CHAPTER 2

DESIGN AND CONSTRUCTION OF DEMOLITION, DISPOSAL AND EOD TRAINING RANGES

GENERAL

0201. Scope. This chapter details the principles for the design and construction of demolition, disposal and Explosive Ordnance Disposal (EOD) training ranges. It should be used as a guide as each range will vary depending on geographical location and size of maximum Range Danger Area (RDA). Both land and tidal sand areas should be considered for the construction of ranges. Advice in the first instance should be sought from the appropriate single service authority.

0202. Procedures. The procedures concerning the procurement, acceptance, authorisation and closure of a land range in the UK or overseas are detailed in Reference D.

0203. Access Restrictions. These are detailed in Reference D.

RANGE DANGER AREA (RDA)

0204. Hazards. The main hazards from the use of explosives and methods of mitigation are as follows:

a. Flash and heat. Personnel and non-essential equipment are to be placed outside the calculated safety distance or in a protected shelter.

b. Blast and noise. Personnel and non-essential equipment are to be placed outside the calculated safety distance or in a protected shelter. Personnel inside a protected shelter should wear appropriate hearing protection.

c. Ground shock. The level of ground shock produced is dependent upon local rock strata, demolition type and soil type on surface and sub surface. Ground shock can be limited by reducing the Net Explosive Quantity (NEQ) per serial.

d. Fragmentation. The ordnance, target and debris in the ground will produce fragmentation. Personnel and non-essential equipment are to be placed outside the calculated safety distance or in a protected shelter.

e. Toxic smoke and gases. Toxic smoke and gas are produced by the initiation of explosive material and are affected by meteorological conditions such as temperature, wind speed and direction. Protective equipment and procedures are to be used where appropriate.

f. Residue and Hazardous Waste Disposal. Toxic substances are produced by the initiation of explosives and disposal of munitions. These must be disposed of in a safe manner taking into account environmental considerations.

0205. Range Danger Area (RDA). The safety distance for a particular explosive nature is to be calculated using the Safety Distance Tables in Annex C to Chapter 3. The maximum NEQ that can be detonated on the range must be contained within the RDA and stated in the Range SO.

0206. Air Danger Height (ADH). In the production of Range SO consideration is to be given to the ADH. The procedures to be followed are detailed in Chapter 6 of Reference D.

FACTORS

0207. Physical Properties. The ideal physical properties of a demolition range are as follows:

a. Isolated to minimise disruption and damage to other facilities and structures.

b. Located where blast and noise can dissipate easily. Wooded areas and scrub will help dissipate noise but hinder control. Rocky and steep surfaces will divert and not dissipate noise but will contain blast more effectively. Balancing these factors will provide the optimum site.

c. Danger radius must be wholly contained on MOD land unless legal agreement has been met with the appropriate landowner.

0208. Areas and Installations. The following areas or installations should be avoided when siting a demolition range:

a. Buildings, especially those which are inhabited.

b. Overhead or underground cables and wires.

c. Land drainage schemes and underground pipelines.

d. Roads, railways, canals, and Rights of Way.

e. Airfields.

f. Radio/ radar transmitters.

g. Agricultural land.

h. Areas of dense vegetation.

0209. Environmental Issues. When selecting the site for a range, the visual and acoustic effects on the environment and the general public, as well as any measures to reduce those effects, are to be assessed. This is particularly important for sites in or near National Parks, areas used for public leisure and inhabited areas. DE, or the appropriate civil authority, is to be consulted at an early stage to ascertain whether the area chosen is a conservation-designated area or a heritage site, and whether there may be planning authority sensitivities which require consultation with statutory Bodies. Advice on noise can be obtained from the Area Health and Safety Environmental Groups for the Royal Navy/Royal Marines (RN/RM), the Division or Formation Environmental Health Officer (EHO), the Environmental Noise Officer (ENO) Royal Air Force (RAF) Health Monitoring Team (HMT) and MOD Directorate of Safety, Environment and Fire Policy (D SEF Pol) as applicable. On operations the Environmental Health Team (EHT) is to be consulted.

0210. Facilities. The following facilities may need to be provided:

a. Firing Point (FP). The FP must be protected or be a safe distance from the demolition area. The ability to observe the initiation of the explosives is highly desirable. Examples of viewing devices are as follows:

(i) A periscope fitted with armoured glass.

(ii) Close Circuit Television (CCTV). The CCTV should be capable of zoom, tilt, and pan and be fitted with wiper blades.

b. Ammunition Storage. Ammunition storage inside the RDA area must be fully protected from blast and fragmentation. Details of the design and construction of facilities are detailed in Chapter 6 of Reference H. Advice on the construction and the necessary regulations concerning ammunition storage should be sought from the relevant single service authority. Ammunition stored outside specifically designed and constructed facilities must be stored in accordance with Field Storage or Road Transport Regulations.

c. Ammunition Holding Area (AHA). Where the AHA is located within the RDA it must be protected or be located outside the maximum calculated safety distance. There should be at least three separate areas to allow safe holding of detonators, munitions and explosives and a segregation area for Unexploded Explosive Ordnance (UXO)[1] and stray ammunition. Consideration must also be given to segregating ammunition of different compatibility groups.

d. Administration Area. An administration area should be available. It may include the following:

(1) Safe area for personnel to relax. The area should be comfortable enough for all personnel on the range to remain for long periods of time.

(2) Toilet and washing facilities.

(3) Facility to heat food and drinks.

(4) First Aid Point with stretcher.

(5) Workshops or garage for storage of targets and tools.

(6) Protected POL store.

(7) Effective and appropriate communications.

(8) Designated smoking area.

e. Design and construction of range structures. Advice on the specification for all facilities on the range should be sought from the Defence Training Estate (DTE) Technical Advisory Section Royal Engineers (TAS RE). Bunkers and protected firing points are already utilised on some ranges. Historical precedent may be suitable justification for continued use but specific requirements must be established for new facilities.

0211. Demolition Area. A demolition range may contain a number of demolition areas. The following should be considered for a demolition area:

a. The area should be clear of trees and undergrowth. This will reduce possible fire hazards and increase the line of sight. It will also allow items thrown clear in an explosion to be located.

b. The ground should consist of deep soil to absorb ground shock. The ground should also be free from stone, as it will reduce fragmentation. The soil should not be marshy or waterlogged. Ground containing peat is not to be used. Demolition pits are liable to collapse and should not be allowed to become too deep, especially in sandy soil.

[1] UXO can only be moved to this area if safe to move.

c. There should be adequate routes to and from the designated FP and range facilities to the demolition area. There will be a requirement for the movement of ammunition, plant and soil moving vehicles to restore the area. Access is required for emergency services. RV points should be clearly signed.

d. The size of the demolition area or pit will depend on a number of factors. These will be considered as part of the risk assessment and the details recorded on the MOD Form 904. The following are to be considered:

(1) When it is necessary to use more than one pit, the pits are to be so sited that a detonation in one pit does not affect the ammunition in other pits.

(2) For confidence charge training students should be separated to aid command and control. This is to be a minimum of 2m between charges.

(3) Student/Instructor ratio. Setting up of charges will require adequate supervision in accordance with single service direction. Application of detonators to charges will always require a 1/1 ratio.

(4) Size and nature of the charge and the procedure to be undertaken. This will be covered in the User Demolition Instruction. Each demolition area is to be large enough to allow the safe conduct of all serials to be conducted.

RANGE SAFETY

0212. Access Control. In order to ensure that the integrity of the RDA is maintained the following may be utilised:

a. Sentries at designated access points on range perimeter.

b. Fencing, Barriers, Warning Signs and Flags. The requirements in Reference D and E are to be applied.

c. Radar.

d. Protected Observation Posts within RDA.

e. On remote or controlled access sites, lockable road barriers.

0213. Communications. Communications will be required between the following:

a. Demolition Area.

b. Sentries and unmanned barriers where access may be permitted.

c. Range control (if present).

d. Emergency services.

e. Administration Areas.

f. Firing Point(s).

g. Other organisations (in accordance with Range Standing Orders).

Safety Note: Where radios are used, all frequencies used must be allocated by RAU through Range Standing Orders. RF precautions are to be observed in relation to Electro-Explosive Devices (EEDs) see Reference P. The RF safety distance tables for BOWMAN radios can be found at Reference M, Section 10.3

OPERATIONAL THEATRE RANGES (OTR) AND TEMPORARY EXERCISE RANGES (TER)

0214. The procedures for establishing OTR and TER (as defined in Reference G) are covered in Reference D. However, the factors listed above must be taken into consideration.

TARGETS

0215. In designing the Range consideration should be given to the types of targets to be used for demolitions and EOD training, to include the hazards listed in Paragraph 0204.