



**IAEA**

International Atomic Energy Agency

# Occupational Radiation Protection

## 4. Exposure of Workers in Emergency Exposure Situations

**GSG7 Section 4**

# Presentation contents

Emergency planning and responsibilities

Protection of emergency workers

Managing the exposure of emergency workers

Exposure assessment

Medical attention

# Introduction

The requirements for protection of workers in emergency situations are set out in GSR Part 3 (BSS) and Part 7

Four groups of workers may be exposed in an emergency situation:

1. Emergency workers who have specified duties
2. Workers at a facility not involved in response to nuclear or radiological emergency
3. Workers asked to leave site
4. Workers accidentally exposed as result of accident but where exposure is not related to emergency response

Duties of different workers in a nuclear or radiological emergency will differ and appropriate protection strategies should be applied to ensure adequate protection of all workers

# **EMERGENCY PLANNING AND RESPONSIBILITIES**

## Emergency Planning and Responsibilities

- Arrangements for protection of workers in a nuclear or radiological emergency should be part of emergency plan
- Emergency plan should include:
  - Roles and responsibilities
  - Immediate actions to be taken
  - Details of protective equipment and monitoring equipment to be used
  - Dosimetry arrangements
  - Consideration of access control for workers



# PROTECTION OF EMERGENCY WORKERS

## Protection of Emergency Workers

- Emergency workers, where possible, should be treated in accordance with graded approach - particularly in later stages of emergency
- Protection of emergency workers should include, as a minimum:
  - Training for designated emergency workers
  - Training for workers not designated in advance – ‘just in time training’
  - Manage, control and record doses received
  - Provision of protective equipment and monitoring equipment
  - Stable iodine thyroid blocking, if relevant
  - Medical follow-up
  - Informed consent obtained

# Radiation Protection Principles

## JUSTIFICATION

- ☐ Protective actions to be justified

## OPTIMIZATION

- ☐ Protection measures to be optimized
- ☐ Use of dose reference levels

## DOSE LIMITATION

- ☐ Emergency workers should be subject to dose limits where possible
- ☐ Dose guidance values (above limits) for specific duties eg. life saving

# Optimization

- ❖ Applied at preparedness stage
- ❖ Reference levels established
- ❖ **Initial phase** of response to nuclear or radiological emergency:
  - ❖ Lack of information
  - ❖ Need for urgency
  - ❖ Little scope to apply optimization
- ❖ **Late phase** of emergency:
  - ❖ Transition from emergency exposure situation to existing exposure situation
  - ❖ Protection measures to be optimized

## Dose limitation

- Emergency workers should be subject to dose limits where possible
- Dose guidance values for specific duties:
  - Life saving
  - Actions to prevent catastrophic conditions
  - Actions to prevent large collective dose
- Guidance value only exceeded if benefit to others clearly outweigh emergency worker's own health risk
- Emergency worker must volunteer and provide informed consent

Tasks	Guidance value
<p><b>Life saving</b></p> <p><b>Actions to prevent:</b></p> <ul style="list-style-type: none"><li>• severe deterministic effects</li><li>• development of catastrophic conditions</li></ul>	<p><b>Both E and Hp(10) &lt; 500 mSv</b></p> <p><b>Absorbed dose to tissues &lt;0.5 AD<sub>T</sub> values in GSR Pt 7, App II</b></p>
<p><b>Actions to avert a large collective dose</b></p>	<p><b>Both E and Hp(10) &lt; 100 mSv</b></p> <p><b>Absorbed dose to tissues &lt;0.1 AD<sub>T</sub> values in GSR Pt 7, App II</b></p>



## MANAGING THE EXPOSURE OF EMERGENCY WORKERS

## Managing the exposure of emergency workers

- ❑ Government is required to establish programme for managing, controlling and recording doses received by emergency workers in a nuclear or radiological emergency
- ❑ Response organization and employers should implement the programme
- ❑ Designated emergency workers can be divided into three categories
  - ❑ Category 1, 2 or 3

Cat.	Doing what?	Who?	When?
1	Urgent protective actions on site – including life saving and prevention of serious injury or development of catastrophic conditions	Likely to be operating personnel at facility, but may be emergency services personnel	Designated at preparedness stage
2	Urgent protective actions off site to avert large collective dose (eg evacuation, sheltering, radiation monitoring)	Police, fire fighters, medical personnel, drivers and crew of evacuation vehicles	Every effort made to designate at preparedness stage
3	Early protective actions and other actions off site (eg relocation, decontamination, environmental monitoring) aimed at terminating the emergency	Emergency services personnel, other response organizations	May or may not be designated at preparedness stage

## Managing the exposure of emergency workers

- Tasks assigned depending on category of worker
- Category 2 emergency workers should not be first choice for taking life saving actions
- Category 3 workers should not exceed an effective dose of 50 mSv
- Female workers that are breast-feeding or who are aware, or suspect that they are pregnant should be encouraged to notify their employer, and should typically be excluded from emergency tasks

## Managing the exposure of emergency workers

- ❖ Operational guidance based on measurement of external penetrating radiation (gamma and neutron dose rates)
- ❖ Doses from intakes, skin contamination and exposure of lens of eye prevented by all possible means
- ❖ Limits in duration and conditions of work driven by dose guidance values



## EXPOSURE ASSESSMENT

## Exposure assessment

- Response organizations and employers should take all reasonable steps to assess and record exposures received by workers in an emergency
- Exposures of emergency workers monitored on an individual basis (eg direct reading, alarm dosimeter)
- Doses received during emergency should be recorded separately from routine work, where possible
- Should be noted on workers' record of occupational exposure
- Information on doses received and associated health risks communicated to emergency worker

# MEDICAL ATTENTION

## Medical attention

- Emergency workers and accidentally exposed employees should receive medical attention appropriate to dose received
- Medical examination if dose received  $> 100$  mSv over a period of a month (or if worker requests)
- If dose received exceeds 200 mSv:
  - Worker may continue to work with radiation subject to qualified doctor confirming that they are fit to work

## Medical attention

- If dose received exceeds thresholds for severe deterministic effects protective actions should be taken, as appropriate:
  - Immediate medical examination
  - Contamination control
  - Immediate decorporation
  - Registration for longer term medical follow-up
  - Providing psychological counselling

## Key messages

- Emergency planning to allocate responsibilities and introduce system of protection of emergency workers
- Protection of emergency workers requires application of RP principles with graded approach
- Guidance values for restricting exposure
- Reasonable steps to assess and record exposure
- Medical attention should be given commensurate to dose received

# QUESTIONS AND DISCUSSION