

CHAPTER 16

THE CONVERTED GALLERY RANGE

AND

ELECTRIC TARGET (LIMITED DANGER AREA) RANGE

(READ IN CONJUNCTION WITH CHAPTER 15)

INTRODUCTION

1601. **General.** Converted Gallery Range CGR is a Gallery Range that has been converted to be equipped with fixed electric targets (FET), each of which provide two 'fall-when-hit' targets per shooting lane (target details are given in Chapter 29). If the mantlet is constructed as shown in Figure 16-2, automatic marking system (AMS) may be installed without further major works. When a new range is constructed without a gallery but with FET, it is termed an Electric Target (Limited Danger Area) Range (ET(LDA)R). The CGR and ET(LDA)R can be used to fire the same SA as the GR using the Gallery RDA template.



1602. **Aim.** This chapter describes the construction requirements to convert a GR to a CGR and the construction of a new ET(LDA)R. The features which do not differ from the GR are not covered in this Chapter and for which reference should be made to Chapter 15. This chapter in particular covers:

- a. Introduction 1601 - 1602
- b. Conversion construction
 - (1) General 1603 - 1606
 - (2) Mantlet 1607 - 1608
 - (3) Stop Butt 1609
 - (4) Targetry 1610 - 1614
 - (5) Control building 1615 - 1618
 - (6) Electricity supply 1619 - 1620
- c. Communications 1621 - 1624
- d. Maintenance 1625 - 1626
- e. Compliance checks 1627

CONVERSION CONSTRUCTION

GENERAL

1603. **Design Considerations.** No range design work should start until full details of the targetry to be used are to hand. Compliance cannot be achieved without full details of the targets and target mechanisms. The firing point crest board, mantlet crest board, stop butt and target centres are all linked in the design to achieve compliance. Ranges with FET and AMS will require different design detailing to those ranges without AMS due to differing target requirements. Ducting should always be included in the mantlet whether or not AMS is to be installed to enable AMS installation at a later date.

1604. **Land Requirements.** The construction of a new CGR or ET(LDA)R may be more expensive than an ETR. Considerations such as land availability may, however, make the ET(LDA)R the preferred choice. A comparison of the land requirement is:

- a. **CGR, ET(LDA)R.** Length 2400 m, width 750 m and an area of 1,800,000 m² (180 hectares or 445 acres).
- b. **ETR.** Length 3325 m, width 1132 m and an area of 3,763,900 m² (376 hectares or 930 acres).

1605. **Conversion.** The conversion of a GR to a CGR requires that all elements of the range are brought up to full new GR specification. The designer / contractor must establish the current range profile and layout in relation to compliance prior to conversion. Ranges with firing points set out in imperial should be converted to metric but it is unnecessary to alter the lane widths and target spacing to metric. By installing FETs on the mantlet of a GR the GR RDA will increase in width due to re alignment of LofS to target centres. To facilitate AMS, it will be necessary to ensure the LofS for each firing position is at right angles to the targets (see paragraph 1606 below). Conversion will include:

- a. Reconstruction of the mantlet and installation of FET.
- b. Realignment of lanes if necessary.
- c. Construction of the control building.
- d. Installation of electric power and target control circuits.
- e. It is most likely that there will be an increase to the stop butt dimensions if mantlet height changes or firing points are taken back to metric distances.

1606. **Layout for Automatic Marking System.** AMS often requires precise range layout to assure accuracy in recording the fall of shot. If firing lanes are re aligned the RDA must be re confirmed. Where AMS equipment requires FET equipment to move back from the crest board, careful design is required to ensure full target exposure with clearances. If AMS is to be installed either at the time of conversion or at a later date and for new ranges refer to TAS(RE) for details of current AMS installation requirements.

MANTLET

1607. **General.** The reconstruction details for the mantlet are shown in Figure 16-2a. The depth from the markers' gallery to the mantlet crest board must be able to accommodate the target system (including AMS) and access path. The face profile of the mantlet is retained at the recommended 34⁰ (2:3) from the horizontal whilst the full face at minimum height of 2m must remain visible to the firer from all firing points. Extending the mantlet by filling on to the existing construction is not good practice. The mantlet is best totally reconstructed as a monolithic structure of fully compacted 150 mm thick layers of stone-free soil, which should ensure that there is no settlement under the additional imposed loading. A rock core is permitted but this must be covered and faced with stone-free soil to a depth of 500 mm on the front face. In accordance with Health and Safety at Work Regulations, protection should be provided where there is a drop into the gallery. To avoid the fall from height hazard when working on the mantlet on CGR it is possible to provide the access path in front of the mantlet. See Figure 16-2.

1608. **LofS Clearance.** The slope from front to back on top of the mantlet is dependant upon the levels on the range floor and in particular the level of firing point crest boards. It is important that at the design stage the following clearances are resolved to ensure full target exposure and clearances. (Note: With current FETs it may not be possible to achieve all clearances.)

- a. FET clearance 50 mm below the lowest LofS.
- b. Bottom of target 75 mm from highest LofS.
- c. No ricochet inducing surfaces from any LofS.
- d. Gallery frames clear of the lowest LofS.

STOP BUTT

1609. **General.** Existing Gallery Ranges have a 1.8m mantlet and the stop butt is determined with a 3.05m pole set on the mantlet crest board. Conversion will bring the mantlet height up to at least 2.0m and a 5.0m pole set on the mantlet crest board is used to determine the increased stop butt height required.

TARGETRY

1610. **Targets.** Only authorised targets described in Chapter 29 may be used. All targetry is to comply with paragraph 1608. Falling plate targets may be used with the same conditions and limitations applicable to the GR. See Reference B, (Pam 21) for details of falling plate practices.

1611. **Fixed Electric Target Locations.** The FET consist of 24 units, 2 for each of the 12 lanes (see Figure 16-1). Each unit is normally housed in a pre-cast concrete box (coffin). It is often necessary to enclose coffins with vandal-proof steel lids. The coffins in each pair are set slightly staggered to allow their lids to open without obstruction; coffins with single lids need not be offset. However, each coffin must be placed symmetrically across the centre line of the firing lane to facilitate AMS.

1612. **Protection.** Coffins are protected against strike by a 12 mm thick armoured steel sheet to the specification provided in Chapter 2. Ricochet

from the steel is reduced by timber or shredded rubber protection (see Figure 16-2). Depending on site conditions, all elements must be set to a level so that no part is above the line from the mantlet crest at a fall of 4.85 (1:12) from the worst case LofS. In addition, it is necessary to ensure that no part of the rear of the coffin is exposed to the firer standing on any firing point. A 50 mm margin for safety is to be provided between the worst LofS and the rear the coffin (see Figure 16-2a).

1613. **Access.** A path wide enough for the FET trolley is required to replace and maintain FET mechanisms. This should be laid close to the level of the coffin base to reduce lifting. If Materials Handling Equipment (MHE) is to be used, the path will have to be designed to provide access to all equipment on the mantlet as well as a ramp from the mantlet down to the workshop.

1614. **Target Store and Workshop.** Extra space is likely to be required in both the target store and workshop to accommodate an increased holding of targets for FET. It may be possible to turn the existing workshop into an extra target store and to build a new workshop behind the range. Roller tables or lifting gear should be provided to move FETs within the workshop. The workshop has to be large enough to allow for:

- a. Storing spare FET and spare parts.
- b. Repairing and servicing FET.
- c. A 240 volt AC power supply.
- d. Working space for 3 men.

CONTROL BUILDING

1615. **Purpose.** This building houses the control, operation and communication systems required to control the range, activate the targetry and record the number of hits. It is an operations room which should be sized only to accommodate personnel essential to running practices.

1616. **Location.** The control building is usually sited to the right, rear of the 300 m firing point at an angle optimising the view of the range (see Figures 16-1 and 16-2b).

1617. **Construction.** The control building walls may be constructed of concrete or brick. The walls exposed to strike must provide ballistic protection and prevent damp entering where earth banks are used. The protected walls will also need to be designed to withstand lateral pressures where earth or sand banks are used. The back wall facing 400 - 600m firing points is constructed to withstand bullet penetration (See Chapter 2). The rear of the building must be faced so that firers during fire and movement practices are not exposed to the risk of backsplash (Note. 7.62mm tracer may backsplash 125m from large sand banks with 34 degree slopes). On compacted earth slopes the 7.62 mm tracer round are normally captured without ricochet. If earth or sand banks are not used, anti-splash protection is provided with 50 mm timber boarding on 50 mm timber battens set vertically to cover the walls exposed to strike. The timber protection is to be off set to allow inspection of the protected walls for shot damage or fixed in such a way to allow inspection of the wall. The building has a raised floor to give the equipment operators clear view of targets over the heads of personnel on the firing point. The building should be vandal-proof.

1618. **Warning Flags and Lights.** A 6-9 m high flag pole made of timber, hollow aluminium or non-ricochet inducing composite material is fixed to the control building at the furthest safety point from the access door. This pole is for hoisting a 1.8 m² red range in use flag. A shorter flag pole is also provided to protect personnel in the control building in a similar way to that used on a mantlet for a butt party. This flag pole made of the same material as the main pole is fixed outside the access door. A red light operated from the control building is fitted to the top of both flag poles for night firing.

ELECTRICITY SUPPLY

1619. **Electricity Supply.** The provision of a reliable supply of electricity is essential. The power requirement to successfully use a CGR or ET(LDA)R will vary with the circumstances of each range but, as a guide, 50 kilovolt Amperes Triple Phase and Neutral (50 kVA TP&N) is generally satisfactory but a generator seldom is. In addition to electricity for target mechanisms and control circuits, power should be provided to heat and light:

- a. Control building and systems.
- b. Range Wardens' workshop.
- c. Target store.
- d. Troop shelter and toilets.
- e. Night firing warning lights.

1620. **Fixed Electric Target.** The power supply to FET should be switched and circuit protected. The switch should be a lockable isolator switch to prevent others accidentally turning on the power while work on FET is undertaken.

COMMUNICATIONS

1621. **External.** A means of summoning the emergency services, ideally a land laid telephone, is to be available.

1622. **Internal.** A range telephone system is required to connect the control building to the:

- a. RCO at each firing point.
- b. Troop shelter.
- c. Butts.
- d. Target line for testing and maintaining target mechanisms.

1623. **Public Address System.** A PA system is required with a microphone in the control building and a wandering microphone for use outside by the RCO. A microphone connection point may be required at each firing point. Loudspeakers are to be fitted to the control building and at each end of the main firing point. If the control building is on a flank, the location of installations may need to be reviewed.

1624. **Protection.** The down-range telephone connection points must be protected against SA fire by timber 100 mm thick or 500 mm of well compacted soil. All cables are to be buried in protective conduit with waterproof connections and fittings (see Chapter 15).

MAINTENANCE

1625. **Responsibilities.** The requirements for maintaining a GR (see Chapter 15) apply equally to the CGR and ET(LDA)R. Maintenance of the range is the responsibility of the RAU and may be divided as follows:

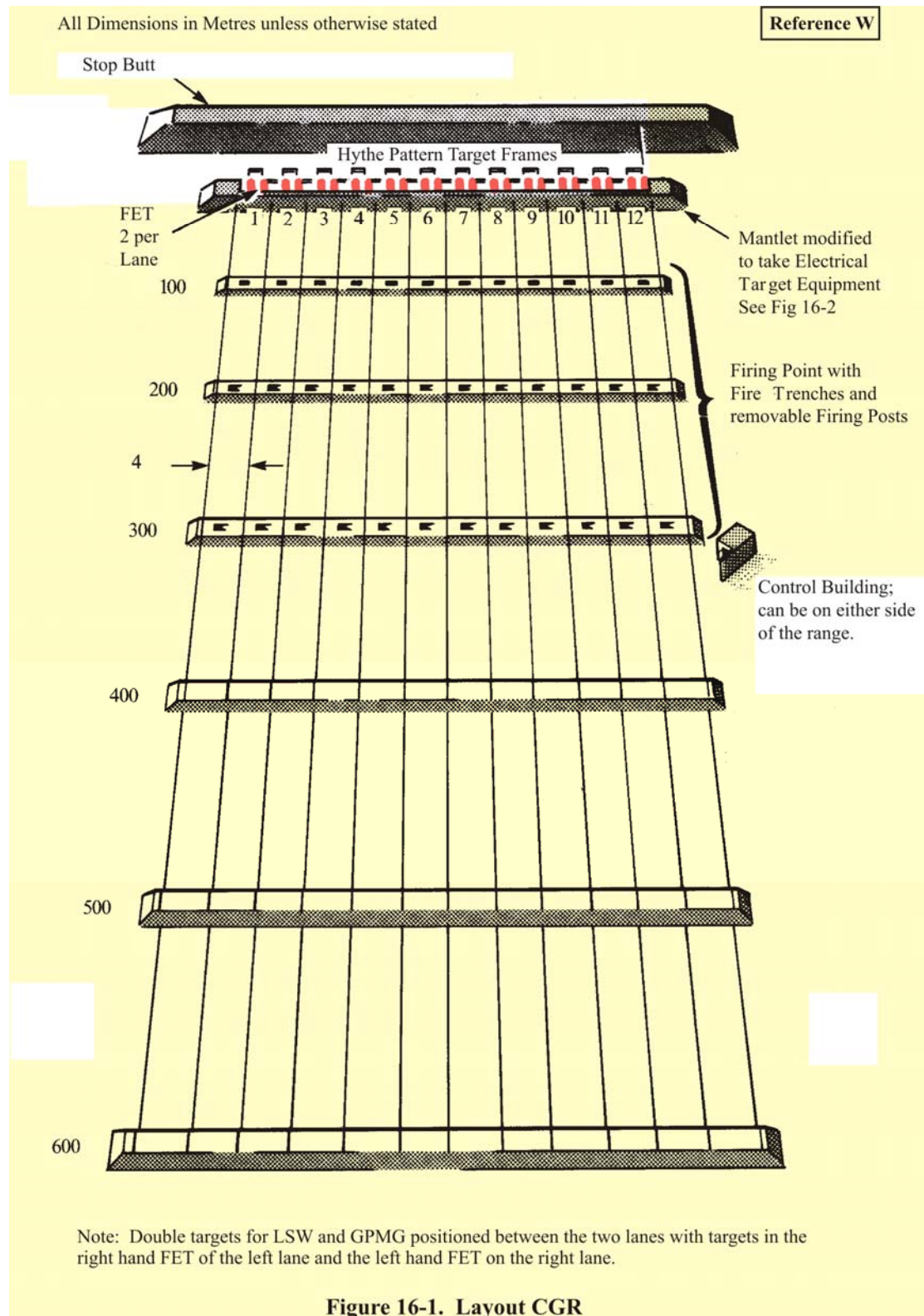
- a. **Range Warden.** See Reference A1.
- b. **Property Management.**
 - (1) Grounds.
 - (2) Fencing and sign posting. (See Chapter 2.)
 - (3) Structures, roads and drainage including stability of slopes and erosion control.
 - (4) Water and electricity supplies.
 - (5) Periodic refurbishment of the range structure.
- c. **Equipment Management.** Repairing and servicing equipment installed by single Service contract.

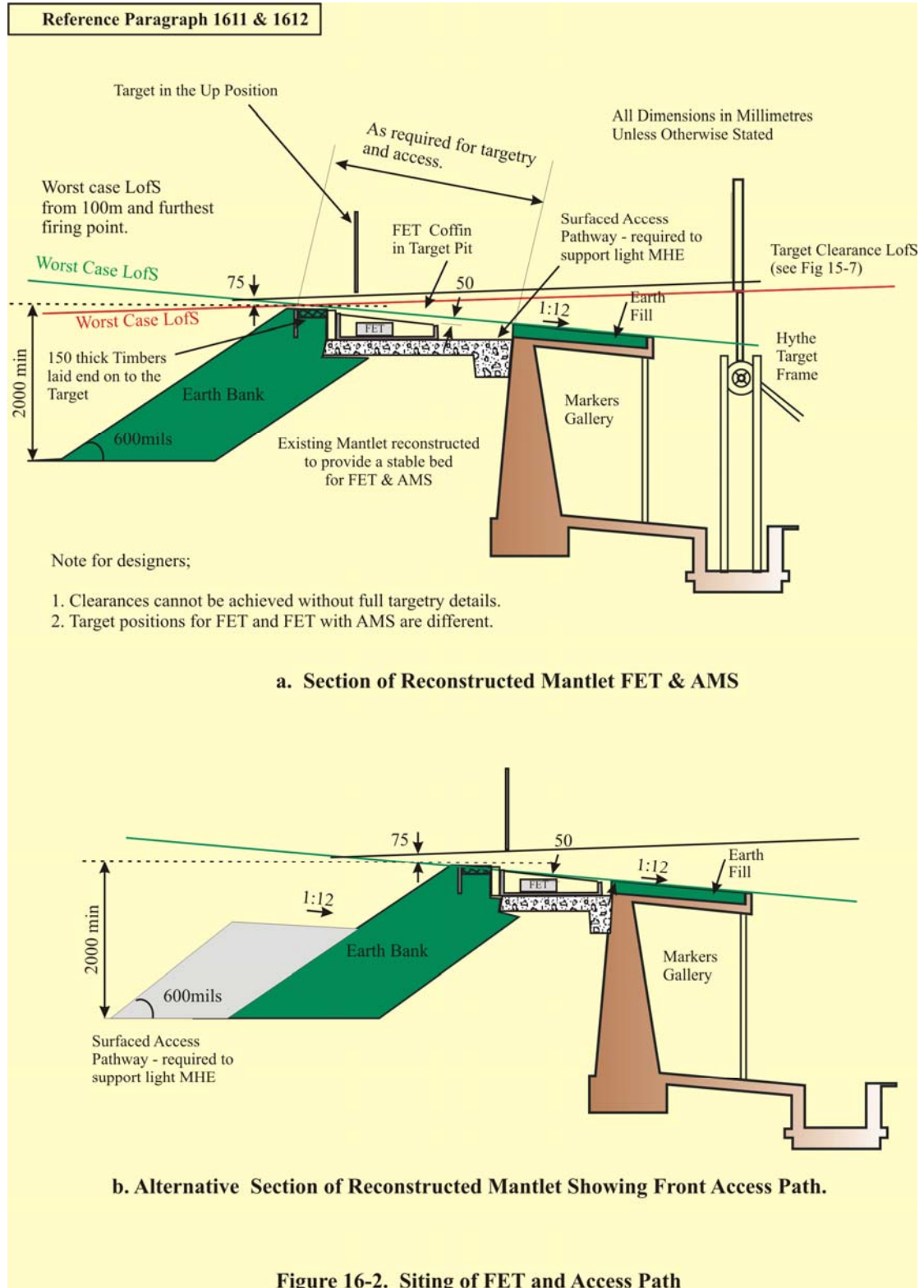
1626. **Frequency.** Proper maintenance depends on good liaison between the Range Warden and the RAU, and properly scheduled maintenance periods. A heavily used range may need one day's maintenance each week plus one or two days' maintenance by the Range Warden each month. Two closed periods of a week or so may be needed each year for repairing buildings and earthworks; this work should be combined with contract repair of equipment.

COMPLIANCE CHECKS

1627. The compliance tests are detailed below:

- a. Authorised weapons, ammunition and practices.
- b. Firing point type, dimensions, construction, lane identification, alignment and profiles.
- c. Visibility of required mantlet face from all firing points.
- d. Mantlet profile, height and width.
- e. Full exposure of all targets from all firing points, spacing, identification and target centre height.
- f. Minimum clearance over mantlet crest board.
- g. Protection to coffins and minimum clearance over coffin.
- h. Minimum clearance over Hythe Frame.(where provided)
- i. Stop butt alignment, distance from target line, size and profile.
- j. Falling plate target position and construction, if applicable.
- k. Positioning, alignment and protection to control building.
- l. Quadrant Elevation to target centre. (CofF then added to determine max QE).
- m. Template alignment.





Reference Paragraph 1611 & 1612

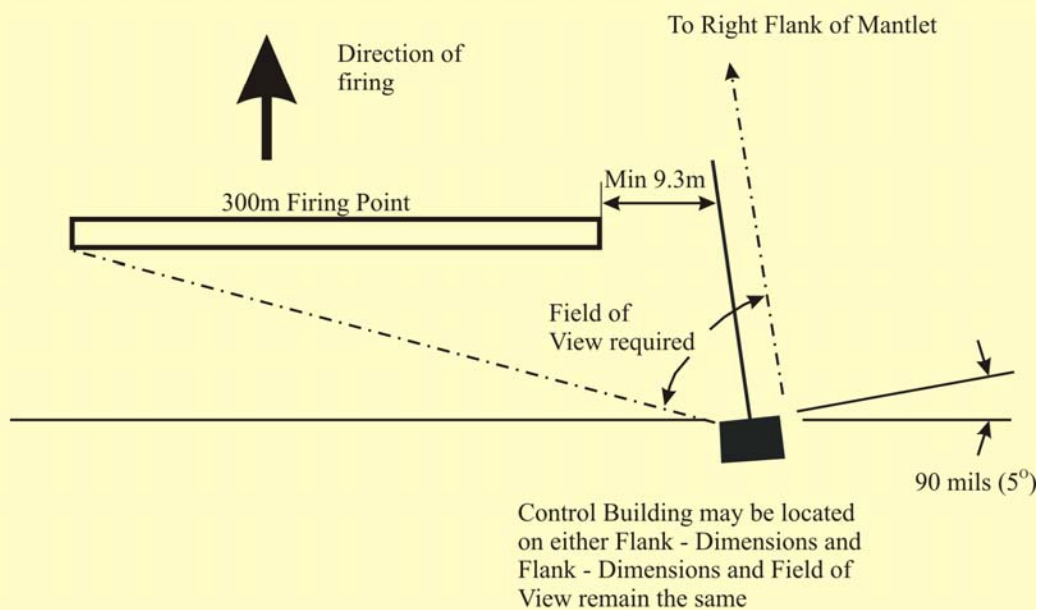


Figure 16-3. Siting of the Control Building