts).

5.14. Periodic drills and exercises should imitate a real situation as closely as possible and should be conducted with all items of equipment intended for radiological crime scene operations to ensure both that items perform according to specifications and that personnel are familiar with their use. Technical specifications should be reviewed and modified periodically to reflect technological developments and to incorporate lessons learned during drills and exercises. The specifications should also be updated to reflect experience gained

during actual radiological crime scene operations, as identified in the after-action review (see paras 4.56–4.59).

Radiation detection instruments

5.15. Preparation for radiological crime scene operations should include the selection of radiation detection instruments. Representative types of radiation detection instruments suitable for use at a radiological crime scene are presented in Annex I. Prior to their first use, instruments should be calibrated according to national regulations/procedures and be acceptance tested to confirm performance to the technical specifications. A maintenance plan for the instrument should be established at the time of acceptance and should be based on national or international standards and the advice of the manufacturer. In addition, calibration, performance testing and preventive maintenance should be carried out periodically by qualified experts based on international or national standards and the advice of the manufacturer of the instrument. Results of calibrations, performance testing and preventive maintenance should be recorded, and these records should be retained.

Personal protective equipment

5.16. Preparation for radiological crime scene operations should include the selection of PPE. Items of PPE should include:

(a) Respiratory protective equipment (RPE);
(b) Gloves;
(c) Footwear;
(d) Undergarments, such as vests worn to reduce heat load;
(e) Overgarments.

5.17. One goal in selecting PPE is to minimize the hindrance caused by the PPE while providing adequate protection against exposure to radiation and the range of possible on-scene hazards (e.g. toxic vapours and blood-borne pathogens). Factors to be considered in achieving this goal include:

(a) Ability to afford protection for the anticipated duration of operations;
(b) Compatibility with various body types (such as different heights, weights and physiques);
(c) Ability to withstand damage during operations;
(d) Ability to withstand loss of normal human sensitivities to speech, sight and touch;
(e) Ease of putting on and removing each item.

5.18. Representative types of PPE suitable for use at a radiological crime scene are presented in Annex I.

Ancillary equipment

5.19. Preparation for radiological crime scene operations should include the selection of ancillary equipment. Examples of ancillary equipment include:

(a) Communications equipment;
(b) Decontamination equipment;
(c) Evidence collection, packaging and transport containers;
(d) Manipulators for remotely moving objects, such as evidence;
(e) Specialized equipment for examining objects, such as portable X ray units.

5.20. Representative types of ancillary equipment suitable for use at a radiological crime scene are presented in Annex I.

INFORMATION RESOURCES AND MANAGEMENT

5.21. Resources to manage the flow of information to and from competent authorities should be identified within the national response plan for managing a nuclear security event. Methods for management of these resources should be implemented and exercised in accordance with this plan.

Points of contact

5.22. Predefined points of contact should be established at each competent authority that needs to receive notifications of a nuclear security event and/or has responsibilities in managing such an event. These points of contact should be available at all times.

Routine communications

5.23. Effective communication in planning, execution and follow-up is essential to effective radiological crime scene management. In preparation for such operations, participants from all levels (strategic, tactical and operational) may be asked for input based on their different fields of expertise. In this way, engagement of participants could broaden the support base for radiological crime scene management.

5.24. It is essential that routine communications between all competent authorities are robust and efficient. These routine communications should be established on the basis of radio systems or telephone/Internet networks, recognizing that in a nuclear security event or other emergency, some methods of routine communications may become compromised or unavailable owing to heavy demand or damage associated with the event.

TRAINING

5.25. Relevant competent authorities should assist each other with planning and training activities designed to improve preparedness. Each relevant competent authority is encouraged to coordinate its training programmes through a coordinating body to avoid duplication, and make its training available to others. An example of a coordinating body is a committee with representatives of all relevant competent authorities.

5.26. An effective training mechanism is a critical component in developing the skills and knowledge of radiological crime scene personnel. However, given the diverse nature of the conditions, demands and activities at a radiological crime scene, formulating a rigorous training approach may be challenging, and should take into account the following:

(a) National needs assessment, such as a need for training facilities;
(b) Awareness efforts;
(c) Roles and personnel;
(d) Continual evaluation of training programmes.

DRILLS AND EXERCISES

5.27. A programme of drills and exercises should be designed to continually improve the effectiveness of cooperation between relevant competent authorities as well as the competencies and capabilities of personnel involved in radiological crime scene operations. Programme officials should use the results of such drills and exercises to identify strengths and address deficiencies in instrumentation, operations and training [19].

SUSTAINABILITY

5.28. Comprehensive planning and commitment of sufficient financial, material and human resources are needed to ensure the long term effectiveness of national capabilities for managing a radiological crime scene [28]. Attention needs to be given to day-to-day operations, maintenance, quality control and continuous system improvements and to the flexibility to adapt to an evolving threat.

5.29. Sustainability of human resources should take into account movements of personnel and attrition within different competent authorities as well as the necessity for continual training of all personnel. Planning efforts should ensure that there will be sufficient qualified personnel to operate and maintain equipment and assess instrument alarms and information alerts. States should consider, in this regard, the possibility of needing to manage multiple radiological crime scenes or the combination of a radiological crime scene with other high priority national events. In considering such possibilities, States may seek arrangements for bilateral, regional or multilateral mutual assistance if their own radiological crime scene management capabilities were to be overwhelmed.

5.30. The goals of promoting sustainable resources for radiological crime scene management and, more specifically, sustainable programmes and practices, include:

(a) Encouraging long term effectiveness by effectively managing costs and fostering sharing of resources and information where appropriate;
(b) Sustaining operations by accounting for the life cycle cost of the equipment and by ensuring the continuous availability of trained and motivated personnel.

6. INTERNATIONAL COOPERATION AND ASSISTANCE

GENERAL

6.1. Radiological crime scenes have the potential to involve transboundary issues. For example, material associated with the nuclear fuel cycle may have been mined and milled in one State, then transported across borders for manufacture into nuclear fuel, and finally moved across other borders for use in a reactor. Similarly, radioactive sources may have been produced in one State and

then transported across one or more borders to another State for use or resale. All such transboundary movements may have been carried out in full accordance with national and international laws governing such transfer and use of such materials. However, there is a possibility of nuclear or other radioactive material falling out of regulatory control at any step associated with these transboundary movements. Dispersed radionuclides from a radiological crime scene may also cross-borders.

6.2. International cooperation and assistance may, therefore, be essential to the effective management of any radiological crime scene from which nuclear or other radioactive material out of regulatory control is collected, packaged and transported. Furthermore, cooperation and assistance might be initiated in advance of any nuclear security event, such as through joint participation in training and exercises in preparation for any specific challenges in managing a crime scene involving radioactive material.

6.3. States may also have obligations relating to cooperation and assistance as a result of being party to bilateral agreements or international legal instruments. For example, States party to the Convention on the Physical Protection of Nuclear Material are obliged to render assistance to another State Party, if requested, on matters where nuclear material is lost or stolen [2]; such an event could involve a known, or suspected, radiological crime scene.

6.4. Because of the universal need to strengthen the means of responding to nuclear security events, sharing lessons learned from actual events or from exercises with international counterparts is desirable. Such sharing allows counterparts to consider whether their own procedures need to be revised.

AREAS OF COOPERATION AND ASSISTANCE

6.5. Assistance on matters related to managing a radiological crime scene may be facilitated by the international community or may be requested directly on a bilateral or multilateral basis [12, 13, 21]. Assistance during response to a nuclear security event may be requested for activities at the scene of the known, or suspected, crime (on-scene) or other locations (off-scene).

6.6. In order to expedite the provision of bilateral or multilateral assistance, arrangements should be made in advance for promptly and directly notifying any State in which urgent protective actions might need to be taken. States are responsible for arriving at such arrangements [12, 13, 16].

6.7. Joint training and exercises will also be beneficial to optimizing international cooperation and rendering assistance during an actual incident. Such training and exercises will help to identify additional areas in which cooperation and assistance might be desirable, and will help to develop enhanced means by which cooperation and assistance are provided.

6.8. A State managing a radiological crime scene may need to request additional resources or expertise from another State. Consequently, cooperation and assistance may be needed to ensure that the actions taken on the scene protect public health and safety while also preserving items of potential value as evidence during any investigation. The precise nature of the cooperation and assistance will depend on various factors associated with the requesting State and the radiological crime scene. Possible areas in which cooperation and assistance might be requested include:

(a) Identifying and subsequently obtaining and operating equipment for radiological crime scene operations. This equipment might include, for example:
    (i) PPE for on-scene operators;
    (ii) Vehicles or specialized equipment needed to gain access to, and to move within, the site, or to control entry to an exit from the scene;
    (iii) Radiation detection instruments.
(b) Rendering safe an IND or an RDD.
(c) Providing experts to assist with on-scene operations, such as:
    (i) Command, control and communication;
    (ii) Material identification;
    (iii) Evidence collection;
    (iv) Mitigating non-radioactive hazards at or near the scene, such as flammable liquids, compressed gases and explosives;
    (v) Medical assistance to individuals exposed to radiation or with other injuries associated with the scene;
    (vi) Decontamination of personnel and equipment;
    (vii) Remediation of the scene to allow reoccupation.
(d) Identifying and applying procedures for collecting, packaging and transporting evidence in a way that is appropriate to the environment associated with the radiological crime scene, the surrounding community, and the situation within the affected State.
(e) Assisting with bringing seized nuclear or other radioactive material under regulatory control [13].

6.9. In addition to requesting and receiving cooperation and assistance with on-scene activities, a State might take similar steps for related activities away from the radiological crime scene.

6.10. In many respects, off-scene cooperation and assistance is similar to that on-scene, with the important distinction that off-scene activities are not in the area directly associated with the recovery of the nuclear or other radioactive material. Therefore, the risk to the health and safety of any individual, team or group rendering such assistance may be more easily manageable. Possible areas in which off-scene cooperation and assistance might be requested include:

(a) Assessment of likely or potential consequences of a nuclear security event;
(b) Development of specifications for, identifying potential sources of, and aiding in the delivery of equipment to be used in managing the radiological crime scene;
(c) Provision of experts and equipment to assist with off-scene screening and treatment of individuals exposed to radiation or with other injuries related to the incident;
(d) Provision of experts to assist with locating, identifying and gathering of off-scene items of potential evidentiary value;
(e) Provision of knowledgeable personnel who can give direction, advice and support with regard to the taking of statements from witnesses or the follow-up of investigative leads related to events associated with the radiological crime scene;
(f) Identification of interim or permanent storage sites for evidence contaminated with radionuclides and for nuclear or other radioactive material;
(g) Identification and coordination of potential locations for analysis to support any nuclear forensic investigation needed to assist in attribution of the nuclear or other radioactive material;
(h) Development of strategies for communicating to the public, other States and relevant international organizations [12, 16].

6.11. One example of off-scene cooperation and assistance that might be afforded to States is that offered by INTERPOL. Operation Fail Safe takes advantage of INTERPOL's Notice System to generate the issuance of a Green Notice regarding individuals involved in the smuggling of nuclear or other radioactive material. Project Geiger involves the development and sharing of analytical products on illicit trafficking and other events (see Annex II).

DEVELOPMENT OF ARRANGEMENTS FOR ASSISTANCE

6.12. In developing or in responding to a request for assistance, it is important to establish a firm understanding of the basis of the request for assistance. Issues to consider include:

(a) Whether payment is to be offered or is expected for the assistance and, if so, the amount, method and timing of that payment;
(b) Whether testimony will be required from donor State personnel and, if so, under what conditions and laws that testimony is to be provided and whether the expertise of such personnel would be recognized in the national legal system of the requesting State;
(c) How security of sensitive information associated with the donor(s) and the recipient State will be managed;
(d) The exact roles and responsibilities of any individual, team or group providing assistance, and the arrangements for command and control of that individual, team or group;
(e) Provisions for medical assistance provided by the donor(s) to individuals from another State present on-scene or otherwise in the State (including expectations regarding payment for such medical assistance);
(f) Arrangements for logistical support (such as lodging, meals and transport) and for personal security (if needed) for any individual, team or group from the donor(s) rendering assistance;
(g) Whether visas might be required and, if so, what assistance might be provided by the requesting State toward obtaining these visas;
(h) Whether and how any individual, team or group from the donor(s) might be indemnified against any unintentional acts that are deemed harmful by an individual, private group or governmental entity in the State receiving the assistance;
(i) The expectations of the receiving State and the donor(s) with regard to sharing of any information regarding the assistance being provided, including the information that assistance is being provided, and clarification of who (if anyone) is authorized to speak publicly on behalf of the assisting State(s).

6.13. One means of formalizing such arrangements is to develop a bilateral or multilateral assistance agreement, memorandum of understanding or similar instrument in advance of any nuclear security event where such assistance might be required or desired. Some of the issues listed above may have been agreed upon in more general mutual assistance agreements and, consequently, could be included by reference. The existence of an approved agreement might expedite

any response to a request for assistance by ensuring that all parties already understand expectations and limitations that apply to the individual, team or group providing assistance to the requesting State.

Appendix I

SAMPLE FORMS USED FOR RADIOLOGICAL CRIME SCENE MANAGEMENT

I.1. This Appendix provides samples of some of the forms that might be used for radiological crime scene management. Each form is described in terms of its intended use, the essential elements of information to be recorded on the form and the crime scene personnel routinely associated with its preparation. All forms, once used, become part of the record of the crime scene and, therefore, should be retained in accordance with national arrangements. The forms given in Figs 5–16 are generic in nature. States might alter or otherwise adapt each form as needed to suit their national requirements or preferences.

ADMINISTRATIVE WORKSHEET

I.2. The administrative worksheet is used to record general information regarding the crime scene, the duties of all personnel involved in processing the scene, and all pertinent times and critical events that occurred during the processing of the scene. It typically consists of three parts:

(a) A cover page;
(b) A notes and observations section;
(c) A record of actions.

I.3. A sample administrative worksheet A cover page is given in Fig. 5. Essential elements of information to be recorded on this cover page include:

(a) Unique identifier associated with the investigation, such as its name or number;
(b) Geographical location of the scene;
(c) Conditions at the scene on arrival;
(d) Weather at the scene;
(e) Lighting conditions at the scene;
(f) Notes and observations regarding the scene itself, such as preliminary survey results and special conditions or situations (if any).

I.4. Those personnel who are named on the cover page should place their initials next to their name. This step both ensures that they acknowledge their assignments and assists in identifying initials placed on evidence packaging. The

ADMINISTRATIVE WORKSHEET A

PAGE ____ OF_____
DATE_____

CRIME SCENE OPERATIONS DATA	NOTES/OBSERVATIONS
Case identifier	
Location of the scene	
Preparer/assistant	
Time and date of arrival	
Person(s) present at the scene at time of arrival	
Control of scene obtained from/time/date	
Condition of the scene (secured/unsecured)	
Lighting conditions	
Weather conditions	

FIG. 5. Generic administrative worksheet — cover page.

cover page should also indicate whether local authorities secured the scene prior to the arrival of the on-scene commander and the persons handing over the scene.

I.5. A sample notes and observations administrative worksheet B is given in Fig. 6. These notes and observations record any occurrence or result of a meeting or briefing held at the scene or any information collected at the scene. Examples of such notes and observations for a radiological crime scene include entries to indicate when and by whom briefings were given on the event action plan (para. 4.11) and the scene safety plan (paras 4.12–4.14). The time and date when processing of the scene was completed is recorded in this section, including indication of who deemed the processing to be complete and to whom the scene was released.

I.6. A sample administrative worksheet C is given in Fig. 7. The administrative worksheet is a useful tool for documenting the sequence of relevant actions taken at the scene and who was involved in taking these actions. Examples of events to be recorded include:

(a) Arrival at the scene;
(b) Conduct of the initial walk-through;
(c) Initiation of the radiation survey;

ADMINISTRATIVE WORKSHEET B

PAGE ____ OF_____

DATE_____

CRIME SCENE OPERATIONS DATA	NOTES/OBSERVATIONS
Scene consists of	
Personnel involved in search and their respective duties	
Preliminary survey/evidence evaluation	
Special situations or conditions	
Crime scene conference	
Final survey	
Crime scene operations completed and release of scene authorized	Name:
	Title:
	Date:
	Signature:
Crime scene released to	Name:
	Title:
	Date:
	Signature:

FIG. 6. Generic administrative worksheet — notes and observations.

(d) Briefing of the evidence recovery team;
(e) Conclusion of operations.

Entries should also be made to indicate any arrival of news media representatives and the action taken in dealing with these representatives.

RADIATION SURVEY MAP

I.7. The radiation survey map provides a record of the radiation levels at the radiological crime scene. It records the results of a radiation survey of the scene. It is prepared by or at the direction of the radiological assessor (para. 3.24), with

ADMINISTRATIVE WORKSHEET C

PAGE ____ OF_____

DATE_____

TIME	ACTIONS TAKEN AND PERSONNEL INVOLVED

FIG. 7. Generic administrative worksheet — record of actions.

advice from evidence recovery personnel regarding the particular areas to be monitored. Essential elements of information given on this map are the:

(a) Location of the survey;
(b) Date of the survey;
(c) Name of the person preparing the survey;
(d) Radiation detector used for each survey result;
(e) Result, in terms of dose rate for radiation field or count rate for surface activity.

In addition, the map records the position of swipe samples. The map also notes the background dose rate. A sample radiation survey map is shown in Fig. 8.

PERSONAL EXTERNAL RADIATION MONITORING LOG

I.8. The personal external radiation monitoring log records the external radiation dose received by each person in the radiological crime scene. The radiological assessor is responsible for ensuring that this log is maintained, with assistance from the evidence recovery team leader and/or scene safety officer. Essential elements of information given on this form are, for each individual operating in the hazard control area:

RADIATION SURVEY MAP

PAGE ____ OF_____

DATE_____

Case identifier:	**Location:**	**Name and signature:**

Instrument type:	**Instrument calibration date:**

Number	**Dose rate/count rate**	**Number**	**Dose rate/count rate**

Survey map drawing:

FIG. 8. Generic radiation survey map.

(a) Unique identifier associated with the case, event or incident, such as its name or number;
(b) Date;
(c) Name of the recording and monitored individuals;
(d) Model and serial number of the personal radiation monitoring device carried by this individual;
(e) Time of reading and the time spent in hazard control area;
(f) Estimated external radiation dose**.**

A sample personal external radiation monitoring log is given in Fig. 9.

PERSONAL EXTERNAL RADIATION MONITORING LOG

PAGE ____ OF_____

DATE_____

Case identifier:		**Prepared by:** *(name, signature)*		
Name and personal ID no.: *(monitored person)*				
1) Using direct reading personal dosimeter				
Dosimeter type:		**Model:**	**Serial no.:**	
Date of reading	**Time of reading**	**Reading (mSv)**	**Location at time of reading**	
2) Using gamma dose rate meter				
Dosimeter type:		**Model:**	**Serial No.:**	
Location	**Dose rate (mSv)**	**Time spent (min)**	**Estimated external dose**	
3) Using thermoluminescent dosimeter (TLD) or film badge				
TLD or film badge no.: *(NOT to be read in the field)*				
Received	**Signature**	**Date/time**	**Signature**	**Reading (mSv)**
NOTE: Film badge or TLDs should be assessed as soon as possible after the exposure and recorded above. To ensure a quick response, the dosimetry service should be informed if the dosimeter was worn during a crime scene operation.				

FIG. 9. Generic personal external radiation monitoring log.

SCENE DIAGRAM

I.9. The scene diagram, or sketch, provides a pictorial record of the radiological crime scene as found prior to collecting evidence. It is typically tied to the photographic log and the evidence recovery log. It is prepared by the scene modeller (paras 3.25 and 3.26). Essential elements of information given on this diagram are:

(a) Date;
(b) Unique identifier associated with the case, event or incident, such as its name or number;

(c) Name of the scene modeller and of any other personnel assisting in preparing the diagram;
(d) Reference data, such as scale, compass orientation, fixed objects (such as geographical features or structures);
(e) Location of any items of evidence that are recovered.

A sample scene diagram/sketch form is given in Fig. 10.

CHAIN OF CUSTODY

I.10. Chain of custody for evidence begins at the crime scene. Each item of evidence has its own chain of custody and, hence, its own form. Essential elements of information given on this form are:

(a) Description of the item;
(b) From whom or from where it was obtained;
(c) Name and signature of the person who obtained the item;
(d) Date on which it was obtained;
(e) Unique identifier associated with the case, event or incident, such as its name or number.

Each transfer of the item is recorded, giving the location, date of transfer, name and signature of the person releasing the item and name and signature of the person receiving the item. This form remains with the item as documentation of its provenance. A sample chain of custody form is given in Fig. 11.

PHOTOGRAPHIC LOG

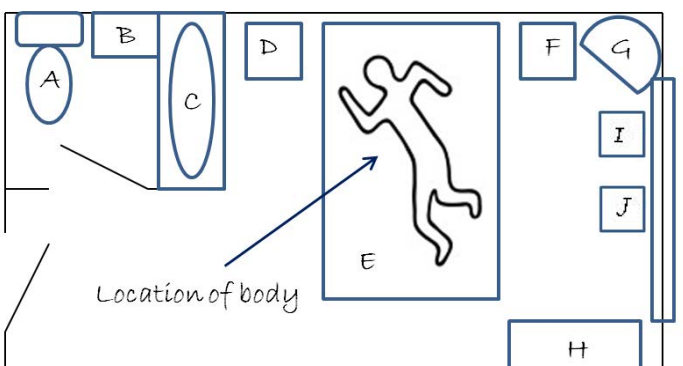
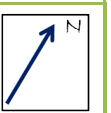
I.11. The photographic log provides a record of images taken at the radiological crime scene. It is typically linked to the scene diagram and the evidence recovery log. It is prepared by the photographer (paras 3.31–3.33). Essential elements of information given on this log are:

(a) Date;
(b) Unique identifier associated with the case, event or incident, such as its name or number;
(c) Name of the photographer and of any other person assisting with photographing the scene;

SCENE DIAGRAM/SKETCH FORM

PAGE ____ OF_____

DATE_____

General information	Reference
Date:	**Scale or disclaimer**: NOT TO SCALE
Case identifier:	**Evidence**:
Location:	**Fixed objects:**
Preparer/assistants:	**Compass orientation:**
	**Key legend:** 

Fixed Objects
A - toilet
B - wash basin
C - tub/shower
D - night stand with lamp
E - bed with two pillows
F - night stand with lamp
G - chair
H - dresser with TV

Evidence:
I - Source Pig
J - Lead container

FIG. 10. Generic scene diagram/sketch form.

CHAIN OF CUSTODY FORM

PAGE ____ OF_____

DATE_____

Description of item:		
Obtained from: *(title, name, location and phone number)*		
Printed name of investigator:	**Signature of investigator:**	**Date obtained:**
Case identifier:		
Temporary deposition of item(s): *(where stored)*		
Released by: *(printed name and signature)*	**Released to:** *(printed name and signature)*	**Date:**
Temporary deposition of item(s): *(where stored)*		
Released by: *(printed name and signature)*	**Released to:** *(printed name and signature)*	**Date:**

FIG. 11. Generic chain of custody form.

(d) Unique identifier/photo number and description for each photograph or other image that is taken.

A sample photographic log is given in Fig. 12.

EVIDENCE RECOVERY LOG

I.12. The evidence recovery log cover sheet provides a record of both the personnel collecting evidence at a radiological crime scene and the items of evidence collected. It is prepared by the evidence recorder/custodian (paras 3.34 and 3.35). It is typically prepared in two parts: a cover sheet and a listing of the items of evidence. Essential elements of information on the evidence recovery log cover sheet are:

(a) Date;
(b) Unique identifier associated with the case, event or incident, such as its name or number;

PHOTOGRAPHIC LOG

PAGE ____ OF_____

DATE_____

General information	
Date:	
Case identifier:	
Photographer/assistant:	
Remarks:	
Photo number	**Description of photographic subject/area**

FIG. 12. Generic photographic log.

(c) Location;
(d) Identifying information, signature and initials of all personnel involved in collecting items of evidence.

A sample evidence recovery log cover sheet is given in Fig. 13.

I.13. Essential elements of information on the evidence recovery log are:

(a) Date;
(b) Unique identifier associated with the case, event or incident, such as its name or number;
(c) Location;
(d) Name of the personnel preparing the log;
(e) Information on each item of evidence recovered.

This information includes the unique identifier assigned to each item, a description of the item, the location where it was collected, identity of the personnel who collected it, the unique identifier for any photographs taken of the evidence and the method used to package the item. A sample evidence recovery log is given in Fig. 14.

EVIDENCE RECOVERY LOG – COVER SHEET

PAGE ____ OF_____

DATE_____

General information	Complete if applicable
Date:	**Site number:**
Case identifier:	**Team number:**
Location:	**Grid number:**
Remarks:	**Remarks:**

Search team personnel					
Print full name	**Signature**	**Agency**	**Office/division**	**Phone**	**Print initials**

FIG. 13. Generic cover sheet (this sheet accompanies the evidence recovery log).

EVIDENCE RECOVERY LOG

PAGE ____ OF_____

DATE_____

General information	Personnel (include initials)
Case identifier:	
Location:	
Preparer/assistants:	

Item number	Description	Where found	Recovered by	Photo	Marking	Packaging method	Comments

FIG. 14. Generic Evidence Recovery Log. This sheet is accompanied by a cover sheet detailing the evidence recovery personnel.

CRIME SCENE ENTRY LOG

I.14. The crime scene entry log is used to record each person entering or exiting the scene. Essential elements of information include:

(a) Name of the agency having responsibility for managing the scene or for maintaining the entry log;
(b) Unique identifier associated with the case, event or incident, such as its name or number;
(c) Geographical location of the scene;
(d) Name of each person entering or exiting the scene;
(e) Date and time of each entry;
(f) Date and time of each exit;
(g) Reason for each person entering the scene.

Local practices might dictate inclusion of additional information, such as the title and agency of each person entering or exiting the scene, or might require the signature of each person to be recorded in the entry log. A sample entry log is given in Fig. 15.

RADIOACTIVE MATERIAL LABEL

I.15. The radioactive material (RAM) label is affixed to each item of evidence collected at a radiological crime scene when that item is determined to have a level of activity or give rise to radiation in excess of thresholds specified in national or local standards. Essential elements of information given on this label are:

(a) Evidence item number (an identifier that is unique to that item);
(b) Description of the item;
(c) Location where it was collected;
(d) Unique identifier associated with the case, event or incident, such as its name or number;
(e) Date collected;
(f) Personnel who collected the item;
(g) Radiation survey data describing the nature of the radiation associated with the item.

A generic RAM label is shown in Fig. 16.

CRIME SCENE ENTRY LOG

ALL PERSONS ENTERING THE SCENE MUST SIGN THIS SHEET

PAGE ____ OF_____

DATE_____

AGENCY:					
LOCATION:		**CASE IDENTIFIER:**			
NOTE: Officers assigned to maintain scene security must also log in and out on this sheet					
NUMBER	**NAME, TITLE**	**AGENCY**	**DATE / TIME IN**	**DATE / TIME OUT**	**REASON FOR ENTERING**

FIG. 15. Generic crime scene entry log.

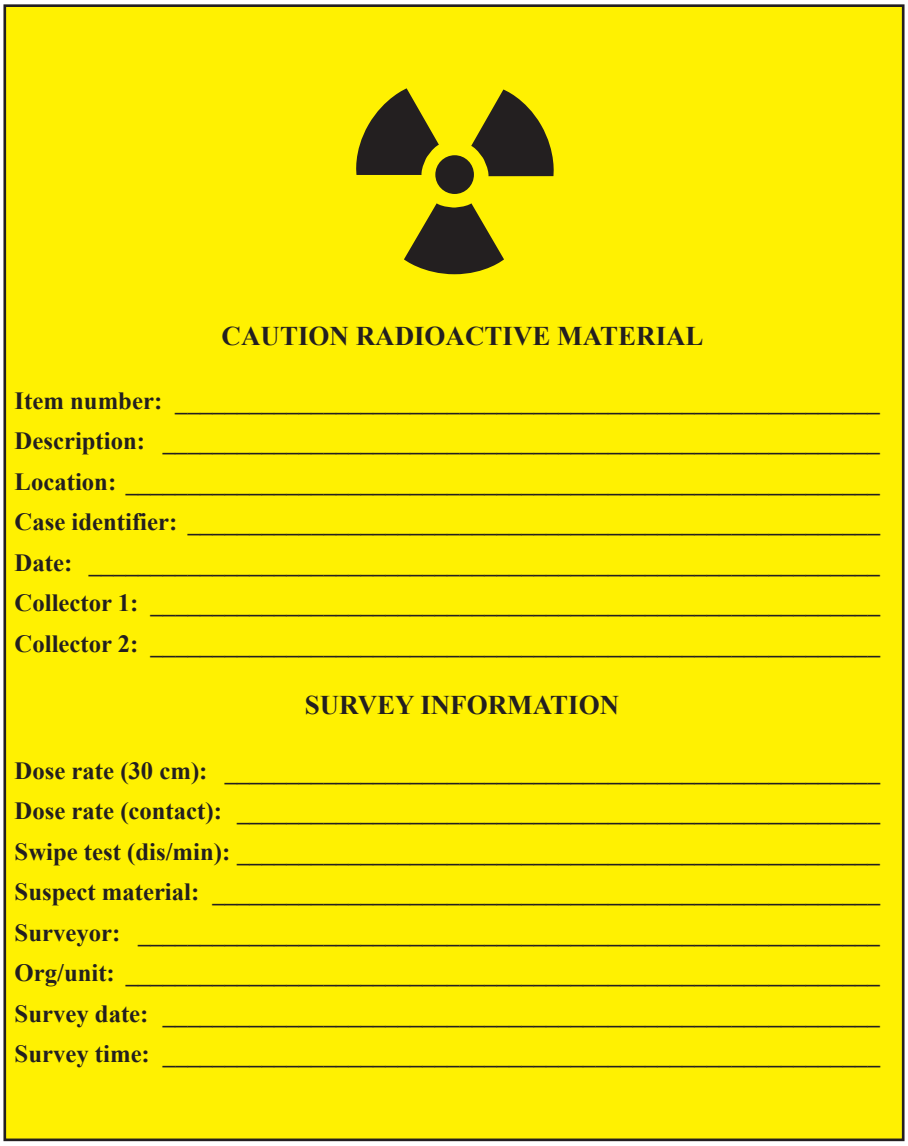


FIG. 16. Generic radioactive material label.

Appendix II

HAZARDS COMMONLY ENCOUNTERED AT CRIME SCENES

II.1. This Appendix briefly describes examples of hazards that might be encountered at any crime scene and, therefore, are to be considered when preparing the common hazards risk assessment (paras 4.8–4.14) and when developing scene specific risk reduction measures (paras 4.15–4.24). The hazardous materials operations specialist (paras 3.20 and 3.21) and the safety specialist (paras 3.22 and 3.23) collaborate in conducting the common hazards risk assessment and in developing risk reduction measures. The assessment and the plan for risk reduction become part of the record of the crime scene.

II.2. Examples of such hazards are as follows:

(a) Chemical or fuel storage tanks, such as those used for chlorine, fuel oil, liquefied natural gas, petrol, propane and other commercial chemicals. The presence of such storage tanks might be of particular importance if the scene has been disrupted by an explosion connected with the nuclear security event or with causes independent of the event.
(b) Confined spaces, such as an empty swimming pool, the interior of a storage tank or a grain silo, a tunnel or an underground vault such as those used for utilities. Such spaces are inherently unsafe and present hazards, such as the possibility of a low oxygen atmosphere and the presence of harmful gases.
(c) Debris, such as concrete, broken or intact glass, construction materials and timber that might be on the ground or suspended above the site. The presence of such debris might call for special planning to ensure that on-scene personnel can manoeuvre safely, including avoiding compromising their PPE. Debris might also interfere with the operation of remotely controlled robotic devices used to aid in processing the scene.
(d) Explosives, including those that might be at the scene for legitimate purposes (e.g. blasting caps, dynamite or explosives for military use), as well as any explosives that might be associated with the nuclear or other radioactive material, as might be the case for an RDD.
(e) High voltage lines or exposed utilities, such as downed overhead electrical lines. Their presence might require coordination with personnel qualified to disconnect electrical supplies.
(f) Natural gas lines, petroleum pipelines or water and sewer lines. As with electrical utilities, the presence of such lines might require coordination with national or local authorities to have the flow through such lines stopped.

(g) Adverse weather, such as heavy rain, thunderstorms, high winds or snow. Such weather conditions might limit visibility for on-scene personnel, obscure the presence of items of potential evidentiary value or cause the uncontrolled dispersal of radionuclides within and beyond the scene. They might also pose a risk to the health and safety of on-scene personnel, for example by contributing to overheating or by creating slippery surfaces for pedestrian or vehicular traffic.

(h) Weapons and ammunition, especially if these items might fall into the hands of individuals whose interests are opposed to the orderly processing of the scene.

(i) Animals, such as livestock, feral animals, birds and pets. The presence of animals needs to be assessed relative to their potential to harm personnel physically, to be carriers of diseases that could be spread to or by on-site personnel, or to disperse radionuclides. The known, or suspected, presence of such animals may necessitate the inclusion of traps as part of the on-scene operations or the presence of an animal control technician, veterinarian or other expert in animal control.

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Annex I

TYPES OF EQUIPMENT SUITABLE FOR USE AT A RADIOLOGICAL CRIME SCENE

I–1. This Annex discusses representative types of radiation detection instruments, personal protective equipment and ancillary equipment suitable for use at a radiological crime scene. Selected examples of specific types of instruments and equipment are presented. However, these examples are for illustrative purposes only. The range of types and manufacturers of such instruments and equipment is extensive and subject to change. More comprehensive listings of instruments and equipment are available from Internet sources and publications such as Ref. [I–1]. States should select instruments and equipment that best suit their national arrangements and resources.

RADIATION DETECTION INSTRUMENTS

I–2. Once the presence of nuclear or other radioactive material has been confirmed at the scene of a nuclear security event, a more comprehensive effort is needed both to assess the radiation safety hazards and to identify the nuclear or other radioactive material. Table I–1 describes radiation detection instruments suitable for use in assessing radiation safety hazards. Table I–2 describes instruments suitable for use in on-scene material identification.

I–3. Figure I–1 illustrates examples of instruments suitable for use in performing on-scene assessment of radiation hazards.

I–4. Figure I–2 illustrates examples of instruments suitable for use in performing on-scene material identification. Additional information on radiation detection instruments is provided in Ref. [I–2].

PERSONAL PROTECTIVE EQUIPMENT

I–5. As noted in paras 5.16–5.18, preparation for radiological crime scene operations includes the selection of personal protective equipment (PPE). Items of PPE include:

(a) Respiratory protective equipment (RPE);
(b) Gloves (two layers of gloves is optimal);

TABLE I–1. EXAMPLES OF RADIATION DETECTION INSTRUMENTS SUITABLE FOR USE IN ASSESSING RADIATION SAFETY HAZARDS

Instrument	Function
Gamma and neutron dose rate meters (may require a telescopic arm for high dose rate measurements)	Source monitor Area monitor Map radiation fields Determine types of radiation emitted
Passive dosimeters (e.g. thermoluminescent dosimeters (TLDs), film badges, electronic personal dosimeters with alarm)	Personal dosimetry
Alpha/beta contamination monitors	Monitor personnel, equipment and scene Identify contaminated areas Identify source locations
Continuous air monitor (or air sampler with filters that can be measured with a survey meter/spectrometer)	Monitor air-borne radionuclides

Note: The radiation safety assessment should be determined by the radiological assessor. It is the basis for specification of personal protective equipment, dosimetry, radionuclide contamination controls and decontamination. The assessment also determines any off-scene risks needing mitigation or monitoring. In situations where air-borne radionuclides are present, additional internal dosimetry measurements or bioassay monitoring should be considered. The radiation safety assessment may be part of the common hazards assessment used to quantify all hazards present at the scene.

TABLE I–2. EXAMPLES OF RADIATION DETECTION INSTRUMENTS SUITABLE FOR USE IN ON-SCENE MATERIAL IDENTIFICATION

Instrument	Function
Low/medium resolution gamma ray spectrometer	Identify gamma emitting radionuclides
High resolution gamma ray spectrometer with high purity germanium detector and specialized expert level software for radionuclide identification including uranium/plutonium isotopic analysis codes (e.g. Multi-Group Analysis Software, Multi-Group Analysis for Uranium and Fixed-Energy, Response Function Analysis with Multiple Efficiency)	Identify gamma emitting radionuclides Perform quantitative analysis of radionuclides (estimate activity, etc.) Characterize uranium and plutonium through analysis of isotopic compositions and through quantitative analysis

Note: Identification of nuclear and other radioactive material at the scene requires expertise in the use of portable non-destructive analysis instrumentation. The information obtained during the radiation safety assessment is also relevant to material identification. In some cases, it may be necessary to obtain assistance from experts, such as personnel at laboratories routinely using similar instruments, to help interpret data. In addition to the identification of nuclear and other radioactive material, non-destructive analysis should be used to estimate the amount of material present. This estimation is necessary to determine specifications for both physical protection and transport. Results should be communicated to the nuclear forensic laboratory that will receive the material.

FIG. I–1. Various models and types of handheld instruments available for assessing a scene for radiation hazards.

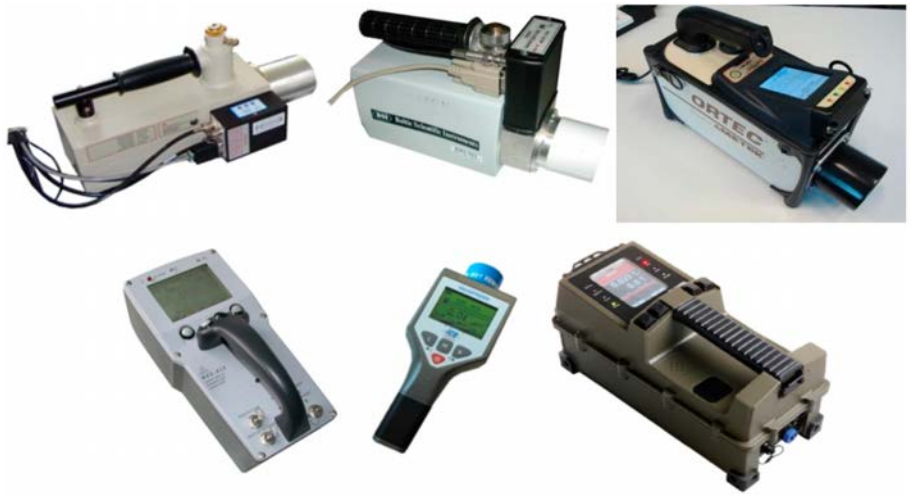


FIG. I–2. Various models and types of instruments available to identify radioactive materials at a scene.

(c) Footwear (can include overboots or shoe covers);
(d) Undergarments, such as vests worn to reduce heat load;
(e) Protective suits or other outer clothing (e.g. lead aprons).

I–6. All personnel entering the operational control area should wear suitable dosimeters in order to provide a record of the accumulated dose. Personnel should be equipped with self-reading (e.g. electronic) dosimeters with a range up to at least 250 mSv, as specified in Ref. [I–3].

I–7. PPE can be described in terms of the different levels of protection. A typical protection range is from Level A (greatest level of protection) to Level D (least level of protection). The level of protection for the PPE to be worn at the scene is decided upon by the on-scene/operational commander with advice from the hazardous materials operations specialist, the safety specialist and the radiological assessor. The PPE chosen could serve as equipment with different levels of protection (e.g. a Level B RPE coupled with a Level C suit), depending on the hazards present and the tasks to be undertaken at the scene.

I–8. Regardless of the level of PPE that it is worn, its use imposes limits on operational capabilities. These limits include:

(a) Restricted mobility and dexterity;
(b) Reduced vision (in terms of both field of vision and visual clarity);
(c) Degraded ability to communicate;
(d) Degraded ability for prolonged operations, especially in view of the thermal (heat) stress attendant to wearing protective suits.

I–9. Additional factors to consider include:

(a) Potential difficulties in obtaining a proper fit with certain designs of respiratory protection devices for individuals having facial hair;
(b) Weight of the PPE;
(c) Limited supply of breathable air associated with a self-contained breathing apparatus (SCBA);
(d) Completion of regular medical checks for personnel prior to the use of RPE, depending on national health and safety regulations;
(e) Limited shelf life of certain items of PPE, which makes procurement and quality assurance a priority;
(f) Possibility that wearing PPE may cause psychological stress in those wearing it due to the induced sensation of claustrophobia.

Level A

I–10. Level A affords the highest level of respiratory, dermal, eye and mucous membrane protection. The Level A PPE ensemble includes:

(a) A fully encapsulating, vapourtight suit, with integral chemical resistant hand and foot protection;
(b) Positive pressure (pressure demand) SCBA; positive pressure supplied air respirator with escape SCBA; or a closed-circuit breathing apparatus (CCBA) (any one of which is typically worn inside the suit);
(c) Chemical resistant gloves, inner and outer (depending on the suit glove construction);
(d) Chemical resistant boots with steel toe and shank (worn either inside or outside the suit, depending on the suit boot construction).

I–11. An example of a closed-circuit breathing apparatus is given in Fig. I–3.

I–12. Optional items worn with Level A include:

(a) Undergarments, cotton;
(b) Radiation shielding, such as lead-lined aprons and garments;
(c) Coveralls (worn under suit);

FIG. I–3. A CCBA is one option for respiratory protection when on-scene conditions require the highest level of respiratory protection.

(d) Safety helmet (worn under suit);
(e) Special overgarments for protection from fire or other high thermal load hazards;
(f) Special undergarments to assist in either reducing heat load or providing warmth, as dictated by local environmental circumstances.

An example of individuals wearing Level A PPE ensembles is given in Fig. I–4.

Level B

I–13. Level B affords the highest level of respiratory protection but a reduced level of dermal, eye and mucous membrane protection. The Level B PPE ensemble includes:

(a) Chemical (splash) resistant clothing (not vapourtight) (such as overalls and long sleeved jacket, coveralls, hooded two-piece chemical splash suit);
(b) Positive pressure (pressure demand) SCBA or positive pressure supplied air respirator with escape SCBA;
(c) Chemical resistant inner and outer gloves;
(d) Chemical resistant boots with steel toe and shank and worn outside the suit.

I–14. Optional items worn with Level B include:

(a) Coveralls (worn under the suit);
(b) Chemical resistant boot covers;

FIG. I–4. Level A PPE ensembles, as shown on these individuals during a training exercise, afford the highest level of respiratory, dermal, eye and mucous membrane protection.

(c) Radiation shielding, such as lead-lined aprons and garments;
(d) Safety helmet;
(e) Special overgarments for protection from fire or other high thermal load hazards;
(f) Special undergarments to help to either reduce heat load or provide warmth.

I–15. An example of individuals wearing Level B PPE ensembles is given in Fig. I–5.

Level C

I–16. Level C affords a reduced level of respiratory, dermal, eye and mucous membrane protection. The Level C PPE ensemble includes:

(a) Chemical resistant clothing (such as a one-piece coverall, hooded two-piece chemical protective (splash) suit, chemical resistant hood and apron, disposable chemical resistant coveralls);
(b) Full-face, or half-mask, air purifying respirator;
(c) Chemical resistant inner and outer gloves;
(d) Chemical resistant boots with steel toe and shank and worn outside the suit.

FIG. I–5. Personnel wearing Level B PPE ensembles, with SCBA, undergoing equipment check prior to entering a hazard control area.

I–17. Examples of half-mask air purifying respirators are shown in Fig. I–6.

I–18. Optional items worn with Level C include:

(a) Face shield;
(b) Coveralls (worn inside chemical protective clothing);
(c) Safety helmet;
(d) Chemical resistant boot covers;
(e) Radiation shielding, such as lead-lined aprons and garments;
(f) Specialty undergarments to help to either reduce heat load or provide warmth;
(g) Specialty overgarments for protection from fire or other high thermal load hazards;
(h) Escape mask (i.e. a full-face or half-mask designed to provide interim respiratory protection so that personnel might safely exit an environment where toxic chemical vapour is encountered).

I–19. An example of individuals wearing Level C PPE ensembles is given in Fig. I–7.

Level D

I–20. Level D affords the lowest level of respiratory, dermal, eye and mucous membrane protection. The Level D PPE ensemble includes the normal work

FIG. I–6. Half-mask air purifying respirators, such as those depicted here, include both the face piece (upper portion of the figure) and the filter. Various options are available for the filter, and selecting the proper configuration of face piece and filter is dictated by local conditions plus national standards.

uniform, coveralls or overalls plus safety glasses, safety helmet, and safety shoes (with steel toes and shanks). Other items, such as gloves, special garments for protection from fire or other high thermal load hazards, and radiation shielding aprons and garments, may be required in accordance with the specific situation.

ANCILLARY EQUIPMENT

I–21. As noted in paras 5.19 and 5.20, preparation for radiological crime scene operations includes the selection of ancillary equipment. Examples of ancillary equipment include:

(a) Communications equipment;
(b) Decontamination equipment;
(c) Equipment for evacuating casualties;

FIG. I–7. Individuals wearing Level C PPE ensembles, including a powered air purifying respirator and safety helmet, are shown prior to entering a hazard control area.

(d) Evidence collection, packaging and transport containers;
(e) Manipulators and remotely operated vehicles for grasping or moving objects, such as evidence.

Communications equipment

I–22. While effective and timely communication is essential for all crime scene operations, special conditions exist for communication at a radiological crime scene. For example, the need to monitor and report levels of radioactivity encountered in the hazard control areas means personnel operating within these areas should routinely communicate such levels to the radiological assessor, scene safety officer or other on-scene personnel. Similarly, the radiological assessor, scene safety officer and other on-scene personnel may need to communicate with personnel in the hazard control areas to ensure they exit the areas before reaching their turn-back dose rate or cumulative radiation dose limit. Finally, on-scene personnel may need to communicate with outside parties, such as subject matter experts at nuclear forensic laboratories, regarding unfamiliar items or unusual radioactive material that is encountered.

I–23. Personnel conducting operations while wearing PPE in a radiological crime scene face several challenges regarding communication. For example, RPE presents a challenge owing to the degradation of voice communications. Additionally, PPE may include protective clothing that covers the ears. Any communications equipment should be:

(a) Compatible with the PPE ensemble such that it does not degrade the protection provided by the PPE.
(b) Designed for ease of operations for personnel wearing PPE.
(c) Intrinsically safe, meaning that the communications equipment will not prevent alarm recognition, will not spark, and will have a limited output of energy. These non-sparking and limited energy features are needed to avoid the accidental ignition of flammable gases or dust or the accidental activation of an explosive device.

Decontamination equipment

I–24. Decontamination is the process of using chemical and/or physical means to remove or otherwise contain radionuclides, thus limiting their unintentional spread beyond the radiological crime scene. In some cases, the careful removal of PPE from personnel and the correct packaging of evidence, together with contamination controls for open radioactive material, will be sufficient to

effectively limit the spread of radionuclides from the scene. In other cases, the removal of radionuclide contamination from animals, areas, equipment, evidence and personnel may be necessary to effectively manage radiological crime scene operations. Various tools and procedures have been developed for this purpose. Many of these tools reflect a low technology approach to removal or containment of radioactive material. Such low technology tools include:

(a) Handheld survey meters (alpha, beta, gamma) for contamination controls before, during and after decontamination (see Table I–1);
(b) Handheld sprayers (such as those used for house plants) filled with water or glycerol solution or hairspray to fix small areas of surface contamination on PPE prior to removal;
(c) Tape, scissors and extra protective suits for covering up small contaminated areas on protective suits prior to removal;
(d) Backpack and handheld, pump operated pressure sprayers (such as those used for applying liquids in gardens and to lawns) for washing down large areas;
(e) Brooms, brushes (including nail brushes) and mops;
(f) Buckets;
(g) Inflatable wading pools;
(h) Plastic or rubber sheeting (for ground cover);
(i) Water storage bags, tanks and similar containers, including those that are portable or collapsible;
(j) Watering hoses;
(k) Large waste disposal sacks;
(l) Clothing for personnel to change into after decontamination measures are complete.

I–25. Slightly higher technology tools include portable showers, shelters, tents and portable decontamination kits, among other things. These units can be used as a decontamination station for personnel and equipment, or for decontamination of selected items of evidence or equipment.

I–26. It is important that personnel at the decontamination station are familiar with all applicable operational procedures and with all deployed PPE, and know in which order, and how, the PPE should be removed. RPE should generally be left on as long as possible to prevent inhalation of air-borne radionuclides (particles). The PPE should be removed with the outer surface turned inwards to prevent the spread of radioactive material. In the case of skin contamination with radionuclides, with or without injuries to the person involved, the radiological assessor should be consulted for advice on the correct decontamination measures.

Equipment for evacuating casualties

I–27. Operations at a radiological crime scene may include evacuation of casualties. These casualties might be victims or perpetrators of the nuclear security event associated with the crime scene. They might also be personnel operating in the operational control areas or the hazard control areas. Casualties who are mobile (i.e. who can move with minimal assistance) might be able to pass through the decontamination station alone. Casualties who are unconscious, who have limited mobility, or who have open wounds may need special procedures and equipment for decontamination. In all cases, life saving measures take precedence over decontamination measures. Guidance on providing medical care to victims of a nuclear security event is given in Ref. [I–4].

Evidence collection, packaging and transport containers

I–28. Evidence collection, packaging and transport may be subject to national and international regulations, such as those given in Refs [I–5, I–6]. These regulations establish standards of safety for radiation, criticality and thermal hazards to persons, property and the environment associated with transport of radioactive material. Various items of equipment have been developed to ensure compliance with these regulations in particular and with best practices for containers used in evidence collection, packaging and transport in general.

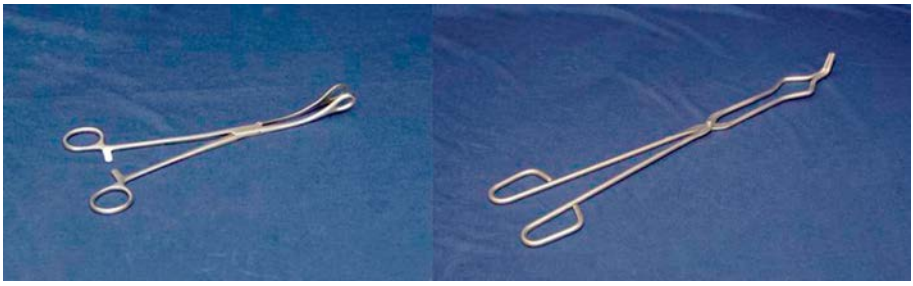
I–29. Figure I–8 depicts various smaller evidence transport containers.

FIG. I–8. Various sizes and configurations of evidence transport containers have been developed, as shown here by these examples which are suitable for smaller items of radioactive material. Note that the container on the left bears a radioactive material (RAM) label, such as the one described in Appendix I.

Manipulators and remotely operated vehicles

I–30. Manipulators and remotely operated vehicles afford a means of limiting the time spent by personnel in the hazard control area and maximizing the distance between individuals and radiation hazards. Manipulators can be low technology tools, such as short or long handled manipulating tools used to grip or to move objects, such as debris, that might be an obstacle to the collection of evidence. These manipulators can also be used to grasp the evidence itself. Fig. I–9 depicts a pair of such manipulators; in this case, the manipulators are also referred to as tweezers or tongs.

I–31. By contrast, remotely operated vehicles are typically higher technology equipment, such as robotic platforms that have been developed for the explosive ordnance disposal community. Remotely operated vehicles can effectively replace human involvement in radiological crime scene operations to, for example, safely conduct the initial entry to a scene, perform radiation surveys and provide surveillance.



Note: Tweezers and tongs, as depicted in this figure, can be used to grasp evidence or to move objects that present obstacles to collecting evidence. The tweezers on the left of the figure are capable of locking in position once the item of interest has been grasped. The tongs on the right of the figure have extended handles to add distance between the individual and the item of interest to be collected or moved.

FIG. I–9. Manipulators.

REFERENCES TO ANNEX I

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Annex II

INTERPOL CBRNE TERRORISM PREVENTION PROGRAMME

II–1. International Criminal Police Organization–INTERPOL is the world's largest international police organization, with 190 member countries. Created in 1923 and headquartered in Lyon, France, it facilitates cross-border police cooperation and provides assistance to all organizations, authorities and services whose mission is to prevent or combat international crime.

II–2. INTERPOL's I-24/7 global police communications system connects law enforcement officials in all of its member countries, providing them with the means to share crucial information on criminals and criminal activities, 24 hours a day, seven days a week. Using INTERPOL's I-24/7 system, National Central Bureaus can search and cross-check data in a matter of seconds, with direct access to databases of information on, among other things, suspected terrorists, wanted persons, fingerprints, DNA profiles, lost or stolen travel documents, stolen motor vehicles and stolen works of art. These multiple resources give law enforcement officials instant access to potentially important information, thereby facilitating criminal investigations.

II–3. INTERPOL is able to provide support services to law enforcement operations, which include analysis, information exchange, incident response and coordination of national authorities for the full spectrum of chemical, biological, radiological, nuclear and explosives (CBRNE) threats and investigations.

II–4. The INTERPOL CBRNE Terrorism Prevention Programme is engaged in a wide range of activities to combat cross-border smuggling of CBRNE weapons and materials by non-State actors, including criminals and terrorists. INTERPOL is engaged in capacity building and training of member country authorities, the development of guidance documents and manuals and active investigations.

Operation Fail Safe

II–5. INTERPOL is uniquely positioned to engage in the global effort to counter nuclear smuggling through use of its internationally recognized notice system (INTERPOL notices are international requests for cooperation or alerts allowing police in member countries to share critical crime related information). INTERPOL's Operation Fail Safe addresses non-State actors and is being implemented to generate the issuance of INTERPOL Green Notices (e.g. a Green Notice is issued to provide warnings and criminal intelligence about persons

who have committed criminal offences and are likely to repeat these crimes in other countries) regarding individuals involved in the smuggling of radioactive or nuclear material. Upon query by law enforcement officials at border crossings or other locations, an alert will be generated based upon the Green Notice.

II–6. The INTERPOL Command and Coordination Centre, staffed continuously, will be notified of the country location and identity of the individual subject of the query and will subsequently notify the INTERPOL CBRNE Programme. This alert and notification process creates a new capability to detect transnational movement of individuals known to be engaged in this activity and facilitates contemporaneous operational coordination by the INTERPOL CBRNE Programme with, and at the discretion of, law enforcement in the affected States, consistent with their laws and policies.

II–7. If a State has established a Counter Nuclear Smuggling Team, which combines specific expertise across relevant disciplines, the coordination to address a situation effectively will be maximized.

II–8. The communication conducted through Operation Fail Safe expands the network of States engaged in the international effort to counter nuclear smuggling and supports the transition from national policy to positive operational engagement, with the goal of prevention.

Project Geiger

II–9. Intelligence is essential in order for INTERPOL and police services worldwide to tailor their operations to specific threats and to drive prevention programmes. Project Geiger focuses on collating and analysing information on illicit trafficking and other unauthorized activities involving radioactive/nuclear material. The Project Geiger database combines the IAEA's Incident and Trafficking Database with additional open source reports and law enforcement data collected through INTERPOL's secure channels.

II–10. The analytical products that are published through Project Geiger are highly valuable to both the international law enforcement community and to other international organizations working to prevent radiological and nuclear crimes. These products include Project Geiger monthly reports that assess current nuclear and other radioactive material trafficking threats, and other reports that address more specific issues, usually at the request of States or partner international organizations.

DEFINITIONS

The definitions given below may not necessarily conform to definitions adopted elsewhere for international use. Examples have been added to some definitions in order to assist the reader in understanding the definition. When examples are given, they are not intended to be exhaustive, or to limit the definition in any manner.

chain of custody. The procedures and documents that account for the integrity of physical evidence by tracking its handling and storage from its point of collection to its final disposition. Other terms for this process are 'chain of evidence', 'chain of physical custody' and 'chain of possession'.

competent authority. A governmental organization or institution that has been designated by a State to carry out one or more nuclear security functions.

— *Example*: Competent authorities may include regulatory bodies, law enforcement, customs and border control, intelligence and security agencies, health agencies, etc.

crime scene. A site containing records of activities, alleged to be a crime.

crime scene operations. The procedures that aim to control access at a crime scene, to document the scene as it was first encountered, and to recognize, collect, package and remove from the scene all relevant evidence.

hazard control area. A designated geographical area, representing the maximum extent of all hazards within a radiological crime scene, into which, within and from which access is controlled.

improvised nuclear device (IND). A device incorporating radioactive material designed to result in the formation of a nuclear yield reaction. Such devices may be fabricated in a completely improvised manner or may be an improvised modification to a nuclear weapon.

information alert. Time sensitive reporting that could indicate a nuclear security event, requiring assessment, and may come from a variety of sources, including operational information, medical surveillance, accounting and consigner/consignee discrepancies and border monitoring.

initial assessment. The process of analysing systematically and evaluating an information alert or an instrument alarm to determine whether a nuclear security event has occurred.

initial entry. The first controlled entry made into a crime scene, conducted for the purpose of gathering data regarding the nature and extent of on-scene hazards.

innocent alarm. An alarm found by subsequent assessment to have been caused by nuclear or other radioactive material under regulatory control or exempt or excluded from regulatory control.

instrument alarm. A signal from instruments that could indicate a nuclear security event requiring assessment. An instrument alarm may come from devices that are portable or deployed at fixed locations and operated to augment normal commerce protocols or law enforcement operation.

nuclear security event. An event that has potential or actual implications for nuclear security that must be addressed.

operational control area. A designated geographical area, representing the maximum extent of the area needed to support the management of a radiological crime scene, into and from which access is controlled.

radiation exposure device (RED). A device with radioactive material designed to intentionally expose members of the public to radiation.

radiological assessor. A person who, at a radiological crime scene, assists by performing radiation surveys, performing dose assessments, assisting with the control of radionuclide contamination, ensuring the radiation protection of crime scene personnel, and formulating recommendations on protective actions.

radiological crime scene. A crime scene in which a criminal act or intentional unauthorized act involving nuclear or other radioactive material has taken place or is suspected.

radiological dispersal device (RDD). A device to spread radioactive material using conventional explosives or other means.

regulatory control. Any form of institutional control applied to nuclear material or other radioactive material, associated facilities, or associated activities by any competent authority as required by the legislative and regulatory provisions related to safety, security, or safeguards.

— *Explanation*: The phrase 'out of regulatory control' is used to describe a situation where nuclear or other radioactive material is present in sufficient quantity that it should be under regulatory control, but control is absent, either because controls have failed for some reason, or they never existed.

response measure. A measure intended to assess an alarm/alert and to respond to a nuclear security event.

response system. An integrated set of response measures including capabilities and resources necessary for assessing the alarms/alerts and response to a nuclear security event.

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Radiological crime scene management is the process used to ensure safe, secure, effective and efficient operations at a crime scene where nuclear or other radioactive materials are known, or suspected, to be present. Managing a radiological crime scene is a key part of responding to a nuclear security event. Evidence collection at radiological crime scenes may share a wide range of characteristics with that at conventional crime scenes, such as evidence search patterns, geographical scene modelling and evidence recording, whether or not explosives are involved. This publication focuses on the framework and functional elements for managing a radiological crime scene that are distinct from any other crime scene. It assumes that States have a capability for managing conventional crime scenes.

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