Setting dose reference levels for emergency responders in the United Kingdom
UK legislation

BSSD transposition into UK law due to be completed Jan/Feb 2018

Current relevant legislation

- Ionising Radiations Regulations 1999 (IRR99)
  - Occupational exposure
  - Defines a “radiation employer” and sets requirements for control

Radiation (Emergency Preparedness and Public Information) Regulations 2001 (REPPIR)

- Emergency exposures
- Allows disapplication of dose limits set in IRR99
Emergency services as radiation employers

- Police, Fire and Ambulance services are all separate employers but are they ‘radiation employers’?
  - Fire services – will respond to fires and rescue operations where a radiation hazard exists
    - Yes
  - Police – traditionally do not deploy into a radiation hazard environment, however
    - Dedicated CBRN response teams trained to operate in hazardous environments
    - Yes
  - Ambulance – Would not knowingly deploy staff into a known radiation hazard environment, however
    - Hazardous Area Response Teams (HART) developed to respond in hazardous environments
    - Yes
Different employers = different advisers

Different roles = different protection advice

Common dose control levels
Common personal dose meter

Thermo EPD Mk2
Common alarm settings

Alarm 1 – Dose rate
- 100 $\mu$Sv/h $Hp(10)$ alarm on, alarm off at 90 $\mu$Sv/h
- Set to avoid false alarms – counting statistics
- Indication of unusual dose rate when source is unknown
  - Withdraw to alarm stop and assess
- Transport Index may exceed alarm rate – known source

Alarm 2 – Dose
- 5 mSv $Hp(10)$
- Withdraw from exposure situation and assess
- < 6 mSv – classified worker level
Common alarm settings

Alarm 3 – Dose

- 100 mSv Hp(10)
- Limit of exposure for life saving actions
- Threshold of detectable deterministic effects

Two versions deployed

- Standard version
  - Shows accrued dose by default and ‘on’ all the time
- Responder version
  - Shows dose rate by default
  - Starts recording accrued dose only once dose rate alarm is activated
<table>
<thead>
<tr>
<th>Reference Level One: Total per event</th>
<th>1 mSv</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Level Two: CBRN decontamination providers</td>
<td>5 mSv</td>
</tr>
<tr>
<td>UK Occupational Dose Limit</td>
<td>20 mSv</td>
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<tr>
<td>Reference Level Three: Maximum dose to informed volunteers for life saving actions</td>
<td>100 mSv</td>
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</tbody>
</table>
Practical tools for responders

Look-up graph – time to dose – for front line responders and control room staff
Practical tools for responders

Ambulance service decision flow-chart – for control room staff
Protection from internal exposure

Ambulance – Hazardous Area Response Team (HART)

Powered Respirator Protective Suit (PRPS)
Protection from internal exposure

Fire Service – Self-Contained Breathing Apparatus (SCBA) and Gas-tight suit
Protection from internal exposure

Police – CBRN responder

Civil Responder suit (CR1)
Operational considerations

- Gamma radiation is not always present and so use of the EPD as the only trigger is limited – E.g. $^{210}$Po

- Balance of 100 mSv limit for life-saving action and the need to save life – E.g. proximity of a high dose rate source to a trapped casualty

- False alarm triggers caused by RF interference E.g. shop security barriers
Additional arrangements

• Reach-back to RPAs
  • On-call RPAs to provide over-the-phone advice

• National Arrangements for Incidents involving Radioactivity (NAIR)
  • Fall-back arrangements or situations where no plans exist

• ECOSA – Emergency Coordination of Scientific Advice
  • Rapid access to coordinated advice from scientists (including RPAs) for counter terrorist operations
Current issues

• No single RPA for Fire and Rescue Service
  • Each service is under a separate employer

• Disapplication of dose limits permitted under REPPIR only applies to fixed sites
  • Does not apply to terrorist incidents, transport incidents
  • Guidance being developed as part of the BSSD transposition process will address all emergency scenarios
In conclusion

• Reference Levels or dose limits reflect the balance of operational needs and radiation protection

• By using a low initial dose rate trigger followed by a dose alarm control steps can be taken progressively to minimise dose.

• Controls for internal contamination need to have specialised response teams trained in their use to be effective
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