30 Depleted Uranium

Scope

1. This Chapter refers to equipment or materials fabricated from or incorporating depleted uranium (DU). The Chapter gives a general description of the hazards associated with such items and the actions to be taken to ensure their safe keeping, use and disposal. However, it should be noted that the construction of an item can significantly affect the hazard from the DU.

Occurrence of Depleted Uranium in Service Items

2. DU is used primarily in some armour piercing discarding Sabot munitions which are not used in peacetime training and so only likely to be encountered in ammunition depots, during very occasional proof firing and in operational theatres. In addition, DU has applications as counterbalance weights in some aircraft, where its presence will be noted in maintenance manuals; in radiation shields for high activity radiography or radiotherapy sources and, in smaller quantities, in radioactive check sources.

Statutory Requirements

3. In addition to the general requirements of the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999, the following specific legislation applies directly or is applied indirectly through parallel arrangements designed to achieve equivalent standards:

a. Ionising Radiations Regulations 2017 (IRR17) (apply directly);

b. The Environmental Permitting (England and Wales) Regulations 2016 (EPR16) (as amended) (parallel arrangements);

c. Environmental Authorisations (Scotland) Regulations 2018 (EASR18) (parallel arrangements);

d. Radioactive Substances Act 1993 (Amendment) Regulations (Northern Ireland) 2011; and

e. Carriage of Dangerous Goods and Transportable Pressure Equipment Regulations 2009 (as amended).

Duties

4. Duties as detailed in Chapter 39 apply.

Hazards

5. Significant external radiation dose rates (up to 2 $mSvh^{-1}$ contact) can be found close to bulk unshielded DU. Most DU in military use is shielded but the amount of shielding depends on the equipment type. Because of this variability, dose rates must be measured as part of the radiation risk assessment for each equipment and use. Suitable shielding and handling techniques are to be employed to ensure that radiation exposure is kept as low as reasonably practicable (ALARP).

6. An internal hazard will only exist where DU materials have corroded, been machined without proper controls, been involved in a fire or explosion or where a DU round has impacted on a hard surface. In such circumstances, monitoring must be carried out to assess the significance of the contamination.

Alpha

7. Alpha radiation arises from U-234, U-235 and U-238 and some decay products. Alpha radiation does not present an external radiation hazard but represents an internal hazard if alpha-emitting material enters the body.

Beta

8. Beta radiations from the decay products Th-234 and Pa-234m give rise to an external and internal radiation hazard.

9. Bremsstrahlung X-rays may be produced in appreciable quantities in close proximity to DU assemblies. X-ray emissions present a predominantly external radiation hazard.

Gamma

10. A range of low-level gamma emissions are associated with the alpha and beta decay of uranium isotopes and decay products. Gamma emissions present a predominantly external radiation hazard.

Restriction of Exposure

11. Employers at MOD establishments undertaking work with DU are to take all necessary steps to restrict as far as is reasonably practical the extent to which employees and other persons are exposed to radiations arising from DU. General arrangements for the restriction of exposure are described in Chapter 4.

12. Where personnel necessarily work close to large components containing DU, monitoring is to be carried out as part of the risk assessment. When the assessment indicates a need for engineered controls to restrict exposure, Perspex shielding is usually adequate, but advice should be obtained from the RPA.

13. Where it is necessary to handle DU components for prolonged periods, gloves may need to be worn. The radiation risk assessment will determine this requirement.

14. Exceptionally, where significant radiation exposure to the lens of the eye is foreseen, consideration is to be given to making specific measurements of the dose to the eye. In these circumstances' advice is to be sought from the RPA.

15. When handling DU munitions, the shot should be handled by the sabot and rear fin case.

16. In the case of an armoured fighting vehicle (AFV) or store containing DU munitions, exposure may sometimes be restricted by limiting occupancy times. Limiting occupancy to 2000 hours per year (e.g. 80 periods of 24 hours) should ensure that personal doses do not exceed 6 mSv annually but monitoring must be carried out to verify this.

17. Contamination control procedures are to be applied to processes that are liable to create DU dust, swarf, mist or fumes. Such procedures may include the use of specially

designed areas with easily cleaned surfaces and measures to provide protection against spread of DU such as fume cupboards, glove boxes or vented areas.

PPE

18. For most situations likely to be encountered, it is not expected that the risk assessment will identify a need for the use of protective clothing or equipment other than gloves to reduce the external radiation dose to the skin.

19. Protective clothing provided as a safeguard against personal contamination is to be marked and kept for this purpose unless it has been monitored and found to be free from contamination. For items used over prolonged periods, regular examination and monitoring is to be carried out to ensure that the items remain fit for purpose and are not contaminated.

20. Contamination is to be assumed if clothing or equipment has, or is suspected of having, come into contact with DU in a dispersed form.

Contingency Plans

21. A contingency plan will be produced where this is identified as necessary within the risk assessment.

22. In the event of an accident involving DU ammunition, the elimination of the immediate explosive hazard is to take precedence over the elimination of radiation hazards arising from DU material.

Monitoring

23. Radiation and contamination monitoring will be required in storage and working areas. The operator is required to seek advice from the RPA on the form of this programme.

24. Gun barrels and targets used with DU projectiles are to be regularly monitored, to determine whether they have become contaminated. Until such monitoring results are obtained, the barrels and targets are to be treated as being contaminated. Advice on monitoring should be sought from the RPA.

25. Contamination monitoring is to be carried out in any areas likely to have been affected by any accident or unexpected event involving DU munitions. The RPA should be consulted on the form of this monitoring.

26. Details of monitoring programmes are to be included in local orders and survey records are to be kept indefinitely.

Storage

27. Where small quantities of DU (less than 2 MBq (about 150 g)) is held, it is to be segregated from non-radioactive materials and stored in a locked metal container displaying a radiation warning sign.

28. Quantities in excess of 2 MBq are to be stored in containers, or on racks of fire-resistant materials in a purpose-built store, as detailed in Chapter 9.

Personal Dosimetry

29. Dose rates near most DU items are low, and in most cases personal monitoring is not required. However, personnel who handle DU munitions on a regular basis or are likely to find themselves in close proximity to 'unboxed' DU munitions (e.g. tank and recovery crews, some stores and ATO / EOD personnel) will require monitoring. This will usually be by the issue of personal dosemeters, but, with the agreement of the RPA, recording of occupancy times may suffice. Dosimetry is to be issued if occupancy or exposure times are uncertain.

30. Personnel who are likely to receive an effective radiation dose in excess of 6 mSv (as described in Chapter 6) are to be designated as classified persons and are required to have their radiation doses formally assessed. For external radiation exposure, personal dosemeters issued by the approved dosimetry service are to be worn and biological monitoring programmes will be employed, where appropriate, to measure any radiation dose due to internal contamination.

31. In addition, unclassified persons (as described in Chapter 6) may be issued with personal dosimetry for reassurance and medico-legal purposes.

Transport

32. For manufactured articles containing natural or depleted uranium in which the dose rate on the outside of the package is less than 5 $\mu Sv h^{-1}$, the articles may be transported as excepted packages.

33. Where DU cannot be transported as an excepted package, it can usually be transported as low specific activity material group I (LSA-I) as defined in IAEA Transport Regulations. Further guidance is to be sought from the Dangerous Goods Safety Adviser (DGSA) and RPA.