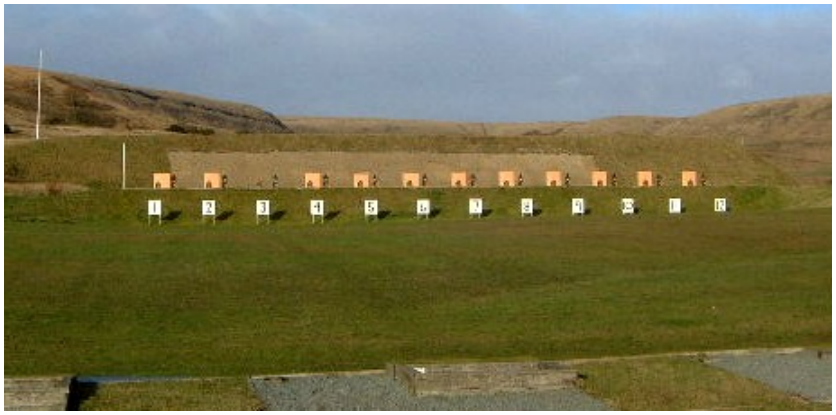
CHAPTER 15

THE GALLERY RANGE IMPERIAL & METRIC

INTRODUCTION

1501. **General.** A Gallery Range (GR) is an open LDA range originally constructed to imperial dimensions in yards (yds) or subsequently converted or partially converted to metres (m) with firing points at 100 intervals normally up to 600. On some ranges the 100 - 400 firing points only are converted to metric. For ease of reference firing points will be referred to as 100, 200 etc with no suffix. This range has a markers' gallery and a stop butt. The common range layout has 12 firing lanes each 4m wide. Targets are manually operated by the markers in the butts.



1502. **Aim.** This chapter describes the design and construction of GR and covers in particular:

1503. **Purpose**. A GR is suitable for practices at recruit and trained soldier level as set out in Reference C (Army Operational Shooting). Weapons typically used on this range include rifle, LSW, LMG, GPMG, SMG, and pistol. Tracer ammunition may also be used under the conditions set out in paragraph 1506. Due to the revised pistol practices using the manlet on GR

or Gallery Type ranges should be confirmed by TAS(RE). Combat shotgun may be used on this range providing the wider WDA can be accommodated, see paragraph 1508b. AOSP 2010 introduces many more practices forward of the 100 firing point into targets mounted in front of the mantlet such as that used with LNV practices. See paragraph 1507c.

DANGER AREAS

1504. **DA Categories**. Five DA may be applied to a GR

a. **Gallery Range Danger Area Template.** The template shown in Figure 15-1 is applied to GR that conform to the requirements of this chapter. There is a limiting QE_{max} of 70 mils (3.94^{o}) for GR with 1.8m mantlet / 3.05m determined stop butt as the design allows some rounds to pass over the stop butt. Where the QE_{max} is limited to 70 mils, rounds will fall inside the RDA. A QE_{max} of 70mils equates to a QE_{tch} of 30mils (1.69^{0}). It is the QE_{tch} that can be measured on site.

b. **Weapon Danger Area Template**. The template shown in Figure 19-2, in accordance with the CofF for fixed ranges (see Chapter 2 Table 3), is used when the stop butt and mantlet design criteria cannot be met, or hard ricochet inducing surfaces exist, and for falling plate practices which do not conform to the standards set out in this JSP. This template may also be applied to those imperial GR where the QE exceeds 70mils.

c. **Combined Gallery Danger Area Trace.** The templates at sub-paragraphs a and b above may be combined to overcome shortfalls in achieving the full GR criteria (see paragraph 1505).

d. **Hill Background Criteria**. The RDA may be reduced when there is a hill or cliff behind the range. The conditions required to meet hill background criteria are explained in Chapter 2. It is more usual to employ WDAAPS in the assessment of hill slopes behind ranges to determine any reduction in GR RDA.

1505. **Combined Gallery DA Trace.** When the full stop butt specification cannot be met or the range floor conditions are such that Gallery criteria cannot be maintained, a combination of RDA and WDA templates might provide a solution. The trace is produced after detailed survey of the range and its geometry matched by TAS(RE) to the requirements of approved RDA and WDA templates. Combined templates are applied from the firing point behind the point of failure.

1506. **SA Tracer Ammunition**. Where 7.62mm tracer ammunition is used there is a requirement to extend the RDA 400 m to the right flank around and behind the stop butt, 300 m to the left flank and backsplash up to 125m back from the stop butt. On ranges where stop butt and mantlet have no sand but are compacted earth, refer to Chapter 2 Table 2 Note 5. For 7.62 mm tracer the ADH increases to 1500 ft. The enhanced Gallery RDA template shown in RED at Figure 15-1 must fall within the overall range DA. Tracer is not to be fired from the 100 firing point unless the stop butt is 25m or more beyond the target line. The gallery is not to be manned when 7.62mm tracer is fired unless additional protection such as timber boarding is provided between the stop butt and gallery.

1507. **Other Factors**

a. **Burst Fire.** The rules for burst fire are given in Reference B (Pamphlet 21).

b. **Moving Targets**. The use of moving targets on a LDA (GR) type range is normally restricted to one 2.4m run at the centre of a 12 lane range. Advice from TAS(RE) should be sought if targets for more than one firer are required

c. **200 Mil Rule.** This reduction from the GR RDA is authorised only between a split or two standard GR / CGR or ET(LDA)R. On these ranges ground ricochet is limited by elevating the targets on top of a mantlet. With reduced ground ricochet a reduction in the flank safety angle (the 200mil Rule) may be applied. For details on the use of 200 mil rule refer to Reference B (Pamphlet 21). The 200 mil rule is not to be applied when ranges are used by non service organisations or when advanced tactical practices are in progress.

1508. **Practices on Gallery Ranges.**

a. **Pistol Practices on a GR**. The accepted location for targets engaged on standard GR pistol practices, from firing positions between the gallery and the stop butt, is at the bottom of the stop butt. On ranges where there is insufficient room between the gallery and the stop butt for pistol practices, targets mounted in front of the mantlet may be engaged. In such cases where the gallery detail between the stop butt and gallery is non standard, advice from TAS(RE) should be sought to ensure the pistol template is contained within the gallery RDA. In all cases the pistol 135mils template is to be applied to ensure flank firing position templates are contained within the range RDA.

b. **Combat Shotgun Practices on GR. Where the WDA can be accommodated (see Figures 19-7 and 19 – 8)**. Combat shotgun (slug and buckshot) may be fired at targets in lane mounted on the range floor in front of the mantlet. Flank lanes are not to be used. No engagement of targets closer than 25m. Those ranges with dense rubber tiles fitted on the mantlet are also suitable for shotgun practices.

c. **Sniper Practices.** Service Sniper practices using .338” (8.6 mm) ammunition may be permitted on the a GR or CGR with a stop butt extending at least 1.5 m above the top of the target from the prone position at 100 m. when firing using .338”(8.6mm) ammunition sniper practices set out in Reference C2 AOSP Vol.2 Chapter 10

d. **Limit of Night Visibility (LNV) and ACMT 50 m Practices.** If the GR has a 1830 m RDA, the engagement of targets at the LNV is to be conducted with targets mounted on the range floor immediately in front of the mantlet. To allow firing in all postures, target centres must not exceed 1.5m off the range floor. No engagement closer than 25m from the mantlet nor further than 75m from the targets. Engagement beyond 75m must take place from the 100 firing point at Gallery or FET mounted targets. For ACMT practices targets are normally placed on the range floor in front of the mantlet. The increased volume of lead fired into the mantlet may require the provision of shooting in boxes behind each of the

targets, see paragraph 1528. For both LNV and ACMT practices the gallery or FET targets may be utilised where a 2900 m FDA is provided or QE and LDA allow. Advice from TAS(RE) should be sought in all cases where there is only an LDA.

e. **CQM LFMT Practices.** CQM 3 m shoots fired from the kneeling or squatting position will generate a QE that may take direct fire rounds about 3.5 km down range. In order to ensure the QE remains low enough for the RDA available, the following restrictions apply on all GR types for any 3 m shoot in the kneeling or squat position:

(1) Targets mounted on the range floor in front of the mantlet or 7 m back from the mantlet are to be limited to 1 m to top of target. The Figure 11 target height is 1140 mm. This may require special short Figure 11 CQM targets, target set into the ground or the use of Figure 22 CQM targets. Anti backsplash measures are required where targets are mounted against the foot of the mantlet.

(2) Targets mounted between the gallery and stop butt in front of the stop butt, no restrictions but anti backsplash measures needed. Targets mounted 7 m back from the stop butt are limited to the upper aiming point being at 1.4 m off the ground. On metricated ranges where the stop butt is extended in height there are no restrictions for these CQM shoots between the gallery and stop butt.

Note; To ease the QE problem the target offset from the mantlet is at 7 m + 3 m engagement distance = 10 m backsplash distance authorised where the mantlet or stop butt is well maintained free of bullet debris.

DESIGN

1509. **Principles**. The GR design is based on principles that have evolved since about 1909. Current design of the stop butt is based on firing from the 100 firing point on the basis that weapons are zeroed from this distance and minimum grouping is achieved before firers move back to the other firing positions. Specific information is provided below:

a. **Target Height.** Targets are placed above the mantlet so that the CofF is raised above the range floor and thereby reduces the incidence of ground ricochet. Some ricochet is inevitable but it will be either stopped by the mantlet or stop butt, or contained within the RDA. To ensure that on existing ranges with 1.8m mantlets / 3.05m determined stop butts the occasional shot passing over the stop butt will fall within the RDA, it is necessary to apply the QE restriction as described in paragraph 1504a.

b. **Stop Butt Height.** The height of the stop butt is based on criteria applied from the 100 firing point only for the following reasons:

(1) The QE to the maximum target centre height being greater from the 100 firing point than from further distant firing points.

(2) The greater deviation of weapons being zeroed at the 100 firing point.

c. **Stop Butt Profile.** The slope of the stop butt face reduces the probability of ricochet from shot fired at the target centre from the 100 firing point. The angle of impact increases from the firing points at greater ranges.

d. **Quadrant Elevation.** (QE) To ensure that on existing imperial ranges and CGR the occasional shot passing over the stop butt will fall within the RDA, it is necessary to apply a restriction as described in paragraph 1504a. QE_{tch} is measured by assessing QE to maximum target centre and adding the respective CofF. Where ranges are found to have a QE_{tch} in excess of 30 mils TAS(RE) will advise on the options available to ensure all rounds are captured. Solutions may include adjusting the range geometry, metrication of the stop butt and mantlet (see paragraph 1515) or the extension of the RDA based on worst case ammunition trajectories. If there is insufficient land for RDA extension and insufficient funds to cover adjusting the range geometry then the range will need to be assessed by WDAAPS to ensure the minimum level of safety has been met.

1510. **Siting**. Careful site selection for the GR should enable construction without extensive earthworks. A site on level dry ground is preferable with the LofF in a northerly direction. Consideration is also to be given to the level of risk around the DA boundary when choosing the alignment of the range and this should take precedence over the problem of firing into the sun. Ground producing a depressed line of sight with a flat or slightly concave range floor is ideal. Rising ground may require additional earthwork to raise the more distant firing points. Rocky, marshy or undulating ground should be avoided as should sites that would produce a very hollow range floor (see Figure 15-2)

1511. **Worst Case Lines of Sight.** The normal firing point width is 4 m: a firer may adopt a firing position anywhere on the firing point. The historic application of criteria is taken from the centre line of the firing point.

CONSTRUCTION

STOP BUTT

1512. **Purpose.** The butt stops most aimed direct shot and low angle ricochets. It also allows the firer and coach to observe the fall of shot. Sand or granulated rubber bullet catchers may also be incorporated into the stop butt behind the target positions for ease of maintenance (see paragraph 1518). However, a stop butt is not a mandatory requirement if a WDA is available and QE does not exceed 150 mils (8.5^0). A reduced stop butt is however still useful to observe fall of shot and it will capture the majority of shot fired enabling recovery of the lead.

1513. **Location**. The stop butt is sited behind the targets and it will normally be at right angles to the range centre line but a maximum deviation of 180mils (10^0) is permitted. It should not be less than 25 m from the gallery target line to prevent backsplash into the gallery. The space can also be used for shooting at 25 m provided the stop butt meets the criteria in this Chapter, and there is sufficient land beyond the GR flank RDA for the pistol WDA. In this case provision for targetry at the base of the stop butt may be considered. Refer to TAS(RE) to determine the pistol WDA required based on flank target positions. On ranges where the stop butt is less than 25m provision must be made to prevent backsplash into the gallery. See Chapter 2 Table 2.

1514. **Structure**. The stop butt is a bank constructed from stone-free soil. It may have a rock core faced with a minimum of 1.5 m of compacted soil free from large stones (>30 mm in any dimension). Measures to reinforce stop butts to take account of torrential rain should be used particularly where stop butts are constructed entirely of sand. Timber framing or geo-grid around shooting in boxes have proven to be successful solutions.

1515. **Height.** The height of the stop butt is determined by setting a boning rod on top of the mantlet and, when viewed from the prone position, at the 100 firing point, the crest of the stop butt, should not appear lower than the boning rod, along the whole length of the stop butt. Where a GR exceeds the QE restriction, lifting the stop butt and mantlet to capture the CofF may provide a solution. The minimum height for the stop butt boning rod is to be 5m though on existing imperial ranges it may be 3.05m as illustrated in Figure 15-3. It must however be established that the mantlet is the correct height (see paragraph 1527).

1516. **Crest Length and Width**. The length of the stop butt crest is determined when a horizontal angle of 60 mils (3.40^0) applied to each flank LofS on the 100 firing point meets the line of the stop butt crest as shown in Figure 15-3. The stop butt must be level across the crest and not less than 1.5 m wide over the full length.

1517. **Profile.** The face profile of the stop butt is constructed and maintained at an angle of 600 mils (34^0) (S) to the horizontal (2:3). This ensures the minimum bullet impact angle of 533 mils (30^0) (C) is achieved, which is the minimum angle required to limit ricochet. The rear of the stop butt and its ends should be constructed at the natural angle of repose for the soil type. Stability can be enhanced with geotextiles, geogrids or a combination of the two, and the surface should be seeded to assist stability. If drainage or soil types make these slopes impracticable, the face of the stop butt may be terraced. The design of a terraced stop butt must avoid terrace steps in the main impact area behind the targets (see paragraph 1521).

1518. **Bullet Catcher or Material Boxes.** A sand or granulated rubber bullet catcher may be formed on the face of the stop butt. With sand, this will help with identifying the fall of shot and with either, will simplify de-leading. An area behind the target is excavated to 500 mm deep and filled with coarse sand as specified in Chapter 2 or granulated rubber. To assist in maintaining the profile, these boxes may be constructed of timber and set into the stop butt. The height and width of the box is to be such that when a 1.22 m^2 ($4ft^2$) target is installed, at least 0.3 m of material all around it is visible to the firer from the 100 firing point. Granulated rubber should not be placed over the whole stop butt due to the fire risk. It is easier to control a fire in smaller shooting in boxes. Light rubber sheet or shredded rubber tiles may be used to stop granulate jumping out of the boxes following bullet strike. This also helps prevent grass from grass cutters and other debris getting into the granulate.

1519. **Flag Poles and Lights**. A flag pole 6-9 m high manufactured from non-ricochet inducing material such as timber, hollow aluminium or penetrable composite material is mounted at one end of the stop butt on which a 1.8 m^2 red range in use flag is flown. If the range is authorised for night firing, a red warning light is mounted on top of the pole

1520. **Lane Numbers.** Lane numbers constructed of timber and WBP grade plywood as shown in Figure 15-4 are positioned at the foot of the mantlet. The lane numbers are to be 1 m high and painted black in silhouette or white numbers on a 1.2 m high black background. On ranges in excess of 600, the height of the numbers should be increased to 1.4 m. For night firing or falling plate practices, the lane numbers must be removable.

Note: Lane numbers on the top of the stop butt have in the past been used as targets. Any shots aimed over the top of the stop butt will almost certainly leave the RDA.

1521. **Terracing**

a. **Hill Stop Butts.** Engineering considerations may make it necessary to terrace a stop butt such as when a hill is used. Each terrace must be cut with a face angle of 34^0 (2:3) (S) and the top of the terrace sloped back from the face at 4.8^0 (1:12). Terraces may be wide enough to accept a small excavator but the possibility of ricochet from the edge will limit the depth of each terrace to ensure capture of the round by the terrace above. The layout of terracing must be planned using established ricochet data. Terraces should be constructed to avoid the main area of impact behind the targets.

b. **Stop Butt and Mantlet Cross-fall.** When a cross-fall exceeds 2.3^0 (1:25), it will be necessary to form a step or steps in the length of the stop butt and mantlet. The slope should be formed at the natural angle of repose for the soil and the resulting horizontal slope length added between lanes. To meet the minimum crest width, lower levels will have an increased crest width to avoid a change in the face angle. A step in the stop butt must be offset from the step in the mantlet to cover the flank angle distance (60 mils (3.4^0)) from the LofS at the 100 firing point. The requirements for a stepped stop butt and mantlet are shown in Figure 15-5.

MARKERS' GALLERY

1522. **General.** The markers' gallery is designed to work with the Hythe target frames. It must provide sufficient height to allow both front and back targets to be lowered out of sight to the firers and to enable the marker to paste up a 1.8 m screen without standing on a step or reaching above the gallery roof. This is not easily achieved and the design dimensions for gallery construction must be carefully adhered to. Figures 15-6 and 15-7 show a typical layout and cross-section of a gallery and the design requirements. The gallery should be at right angles to the axis of the range but, like the stop butt, a deviation of 180 mils (10^0) is permitted. It is desirable that the gallery and stop butt are parallel but this is not essential. See also paragraph 1506.

1523. **Construction**. The construction should be of brick or concrete, pre-cast concrete cantilever sections are ideal. Provision must be made behind this wall for the relief of hydraulic pressures. The target trench is the lowest point in the gallery and has to be properly drained by laying the bottom of the trench to a self-draining fall from the centre out towards each end of the gallery or from one end to the other over its full length. From the end the drainage may lead into the range system or into a soakaway. It may be

necessary to install a lift pump but every effort must be made to prevent flooding in the gallery area.

1524. **Fixtures.** A seat for each marker is fixed to the gallery wall opposite each target and provision made for telephones. A flag pole of the same material specified in paragraph 1519 is fixed to one end of the gallery for mounting a 1.2 x 0.9 m red butt flag. Access to the gallery is at this end.

1525. **Target Spacing**. Ranges built to imperial units have target spacing which give a lane width of 4 yds. This is the minimum requirement to ensure sufficient working space for markers in the gallery and to give sufficient visual separation between targets. Even at short range, firers may have difficulty identifying their targets if this spacing is reduced. On new ranges lane widths should be 4 m.

1526. **Target and Target Frames**. The in-service target frame is the 'Hythe' pattern shown in Figure 15-8. The original frames were built of malleable iron and are normally supplied by McQueens Ltd of Galashiels who hold the original drawings. The calculations for setting the height of the target frames are critical for the safe operation of the range. Great care must be taken in ensuring accurate design and setting out the work. Details of the modifications to be made to the target carriages for fixing Figure targets and target poles are shown in Figure 15-9. The legs of the targets used in target frames must allow the bottom edge of the target to show 75 mm above the crest of the mantlet as seen from all firing points (see Figure 15-10).

MANTLET

1527. **Length and Height.** In terms of safety it is the mantlet that determines whether the range is an imperial or metric range. Whenever possible, the mantlet length should be extended beyond the flank targets to protect structures at the ends of the gallery. As a guide the flanks of the mantlet should be in the LofS from the 100 firing point to the flanks of the stop butt. The minimum height of the mantlet is to be 2m. On existing imperial ranges it may be 1.8m. (See Figure 15-3). The full minimum height must be visible from all firing points in the prone posture. For mantlets that are higher, it is only necessary to see the minimum height from the crest board down from each firing point, not the whole mantlet. The mantlet and the stop butt height are key factors in justifying confidence in the capture of direct aimed shot and low, long ranging ricochets.

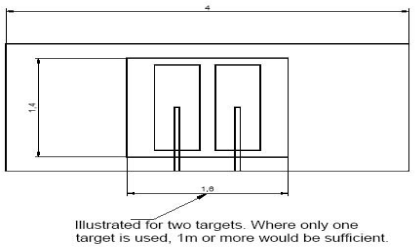
1528. **Construction.** A typical cross section of a mantlet is illustrated in Figure 15-7. The mantlet is formed of compacted soil free from large stones (>30 mm in any one dimension). It must not be less than 1.5 m thick at any point. A rock or rubble core may be incorporated providing there is a minimum of 500 mm of stone-free cover. The forward face has to be constructed to a minimum slope of 34^0 (2:3) to the range floor. Due to increased use of targets mounted on the range floor in front of the mantlet, shooting in boxes 1.4 m x 1 m wide (T) should be provided in each lane to facilitate effective de-leading. The depth of the sand or granulate in each box is around 450 mm perpendicular to the surface, 500 mm in line with the path of the bullets. To reduce ricochet the top of the mantlet is raked back to a slope of 1:12 (S) below the highest LofS. To ensure that the correct height and width are maintained, the crest of the mantlet is defined by a timber profile board 230 mm x 40 mm set on edge along the full length of the

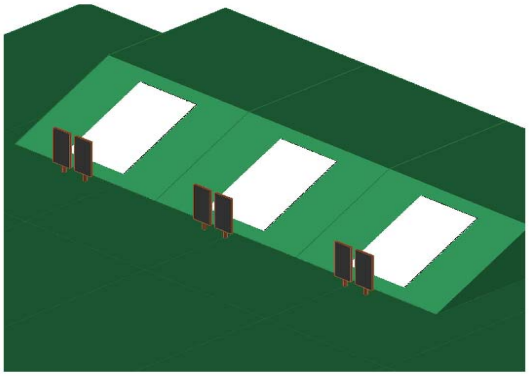
mantlet. The face of the mantlet should match the range floor. In accordance with Health and Safety at Work Regulations, protection for maintenance staff should be provided where there is an open drop into the gallery. The minimum measure is a steep drop warning sign at each end of the mantlet. The type protection provided on the mantlet is to be dictated by local risk assessment based on the degree of permitted and unauthorised access onto the mantlet.

1529. **Construction Of Shoot In Boxes.** Shooting in boxes are provided to take the majority of rounds fired during 50 m ACQM shoots and as such need to be constructed around each target array. The boxes are to be made of a soft material such as timber that will not generate hard ricochet. There will always be wide shot that will damage the materials used in constructing these boxes so this should be taken into consideration when choosing the material used. Also on ranges where LMG or GPMG are used extensively, attrition on the mantlet may be high. Refer also to Reference B that describes the use of plastic timber. Targets are normally positioned in pairs within a 4 m lane on Gallery Ranges. Mantlets vary greatly in layout so the actual size and position of shooting in boxes may vary from range to range; a typical layout is shown below:

Mantlet Conversion

Typical detail to capture the majority of shot fired in order to ease maintenance.





1530. **Falling Plate Targets**. Falling plate shooting-in boxes set into the face of the mantlet lower the CofF, which increases the risk of ricochet off the range floor and therefore requires the 2900 m RDA template to be applied (see Figure 19-2). To avoid lowering the CofF, shooting-in boxes may be set into the stop butt between target frames on the normal LofS. However, as this creates a backsplash hazard, the markers' gallery should not to be manned. To fire falling plate practices on gallery ranges without the need to increase the Gallery RDA, falling plate boxes or covers over the steel plates mounted on the mantlet may be used (5.56 mm only; refer to TAS for details). Only the issued falling plate targets are to be used (see Chapter 29).

TARGET STORE and WORKSHOP

1531. The preferred position for the target store and workshop is at one end of the markers' gallery (see Figure 15-6). On ranges with up to twelve targets it will be found that a combined target store and workshop will be adequate. In the case of larger ranges it is advisable to have the workshop sited centrally and the target store sited in the gallery. The workshop should be equipped with a large flat-topped target table, a carpenter's bench, cupboards, and adequate heating and lighting. A water supply is desirable. RAU should be aware that most target stores and workshops on GR are located within the GR RDA. Personnel in this area are exposed to rounds that “pop over” the stop butt. All those in the workshop / store area whilst firing is taking place are to be under cover protected from potential pop over. The CGI or profile steel roofing typically found on workshop / store roofs has been shown to provide protection from pop over.

RANGE FLOOR

1532. **Levelling**. Visibility of targets must be maintained throughout, when advancing from the 400 firing point forward. Drainage ditches, streams etc need to be culverted and brought approximately to ground level. It is not satisfactory to place footbridges across such obstacles as timber will become slippery, and steel and concrete are a ricochet hazard. Depth of soil cover on the range floor is 150mm (S) and should be free from stones >30mm in any direction.

1533. **Distance and Lane Markers.** Timber markers are suitably positioned to show lane numbers and the firing distance of the firing points.

FIRING POINTS

1534. **Construction.** Firing point construction details are shown in Figure 2-13. The minimum height of the mantlet (see paragraph 1527) must be visible to the firer in the prone posture or in a firing trench. The crest board must be 450mm above the range floor. In addition, to reduce ricochet, no ground or obstruction is to intrude into a line 450 mm below the prone firer's LofS. New firing points on the range floor between the 100 firing point and mantlet need only be marked with wooden pegs. In areas where the range floor may be eroded alternative materials may be incorporated such as those used on the main firing points.

1535. **Surfaces.** Firing point surfaces should be slip resistant, have no trip hazards and designed to minimise maintenance bearing in mind that they are exposed to shot from firing points to the rear.

1536. **Fire Trenches.** Properly drained fire trenches together with a post to simulate fire from cover are normally provided at the 100, 200 and 300 firing points but may not be possible if the water table is high. The trenches may be revetted with timber or pre-formed concrete sections with a 225 mm timber surround at the top to prevent ricochet. Where the local risk assessment determines a potential hazard such as animals or children accessing the range when not in use , lids to cover the trench when it is not in use should be considered. Where trench covers are not suitable, warning signs around the area should be provided.

COMMUNICATIONS

1537. **External.** A means of summoning the emergency services, ideally a land laid telephone, is to be available.

1538. **Internal.** Provision should be made for the following telephone communications:

a. **Gallery.** The connection point in the gallery should be placed centrally to each bank of twelve targets and is to be an external weatherproof fitting made vandal-proof by putting it into a secure access box with the cable in securely fixed trunking. The spur that runs to the side of the range to connect with the line from the firing points is in a cable duct buried 600 mm deep.

b. **Firing Points**. The connections at the firing points are to be external weatherproof fittings located to the rear of the firing point. Preferably the connections are set below ground in a damp-proof container with a 50 mm thick timber lid set flush with the range floor. An above ground connection point should be provided on a pole set as low as possible but not more than 500 mm high protected by 100 mm thick timber or 500 mm of earth ramped up from the range floor.

c. **Inspection Pits**. All inspection pits on or adjacent to the range floor are fitted with 50 mm thick timber covers set flush with the range floor.

MAINTENANCE

1539. **Range Profile Survey**. The effects of weathering, soil movement and attrition will cause changes in the range profile. Range inspectors should call on TAS if they are in any doubt on ballistic element compliance.

1540. **Responsibilities.** Maintenance is the responsibility of the RAU. Responsibilities 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.

1541. **Frequency**. Proper maintenance is dependent upon good liaison between the Range Warden and the RAU, and on 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 building and earthworks repair; this work should be combined with the contract repair of equipment.

1542. **Bullet Catcher.** The requirements for maintaining the bullet catcher sand, granulate and de-leading are given in Chapter 2.

1543. **Mantlet Scooping**. Low shots can cause deep scooping to the front of the mantlet in line with the targets. This can generate high ricochet and may allow shot to penetrate through the mantlet to strike target frames. Maintaining the mantlets correct profile is essential. Where scooping occurs the range configuration should be checked, especially target clearance above the mantlet. Should the configuration be correct, shooters need to be made aware that they should be aiming correctly and should avoid low shot. As a final resort, timber or shredded rubber/polymer blocks may be used to minimise the maintenance effort though minimum target clearance must be maintained (see figure 15-12)..

COMPLIANCE CHECKS

1544. The following areas are considered during a compliance check:

a. Authorised weapons, ammunition and practices.

b. Firing point 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.

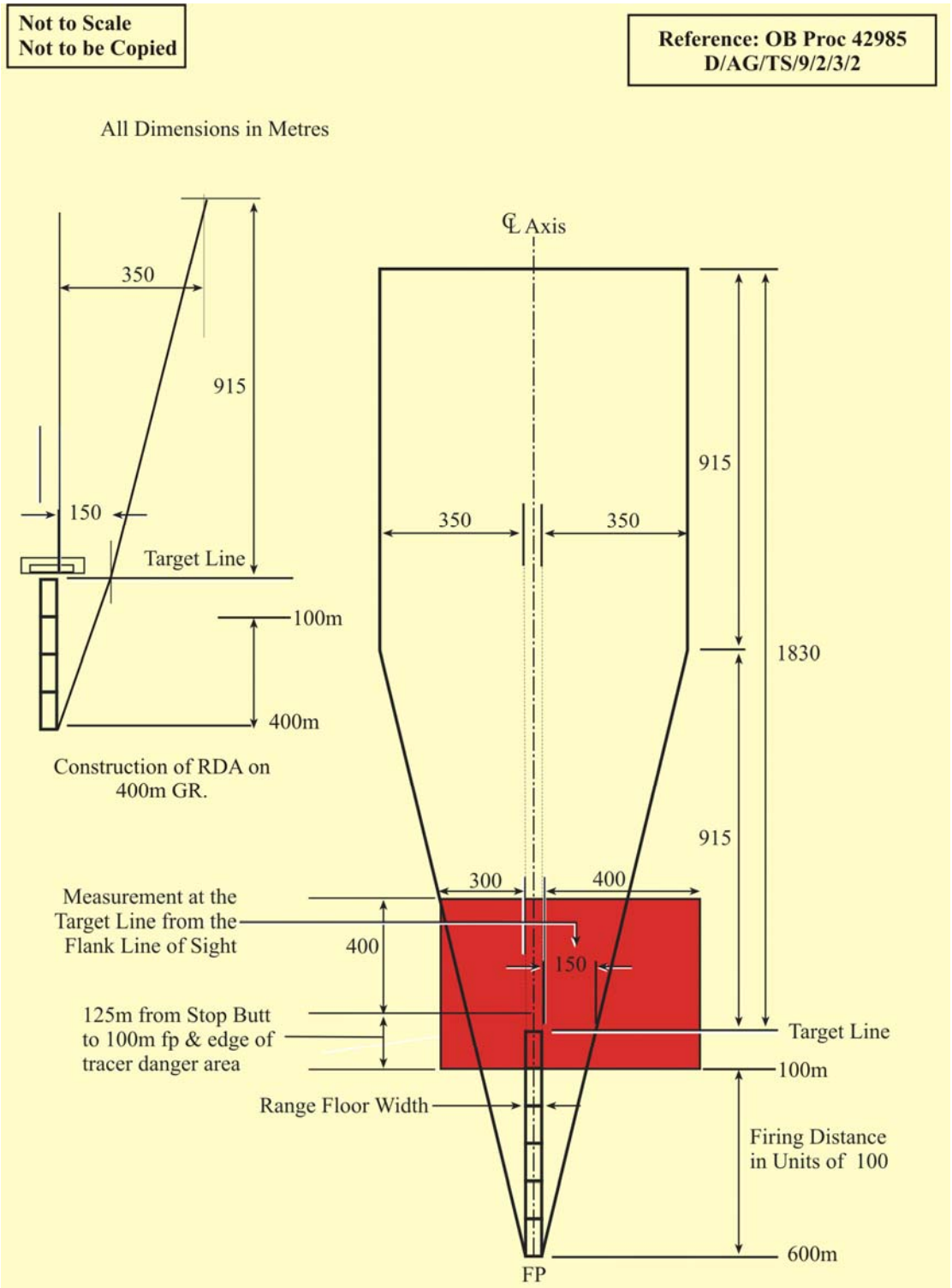
g. Minimum clearance over Hythe Frame.

h. Stop butt alignment, distance from target line, size and profile.

i. Falling plate target position and construction, if applicable.

j. Quadrant Elevation to target centre. (CofF then added to determine max QE).

k. Template alignment.



Notes:

1. ADH: 5.56, & 9mm: 500 ft, 7.62 Ball 750 ft, 7.62 mm Tracer: 1500 ft AGL.
2. When firing 7.62 mm Ball an air sentry may be required.
3. This template only applies to ranges built to metric standards (see Figure 15-3) and to those constructed to Reference W with a QE restriction (QE_{max}) of 70mils (30mils to target centre QE_{tch})).
4. Maximum MV / ME permitted - see Chapter 2 Table 4.
5. Tracer DA shown in red (5.56mm tracer may be treated as ball ammunition).

Figure 15-1. RDA Template Gallery Range

Reference W

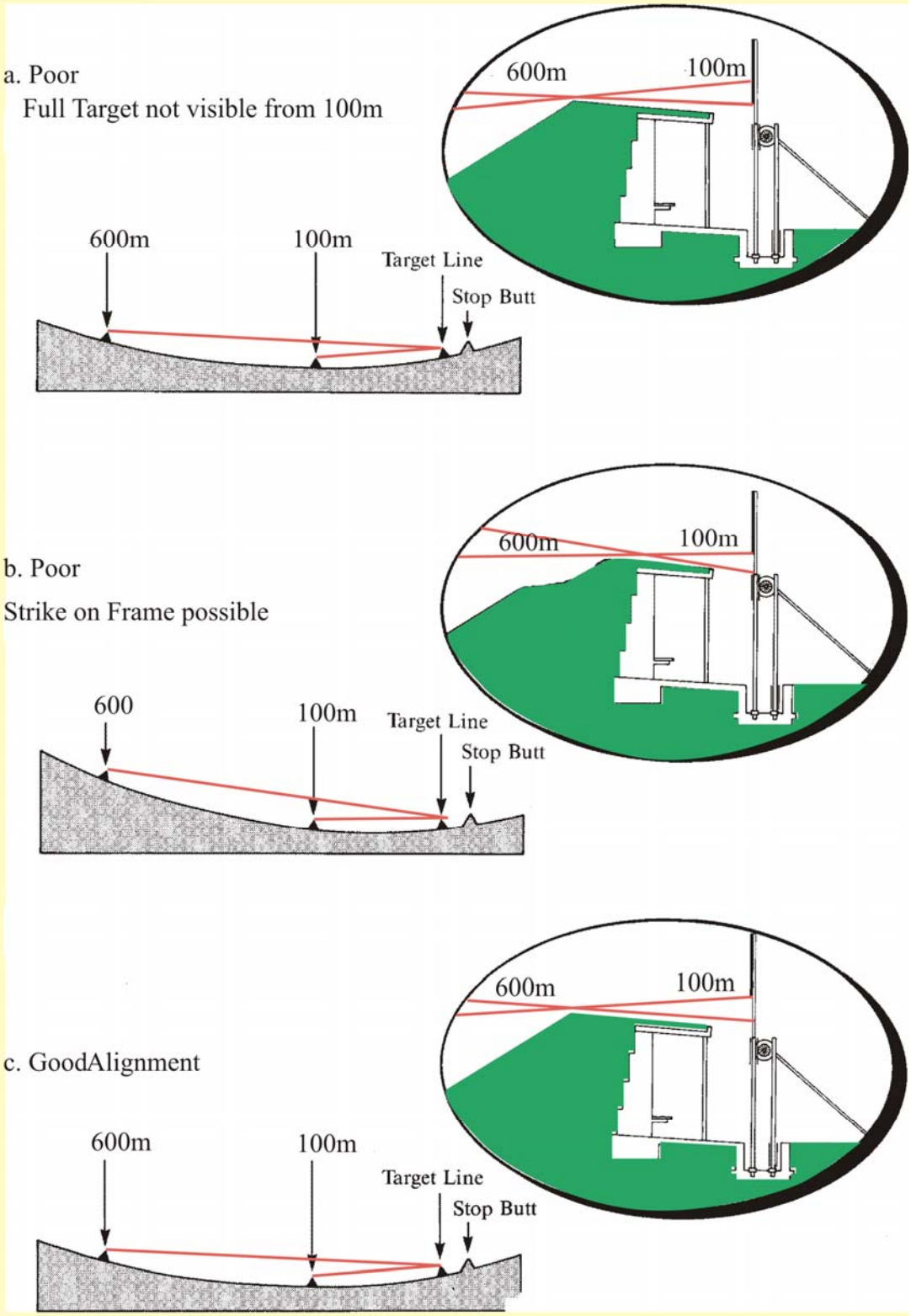


Figure 15-2. Effects of Hollow Sites

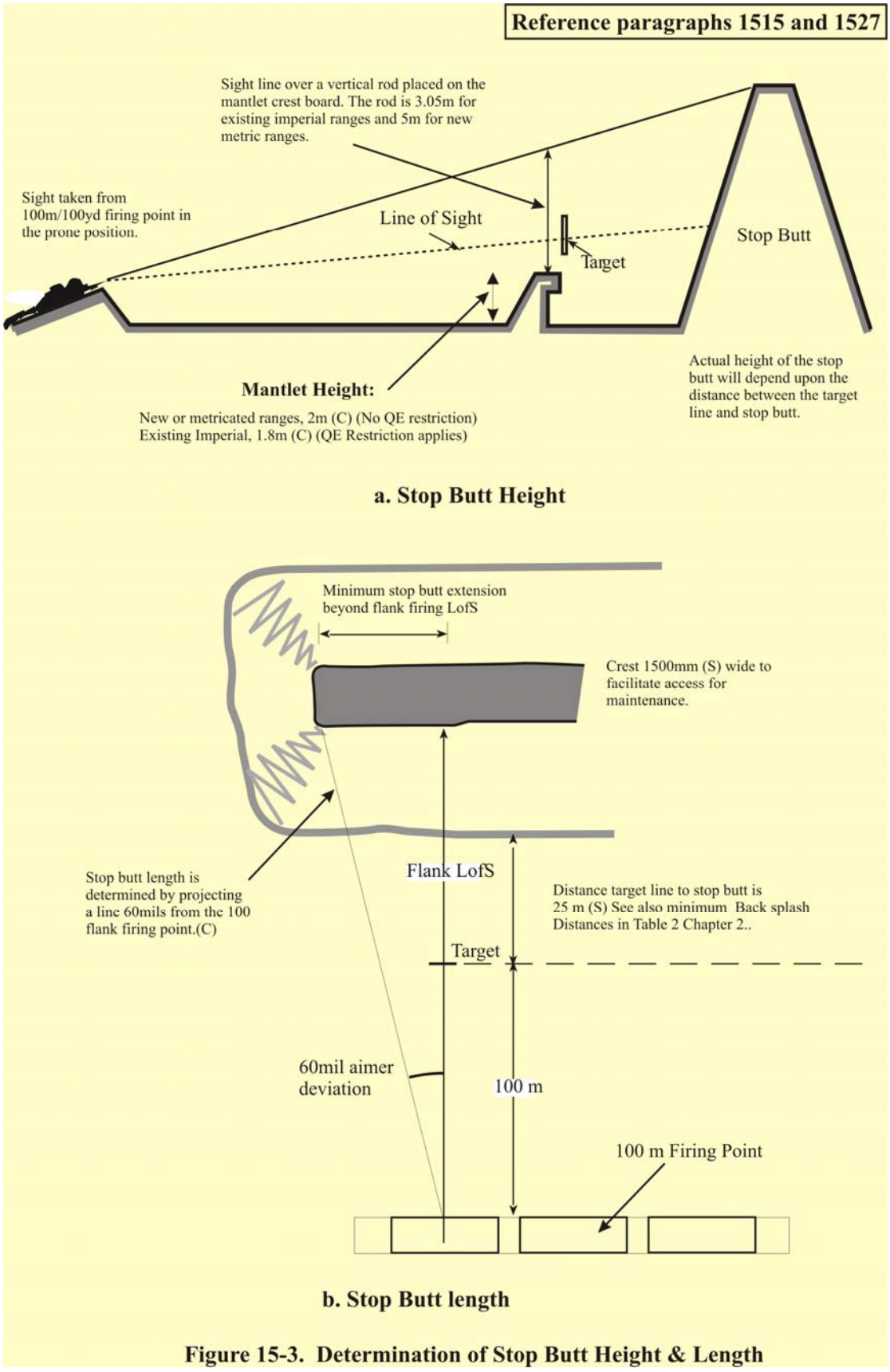


Figure 15-3. Determination of Stop Butt Height & Length

Reference W

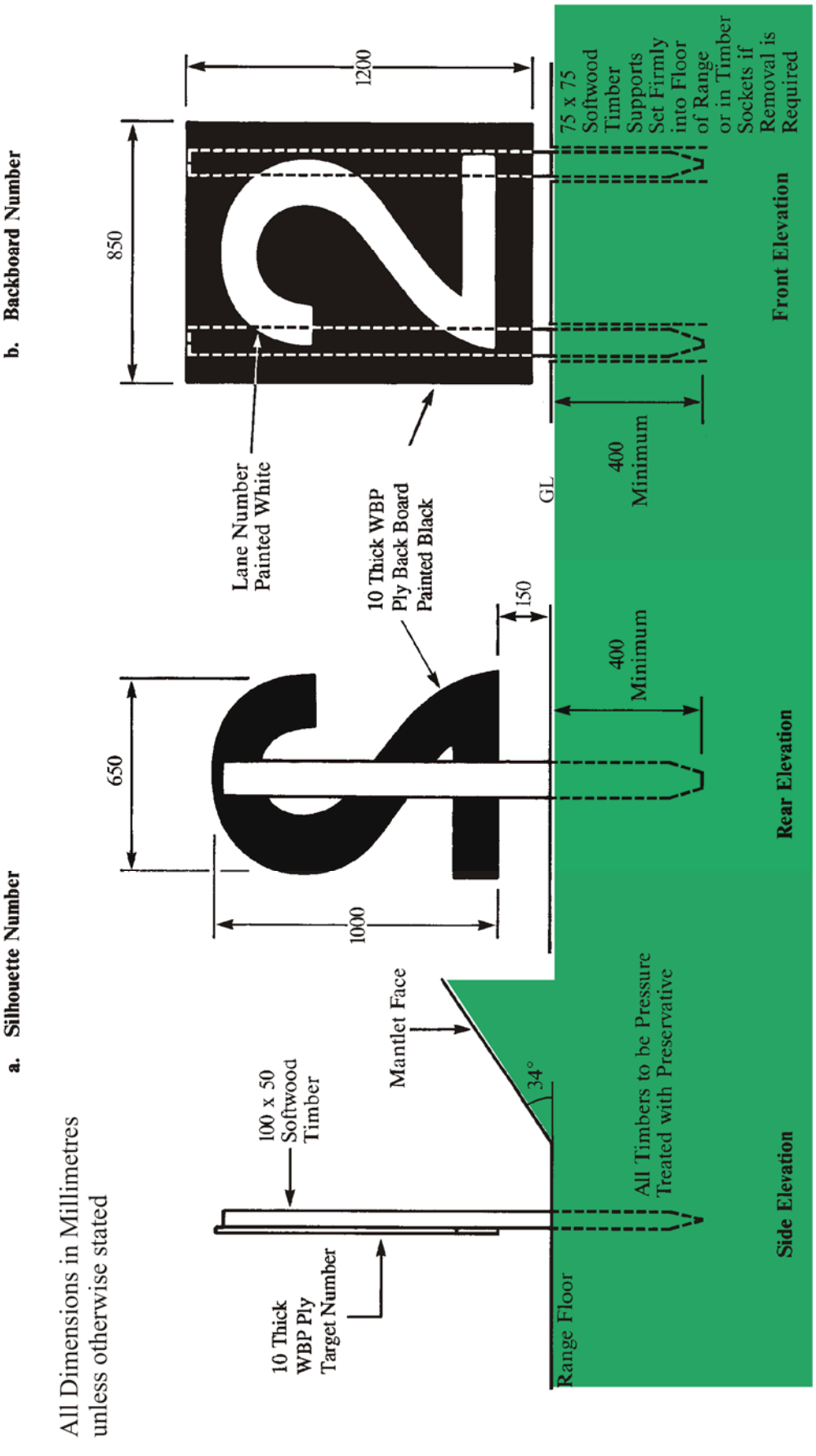


Figure 15 - 4. Lane Marker Numbers

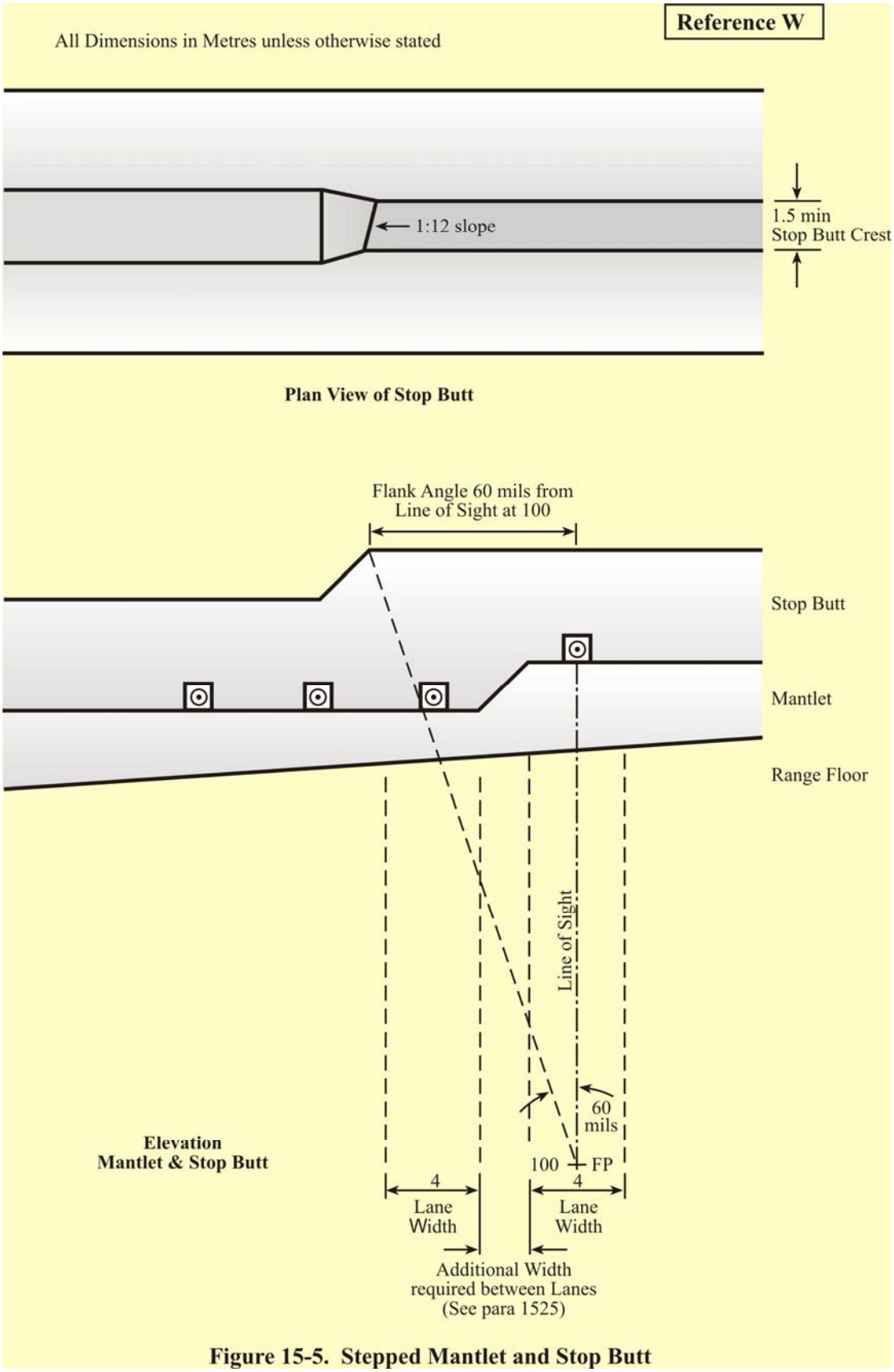


Figure 15-5. Stepped Mantlet and Stop Butt

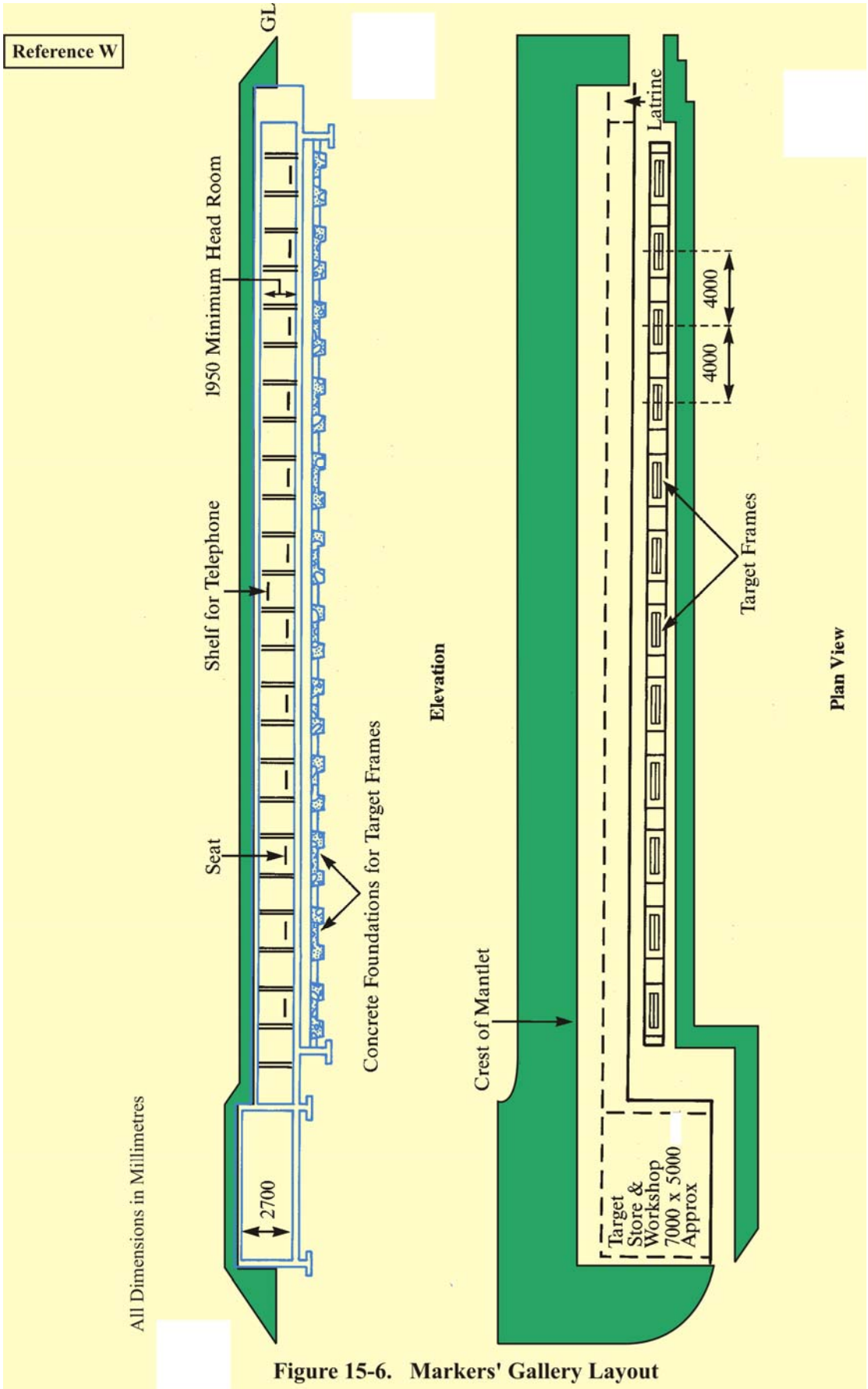


Figure 15-6. Markers' Gallery Layout

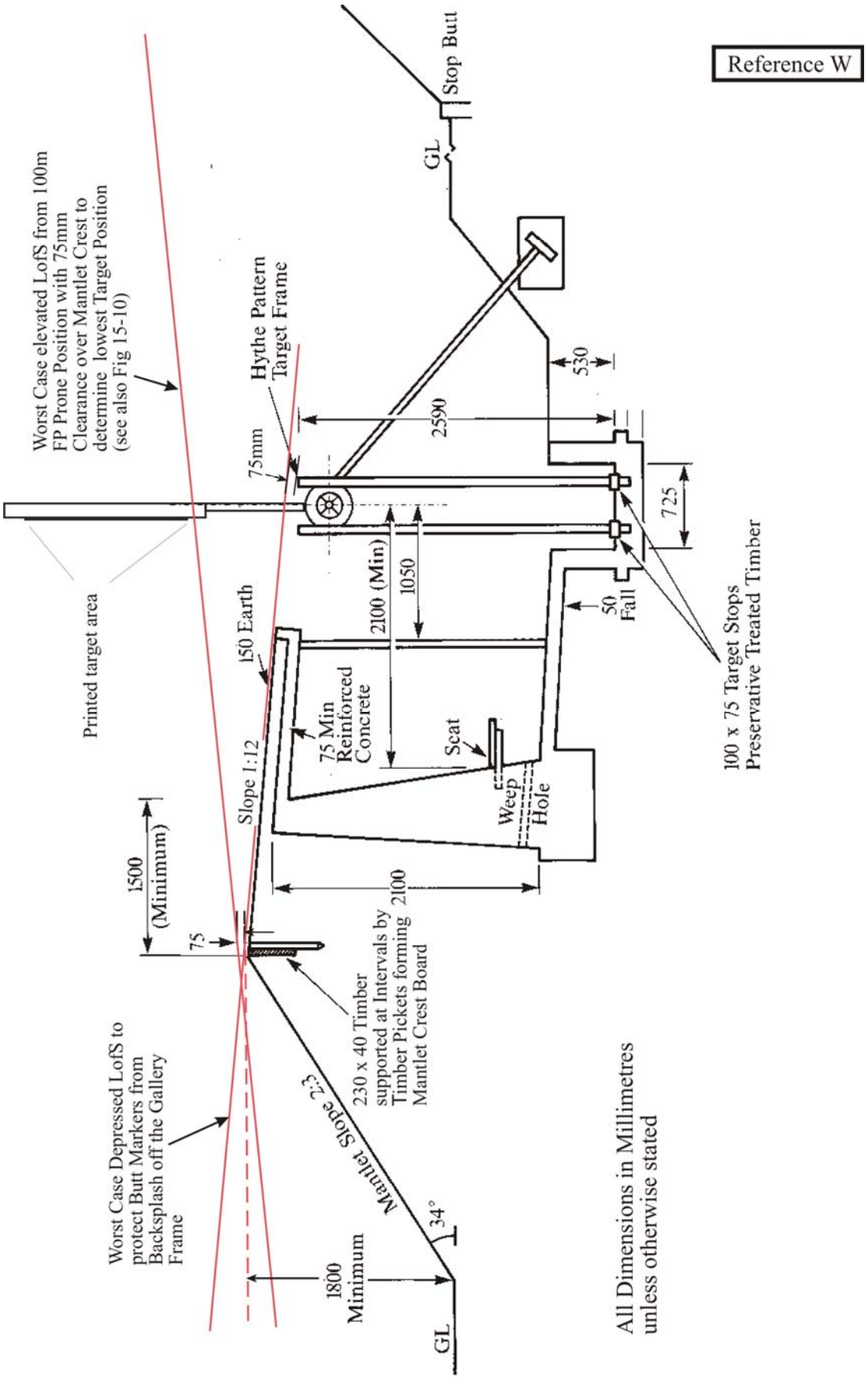


Figure 15-7. Markers Gallery Detail

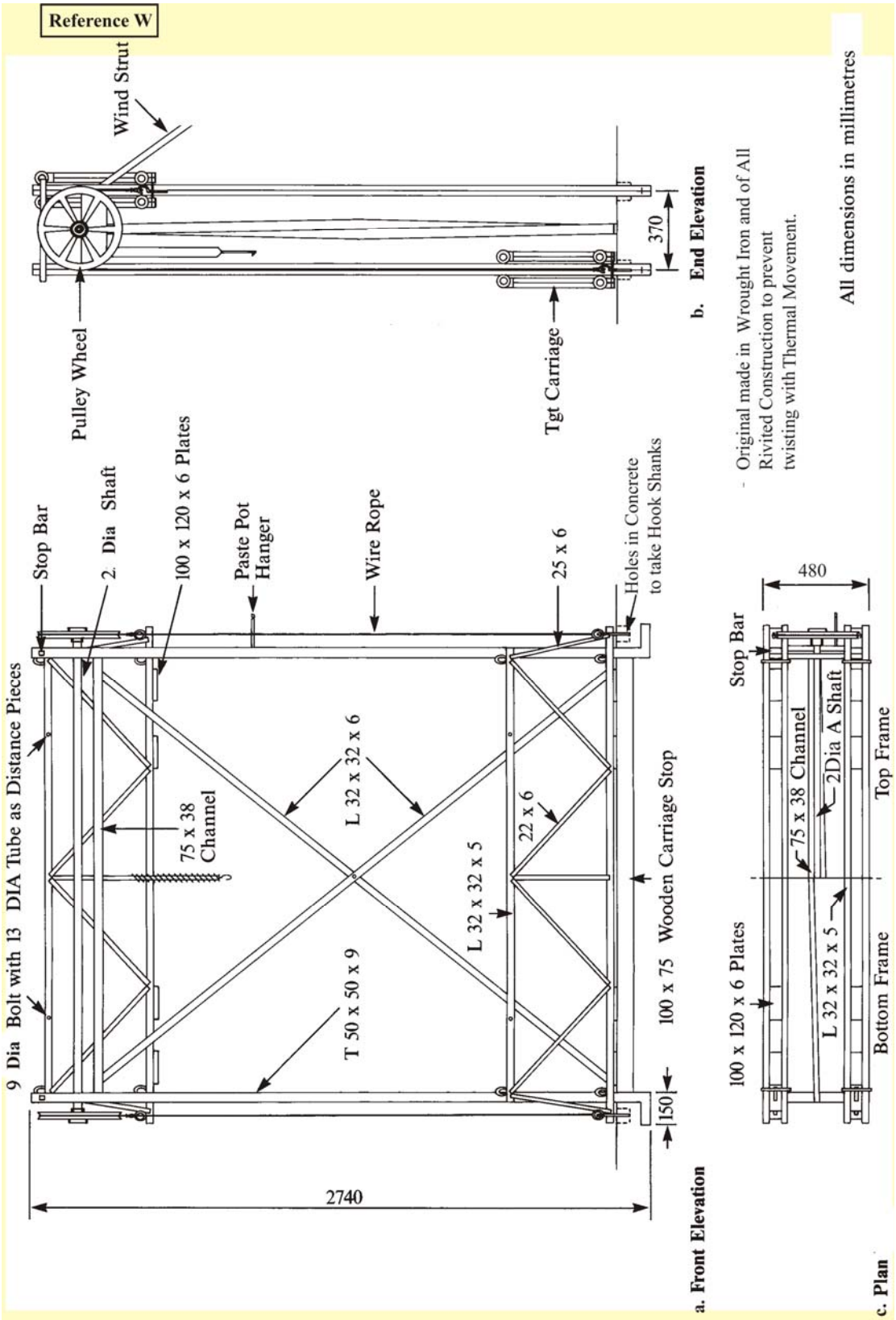
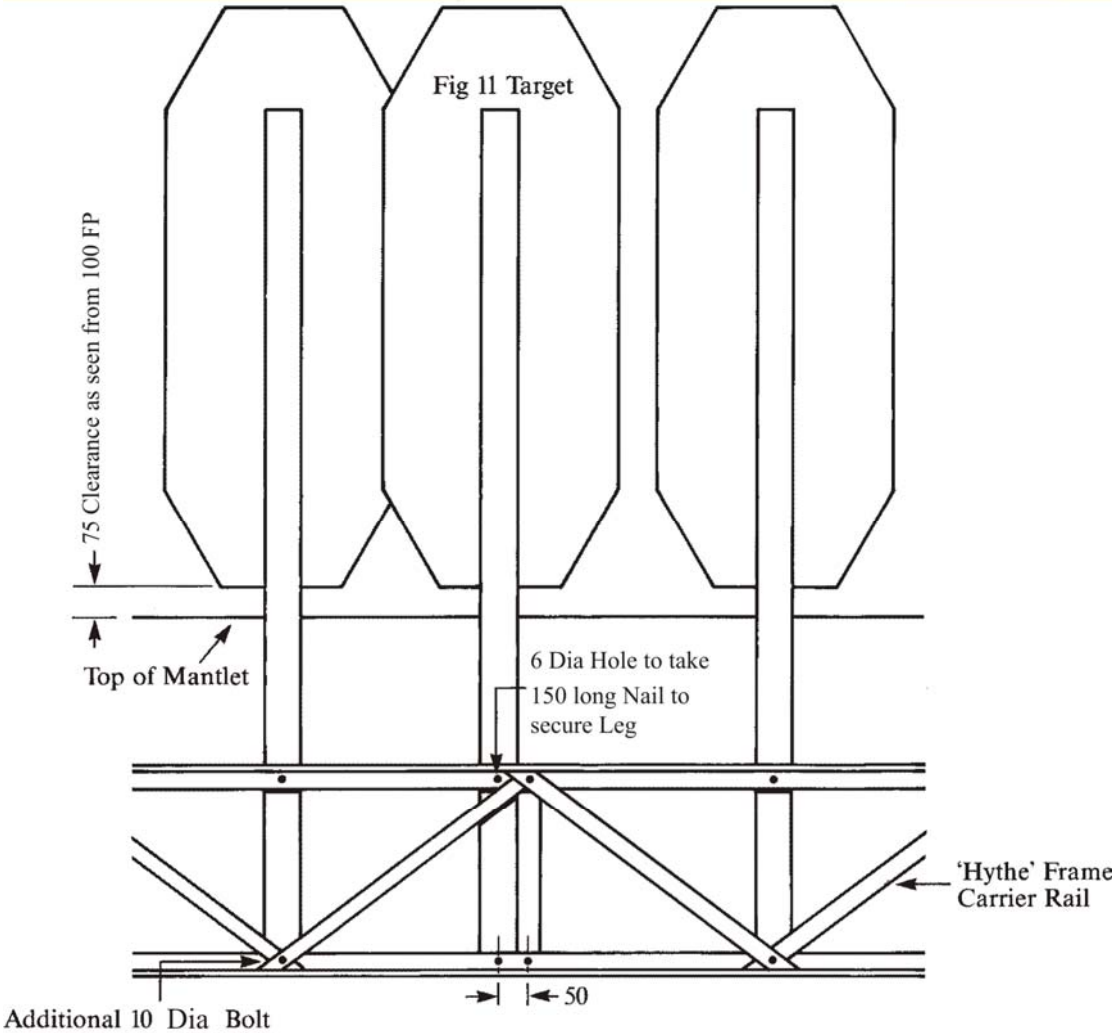
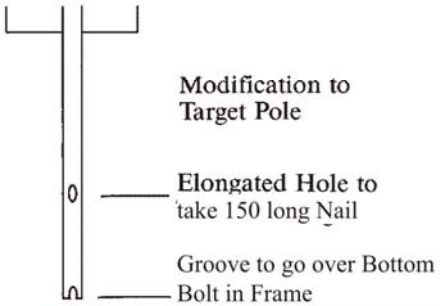


Figure 15-8. The Hythe Pattern Target Frame

Reference W



All Dimensions in Millimetres
unless otherwise stated



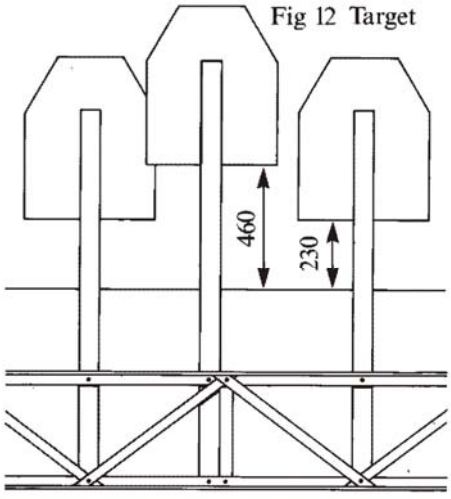
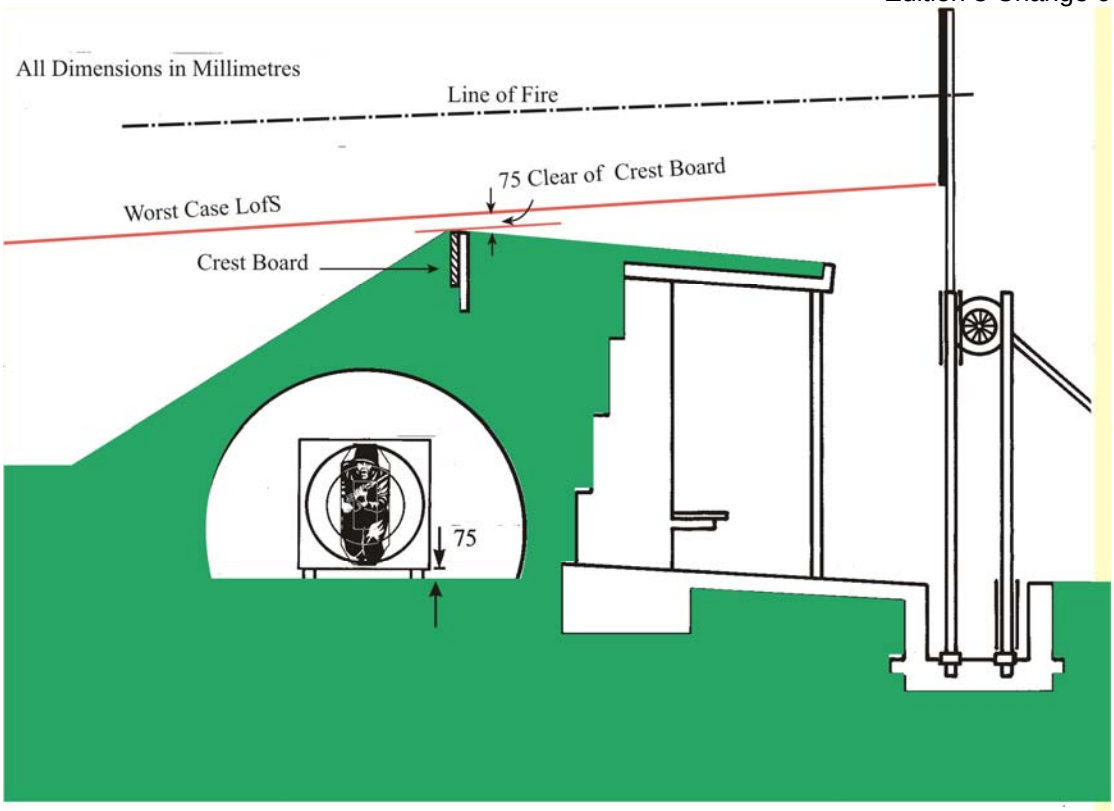


Figure 15-9. Fixing Detail for Figure Target in Hythe Frames



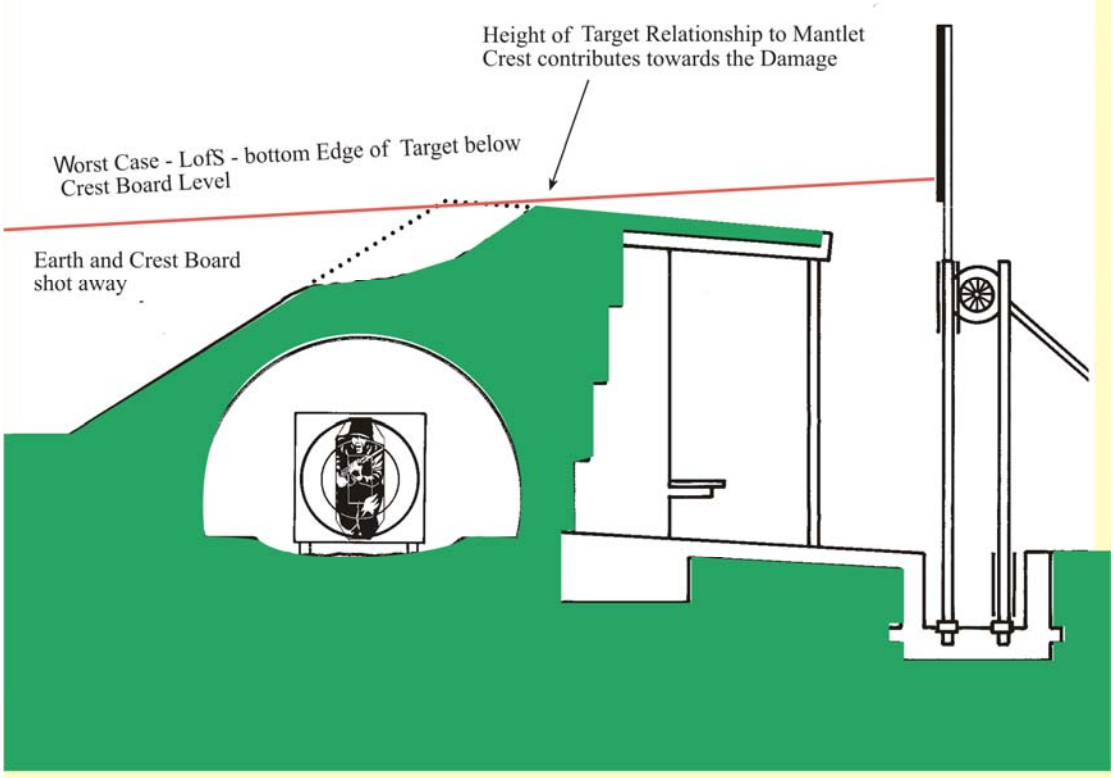


Figure 15-10. Crest Board Clearance and Mantlet Damage

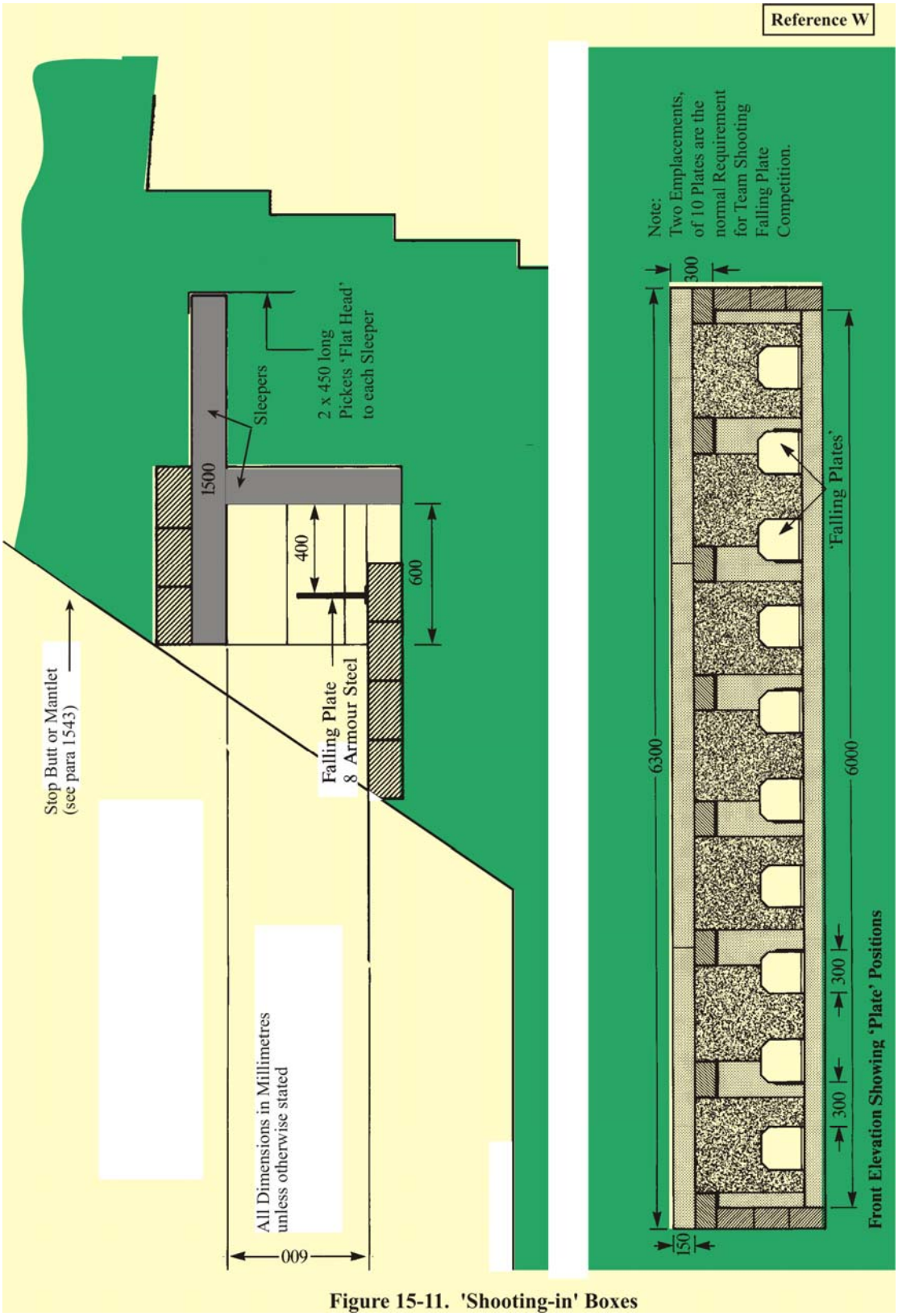


Figure 15-11. 'Shooting-in' Boxes

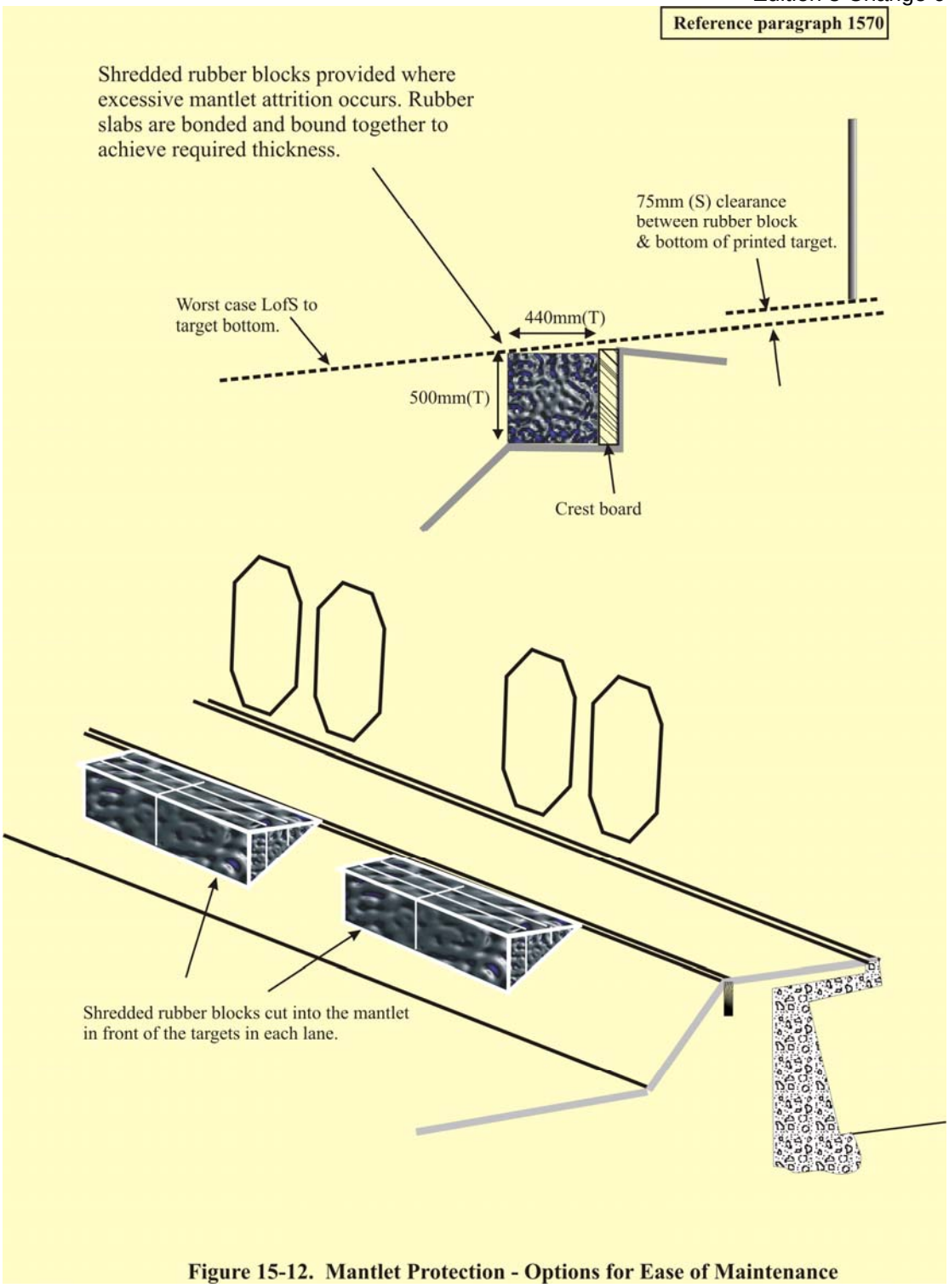


Figure 15-12. Mantlet Protection - Options for Ease of Maintenance