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Development of on-site Radiological Emergency Methodology for Nuclear Facilities

wood.

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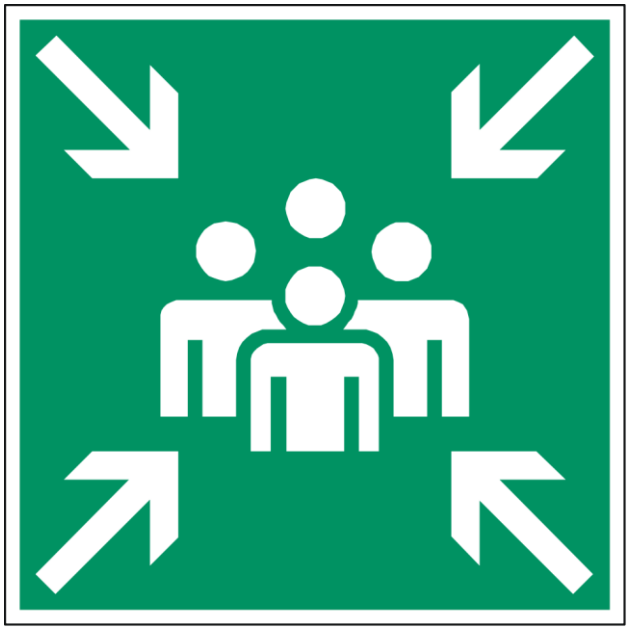
Introduction

- What is radiological evacuation?
- Do nuclear facilities have radiological evacuation plans?
- On-site emergency vs off-site emergency
- Wood have developed a comprehensive methodology for on-site radiological evacuation

Scope of presentation

- Overview of Evacuation Design Methodology
- Identification of:
  - Radiological Hazards
  - Personnel at Risk
  - Evacuation Initiating Mechanism
- Identification and Assessment of Evacuation Routes
- Evacuation Time Evaluation and Human Factors aspects

What exists currently?

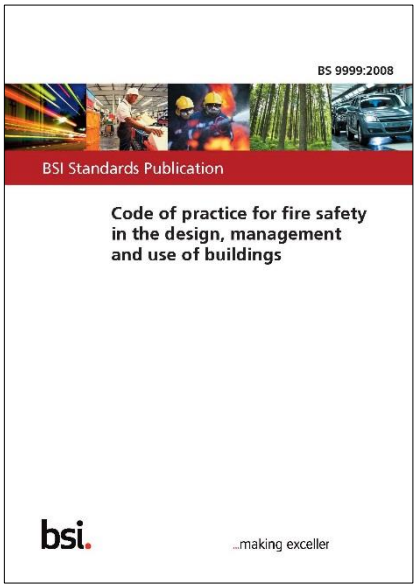


UK Guidance and the principle of ALARP

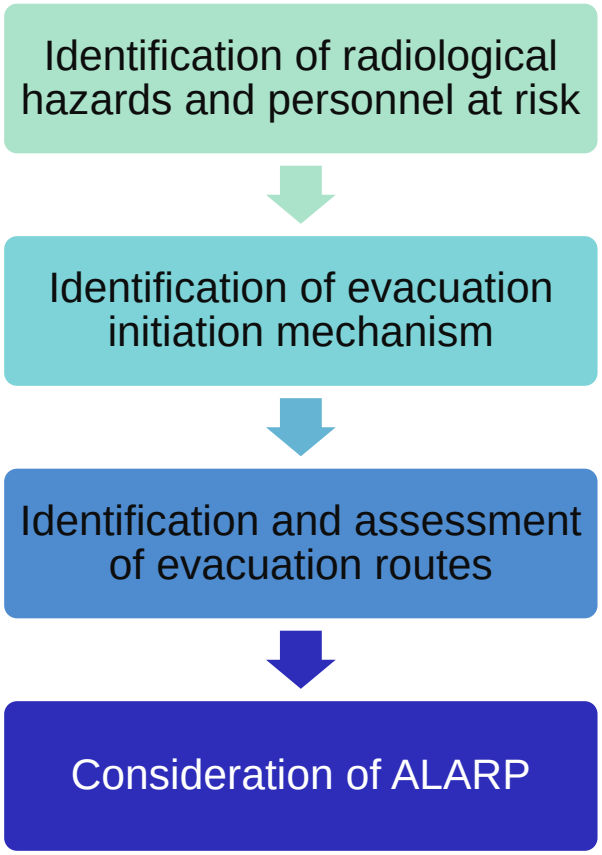
- **ALARP** - "**A**s **L**ow **A**s **R**easonably **P**racticable"
- Residual risk shall be reduced as far as reasonably practicable
- Often used in the regulation and management of safety-critical and safety-involved systems

Why do we need to consider radiological evacuation separately?

- Minimise radiation dose to workers
- Prompt evacuation via an ALARP route - dedicated radiological muster point
- Fire and radiological incident require separate evacuation instructions

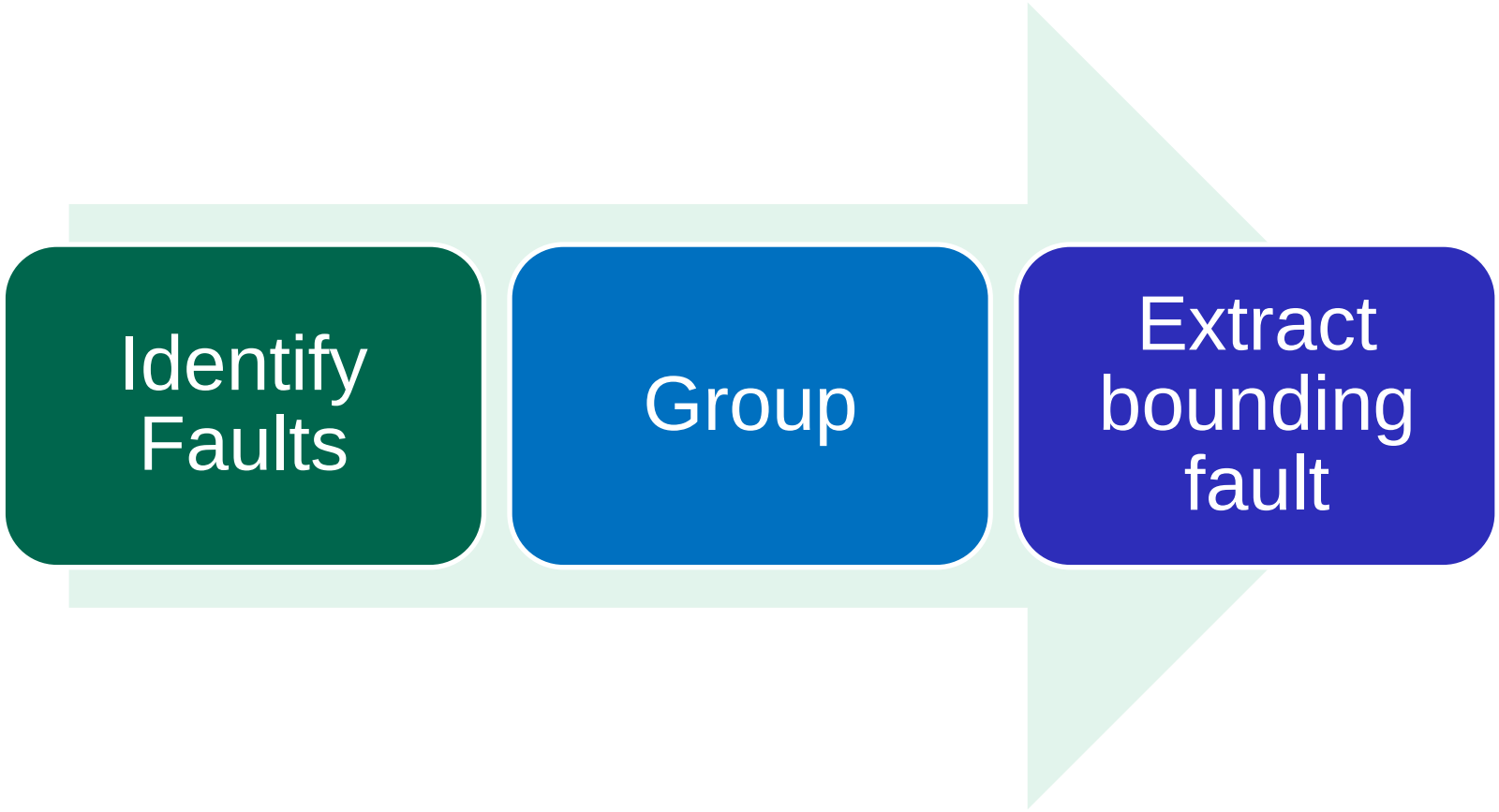


Overview of Design Guidelines



Identification of Radiological Hazards and Personnel at Risk

- Identify radiological hazards

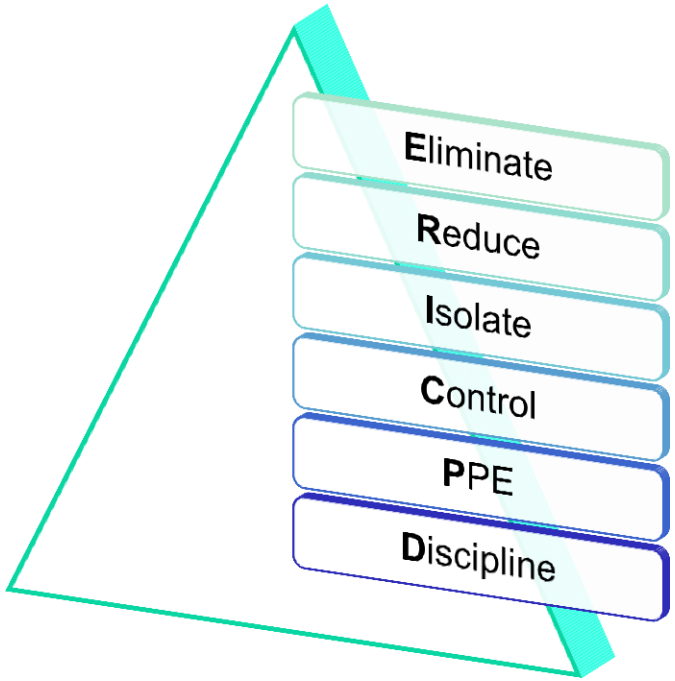


Identification of Radiological Hazards and Personnel at Risk

- Identification of personnel at risk
  - For each fault, identify numbers and locations of personnel who may be exposed.

- Consider following groups of workers:
  1. In the immediate vicinity
  2. Away from the incident

ERIC-PD



- ERIC-PD methodology
- Identify mitigation options

Evacuation as part of the administrative controls (Discipline)

Identification of Evacuation Initiating Mechanism

- Evacuation may be initiated in response to:
  - Alarm
  - Direct observation
- Points to consider regarding detector systems:
  - Types of radiation hazard
  - Detector and alarm locations
  - Threshold for detector response
  - Detector and alarm system reliability and sensitivity
  - Types of alarms required

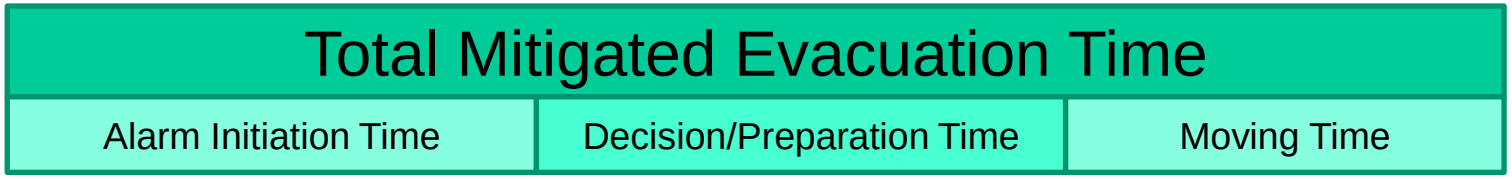
Identifiaction and Assessment of Evacuation Routes

- Identification of radiological hazard
- Determine worker locations
- Identify available evacuation routes
- Dose rate and transient info in affected areas
- Determine evacuation initiation speed
- Evaluate evacuation time for each evacuation route
- Evaluate dose for each evacuation route
- Compare doses for each evacuation route
- Determine the ALARP route

Evacuation Time Evaluation

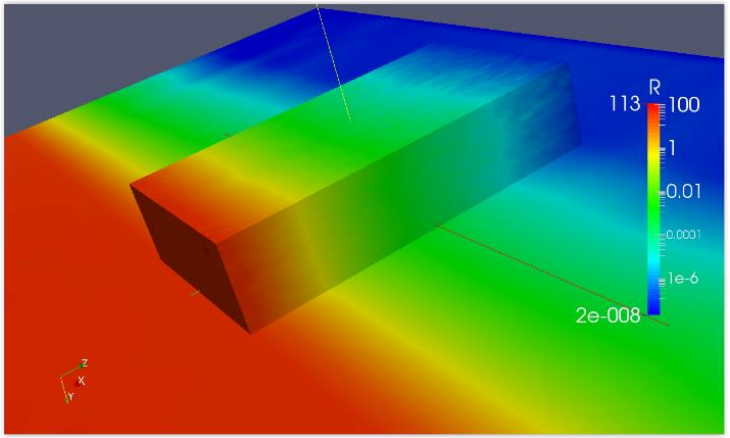
- The evacuation time model requires Human Factors input and is based on the following steps:

1. Event initiation
2. Alarm initiation/alerting workers
3. Pre movement activities
   a) Perception/recognition
   b) Response/decision
4. Movement activities



Consideration of ALARP

- Avoid overly pessimistic calculations
- Consideration of other measures
  - Make safe activities
  - Temporary shielding
- Training and procedures should identify the evacuation response



Engagement of Human Factors

Important component during design of equipment and workspaces

Aspects to consider:

- Regulatory requirements?
- Worker decision time?
- Applicability of movement rates
- Obstructions, doorways, blocked routes, smoke and other hazards.
- Numbers of personnel required to evacuate

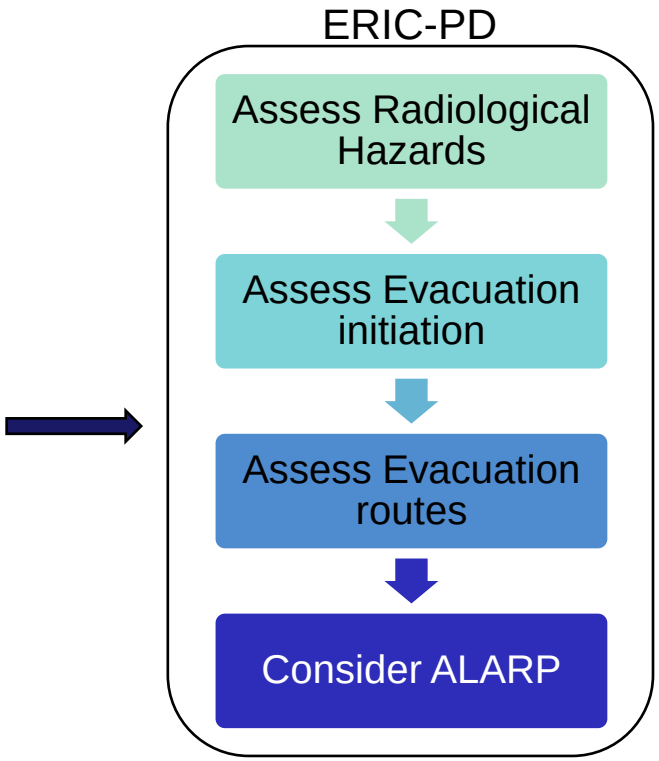
Radiological vs other evacuation

- Risk to life is the overriding factor – for all types of evacuation
- Radiological evacuation route: optimised to minimise radiation exposure so evacuation time may be longer
- Need to evacuate to a dedicated radiological muster point
- Fire and radiological evacuation routes may be the same but need ALARP demonstration
- Final evacuation route must be designed considering all safety aspects – radiological and conventional

'Running shoes?'

Summary

- Comprehensive Radiological Evacuation Methodology has been developed
- Applicable for nuclear new build as well as for existing facilities



Any questions?

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