

Protection of Emergency Workers and Helpers

IAEA-KINS Workshop on the Emergency Preparedness and Response to Nuclear and Radiological Emergencies

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Introduction

- Requirement 11: *“The government shall ensure that arrangements are in place to protect emergency workers and to protect helpers in an emergency”*
- Not all emergency workers may have been designated as such in advance. Also helpers may decide to join the responders
- Emergency workers and helpers should be registered and integrated into emergency response operations

Emergency Workers

- Person having specified duties in an emergency, who might be exposed while taking actions
 - Includes those employed by registrants and licensees
 - Includes police officers, fire fighters, medical personnel and drivers and crews of evacuation vehicles



Image courtesy CDC

Emergency Helpers

- Members of the public who willingly and voluntarily help in response to a nuclear or radiological emergency
- Helpers in an emergency are aware that they may be exposed to radiation while helping in response to a nuclear or radiological emergency



Image courtesy CDC

Requirements for Emergency Workers

- Should be clearly informed in advance of the associated health risks and protective actions
- Should be trained
 - In advance when pre-designated, or if not
 - Just-in-time: before being assigned his/her task

Requirements for Emergency Workers (cont.)

- Relevant requirements for occupational exposure in planned exposure situation are to be applied
- No emergency worker should be subject to an exposure in an emergency in excess of **500 mSv**
 - Unless exceptional circumstances are present

Requirements for Helpers

- Helpers in an emergency shall not be allowed to take actions that could result in their receiving doses in excess of an effective dose of **50 mSv**



Image courtesy CDC

Emergency Workers Categories

Emergency workers	Duty	Designated	Examples
Category 1	undertaking mitigatory actions and urgent protective actions on-site	Are designated in advance	• Operating facility personnel • Emergency services
Category 2	undertaking urgent protective actions off-site	Should be designated in advance	• Police, fire fighters, medical personnel and drivers • crews of evacuation vehicles
Category 3	undertaking early protective and other response actions off-site as well as other actions aimed at terminating the emergency	May not be designated in advance	<i>Participants: Can you give examples of category 3 emergency workers?</i>

Emergency Workers - Category 1

- Those undertaking **mitigatory actions** and urgent protective actions on-site
 - Life saving actions, actions to prevent development of catastrophic conditions, actions to prevent severe deterministic effects and actions to avert large collective dose
- Have to be designated as such **in advance**
- Most likely to be:
 - Operating facility personnel
 - Emergency services

Emergency Workers - Category 2

- Those undertaking **urgent protective actions off-site**
 - e.g. evacuation, sheltering, radiation monitoring
- Should be designated **in advance**
- Most likely to be:
 - Police, fire fighters, medical personnel and drivers and crews of evacuation vehicles

Emergency Workers - Category 3

- Those undertaking early protective actions and other response actions off-site as well as other actions aimed at terminating the emergency
 - e.g. relocation, decontamination, environmental monitoring
- May not be designated in advance

Requirements for Emergency Workers and Helpers

- **Arrangements** should be in place for:
 - Managing, controlling and recording the doses received
 - The provision of appropriate specialized protective equipment and monitoring equipment
 - The provision of medical follow-up and psychological counselling
 - Obtaining information to perform specified duties

Guidance Values For Restricting Exposure Of Emergency Workers

Tasks	Guidance value ^a		
	$H_p(10)^b$	E^c	AD_T^d
	<500 mSv	<500 mSv	$<\frac{1}{2}AD_{T, \text{ Table II.1}}^e$
Lifesaving actions	This value may be exceeded — with due consideration of the generic criteria in Table II.1 of Appendix II — under circumstances in which the expected benefits to others clearly outweigh the emergency worker's own health risks, and the emergency worker volunteers to take the action and understands and accepts these health risks		
Actions to prevent severe deterministic effects and actions to prevent the development of catastrophic conditions that could significantly affect people and the environment	<500 mSv	<500 mSv	$<\frac{1}{2}AD_{T, \text{ Table II.1}}$
Actions to avert a large collective dose	<100 mSv	$E < 100 \text{ mSv}$	$<\frac{1}{10}AD_{T, \text{ Table II.1}}$

Optimization During the Response Phase



- Situation is often **complex and ill-understood**
- Measurements related to **external dose**
- Establish **limits** based on external dose
 - Dose limits
 - Dose rate limits and alarms
- Provide respiratory protection to limit **inhalation dose**
- Provide **personal protective equipment** to limit skin dose
- **Iodine thyroid blocking** when radioactive iodine may be present

Optimization During the Response Phase (cont.)

- Minimize time within area with dose rate greater than **10 mSv/h**
- If dose rate is greater than **100 mSv/h**
 - Perform only life saving actions
 - Limit total time to less than 30 minutes
- Do not enter area with dose rate greater than **1 Sv/h**
 - Unless directed by radiological assessor

Optimization Means...

- Respecting limits
- Not exposing unless it is necessary
- Reducing internal dose contribution
- Providing the right equipment
- Keeping the dose well under the guidance values
- Rotating personnel

Reducing the Internal Hazard



Individual and collective protection measures



Control of radioactive contamination

Discussion



- What are the basic precautions emergency workers should adopt to protect themselves from radiation?

Briefing for Emergency Workers and Helpers

- Description of the work
- Work area radiation conditions
- Dosimetry
- Pre-job briefing
- Protective clothing and respiratory protection
- Stay time
- Maximum permissible level of radiation
- Other exposure reduction considerations



Protection of Female Emergency Workers

- If aware of pregnancy, notify employer
- Employer should make arrangements to protect the embryo or fetus



Understanding Radiation at the Scene

- Define and evaluate radiation levels at the scene
- Provide radiation survey to support operations at the scene



Image courtesy IAEA

Individual Monitoring of Emergency Workers and Helpers

- Dosimeters to be operated during work in radiation areas
- Team dosimetry may be acceptable
- Dose estimation based on time and dose rates is better than nothing



Monitoring of Individual Exposure

- TLD or OSL dosimeters are used as a primary individual dosimeter during response



Supplementary Individual Dosimeter



- Electronic dosimeters used as supplementary individual dosimeter for monitoring individual dose received during conduct of individual actions (operations)

Contamination of Skin/Clothing

- Not normally a concern except when burns to skin or severe deterministic effects from inadvertent ingestion
- Unlikely from secondary contamination
 - For example, from a contaminated person
- Dangerous levels of contamination removed by:
 - Washing hands and face
 - Removing outer clothing

Monitoring for Inhalation Hazard

- Surface contamination meters
- Air samplers with paper and charcoal filters



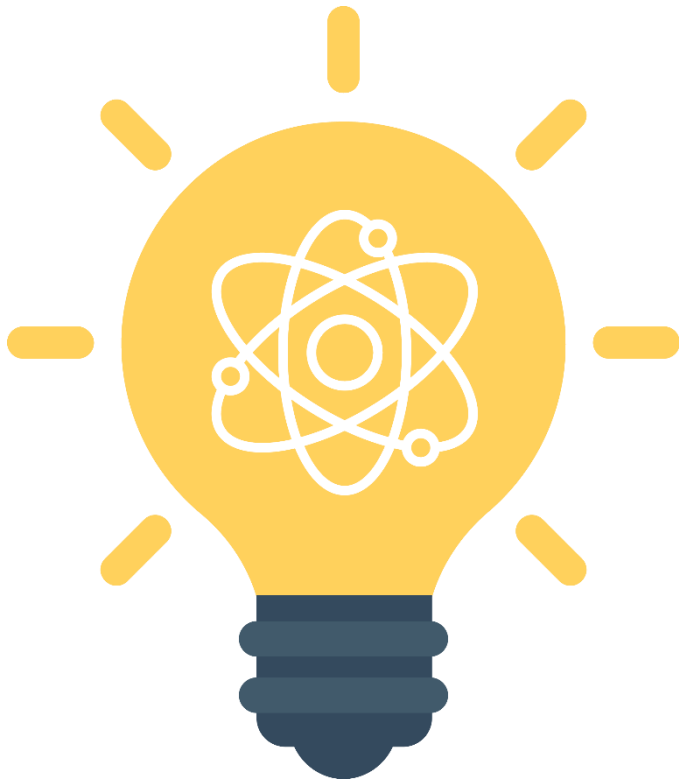
Image courtesy IAEA

After Transition to Existing Exposure Situation

- Apply relevant requirements for occupational exposure in a planned exposure situation



Key Points



- There are three categories of emergency workers
- Optimization at the preparedness stage means setting dose limits, designating and training
- Optimization at the response stage means minimizing while optimization during the transition phase means planning

Where to Get More Information

- IAEA GSR Part 7 (2015)
- IAEA GS-G-2.1 (2007)
- IAEA EPR-Method (2003)
- IAEA GSG-7 (2018)

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Thank you!

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