



NSW Police Force

NSW FIREARMS REGISTRY

RANGE USERS GUIDE

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CHAPTER 1 INTRODUCTION

SECTION 1. PURPOSE & COLLATION OF THE GUIDE

This Guide has been produced to provide those Clubs and Organisations that are contemplating or are currently operating live firing ranges a reference manual as to the conduct and regulation requirements pertaining to the operation and construction of a live firing range.

The material and information that is contained within this guide has been collated from up to date sources and has been included as being relevant to live firing ranges that may be encountered in the State of New South Wales.

As far as possible the contents of the Guide are seen to be without prejudice and without the need for interpretation. Should an individual or a Club need clarification on any content of the Guide the Range Inspectors of the Firearms Registry are the only persons authorised to provide that clarification.

SECTION 2. DISTRIBUTION OF THE GUIDE

This Guide was initially distributed electronically to the relevant approved Associations listed in clause 91(3)(d) of the *Firearms Regulation 2006*. Under no circumstances will a copy be provided to individual Clubs direct from the Firearms Registry. A current Version of the Guide can be obtained by going to the Firearms Registry Site and by clicking the [Ranges](#) selection can view and if wish print out a copy.

All subsequent amendments to the Guide will be downloaded to the Firearms Registry Internet Site.

SECTION 3. SUGGESTED AMENDMENTS, INCLUSIONS AND LIMITATIONS

All suggested amendments and inclusions are to be forwarded in writing to the Range Inspector, Firearms Registry, Locked bag No 1, Murwillumbah NSW 2484.

It is recognised that this Guide will not be all encompassing but should cover the vast majority of conditions and specifications that may be encountered.

SECTION 4. DISCLAIMER

It will still be a requirement for new Ranges to be approved by the Manager, Firearms Registry (FAR). Any changes or additions to Ranges are also to be approved by the FAR. Under no circumstances are Clubs to assume if they follow the Guide that the Range Inspectors of the FAR are not to be consulted through any process that would or may require a change in the Range Approval or conditions therein.

This information is provided as a guide only and does not constitute legal advice. This advice does not constitute a decision to the Registry in relation to any matter and does not give rise to an expectation in the recipient based on the advice contained herein. Interested parties are advised that they should seek independent legal advice before making any decisions based on this advice.

Interested parties are also advised that any reliance upon this advice is at their own discretion and risk. NSW Police bears no responsibility for any loss or damage incurred as a result of the reliance by any person on this advice

SECTION 1. SITING A NEW RANGE

First Step. As a first step in selecting potential range sites, clubs should study the general area using the largest scale map of the area available, prior to visiting the area. The outer boundary of the area should be accurately marked on the map and should also include details of adjoining properties. The status of ownership of both the proposed range area and adjoining properties should be ascertained to determine any impediments to the establishment of the range. To name but a few, examples of this may include neighbours who are unwilling to grant firing rights, matters related to native title and restrictions imposed by local councils or the Department of Natural Resources.

Is the Site Suitable? Range and ammunition danger templates (correctly scaled to the map being used) should be prepared on clear transparencies (traces). By carefully applying the traces to the area, a number of possible sites may become apparent. The possible sites should be studied to select the best two or three options on the basis of access, shape of terrain, availability of services, direction of fire, multiple usage etc. Detailed information on Range Danger Area (RDA) templates and their construction are discussed in Section 2-5 of this chapter.

Geographical Considerations. As a general rule, sites should be level or slightly hollow (concave), and preferably dry and above flood lines. Sites on rocky, marshy, uneven, rising or falling terrain create difficulties in both construction and use. Rocky ground should be avoided because of the increased danger of ricochets and the cost of removing exposed rocks.

When multiple firing points are used, hollow, low-lying sites are generally unsatisfactory for the following reasons:

- a. If firing points at shorter ranges are not built up, the line of sight will be uphill. This is likely to increase the range of ricochets and is detrimental to good shooting techniques.
- b. Raising the firing points to achieve a level line of sight may be expensive.
- c. It may be difficult to present the full target face at all ranges due to the different lines of sight

When a single firing point is used, concave sites can provide a clear line of sight. The recommended range axis is from North to South. East to west sites should be avoided due to the difficulty in sighting that will be experienced in the morning and afternoon with the sun shining directly into the firers' faces.

Wherever possible, ranges should be constructed so that the range danger areas are contained fully within the area closed to public use. Consideration should be given to overlapping two or more danger area templates to reduce the amount of land required within the boundary and if necessary, to site more ranges in limited space.

It is normal practice to provide some form of stop butt for the majority of outdoor longarm and pistol ranges and is to be considered in the planning process for any new

longarm or pistol live firing range. The standard and the recommended minimum height for a stop butt is 4 metres above the range floor and at that height should be at least 1 metre in thickness.

The forward slope of a stop butt must be free of any ricochet inducing material for at least 300mm in depth in the case of an earthen stop butt. The angle of the forward slope must be at least 30° to the perpendicular to prevent that face from becoming a launching ramp for fired projectiles.

It is generally accepted that the reasons for the provision of stop butts are:

1. To prevent a fired round from traveling any distance thus making the immediate area around a live firing range inherently safer.
2. To allow the shooter to observe the fall of shot.
3. To allow the stop butt to retain the majority of lead for the later efficient removal and disposal of lead residue.

SECTION 2. RANGE DANGER AREAS DESCRIPTION

An RDA includes those areas of land or water, together with a specified air space, within which danger to life, limb or property may be expected to occur arising from the initiation of specified ammunition. The distance a projectile will travel varies according to several factors including ballistic co-efficient, projectile weight, muzzle velocity, calibre, projectile shape, angle of elevation, relative humidity and height above sea level. As shown in Figure 2-1, an RDA consists of the following:

- a. **Firing Point.** The firing point is the position from which firing occurs. It may take the form of a point for an individual firearm, a line for a number of firearms or an area for one or more firearms firing from different positions.
- b. **Impact Area.** An impact area is an area having designated boundaries within the limits of which all ordnance is to make contact with the ground. An impact area consists of:
 - (1) the target area, which is the point or location at which fire from the firearm is directed;
 - (2) the dispersion/human error angle which delineates an area on both sides of the line of fire to cover such eventualities as human error which may include unsteady aim or the effects of meteorological conditions;
 - (3) the ricochet area, which is the area in which ricochets of ammunition may be expected to travel.

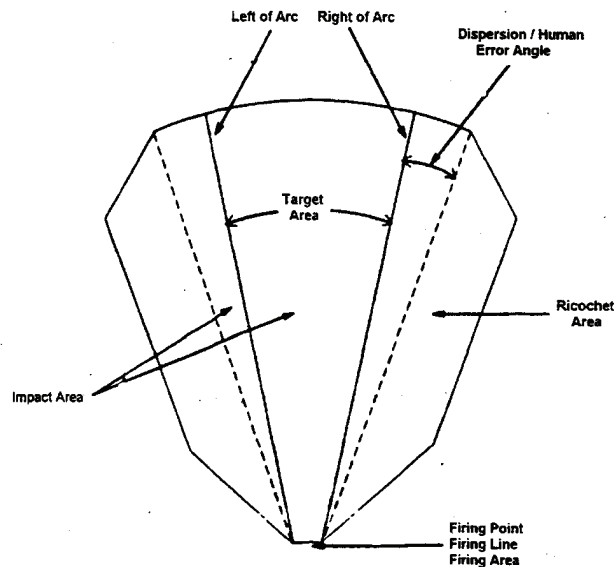


FIGURE 2-1. A RANGE DANGER AREA

SECTION 3. DEFINITIONS

The following definitions apply to danger areas:

- a. **Angle of Elevation.** The angle of elevation is the angle between the horizontal plane and the axis of the firearm barrel.
- b. **Angle of Depression.** The angle of depression is the angle between the horizontal plane and the axis of the firearm when it is depressed below the horizontal plane.
- c. **Arc of Fire.** The arc of fire is that area within which firing is to be directed. It is indicated from the firing point or area.
- d. **Culminating Point.** The culminating point is the highest point to which the projectile will rise above the line of sight along the trajectory.
- e. **Ammunition Danger Area Template.** An ammunition danger area template is a scaled drawing of the area of danger created when a single round of ammunition is initiated from a static position along a single line of fire. Each separate combination of firearm and specific ammunition nature has a distinct danger area template and must be combined with a high degree of range discipline. The dimensions of a danger area template are based on a combination of:
 - (1) the degree of accuracy of the firearm;
 - (2) the type of ammunition, propellant and charge;
 - (3) an accepted degree of human error; and
 - (4) the ground and conditions of firing.
- f. **Hard Target.** A hard target is one that is likely to cause ricochet, such as metallic targets. If part of the target area is a hard target, the whole area is treated as a hard target area.
- g. **Soft Target.** The target area is considered a soft target area when there is no crystalline rock, concrete or metal objects in the impact area, which could cause an increased ricochet risk.
- h. **High Elevation Fire.** High elevation fire occurs when high mounted targets are used. High elevation templates are to be applied in accordance with Annex A to this chapter. Approval for high elevation firing will only be granted in circumstances where land restrictions dictate a high angle of firing.
- i. **Quadrant Elevation (QE).** The QE is the angle of elevation, measured from the horizontal plane at which a projectile is launched from a firearm barrel.
- j. **Range Danger Area Template (RDA).** An RDA safety trace defines, diagrammatically, the limits of the dangerous area created when an ammunition danger area template is applied from all firing points to all target positions on a map of the same scale. It is used by:
 - (1) range users, to determine maximum permissible arcs of fire;
 - (2) range authorities, to determine whether the activity can be conducted within the confines of the range boundaries; and
 - (3) clubs and organisations, to determine the requirement for things such as closure of access or warnings to local inhabitants.

SECTION 4. TEMPLATE DESIGN GENERAL

A thorough understanding of ammunition danger area templates and their application is required before range danger area templates can be designed.

Organisations that have multiple ranges may nominate one person to prepare the template. It can then be passed to each affiliated club to include in their application. In such cases it is important that the maps used are to the same scale as the template.

Ammunition planning factors that affect template design are specified in Annexe A to this chapter and include:

- a. maximum ranges;
- b. dispersion, human error angles;
- c. ricochet angles;
- d. ricochet distances;
- e. quadrant elevation;
- f. air danger heights; and
- g. ballistics restrictions.

The factors that must be taken into account when designing an ammunition danger area template are:

- a. ricochet characteristics;
- b. danger heights,
- c. high elevation fire including excessive wind.

Ricochet Characteristics

When determining the dimensions of a template, the following ricochet characteristics must be considered:

- a. A ricochet occurs when a projectile strikes a surface then rebounds one or more times.
- b. If a projectile strikes at an angle of less than 530mils/30 degrees to the surface and does not explode or disintegrate, it may ricochet at an angle up to 800mils/45 degrees in any direction from the line of fire.
- c. The range at which a projectile achieves an angle of descent of 530mils/30 degrees is taken as its maximum ricochet range. The firearm elevation that achieves this range is taken as the elevation above which ricochets will not occur.
- d. A projectile that strikes short of its maximum ricochet range can skip on up to the maximum range of the firearm.
- e. The angle to which a projectile will ricochet laterally depends on the type of surface struck. The lateral ricochet distance for hard and soft surfaces is the same in most instances, because of the loss of kinetic energy after deflection.

Danger Heights

Safety traces are concerned, not only with danger areas at ground level, but also with danger heights. Although ammunition may only reach peak heights in certain very small portions of the overall area, the danger height is still applied over the whole template area. Danger heights are specified in Annex A to this chapter.

High Elevation Fire

The elevation at which high elevation fire is said to occur varies from one ammunition nature to another. In general terms, it is that particular angle above which a ricochet is not expected under normal circumstances. The danger area for higher elevation fire is no longer than the normal danger area. The high elevation template is not applied where firing is to take place below the angle specified in Annex A to this chapter. Approval for high elevation firing will only be granted when land restrictions dictate firing along an elevated line of sight.

Excessive Wind

The danger area template makes provision for a wind velocity of up to 50 km/h. Where high elevation firing is proposed in wind conditions in excess of 50 km/h, the danger periphery on the downwind side must be extended by at least 500 metres. Where, in such circumstances, the danger area would extend outside the boundary of the template, firing is not permitted.

SECTION 5. CONSTRUCTION OF AN AMMUNITION DANGER AREA TEMPLATE

Before commencing the construction of an ammunition danger template, it is necessary to determine:

- a. the ammunition type to be fired;
- b. the scale of the map to be used (to determine scale of construction);
- c. the angle of elevation, firer to target, field firing area (FFA) or high elevation fire (HEF) templates for the relevant ammunition, or a combination of both, may be required; and
- d. the type of surface in the target area.

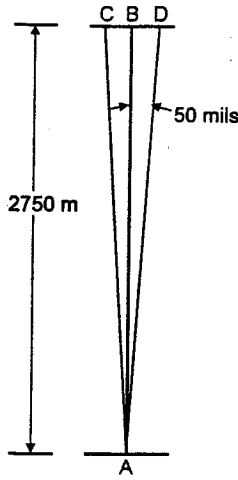
The dimensions of the more common ammunition danger templates are contained in the appropriate firearm chapter in Part Two of this manual and in Annex A to this chapter.

Constructing Ammunition Danger Area Templates

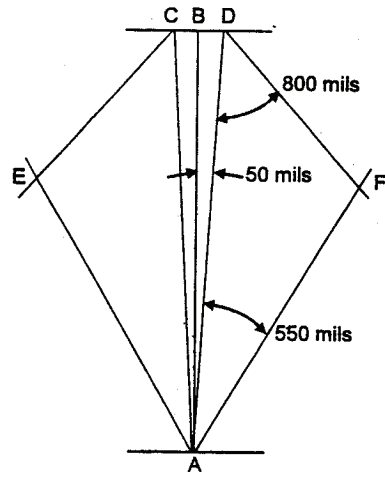
The details to be followed when constructing a danger area template are detailed in the following sub-paragraphs a. to f. An example is shown in Figure 2-2 (**not to scale**) and is based on a danger area generated when using 7.62 mm ammunition at low elevation QE (below 200mils/11 degrees). The dimensions used are contained in Annex A to this chapter. After securing a piece of graph paper, proceed as follows:

- a.. Line of Fire. Draw a single centre line that will indicate the line of fire (Figure 2-2a). From the firing point (point A), measure a distance, to scale of 2,750 metres (the low elevation maximum range for 7.62 mm ammunition) along the line of fire (point B).
- b. Dispersion/Human Error Angle. At point B, draw a line of any length at 1600 mils/90 degrees to the line of fire. From point A and on each side of the line of fire, draw lines AC and AD at an angle of 50 mils/3 degrees to AB (the applicable dispersion/ human error angle) (Figure 2-2a).
- c. Ricochet Angles. draw a line from point A at an angle of 550 mils/31 degrees (the applicable ricochet angle) from AD (the dispersion/human error line, NOT THE LINE OF FIRE). Similarly, draw a line at an angle of 550 mils/31 degrees from AC. From points C and D, draw lines back at an angle of 800 mils/45 degrees (the maximum angle at which a round may ricochet) to meet the other two lines at E and F respectively (Figure 2-2b).
- d. Ricochet Boundaries. Draw a line WX parallel to AD and at a scale distance of 400 metres (the maximum ricochet distance) from AD (Figure 2-2c). Similarly draw a line PQ parallel to AC.
- e. Confirmation. Confirm that all angles and scale distances are correct.
- f. Completed Template. Erase all construction lines to reveal the seven sided shape AQPCBDWX (Figure 2-2d). Inscribe all relevant information onto the completed template.

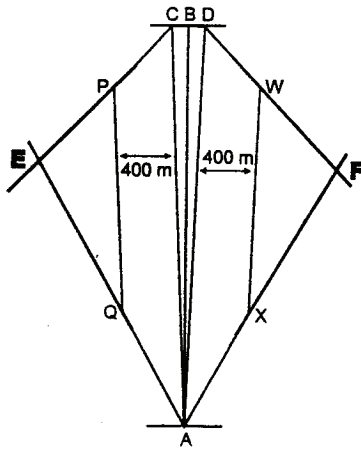
Please Note:
 800mils=45°
 550mils=30°
 50mils=3°



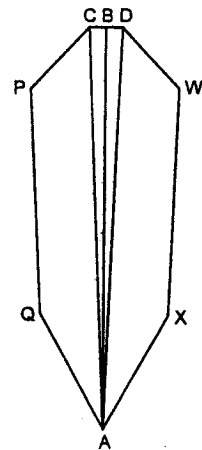
a. Human Error Dispersion Angle



b. Ricochet Angle



c. Ricochet Boundaries



d. Completed Template

Figure 2-2. Construction (by stages) of a Danger Area (Template for Non-exploding Ammunition (7.62mm))

Transferring the Template to Talc

When the accuracy of the template has been verified, it should be transferred to talc or rigid, transparent plastic or perspex. This is achieved by placing the talc or film over the completed template, firmly securing it in place and then proceeding as follows:

- a. Using the point of a sharp metal instrument, trace the shape onto the talc. A straight edge should be used when tracing straight lines.
- b. Lightly etch in the line of fire. It is not necessary to show the dispersion/human error angle as this is no longer required once the danger area shape has been determined.
- c. Remove the talc from the drawing and cut along the outside lines to remove the template from the sheet.

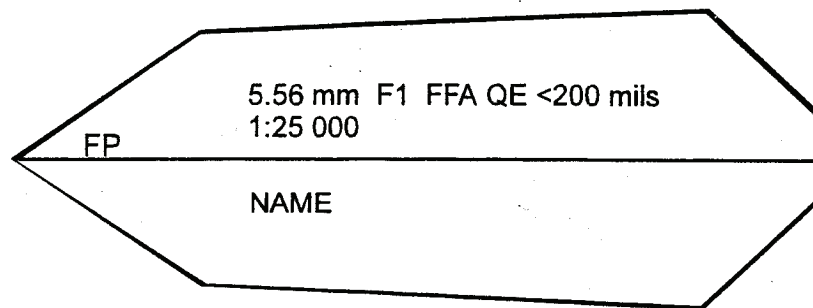
- d. Use fine sandpaper to rub off any burrs along the edges of the talc and to correct any oversize bias in the shape. Ensure that sharp corners are not rounded off. Finally, check the construction drawing to ensure it is accurate in every respect.

Organisations may forward talcs to FAR for checking if they so desire.

Template Annotation

An example of a completed template is shown in Figure 2-3. All completed RDA templates are to be annotated with the following information:

- a. The types of firearms to be used, including proposed Muzzle Energy and Velocity.
- b. The calibre of the ammunition to be used.
- c. The scale of the template.
- d. The firing point (to avoid incorrect usage of the template).
- e. The name and contact details of the person who prepared the template (merely as a point of contact for any discussion concerning its construction).
- f. The QE where applicable.
- g. The nature of the target - hard or soft.



MV = 3100 ft/sec or 1250 m/sec ME = 1200 ft/lb or 5675 joules

Figure 2-3. Ammunition Danger Area Template for 5.56 mm F1 with a QE of less than 200mils (11 degrees)

SECTION 6. APPLICATION OF AMMUNITION DANGER AREA TEMPLATES

The ammunition danger area template can be used to:

- a. construct an RDA safety trace for ammunition fired by a single firearm, or a number of like firearms, from a static firing point or line, to targets located within a defined arc of fire; and
- b. construct an RDA safety trace for ammunition fired by any number of firearms from a firing area that allows firers to move and engage targets located within an identifiable target area.

Factors Affecting the Application of Templates

When using danger area templates, the principal limiting factor will normally be the availability of a large enough area. The full advantage of the area can only be obtained by skilful application of the correct danger area templates. Considerations should include:

- a. the type of ammunition and firearm;
- b. the ricochet dimensions for hard and soft targets;
- c. the type of firing position, whether static or moving; and
- d. RDA safety traces are not only concerned with danger areas at ground level but also with danger HEIGHTS. Although ammunition may only reach peak heights in certain very small portions of the overall area, the danger height is still applied over the whole trace area. Danger heights are included in Annex A.

Application of Templates

Firing Point. The overall size of the RDA safety trace is determined by applying the point of the appropriate danger area template to the firing point located on the map and then swinging the template as far to the left and right as any restrictions allow. The centre-line of the template will then indicate the maximum left and right of arc for that RDA safety trace.

Firing line. When a number of firers are to be located along a firing line, the template is applied, in turn, to each end of the line; on the left to establish the left of arc, and on the right to establish the right of arc.

Moving Targets. The construction of range danger area templates involving moving targets is based on the same principles as for static firing. The appropriate template must be applied from the firers' position to the extremities of the target run, thereby obtaining the required arcs of fire.

Mobile Firing Point. The term "mobile" refers to the firer moving. Once the firer is allowed to move, the danger area must also move. This can be achieved by applying the appropriate template to every planned firing position to every target that may be engaged from that position in order to build up an overall RDA safety trace.

Submitting an RDA Safety Trace

Once the overall safety trace has been determined, it is to be submitted to FAR. Safety traces are not to be submitted by FAX machines. Copies of traces made by using a heat transfer method on photocopy machines are to be checked against the master copy for correct size. To be approved the template must include:

- a. at least three grid intersection points,
- b. the location of fixed arc markers if appropriate,
- c. the eight figure grid reference of the firing point/line,
- d. the ammunition natures involved, the QE permitted for each and the ricochet area used,
- e. the author's name and date of construction, and
- f. reference to the map used and its scale.

SECTION 7. REDUCED RANGE DANGER AREAS ADJOINING RANGES

When two or more ranges are constructed on adjoining sites, the area of land required by the combined danger areas may be considerably reduced by siting them so their separate lines of fire converge.

Hill Background Reduction

The value of hill background is usually overestimated, because:

- a. it is regarded as a natural stop butt for bullets fired accidentally if the firearm is elevated beyond normal, and not in relation to the trajectory of ricochets. Ricochets constitute the greater and more prevalent danger.
- b. the effective height between the targets and hill crest is the perpendicular difference from the crest to the extended line of sight beyond the target line and not the contour difference in height between them.
- c. the adequacy of the hill background as a natural stop butt depends on the nature of the ground, its slope and distance behind the target line and its height above the line of sight.

The effectiveness of any hill background that might offer grounds for the possible reduction of a danger area, depends on the availability of a properly profiled combined bullet catcher and stop butt, maintained to the prescribed standard.

Reduction of danger areas for hill backgrounds is normally confined to classification ranges where there is steep hill immediately behind the target line. In such conditions, the hill will usually constitute the stop butt. The reduction may also be applied to open ranges when the following criteria can be met.

Classification Range. To reduce a danger area for a classification range the following conditions must apply:

- a. Where the hill slopes between 55 and 90 degrees to a height of 50 metres or more above the mean line of sight, taken from the 100 metre firing point, and where the marker's gallery is built close to the foot of the hill, the danger area may be limited to the 50 metre line.
- b. Where the hill slopes at 35 degrees or greater to a height of 100 metres or more, the danger area may be limited to the 100 metre line.
- c. If there are any rock outcrops in the bullet strike area, the reduction cannot be applied unless the outcrop is covered by a soil bank, timber wall or other suitable baffling material.
- d. Slowly rising ground, which eventually reaches the required height, is not acceptable for a danger area reduction.
- e. The hill background must be evident for the length of the bullet strike area.

Open Ranges. Any consideration by FAR for approval of the reduction of the danger area for open ranges will be on a case by case basis. It will be the responsibility of the club to demonstrate that the design of the range is consistent with the requirements of a reduced danger area range. The minimum acceptable angle of the hill is 35 degrees.

Any hill reduction to danger area approval will normally only be considered in exceptional circumstances such as severe land area restrictions.

SECTION 8. ANNEXURE A – LIVE FIRING RANGE GUIDE

Procedures Guide for the Approval of a Live Firing Range

General:

[Clauses 85](#) through to [clause 89](#) of the *Firearms Regulation 2006* should be read in conjunction with this procedures guide. The approval of a live firing range should occur in at least two phases. Those phases are the planning/construction phase and the final inspection/approval phase.

It is recognised that the planning/construction phase may extend over a considerable time and will involve many consultations between the organisation building the Range and the Range Inspectors of the Firearms Registry (FAR). This consultative process is essential to ensure that the final inspection/approval phase goes ahead with the minimum of fuss and to negate a later requirement of additional works or approvals.

Planning/Construction Phase:

This phase is used to ensure that the Range is viable before any expense is outlaid and that all statutory bodies will approve the construction and the use of a live firing range in the locality selected.

The Manager, FAR will not consider the Approval of a Range unless all other authorities such as the Shire Council have received, considered and approved a Development Application or at least a notice of non objection. It has become common practice for the Council to carry out or arrange a noise pollution test on behalf of the EPA. The cost of the test in the majority of cases is borne by the body constructing the Range.

The Range Inspectors of the FAR should then be consulted to carry out a preliminary investigation on the viability of the Range as far as siting and control of the area affected by the use of the Range. The following should be provided to the FAR to allow this to happen.

- A military topographical map covering the entire area affected by the use of the Range. The map should be of the scale 1:25,000 or if unavailable 1:50,000.
- The map should have marked on it the position of the firing points, the target line, stopbutts and the direction of fire.
- Copies of any plans or drawings and any photographs that may have been generated during the initial planning phases.
- Copies of any lease agreements or documentary proof of ownership of the land the Range will occupy. Bear in mind the Range Inspectors will apply a Range Danger Area Template to the map provided and will insist upon the Range User having control or permissive shooting rights over the land

shadowed by that template. **The withdrawal of permissive shooting rights by a landowner at a later date will see the Authority to operate the Range revoked.** Organisations should strive towards buying or leasing the entire area the Range Danger Area Template shadows.

- A comprehensive list of all shooting events and the type, calibre and ballistic data of all firearms that are envisaged to be used on any particular Range that is being built.
- Complete copies of all prior approvals obtained from any other authority.
- A copy of the Club Approval of the body applying for the Range Approval. No Range will be approved before the prospective user is licensed either as a Club or a business.
- A request to the Manager, FAR for a Range Inspector to conduct a preliminary inspection of the site and to discuss any aspects of the construction of the proposed Range.
- Working hours contact details of the individual responsible for overseeing the construction of the Range.
- Any other information that may be useful in the decision making process in the approval of the Range.

Note: As previously mentioned the foregoing phase may take some considerable time and the relay of information to the FAR likewise. Constant consultation between all parties involved is encouraged to ensure the process proceeds to an amicable finale.

Final Inspection/Approval Phase:

This phase is basically the confirmation phase of the prior planning and subsequent construction. All perceived problems should have been identified and been rectified through the consultative process between the prospective Range user and the FAR.

The final inspection should not be arranged unless all parties have reached a mutual agreement that the Range is ready for immediate use.

The potential Range User is to provide the following to the Range Inspectors of the FAR prior to the inspection being arranged.

- The Application for the Approval of Shooting Range or Gallery is to be made on the Form P512 (Annexure A) and is available from the FAR on request. The form is to be filled out ensuring that all information is provided. A criminal check will be carried out on the applicant for the Range Approval Holder to ensure all conditions of the Firearms Regulations are adhered to.
- A cheque, money order made payable to the NSW Police Force or credit card details are to accompany the Form P512.
- Any changes in the construction or any matter that has changed since the last consultative agreement that may affect the approval.
- Copies of any finalised plans, drawings or photographs that may assist the Range Inspectors in assessing the Application.

- A letter of request to the Manager, FAR for the final inspection to be carried out. In that letter provide the full contact details of the official that is nominated as the Range Approval Holder on the Form P512.
- Copies of any letters of permissive firing rights from landowners of any portion of land that the Range Danger Area Template shadows that is not under the direct control of the Range User.

SECTION 9. ANNEXURE B - TEMPLATE DESIGN OPTIONS

Serial	Suitable for firearms as indicated below. "Note restrictions." (See note 2 below)	Angles - mils and deg				Backsplash Hazard Distances						
		Max MV ft/sec and (m/sec)	Max Muzzle Energy (ME) ft/lb and (joules)	Down Range Distance (metres) from Firing Lines	Dispersion Human Error Angle (Static)	Ricochet Angle	Maximum QE Permitted	Ricochet Distance (metres) Each side of human dispersion line	Air Danger Height - m and ft	Soft Targets	Hard Targets, mounds and bullet catchers	Details sourced from Defence Department's Manuals of Land Warfare (MLW):
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	
1	0.22 inch rimfire rifle only	1710 (521)	210 (285)	1300	50mils or 3deg	550mils or 31deg	220mils or 12deg	80	150m/ 500ft	10	20	MLW 9-2 FFA .22 inch template
2	Centrefire and muzzle loading and percussion rifle and pistol	1400 (426)	500 (678)	1500	50mils or 3deg	550mils or 31deg	220mils or 12 deg	200	275m/ 900ft	10	20	MLW 9-2 FFA 9mm template
3	Rimfire rifle and pistols	2000 (610)	320 (434)	1500	50mils or 3 deg	550mils or 31deg	220mils or 12deg	200	275m/ 900ft	10	20	MLW 9-2 FFA 9mm template
4	Centrefire, rimfire, muzzle loading and percussion rifles and pistols	1675 (509)	1000 (1356)	1550	50mils or 3 deg	550mils or 31deg	220mils or 12 deg	400	290m/ 950ft	C/FRifles 20 R/FRifles and Pistols 10	C/FRifles 50 R/FRifles and Pistols 25	Draft MLW 9-6 .44"Magnum (Normal) template
5	Rimfire rifles and pistols	2000 (610)	320 (434)	1200	50mils or 3 deg	550mils or 31 deg	220mils or 12 deg	150	250m/ 800ft	10	20	Draft MLW 9-6 .22" Winchester Magnum template
7	Centre and Rimfire Firearms and Muzzle Loading and Percussion rifles and pistols. Note- Fragmented rounds only - No Ball	4100 (1250)	4182 (5675)	2750	50mils or 3deg	550mils or 31deg	200mils/ 12deg	400	315m/ 1000ft	Centrefire 20 Rimfire 10	50	MLW 9-2-7.62 mm 0.303 inch 0.30 inch 5.56 mm (F1) 7.62 x 39 mm template and Draft MLW 9-6 Ballistics table.

CHAPTER 3 FULL BORE CLASSIFICATION RANGES

SECTION 1. DESCRIPTION

Classification ranges allow for a reduced danger area due to the nature of their construction. The template has been reduced in size based on the premise that all firing will take place on a limited arc of fire, from prepared firing points and at penetrable targets. The safety of such a reduced template also depends on a high degree of range discipline, as a bullet in free flight which passes over the crest of the stop butt could exit the RDA by up to 1000m. A reduced danger area is applied, but is dependent on:

- a. all firing taking place on a single line of fire at a target presented within determined limits.
- b. all projectiles striking the stop butt,
- c. the range area forward of the firing points and up to the stop butt being free of ricochet inducing materials,
- d. a high degree of range discipline being enforced, and
- e. a high degree of integrity being shown on the part of the firers.

Classification ranges comprise the following:

- a. **Firing Mounds.** Firing mounds are located at intervals of 100 m/yds. The mounds are elevated and provide the number of firer positions required for the specific range. A distance of 1.5 m is normally provided between firers on the firing mound, and firing lanes are to be numbered with a marker positioned on the right edge of each lane.
- b. **Stop Butts.** Stop butts may be artificial or natural and are located behind the targets to stop bullets fired down the range. The butts also enable firers to see the strike of the bullet.
- c. **Target Numbers.** Target numbers are located on the crest of the stop butt, immediately above each target and are numbered from left to right (when looking from the firing point).
- d. **Markers Gallery (Butts).** The markers gallery is located immediately behind the mantlet and houses the target mechanisms. The gallery is protected from small arms fire by an earthen mound known collectively as the mantlet. The gallery provides a protected area for the butt party.
- e. **Mantlet.** The mantlet provides protection to the gallery and reduces the number of ricochets from low shots. The mantlet must be maintained to prevent the formation of scoops caused by low bullets cutting the earth away.

The standard layout for a Classification Range is depicted in Figure 3.1 on the following page.

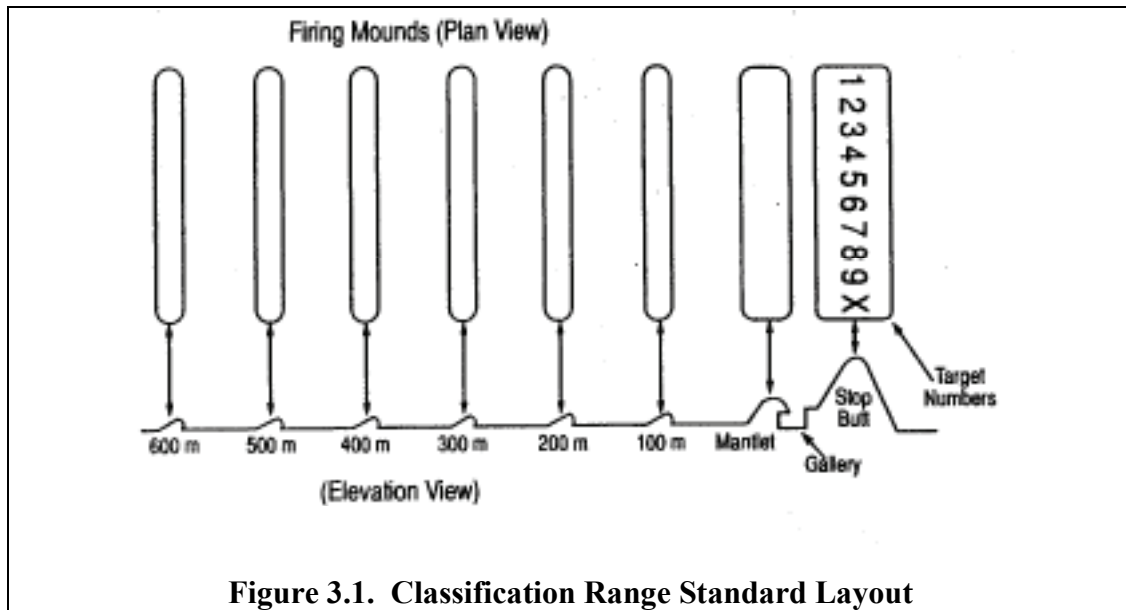


Figure 3.1. Classification Range Standard Layout

Dimensions

A depiction of a 10-lane classification range is shown in Figure 3.2. The overall length of the range is divided into three sections by the target line, and the rear area full width line. The distance occurring before the target line is variable and depends on the number of firing points catered for. This could be as little as 100 m or as many as 1200 m in rare cases. The length of the danger area behind the target is a constant 1830m in length. The first 915m behind the target line expands in width from 150 m to 350 m as measured outward from each flank line of sight. The end portion of 915m length continues at a constant width of 350 m measured from each flank line of sight throughout its length. From this it will be seen that the terminal width is twice 350 m plus the width between the flank firers.

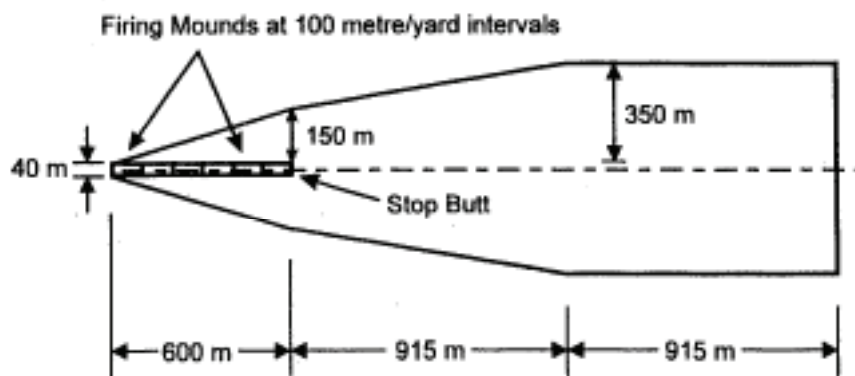


Figure 3-2. An Example of a Classification Range Danger Area Safety Trace, 10 Target Range

The Classification Range should always have a stop butt behind the targets, to both stop bullets in free flight and low ricochets, and to enable the markers to accurately locate

the strike of the bullets on the face of the stop butt. If a full danger area template is applied, a stop butt is not strictly necessary but is to assist both the firer and the observer to see the fall of shot, a reduced stop butt or bullet catcher should be constructed. If the complete classification range specifications can not be met e.g. height of stop butt or the full depth of the mantlet is not visible from a firing point, the full danger area template is to be applied.

Firers are required to fire in line with the axis of the range. Should firers be required to fire at an angle to the axis, the danger area required for the range is to increase. It will be necessary to construct a new RDA safety trace to cover the changed danger area.

In exceptional circumstances and at the discretion of FAR, old existing ranges may be permitted to maintain the template that was first applied at the time of construction.

Falling Plate Targets

The following safety requirements are to apply when using falling plate targets on the classification range:

- a. **Mantlet.** UNDER NO CIRCUMSTANCES ARE PLATES TO BE PLACED ON THE CREST OF THE MANTLET. Plates may be mounted on the forward slope of the mantlet as long as there is no obstruction to the vision of the firer. No obstruction is to protrude more than 0.5 m above the mean line of sight. A check is to be made to ensure that the full height of the plates, and the supports upon which they stand, are visible from the firing position, and that the centre line of the plates is at least 0.8 m below the crest of the mantlet.
- b. **Stop Butts.** When plates are positioned on the range stop butt, it is necessary to guard against "splashback". This is done by ensuring that the butt party does not remain in the marker gallery during firing, if the distance from the plates on the stop butts is less than 50 m. In this case, the butt party should be positioned outside the RDA, for example behind the firing mound.
- c. **Danger Area Template.** Regardless of their position, steel plates (hard targets) may only be used on a range which has a field-firing template for the appropriate ammunition applied to it. The classification RDA template may be used where a purpose-designed bullet catcher for falling plates is provided.
- d. **Minimum Engagement.** The minimum engagement distance from firer to falling plate is 50 m.

Selection of Sites

Selection of sites is discussed in Chapter 2.

SECTION 2. DESIGN REQUIREMENTS FIRING POINTS AND RANGE SURFACE

Prepared firing points on most existing classification ranges are keyed to multiples of 100 yards, but in all new construction measurements should be keyed to metres.

The centre line of each firing lane is to be parallel to the main axis of the range. If any firing point has to be built off centre, the danger area for the range is to be adjusted accordingly.

Firing points should be as close to ground level as possible so that they are self-draining and provide an uninterrupted view of the full mantlet. Elevated or raised firing points may be necessary in the case of hollow or swampy sites. The dimensions of firing points, whether elevated or ground level are to be the same.

The firing points or mounds as shown at Figure 3-1, are to be built to the following dimensions:

- a. *Length.* The length is to provide for 4m lanes, times number of targets plus end ramps where necessary.
- b. *Width.* The useable width is to 3 m with run up and run off slopes added to the width.
- c. There should be a minimal fall from the front edge (which should be 0.6m above the surrounding ground) to the rear edge of approximately 1:12 (180 mils or 10 deg).
- d. *Access Slopes.* The slope down from either end of the firing mound should be at the natural angle of repose. It is suggested, but not mandatory that the slopes leading up to the mound should be at a gradient of not more than 1:6 (90 mils or 5 deg) to cater for easy movement to and from the mound.

Each firing point is to be accurately measured from the target line and indicated by a timber marker with the firing distance painted on it. Lane numbers are to be painted on bricks recessed into the firing point, on the right side of each firing lane. These markers are to be spaced at the same distance apart as the centre to centre spacing of the targets. To assist ongoing range safety inspections, a range centre line marker is to be placed on all firing points and the mantlet.

A PVC pipe is to be permanently sunken at one end of the firing points to support the firing point flags. A firing point flagpole may be erected as an alternative.

On the surface of the range, flagpoles are to be of non-ricochet inducing material and any structure or flagpole base is to be protected from projectile strike with an earth bank.

Consideration should be given to the installation of a loudspeaker system on large ranges.

Mantlet

The mantlet offers protection to the markers in the gallery and reduces the number of ricochets from low shots. It is important to understand that shot errors are just as likely to occur equally above, below or to the flanks of the target. For this reason, it is essential to provide a mantlet of a minimum height of 1.8 m, such that the whole forward face of the mantlet is visible to any firing position on the range. This provision is a key factor in justifying the use of the Classification Range RDA trace.

Where little or no mantlet is provided, the target will necessarily be lower, thereby lowering the general line of sight, resulting in low shots which would normally be caught by the full mantlet, ricocheting off the ground where a mantlet would normally be. To retain the use of a classification range RDA trace in these circumstances, very stringent conditions must be imposed with regard to the ground between the target line and the 100 m firing point (see para 3.22).

Mantlets are normally composed of earth with concrete, brick, timber or concrete slab walls. They must be a minimum of 1.5 m thick throughout the whole length and depth (Figure 3 - 3 gives typical cross sections).

The forward face should be constructed to a slope not less than 2:3 (580 mils or 33 deg) from the horizontal and should not be less than 1.8 m to the crest line. The top surface should be provided with a fall of 1:12 (180 mils or 10 deg) from the crest toward the target line. This is an additional feature that reduces the incidence of ricochet.

To ensure the correct height and width are maintained, the crest of the mantlet must be defined by the insertion of a profile board consisting of a wooden plank on edge. The crest formed by the profile board is critical, as it will contribute to the safety of those in the gallery. It is essential that the profile of the mantlet is maintained.

Not only do these scoops tend to cause widely divergent ricochets but also make it possible for bullets to penetrate the gallery. The mantlet must be regularly maintained and the profile board replaced when it deteriorates. The use of materials such as "Tenax Tenweb" should reduce the speed at which scoops form, and thus reduce maintenance.

Marker's Gallery

Figure 3 - 3 shows cross sections of marker's galleries. The following design conditions apply:

- a. The gallery should be at right angles to the axis of the range, but where this is unattainable a deviation of up to 90 mils / 5 deg is permissible. It is desirable that the gallery and stop butts are parallel.
- b. Protection is to be afforded to ensure the safety of the markers.
- c. The height of the gallery roof is to be at least 1.8 m and should generally be not more than 1.95 m.
- d. The markers must be able to see the strike of the bullets on the stop butt.
- e. The bottom of the target, when raised, must be clearly seen from all firing points.
- f. The roof of the gallery should slope approximately 1:12 (180 mils or 10 deg).

- g. The preferred construction is a "half pit/half bank" as shown in Figure 3 -3.

Where the range is hollow (concave) or uphill, it may be necessary to construct a "full pit" gallery below ground level. In such cases, drainage may be a problem.

"No Mantlet" Galleries

A disadvantage of building a "full pit" gallery below ground level is that a greater number of low shots ricochet off the ground, whereas with a built up gallery they are absorbed by the mantlet. A method of reducing the number of ricochets is to cut out the ground between the gallery and the 100m firing point, using the earth to:

- a. provide a small bank forward of the gallery as a mini mantlet;
- b. improve the ground line and line of sight from the 100m firing point; or
- c. provide topsoil to form a stop butt or build up the more distant firing points.

Where a full stop butt has been constructed, together with a small mantlet, the use of the classification range RDA trace may be permitted provided the range area is free from hard ricochet inducing surfaces and the area between the targets and firing point is not of hard, compacted material. Light topsoil, silts and sands free from stones should be placed in this area.

Where the full stop butt is not provided, or when the ground condition is unsuitable to permit the use of the classification range RDA, the field-firing template is to be applied.

The length of the gallery is governed primarily by the spacing between the target frames and the number of frames to be used. This spacing should be not less than 4 m between target frame centres. Even if firing only takes place over short distances of 300 m or less, this spacing should be maintained since any reduction of this dimension will cause congestion in the gallery and prejudice the efficient conduct of range practices. Some older ranges may be established with target centres 3.05 m (10 feet) for distances back to 700 yds and 3.7 m (12 feet) for ranges with longer distances.

A target store or workshop or both may be constructed at one end of the gallery and toilets at the other. The total length of gallery will therefore depend on these factors.

Overhead cover for the markers is to project at least 1.05 m, measured from the inside of the gallery wall, and must extend the whole length of the gallery. This cover, of 75 mm thick reinforced concrete, must slope at 1:12 (180 mils/10 deg) downwards towards the target frames, and should, where possible, be covered by at least 150 mm of earth and suitably supported along its length.

The material of which the retaining wall and gallery are constructed depends on the degree of permanency of the range. Preferably they should be built of concrete or brick or both. Some older ranges are constructed using timber or concrete slab retaining walls. Timber walls could be used to construct expedient ranges in times of expansion.

Any timber material used must be treated against white ants etc. Weep holes for drainage of water should be provide through the structure at low level.

The target trench may be drained by inserting clinker drainage beds between the concrete target foundations.

A small seat for each marker should be fixed to the gallery wall opposite the centre of each target. A chalkboard should be affixed to the gallery wall at each target position.

A shelf or recess in the gallery wall should be provided for a telephone or radio. In large galleries it will often be necessary to provide additional telephone connections; these should be spaced proportionately along the gallery. Consideration should be given to the installation of a public address system on large ranges.

A permanent pole, of non-ricochet inducing material e.g. wood or plastic, and guide is to be installed at one end of the gallery to mount the markers flag while firing is in progress without exposing the person raising the flag.

Target Mechanisms

The target mechanisms installed on recently constructed Classification Ranges in a cantilever style, sometimes referred to as the 'Neilsen Mechanism'. The most common target mechanism installed on older ranges is the 'Hythe' pattern.

The following should be noted when erecting target mechanisms:

- a. They should be set in a straight line, and should be mounted at no less than 4 m centre to centre of frame.
- b. The exact level at which the targets are to be set to ensure that no part of the target mechanism projects above the mantlet and that they are not struck by a projectile travelling on its downward trajectory from the maximum range.
- c. The distance from the edge of the gallery roof to the centre of each target frame is to be 1.05 m.
- d. The frame should then be placed perfectly plumb and square in relation to the gallery and mantlet.

For 'Hythe' pattern mechanisms:

- a. The concrete bases on which the turned ends of the main uprights are to be placed should be 0.3 m wide.
- b. To prevent the target carriages from being damaged on the concrete floor, a 100mm by 75mm softwood timber buffer should be provided 13 mm above the floor.

Target Store and Workshop

The best position for the target store and workshop is at one end of the marker's gallery. On ranges with up to 10 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 a larger building divided into two parts, with the target store sited nearer the gallery.

It is important that the target store and workshop be provided with adequate forward and overhead protection.

The workshop should be equipped with a large flat-topped target table, a carpenter's bench, cupboards, and adequate heating and lighting facilities. A water supply is desirable.

Where it is necessary to locate the workshop away from the gallery and in a place where it cannot be adequately protected, it must be sited outside the danger area.

Stop Butts

A stop butt is an artificial bank constructed with soil or other small grained material, free from stones and other hard elements, sited within prescribed distances behind the target line. The primary purpose for the construction of a stop butt is to reduce pollution to a minimum by containing the lead of spent projectiles in specific areas for ease of collection and removal, and environmental control. Various types of stop butts include:

- a. earth mound,
- b. earth mound with wall,
- c. tandem, and
- d. terraced hill.

The most common stop butt, and the most likely to be constructed on modern ranges is the earth mound. The specifications are discussed in the following paragraphs.

Height of Stop Butts. The minimum acceptable height is defined as a visible projection above the mantlet crest of 3.05 m as viewed from the prone position on the 100 m / yard firing point. This view produces constant angles of 32 mils / 2 degrees at 100 m. These angles do not relate to the horizontal, but to a line drawn between the mantlet crest and the viewer on the firing point, each usually at different levels. The total height of the stop butt cannot be deduced from this angle alone, but will depend upon the ground level differences between the 100 m firing point and the selected site for the stop butt.

The greater the distance between the target line and the centre line of the stop butt, the greater the overall height of stop butt is required. A simple method of assessment to determine whether the stop butt is an adequate height is to provide a post, fitted with a cross bar at right angles, in the form of a 'T' with an overall height of 3.05 m. The pole is placed upright at any point on the leading edge of the mantlet. When viewed from a

prone position from 100 m / yards forward of the targets, the crest of the stop butt should never appear lower than the top level of the 'T' post. The whole length of the stop butt must conform to this minimum crest height.

Length of Stop Butts. The overall length along the crest should be ascertained by describing lines at 60 mils (4 deg) outwards from flank lines of sight using the flank positions at 100m / yards as centre points. The points where these lines bisect the stop butt line, indicate the required length of stop butt. The overall length may also be assessed by taking the whole distance between centre points of both flank targets and adding 14 m. The system is valid where the distance between the target line and the base of the stop butt does not exceed 30 m. As an example, in the case of a 10 target Classification Range, ideally situated with a stop butt 30m behind the target line, and where lane widths are 4 metres, the crest length is assessed as follows:

$$\begin{array}{rcl} 10 \text{ lanes with 9 separations of 4 m} & = & 36 \text{ m} \\ \text{plus flank widths of 7 m per side} & = & 14 \text{ m} \\ \text{Crest length} & = & 50 \text{ m.} \end{array}$$

Where the distance between the target line and the base of the stop butt exceeds 30 m, the overall crest length must be increased by 0.6 m for every additional 5 m. The length at the base of the stop butt depends on the overall height and the degree of end slope.

The stop butt is to be sited so that it is bisected by, and lies square to, the range axis.

Thickness of Stop Butts. The crest of the stop butt should be level and not less than 1.5 m thick. The thickness of the base will vary, depending on the slope and height of the stop butt. It is advantageous if the crest of the stop butt is wide enough to allow vehicles used for maintenance (e.g. backhoe) to drive onto the crest with safety. This will enable maintenance to be conducted with relative ease.

While the face of the stop butt need not be steeper than the natural angle of repose of the material of which it is composed, an attempt should be made to preserve as steep a slope as possible, thus reducing the likelihood of ricochets. Where possible, slopes of 1:1 (800 mils / 45 deg) or better should be provided. Slopes of less than 2:3 (600 mils / 35 deg) are not acceptable. Layers of fascines placed at right angles to the slope, will assist in its preservation. Plastic geo textiles used for erosion control, especially those that form a series of pockets when laid, may be placed on the stop butt to retain the sand face. The slope at which the ends and rear of the stop butt may be at the normal angle of repose of the material of which the stop butt is composed.

Position of Stop Butt in Relation to Targets. The distance between the foot of the stop butt and the targets is to be no less than 5 m, and this minimum distance is only permissible when the stop butt is constructed of sand or soft earth which can be guaranteed to be completely free from stones and any other material that may permit backsplash and potential injuries to markers. Generally, the distance from the foot of the stop butt to the target line is to be no less than 25 m.

Where possible, the stop butt should be constructed 25 to 30 m from the target line. This will enable the intervening space to be adapted for use as a 25m range. When the

area is so adapted, it is advantageous to construct a target trench along the foot of the butt.

Sand Boxes or Bullet Catchers. When the stop butt is unavoidably constructed of shingle or any other hard material or where it is not possible to guarantee that the fill material is free from stones, sand boxes or bullet catchers must be provided to prevent backslash and to aid marking. The effective height and width of the sand boxes is to be such that where a 1.8 m (6 ft) large square target is installed, at least a clear 0.3 m of sand would be visible to the firer all round it. The material in the bullet catcher is best composed of an equal mixture of washed coarse river or pit sand and sawdust, and should be not less than 900 mm thick at any point. Beach sand is not to be used as the fine sand grains compact and are likely to cause ricochets. The use of plastic geo textile that is designed for soil retention may be added to the bullet catcher to assist in retaining the sand.

A natural stop butt may be provided by a steep hill immediately behind the targets. However as the hill should rise very steeply immediately behind the targets, it will usually be necessary to cut into the face of the hill and place bullet catching sand or other material in the bullet strike area, until it conforms to the conditions required for an artificial stop butt.

Use of Tyres. On some classification ranges, in particular those used by rifle clubs, it has become common practice to use tyres in the bullet strike area of the stop butt. Tyres can cause backslash ricochets into the marker's gallery, either by projectiles bouncing back from the tyre directly or from pieces of steel belt being broken off when a projectile hits the tyre and deflects into the gallery as a secondary missile. Tyres do not allow sand to fall into tunnels created by concentrated bullet strike and the presence often hides the true condition of the stop butt. For these reasons, tyres are not to be used in the bullet strike area, or the face of the stop butt.

Use of Hay or Straw Bales. On some ranges, hay or straw bales have been placed on stop butts and terraced. These bales hide the condition of the stop butt, and do not prevent backslash. For these reasons, hay or straw bales are not to be used on stop butts.

Flagpole

A flagpole 6 to 9 m high, of non-ricochet inducing material, is to be provided on the stop butt for the red flag or warning lamp (for night firing).

Target Numbers

Targets are to be numbered by either erecting target numbers along the crest of the stop butt or mounting them on the forward face of the mantlet. It may sometimes be found that those placed on the crest of the stop butt provide temptation to firers to use them as targets. In such cases long range shots will occur for which the RDA does not cater. Such shots can range as far as 4000 m. Where no stop butt is constructed, the target numbers should be installed on the forward slope of the mantlet.

Target numbers are to be constructed of penetrable material, usually wood, plastic or aluminium. The numbers should be well coated with paint or preservative to minimise deterioration due to weathering. The overall height of these numbers should be one metre for use on ranges with firing points up to 600 m from the target line. For longer ranges 1:4 metres is recommended. The width should be proportioned to the required height.

Stepped Mantlets and Stop Butts

Where cross fall occurs on a selected site, stepped mantlets and stop butts may be constructed, provided that all other design criteria are met.

Communications

Classification ranges may be equipped with a telephone system but it is now common practice to use hand held radios. If telephones are installed, underground cable or overhead line may be used. It is advantageous to have the telephone or radio connected to a loudspeaker system.

On ranges up to ten targets, one circuit from the centre of the firing point to the centre of the gallery will normally suffice. However on larger ranges additional circuits should be provided, on a scale of one circuit to every 10 targets, the cable being laid centrally between each group of 10 targets and their corresponding positions on the firing point. For example, on a 20-target range, two cables should be laid down the range, opposite number 5 and 15 firing positions and targets. When the overhead line system is used, the poles should run down one side of the range, well clear of the firing point (for larger ranges) to each group of 10 firing positions. It is essential that, whichever system is used, that each circuit can be used independently.

The telephone circuits should in all cases consist of approved and suitable cable, which should be buried to a depth of not less than 0.5 m. Where surface cable markers are used, they must be mounted flush or defended from fire to their rear and must not constitute a ricochet hazard.

The connections at the gallery and at each firing point are to be approved external weatherproof fittings. The cable should run directly between sockets, without joints.

The firing point terminals are to be housed in strong weatherproof boxes of wood, metal or concrete, with the opening facing towards the targets. The boxes should be sunk into the ground so that their lids are flush with or slightly below ground level.

Maintenance

The design and construction of this type of range creates prepared ground conditions up to the target line that reduces the ricochet hazard to a minimum. For this reason the total danger area is smaller than that required for free firing over open ground. It is therefore essential that classification ranges are regularly and thoroughly maintained. Deterioration of the firing points, mantlet and stop butt including a build up of lead, will

increase the chance of ricochet and in extreme cases may result in the closure of the range or restrictions in its use.

Due to the high maintenance effort and costs for this type of range, it is strongly recommended that regular maintenance days be set aside to permit remedial work to minor damage before it deteriorates further.

Falling Plates

The Classification Range RDA trace may be retained when engaging falling plates, if a timber bullet catcher is constructed. It consists of a heavy timber construction having only the forward face open to receive fire, built so that the plates are fully accommodated and have sufficient room to fall. This falling plate bullet catcher may be a single permanent structure or may consist of several small portable units that are mounted on a prepared ledge when required for use. The minimum thickness of timber to be provided above, below and to the flanks of the plates is 130 mm of hardwood. Timber railway sleepers (without spikes) are ideal for this purpose.

Constant maintenance is required to keep falling plate galleries and bullet catchers in good condition. As the timber is shot away or filled with projectiles, the effectiveness of such bullet catchers degrade and the reduced safety template will be void.

Falling plate bullet catchers can only be mounted on the mantlet provided the range has a full mantlet of 1.8 m. Considerations when mounting the plates on the target are:

- a. There are no obstructions between the firer and the centre of the falling part
- b. The plates are to be mounted at a height greater than 0.5 m below mean line of sight with the centre line of the plates being at least 0.8 m below the crest of the mantlet.
- c. Considerably more maintenance will be required.

Design Modifications

The Firearms Registry has the discretion to consider the application of alternative templates in exceptional circumstances. Such consideration will only be applied to existing ranges that were built using design criteria that were acceptable at the time of construction.

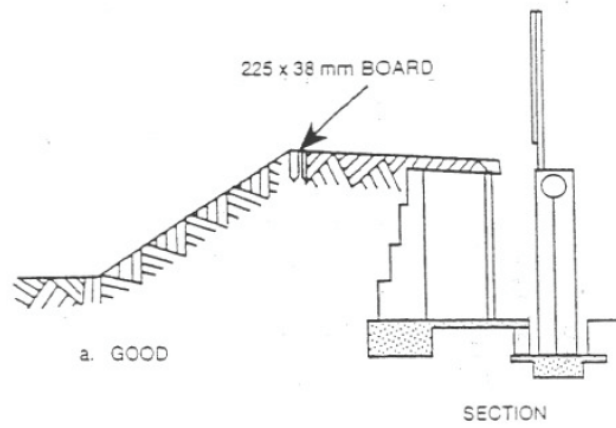
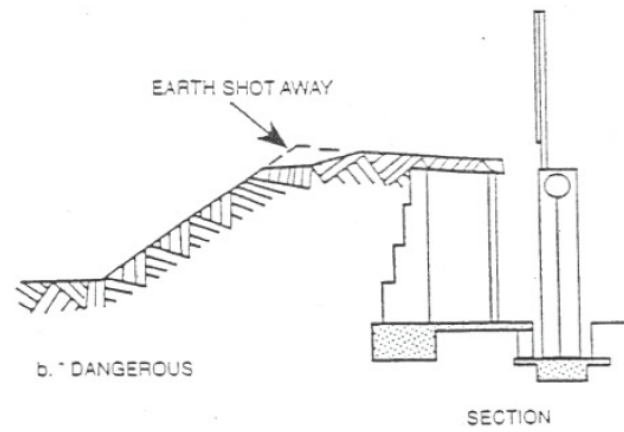


Figure 3.3 Mantlet/ Gallery Configuration

CHAPTER 4 SHOTGUN RANGES

SECTION 1. INTRODUCTION TO SHOTGUN RANGES

Shotgun shooting competitions are primarily “Down the Line (DTL)”, “Skeet” and “Sporting Clays”. DTL and Skeet are shot from fixed firing positions and ranges whereas Sporting Clay matches are shot from various locations on a circuit. These circuits may be altered to present shooters with changing conditions and targets.

Range layouts for DTL and Skeet must comply with the Australian Clay Target Association guidelines.

Range Danger Area

Shotgun ranges must be designed in such a manner that all pellets fall within the property controlled by the range operator. The chart below details the danger area required for each shot size.

Shot Size	Diameter (inch)	Range Length (metres)
No.6	.102	205
No.7	.095	195
No.8	.087	175
No.9	.080	160

The down range area should be clear of trees and other obstacles to a depth equivalent to the flight distance of the furthest thrown target.

Where possible the full danger area should be visible from the firing lines. Where this is not possible warning signs are to be erected and a visual check of the danger area conducted prior to the commencement of shooting.

DTL Ranges

DTL ranges are to be constructed in accordance with the ACTA guidelines.

DTL TRAP HOUSES

DTL ranges have a single trap house located to the front of the shooting positions. These houses may be either occupied by a person manually releasing the clays or by a remotely operated or sound operated trap.

Unoccupied trap houses may be built to satisfy the users' requirements. Trap houses that require people to operate the trap must satisfy the following requirements:

- The roof sides and rear of the trap houses must be impenetrable to the largest shot used on the range.
- There are to be no openings such as windows or cracks in the roof, side and rear of the trap houses.
- A sign is to be placed inside the trap house warning the trap operator to remain inside until given permission to leave by the Range Officer.
- A red flag is to be available within the trap house to signify the operator requires a check fire. Provision is to be made to ensure that this flag can be prominently displayed without exposing the operator to any danger. The flag should be approximately 45x45cm.
- It is highly recommended that the Range Officer and Trap Operator have radio or dedicated landline communications.

DTL SHOOTING STATIONS

Shooting stations should be clearly identifiable. Paths should be flat and with no tripping hazards.

Skeet Ranges

Skeet ranges are to be constructed in accordance with the ACTA guidelines.

Skeet matches are fired from 8 shooting stations in a semi-circular path. Skeet fields have a high house on the left and a low house on the right, located at either end of the path.

SKEET TRAP HOUSES

Where skeet ranges are located adjacent to each other, the high house can be constructed to allow it to act as the low house for the range to the left.

High and low houses may be either occupied by a person manually releasing the clays or configured for remote or sound activated throwers.

Unoccupied trap houses may be built to satisfy the users' requirements. Trap houses that require people to operate the trap must satisfy the following requirements:

- The roof, sides and rear of the trap houses must be impenetrable to the largest shot used on the range. This is also to apply to any access points to the trap houses.
- Other than the entry to the work area and the opening for the clays to pass through, there are to be no other openings such as windows or gaps in the roof, sides and rear of the trap houses.
- A shield must be installed at the target opening of each trap house so that the trap operator is not visible to the shooter when he or she is firing from any position. This is to protect the operator from direct or ricocheting shot.
- A sign is to be placed inside the trap house warning the trap operator to:
 - . remain inside until given permission to leave by the Range Officer,
 - . not look into the trap chute when firing is in progress, and
 - . not to reach into the trap chute when firing is in progress.
- A red flag is to be available within the trap house to allow the operator to signify that he or she requires a check fire. Provision is to be made to ensure that this flag can be prominently displayed without exposing the operator to any danger. The flag should be approximately 45x45cm.
- It is highly recommended that the Range Officer and Trap Operator have radio or dedicated landline communications.

SKEET SHOOTING STATIONS

Shooting stations should be clearly identifiable. Paths should be flat and with no tripping hazards.

SKEET SIDE WALLS

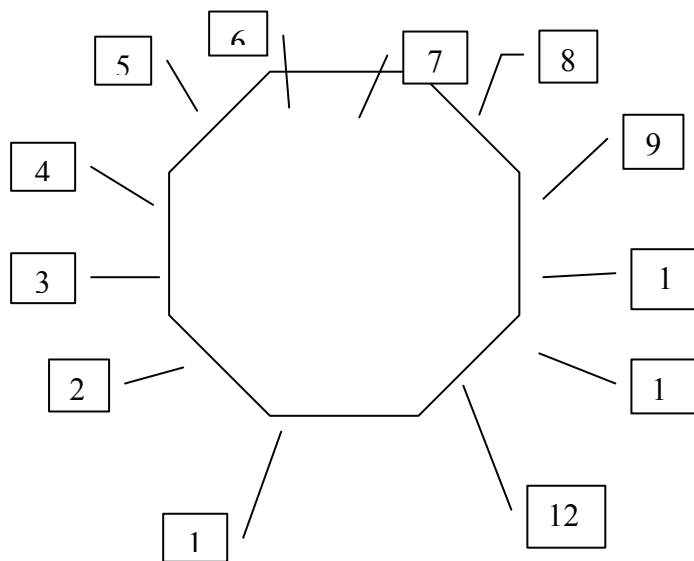
Sidewalls are to be built when adjacent ranges are being operated simultaneously. Sidewalls are intended to protect shooters on adjacent ranges from errant targets and shots.

Sidewalls are to be impenetrable. They should be at least 2.4m high and extend 12.2m back from the trap house.

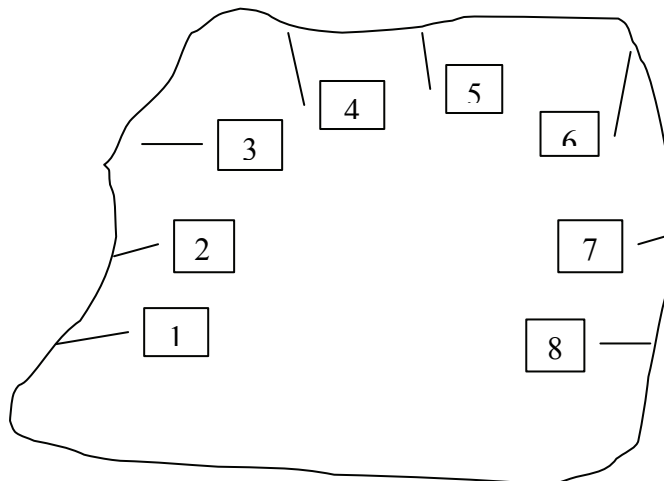
Sporting Clays Ranges

Sporting Clays ranges are usually equipped with a sufficient number of traps to simulate field conditions. Ranges provide challenges to shooters by varying shooting locations, speed and angles of fire. Sporting Clays Ranges are normally laid out as a circuit. Examples are as follows:

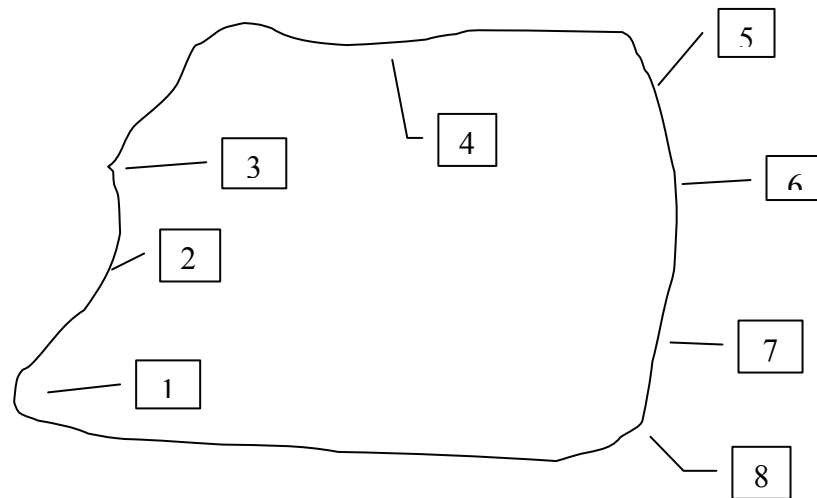
Outward Layouts – The main path is laid out in a circle or horseshoe. The stands either face outward from the circle or the paths are parallel and the stands are placed on either side of the path.



Inwards Layouts – The main path is laid out around the perimeter of the property. The stands face inward and the fallout zone is contained within the property.



Outward-Inward Layout. On one side of the path the stands face outwards and on the other side they face inwards. This layout is only possible if the distance and terrain permit.



SHOOTING STATIONS

When establishing a shooting circuit, the Range Operator must take into account the position of each shooting station in relation to other shooting stations, the property boundary and all other infrastructure within the danger area. In order to achieve this, the Range Operator is to maintain a site plan that accurately depicts the details just mentioned. This plan is to be superimposed to scale onto a map or site plan and is to be adjusted when shooting positions are moved. A GPS can be used to plot locations on the range, however it should be remembered that these coordinates could be inaccurate to over 30m.

Shooting stations are caged areas from where the shooter will shoot his target or targets and are utilised to control the direction of fire. Each shooting station is to:

- be clearly identified with a reference number that is reflected in the site plan;
- be clearly marked with the course of fire, e.g. bounding rabbit; provide firm footing for the shooter.

Shooting stations can utilise local material such as sawn branches or can be of more sturdy construction. Stations are to have muzzle restraints to limit the arc of fire to safe areas. They are to be stable and provide firm footing for the shooter.

TRAP HOUSE

If traps are to be manually operated, the operator is to be protected from pellet strikes from any possible direction. The same safety requirements as detailed in the DTL section (paragraph 4.8) are to apply.

ADDITIONAL SAFETY PRECAUTIONS

Fencing. Where practical, a fence should be erected around the range boundary. This fence should be of sufficient construction that a person would realise they were approaching a property boundary. If the range is in an area where there is livestock, it may be desirable to erect a sturdy stock proof fence, e.g., 3 strand high tensile. If not, a simple two-strand fence would suffice.

Signage. Signs are to be placed around the range boundary and should be red or black lettering on a white background, properly sign-written with the words ‘Shotgun Range – Danger, Keep Out’ (or similar). If the range is approved for multiple types of firearms, the words “Firearms Range – Danger, Keep Out” (or similar) may be used. These signs must be fixed to the fencing such that each sign is visible from the next and be facing the public, and at all points of access.

Known and/or likely access points along the boundary of the range are to be marked with permanent notice boards warning people that they are approaching a danger area.

DANGER
SHOOTING RANGE BOUNDARY
KEEP OUT UNLESS AUTHORISED!

Entry Points. Entry to a range area for all personnel is to be made via entrances nominated and controlled by the range authority. It is preferable to have only one entrance, and one that does not require personnel or vehicles to cross the danger area.

Flags. Red Flags are used to indicate danger and indicate that live firing is in progress. A flag should be positioned at the entrance to the complex and in a prominent location on each active firing line. Flags are only flown whilst shooting is in progress. Red flags are to be no less than 120 x 90 cm.

Red Lights. If ranges are approved for night shooting, red lights are to be displayed in lieu of flags. Alternatively, red flags may be clearly illuminated by a spot light.

CHAPTER 5 MOBILE SHOOTING GALLERIES

SECTION 1. GENERAL INFORMATION

Mobile ranges are those shooting gallery type ranges that are normally associated with carnivals and local agricultural shows. A few shooting associations also have these galleries for use at events such as open days.

The set up of the gallery is normally based around a trailer or a tent. The construction of the gallery is to be such that it will prevent the escape of any projectile from the structure. Refer Section 5-3

SECTION 2. APPROVED FIREARMS

It is generally accepted that the only firearms that are to be used in a gallery are single shot air rifles of .177 calibre. In the State of New South Wales automatic air rifles are a declared prohibited firearm and are excluded from use. A few galleries exist that use adapted firearms that propel balls and corks.

SECTION 3. GALLERY CONSTRUCTION

The use of lead pellets in this environment dictate that areas of possible impact are such that rebounds or ricochets are eliminated. Materials that will prevent penetration are also to be used. It is a requirement for the gallery to be totally enclosed except for the front where firing takes place. It is a good practice to ensure that impact of lead pellets does not occur on any outer skin of the gallery but on an inner skin or target.

SECTION 4. RANGE CONDITIONS

To ensure safety and that statutory requirements are met, certain mandatory Range Conditions are imposed on all Mobile Ranges. Those conditions are:

- The Approval remains in force until the expiry date unless sooner revoked by the Commissioner
- The Approval may be revoked, or the conditions varied, at any time by the Commissioner for any reason deemed sufficient.
- No alterations or extensions shall be made to the Shooting Gallery without the prior approval of the Manager of the Firearms Registry.
- The Approval Holder shall notify the Manager, Firearms Registry, in writing within seven days if the Shooting Gallery permanently closes, or there is a change of Approval Holder or change of postal address of the Approval Holder.
- All persons using the Mobile Range must not be less than 18 years of age and must be under the general supervision of the person in control of the

range. A minor (aged 12 to 17 years) may use the range provided they are accompanied at the shooting range by the minor's parent or legal guardian or for whom the person having control for the time being of the range has received written consent from that parent or legal guardian to shoot at the range. Close supervision is to be provided to any minor by the person having control for the time being of the shooting range.

- The Shooting Gallery must be conducted with proper regard to the preservation of public safety or the peace.
- Police may inspect the Range and its operations at any time.
- The Range Approval cannot be transferred.
- The Mobile Shooting Gallery must be inspected by the NSW Police at least every three years. Safe storage of firearms used on the Range is to be included in that inspection.
- The Mobile Shooting Gallery must be under the direct control of a competent holder of a current Category A Firearms Licence or equivalent interstate licence.
- All firearms must be fixed to prevent the muzzle being turned to the rear.
- The number of firearms to be used on a Mobile Shooting Gallery shall not exceed 10.
- All firearms used on the Range are to be registered to the Business or the Approved Range Holder.
- This approval must be prominently displayed whilst the range is in operation.

CHAPTER 6 MUZZLE LOADER (BLACK POWDER) RANGES

SECTION 1. GENERAL INFORMATION

Black powder Muzzle Loading shooting covers a wide range of firearms, ammunition types and disciplines. As a consequence it will be normal practice for clubs to provide FAR with a detailed explanation of their intentions for new ranges. This chapter should be read in conjunction with the appropriate shooting association's rules and regulations.

Selection of Sites

Selection of sites is discussed in Chapter 2. Where practical, range designers should consider both short and long range shooting to cater for all disciplines and future expansion.

SECTION 2. DESIGN REQUIREMENTS

Templates

The size of templates will vary greatly dependent on the style of firearm, ammunition type, muzzle velocity and muzzle energy. The Range Inspector of the FAR after taking the above factors into consideration will determine template sizes.

Powder Ignition

Due to the potential danger from the ignition of powder, the following precautions are to be made:

- a. The loading area is to be cordoned or fenced to restrict access by spectators. The spectator area is to be at least 2m behind the loading area. Additionally, the loading area is to be at least 2m behind the firing line.
- b. "No Smoking" signs are to be clearly visible around the loading area.
- c. Smoking areas are to be designated and are to be a minimum of 10m from the firing line.
- d. Floors are to be constructed of non-flammable material such as concrete or soil. Care should be taken to avoid placing the firing line over potential fire hazards such as dry grass.

Firing Line

Firing bays are to be large enough to allow easy access to, and movement within, by firers. The major danger on the firing line is from hot gases and burning powder being directed onto adjoining firing positions. Spacing between firers is strongly recommended but where shoulder to shoulder shooting is an approved practice the Range Safety Officer is to inspect all firearms to ensure they comply. 2.5 metres is an ideal distance between firers.

Firing positions where they can be are to be separated by Screens. Screens should not obstruct the view of the Range Officer. They are to be:

- a. Extended at least 0.5m forward of the front edge of the firing point.
- b. A minimum of 1.5m wide and 1.7m high with the top edge at least 2m above the floor.
- c. where the screen does not reach the ground, the bottom edge is not be more than 0.7m above the floor on which the competitor stands.

When a covered firing line is constructed, the ceiling height should permit the ramrod of the longest firearm to be used. The front of the roof should slope downwards in order to act as a baffle and deflect stray shots.

Baffles

When a full firing template cannot be applied due to inadequate land tenure, it will be necessary to construct a limited danger range. New ranges will normally be required to construct downrange baffles to ensure that all projectiles are directed into the stop butt. These may be constructed of any non-penetrable material, the most common being metal or wood. Limited danger area ranges will only be considered as a last option.

It is recommended that a layer of wood be positioned to cover the lower face of the baffle. This will decrease noise from projectiles striking the baffle.

Overhead baffles are to extend the whole length of the firing line and connect to either a sidewall or berm. Any proposed baffling is to be tested to establish its effectiveness.

ADDITIONAL SAFETY PRECAUTIONS

Flash guards are to be fitted to all Fire Locks

Fencing and sign posting. Where practical, a fence should be erected around the range boundary. This fence should be of sufficient construction that a person would realise they were approaching a property boundary. If the range is in an area where there is livestock, it may be desirable to erect a sturdy stockproof fence, e.g., 3 strand high tensile. If not, a simple two strand fence would suffice. The boundary of the range is to be marked with permanent notice boards located at those places where the public may be likely to enter the danger area. Signs should ideally be visible from any approach. A suggested format is:

DANGER SHOOTING RANGE KEEP OUT!

In areas where there is a negligible risk of people entering the danger area, e.g., on large properties or in extremely difficult terrain sign posting may be the only practical option.

Entry Points. Entry to a range area for all personnel is to be made via entrances nominated and controlled by the range authority. It is preferable to have only one entrance, and one, which does not require personnel or vehicles to cross the danger area.

Flags. Red Flags are used to indicate danger and indicate that live firing is in progress. A flag should be positioned at the entrance to the complex, in a prominent location on each active firing line and in a central position on the stop butt. Flags are only flown whilst shooting is in progress. The recommended size for red flags is 120 cm x 90 cm.

Red Lights. If ranges are approved for night shooting, red lights are to be displayed in lieu of flags.

Flagpoles. Flagpoles, which may be subject to impacts from projectiles, e.g., on ranges with echeloned targets, are to be constructed of a non-ricochet inducing material.

Communications

All firers are to be capable of hearing instructions from the Range Officer and other safety staff even whilst firing is in progress. On small ranges there may be no special requirements, however on larger ranges a public address system may need to be provided.

CHAPTER 7 SKIRMISH / PAINT PELLET RANGES

SECTION 1. GENERAL INFORMATION

The sport of paintball is an interactive pastime in which individuals or teams attempt to mark opponents with paint filled gelatin capsules. Paintball ranges can be established on indoor or outdoor playing fields and with a wide variety of scenarios.

The FAR will require a copy of Council Approval before a Permit to Conduct Paintball Games will be issued.

SECTION 2. DESIGN REQUIREMENTS

Field Boundaries

Field boundaries are the perimeter of a designated playing field. They refer to the buffer zone or protective screens or barriers that bound the field. Field boundaries that do not form part of the property boundary must be clearly marked or posted. The postings must be placed wherever a person without approved protective clothing and eye protection might enter, or be directly exposed to the playing field while games are in progress.

Field boundaries are to be clearly marked by either:

- brightly coloured tape, or
- signposted – eg. “Paintball Shooting Range – Danger Keep Out”.

Buffer Zones Protective Screening or Barriers

Buffer zones, protective screening or barriers must be placed around the field boundaries to prevent paint balls exiting the playing field. The staging ground, which is the part of the paintball location used for issuing equipment and for briefing players must not be subject to stray pellets. This requirement also applies to other non-playing areas and adjoining properties.

For outdoor fields, the minimum buffer width is:

- 25m over bush land, and
- 50m over clear ground.

The barrier or protective screen must be at least 3.5m high and must be constructed of a material that is impenetrable by a projectile fired from a paintball gun. Shade cloth materials are to be knitted netting.

Screening or barriers must protect the Staging Area (Safe Area). Spectators must be located behind screens and not in the buffer areas.

The sight of people, often in military type uniforms with firearms may be of concern to some passers by. For this reason the playing area is to be screened from view by the general public.

Identification of Paintball Venues

When shooting is in progress the range must be clearly identifiable to warn and advise a person that they are moving into a danger area. Identification must consist of:

- a. Adequate, well maintained fencing on all outdoor, range land boundaries to prevent easy access. Where this is not possible due to lease arrangements or impractical, additional safety precautions such as extra signs may be required.
- b. Signs, with red or black red lettering on a white background, properly sign written with the words “Paintball Shooting Range – Danger Keep Out” (or similar). On outdoor ranges these must be fixed to the fence facing the public either, in such a way that each sign can be seen from the next or at 25m intervals and at all points of access. Indoor ranges will require danger signs at all entry points.
- c. On outdoor ranges, red warning flags on poles that are visible from all likely approaches. The poles must be erected at the entrance to the paintball location. All red flags must be replaced by clearly visible red lights during night shoots. On indoor ranges a red light is to be illuminated at the entry to the playing area when firearms are being discharged.

Protection of Players and Staff

All care must be taken to protect players and staff from injury. All players and staff must wear “Paintball and ATSM approved” goggles and protective facemasks.

The minimum engagement distance is 6m. On indoor ranges additional care will need to be taken to ensure that people are not engaged from close distances, eg, when appearing around blind corners.

Maintenance

It is not possible to expect a paintball range to function without adequate and regular maintenance. Regular maintenance ensures that signs, protective screening, barriers and other protective measures are maintained to the required safety standards.

CHAPTER 8 LIMITED DANGER AND NO DANGER AREA RANGES

The contents of this Chapter discuss the construction requirements for Limited and No Danger Area Ranges. It should be noted that these are a general guide. Firearms Registry Range Inspectors will determine final requirements. There may be instances, for example, where the location and use of the range may permit some degree of dispensation. Conversely, some ranges may require additional features due, for example, to the location of nearby housing.

SECTION 1. GENERAL INFORMATION

Where insufficient land area is available to accommodate a full danger area template, a limit to the free flight of projectiles must be constructed, which must totally impede the passage of projectiles into areas outside the range property boundary.

To create a limited danger or no danger area range there must be a stop butt or wall, either of natural or artificial composition, used in conjunction with a restricted arc of fire. Lead catchers may also be constructed in front of the stop butt in order to reduce pollution and allow for ease of projectile collection and removal. Eyebrow and overhead baffles are constructed to capture inadvertent high shots in conjunction with ground baffles to capture low shots and ricochets. It is a requirement that sidewalls be constructed on both sides of the Range extending from the firing point to and extending into the stop butts.

SECTION 2. SITE SELECTION

Artificial barriers are expensive to provide and maintain, therefore the use of natural terrain may be an option. For example, disused quarries may provide the first step in creating a stop butt to the required height.

The following should be considered when selecting the range alignment:

- a. highest available face,
- b. an axis so that the firer does not look into the sun,
- c. ideally a downrange area, free from houses, roads and tracks,
- d. a range area and face free from hard, ricochet inducing surfaces if possible, and
- e. if available, a face slope not less than 35 degrees from the horizontal (over the total mean height). Slopes of less than 35 degrees may be acceptable depending on the overall height and condition of the terrain.

Stop Butt

A stop butt is an artificial bank or natural feature/slope, constructed of spoil or other small grained material, free from stones and other hard elements. The major purposes for the construction of a stop butt is to impede the passage of projectiles from the range and to capture lead and other contaminants not caught by the bullet catcher. Various types of stop butts include:

- a. earth mound,
- b. earth mound with wall,
- c. tandem mound, and
- d. terraced hill.

The stop butt is to be sited so that it is bisected by, and lies square to, the range axis / firing line.

The most common stop butt, and the most likely to be constructed on modern ranges is the earth mound. Specifications are discussed in the following paragraphs.

Height of Stop Butts. The stop butt height will be governed by the following:

- a. maximum range to be fired over;
- b. types of firearms and ammunition used, and
- c. firing positions (prone, kneeling or standing) related to:
 - (1) mean line of sight;
 - (2) degrees of slope of stop butt from the vertical;
 - (3) distance between target line and stop butt/wall; and
 - (4) use of baffles.

The greater the distance between the target line and the centre line of the stop butt, the greater the overall height of stop butt is required. A guide to the required height of stop butts is contained in Annex A to this chapter. Prior to construction, Firearms Registry Range Inspectors are to be contacted in order to provide confirmation of the required height.

A natural stop butt may be provided by a steep hill immediately behind the targets. However as the hill may not rise very steeply immediately behind the targets, it is usually necessary to cut into the face of the hill and place bullet catching sand or other material in the bullet strike area, until it conforms to the conditions required for an artificial stop butt.

Length of Stop Butts. A guide to the overall length along the crest is also provided in Annex A. Again, prior to construction, Firearms Registry Range Inspectors are to be contacted in order to provide confirmation of the required length. The length at the base of the stop butt depends on the overall height and the degrees of end slope.

Thickness of Stop Butts. The crest of the stop butt should be level and not less than 1.5 m thick. The thickness of the base will vary, depending on the slope and height of

the stop butt. It is advantageous if the crest of the stop butt is wide enough to allow vehicles used for maintenance (e.g. back hoe or Bob Cat) to drive onto, and operate on the crest with safety. This will enable maintenance to be conducted with relative ease.

Slope of Face. While the face of the stop butt need not be steeper than the natural angle of repose of the material of which it is composed, an attempt should be made to preserve as steep a slope as possible, thus reducing the likelihood of ricochets. Slopes of 35 degrees or better should be maintained. Plastic geo-textiles used for erosion control, especially those that form a series of pockets when laid, may be placed on the stop butt to retain the sand face. Other penetrable materials such as tarpaulins and shade cloth may assist in maintaining the slope of the mound. The slope at the ends and rear of the stop butt may be at the natural fall of the material used in its construction.

Position of Stop Butt in Relation to Targets. The distance between the foot of the stop butt and the targets should be as short as possible, but no more than 5m. Sufficient space between the targets and the stop butt should be available for maintenance work and the use of equipment such as Bob Cats. Should intermediate targets be employed, the use of additional overhead and ground baffles will need to be considered. The use of intermediate targets will only be considered under exceptional circumstances.

Sand Boxes. When the stop butt is unavoidably constructed of shingle or any other hard material or where it is not possible to guarantee that the fill material is free from stones, sand boxes must be provided to prevent backsplash and to aid marking. The material in the sand boxes is best composed of an equal mixture of washed coarse river or pit sand and sawdust. Beach sand is not to be used as the fine sand grains compact and are likely to cause ricochets. The use of plastic geo-textile, which is designed for soil retention, can be added to the bullet catcher to assist in retaining the sand.

Use of Tyres. On some ranges it has become common practice to use tyres on the forward face area of the stop butt. Tyres can cause backsplash and ricochets, either by projectiles bouncing from the tyre directly or from pieces of steel belt being broken off and deflecting as a secondary missile. Tyres do not allow soil or sand to fall into tunnels created by concentrated bullet strike and their presence often hides the true condition of the stop butt. For these reasons, tyres are not to be used in the bullet strike area. In all cases tyres are to be covered with at least 900mm of debris free soil or other material if they are in danger of being struck by any fire.

Use of Hay or Straw Bales. On some ranges, hay or straw bales have been placed on stop butts and terraced. These bales hide the condition of the stop butt, do not prevent backsplash and may be a fire danger. Hay bales may also attract unwanted pests and vermin. For these reasons, hay or straw bales are not to be used on stop butts except as mulch or for erosion control.

Bullet Catchers (non-earthen stop butts)

A bullet catcher located in the bullet strike area must be provided on ranges that utilise a wall rather than earth as a stop butt. These are to be constructed of timber, dense rubber screens, sand or fine soil, free from lumps and stones. Alternatively proprietary steel bullet traps with baffles may be used, provided all risk of backsplash to firers has been eliminated.

The bank face itself may consist of sand or light small grained material, which is itself suitable as a bullet catcher; however due to de-leading, constant firing and weathering, the lower portion will eventually collapse and seek a natural angle of repose in the order of 30-35 degrees from the horizontal, thereby rendering the bank unsuitable.

In such cases, even timber supports, fascines etc., will not save the undermining and eventual collapse of the face. It will therefore be a more economic proposition to raise a supported or semi-supported bullet catcher forward of the face, which can then be sieved, de-leaded and turned over with no harmful effect on the bank wall.

In lieu of dense sand bullet catchers, vertically mounted timber or rubber brick walls may be erected immediately behind the targets. Such walls include:

- a. Timber of sufficient density and thickness to absorb all shot. This will usually require a thickness of at least 200 mm of soft wood or 175 mm of hardwood. Build up of lead is to be expected, creating the need to frequently turn the timbers or replace them.
- b. Intention of slowing the shot and eliminating backslash only. Where this method is adopted, a clear space behind the timber wall should be provided, to permit clearance of lead and debris. Such timber walls should be not less than 125 mm thick, and will clearly be destroyed by shot fairly rapidly.
- c. Granulated rubber placed in a holding container within steel bullet catchers or in front of walls has been found to be an effective means for capturing projectiles. The rubber is also effective in protecting the steel or wall and decreasing noise levels.

Canopies (non-earthen wall stop butts)

On ranges that do not utilise an earthen wall or stop butt, the bullet catcher may need to be provided with a 19mm thick timber / plywood canopy. The underside of the canopy is to be covered in 5 mm mild steel to the rear half only.

Ranges that do not have the required 100m “pop over” distance behind the stop butt will also require a stop butt canopy. These canopies are designed to capture any ricochets or pop outs from the stop butt that might exit the property boundary. Canopies are to be placed approximately 3m above the range surface, i.e., the bullet strike area. When hard targets and ricochet prone frames are present, the canopy is to be built over the target line.

Baffles

Types of baffles include, eyebrow / firing line, overhead and ground.

Eyebrow / Firing Line Baffles. (See Diagram Annex B) These baffles are constructed from the firing line roof toward the target line and are designed to stop bullets that have been inadvertently fired at a high angle from the firing line. The baffle should be constructed in such a way that the barrel of the gun cannot “see” the sky. The baffle is to be on a gentle angle towards the range surface to minimise backslash and is to be constructed of non-penetrable material. The thickness of the baffle will depend on the type of firearms and ammunition being used on the range. It is recommended that the under-face of these baffles be constructed of soft timber with an air gap to prevent backslash.

Downrange Overhead Baffles. (These should not be confused with eyebrow baffles.) Downrange baffles are constructed above the range surface to capture high shots and ricochets. They are normally required on ranges that cannot achieve the required stop butt height. Baffles can be either vertical structures or angled to deflect projectiles toward the range floor. The advantages of constructing these baffles are:

- a. Stop butt heights may be lowered (only in exceptional circumstances) thus creating savings in construction and on-going maintenance costs, and
- b. Improved safety by ensuring that all projectiles remain within the property boundary.

Design requirements will depend on whether the range has a fixed firing line or multiple firing lines downrange. These requirements are discussed in the following paragraphs.

- a. **Fixed Firing Line.** On ranges where the required stop butt height cannot be achieved there will be a requirement for down range baffles. The first baffle should be located approximately 5m from the firing line and positioned so that the gun barrel cannot “see” the sky or the top of the stop butt. Subsequent baffles are to be positioned such that the sky is not visible below the first baffle from any firing height, i.e., standing, prone or sitting. Ground baffles will also be required as discussed later.
- b. **Multiple Firing Lines.** This paragraph also refers to ranges where stop butt height cannot be achieved and the club wishes to have multiple firing lines. This type of range will require additional overhead baffles. Baffles are to be so positioned that the sky is not visible from the barrel at each firing position. Sufficient baffles are to be constructed such that projectiles that ricochet at an angle of 30 degrees from the range surface are captured. This requirement will determine the height and number of baffles required. Taller baffles will cover a greater area thus requiring fewer baffles downrange.

Overhead Baffle Construction. Vertical baffles located closer than 15m from shooters are to be clad in timber to avoid backslash. An air gap should be engineered into their construction as this will assist in minimising backslash and decreasing noise levels.

Ground Baffles - Echeloned or Intermediate Targets (See Diagram Annex B)

Where, prior to construction, it is known that echeloned or intermediate targets will be employed, or where several firing points at differing distances will be used, it may be necessary to construct down range ground baffles. The overall design concept is to reduce ricochet and capture low shots. The requirement for ground baffles will normally be on ranges exceeding 25m in length. Intermediate baffles can be soft material such as soil or granulated rubber or vertical structures constructed of harder material such as wood or other suitable material. The number of baffles required will generally depend on their height. Baffles are to be constructed and spaced such that the range floor is not visible between mounds. The following particular requirements apply to soft or hard baffles:

Soft Ground Baffles:

- a. Baffles must be thick enough to absorb a direct hit.
- b. The forward face should be constructed to a slope not less than 35 degrees from the horizontal.
- c. To ensure the correct height and width are maintained, it is recommended that wooden stakes be placed at either end to provide a visual indication of their height when first constructed.
- d. The formation of bullet scoops should be avoided, as these scoops tend to cause widely divergent ricochets. The mounds must be regularly maintained. Ground cover will reduce the speed at which scoops form, and thus reduce maintenance.
- e. Targets should be placed at the base of the baffle and never on top.

Hard Vertical Ground Baffles.

- a. Baffles must be capable of withstanding direct shots.
- b. Baffles may be back filled to provide additional strength.
- c. The top strip of the baffle should slope backward towards the target area to prevent upward ricochets.
- d. Targets should be placed at the base of the baffle and never on top.

Where, subsequent to construction it is desired to employ echeloned or intermediate distance targets on the range, it is essential that these targets be presented so that their central aiming points fall at, or slightly below, but never above the planned line of sight that was used when determining the stop butt height of the range.

Any intermediate form of target or bullet catcher together with its associated supporting frame, must never, itself, create an additional hazard on the range.

Flagpole

Where there is the remotest possibility of people approaching the range from the rear of the stop butt, a flagpole 6 to 9 m high, of non-ricochet inducing material is to be provided on the stop butt for the red flag or warning lamp (for night firing). A red flag is also to be flown in a prominent location at the entrance to the range or behind the firing line or both if deemed necessary.

DATA FOR LIMITED / NO DANGER AREA RANGES

Note 1: Hard targets not permitted on NDA/LDA Ranges without extensive additional construction.

Note 2: Linear & vertical dimensions approximate

Note 3: Calculations are based on targets being within 5m of stop butt.

Note 4: NDA ranges will require the construction of canopies and potentially sight baffles.

Note 5: NSW Police Force Firearms Registry has discretionary power to reconsider the 35 deg slope requirement. Such a decision will be influenced by ammunition type, stop but construction and the presence of a separate bullet catcher.

Note 6: A 100m buffer is required beyond the far side base of the stop butt for Limited Danger Area Ranges.

CENTRE FIRE PISTOL

Distance from firing line	25	50	100	150	200
Crest Height	6.5	8	11	15	17
Extend beyond flank LOS	5.8	7.3	10.3	13	16.3

Face slope from Horiz = > 56 deg (3:2 or 1,000 mils)

Crest thickness – 1 metre

Surface standards – no visible hard surfaces

Condition – Level crest, no tumble down or scooping

Distance from firing line	25	50	100	150	200
Crest Height	2.5	2.5	2.5	3	4
Extend beyond flank LOS	1.6	1.7	2	2.3	2.6

Crest thickness – 0.75 metre

Minimum behind targets – 0.75 metre (if sand or soil)

Face of slope from horiz = or > 30 deg (2:3 or 530 mils)

Composition – Timber, dense rubber, sand, fine soil, steel bullet trap with water or sand tray

Condition – As for stop butt if sand or earth

CENTRE FIRE RIFLE

Distance from firing line	25	50	75	100
Crest Height	8.5	10.5	12.5	14.5
Extend beyond flank LOS	5.5	7.5	8.5	10

Face slope from Horiz = > 56 deg (3:2 or 1,000 mils)

Crest thickness – 1 metre

Surface standards – no hard surfaces to min 300 mm

Condition – Level crest, no tumble down or scooping

Distance from firing line	25	50	75	100
Crest Height	2.5	2.5	2.5	2.5
Extend beyond flank LOS	1.5	1.5	1.75	1.75

Crest thickness – 1metre

Minimum behind targets – 3 metres if sand or soil

Face of slope from horiz = or > 30 deg (2:3/530 mils)

Composition – Timber, dense rubber, sand, fine soil, steel bullet trap with water/ sand tray

Condition – As for stop butt if sand or water

RIM FIRE RIFLE

STOP BUTT

Metres

Distance from firing line	25	50	100	150	200
Crest Height	5	5.5	6.5	7.5	8.5
Extend beyond flank LOS	2	2.5	4	5.5	7

Face slope from Horiz = > 56 deg (3:2 or 1,000 mils)

Crest thickness – 0.6 metre

Surface standards – no hard surfaces to min 300 mm

Condition – Level crest, no tumble down or scoop

BULLET CATCHER

Distance from firing line	25	50	100	150	200
Crest Height	2.5	2.5	2.5	3	3
Extend beyond flank LOS	0.5	0.6	0.75	0.9	1

Crest thickness – 0.6 metres

Minimum behind targets – 0.75 metre (if sand or earth)

Face of slope from horiz = or > 30 deg (2:3 or 530 mils)

Composition – Timber, dense rubber, sand, fine soil, steel bullet trap with water or sand tray

Condition – As for stop butt if sand or earth

RIM FIRE PISTOL

STOP BUTT

Metres

Distance from firing line	25	50	100	150
Crest Height	6	7.5	10.5	13.5
Extend beyond flank LOS	3.5	5	8	11

Face slope from Horiz = > 56 deg (3:2 or 1,000 mils)

Crest thickness – 0.6 metre

Surface standards – no visible hard surfaces

Condition – Level crest, no tumble down or scoop

BULLET CATCHER

Distance from firing line	25	50	100	150
Crest Height	2.5	2.5	3	3.5
Extend beyond flank LOS	0.8	1	1.2	1.5

Crest thickness – 0.6metre

Minimum behind targets – 0.75 metre if sand or earth

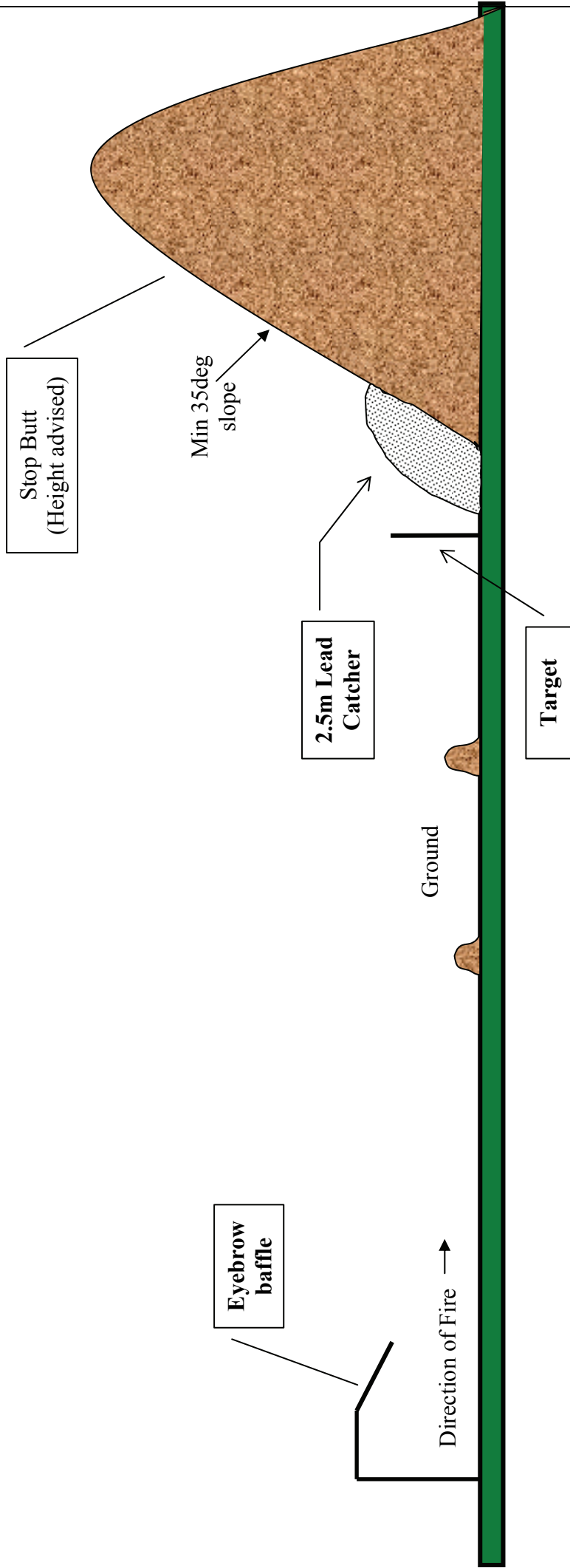
Face of slope from horiz = or > 30 deg, 2:3 or 530 mils

Composition – Timber, dense rubber, sand, fine soil, steel bullet trap with water and sand tray

Condition – As for stop butt if sand or earth

FIXED FIRING POINT RANGE
WITH FULL STOP BUTT HEIGHT
AND POP OVER ZONE (in excess of 100m)
(INDICATIVE VIEW ONLY)
FIXED FIS

- Note 1** – Not to Scale
- Note 2** – Stop butt height will be dependent on the type of range, ammunition and firearm considerations.
- Note 3** – Eyebrow baffle should remove visibility of the sky from the end of the barrel.
- Note 4** – Ground baffles should remove visibility of the range surface – normally 25m from firing line forward.



FIXED FIRING POINT RANGE
WITH FULL STOP BUTT HEIGHT
BUT NO POP OVER ZONE
(INDICATIVE VIEW ONLY)

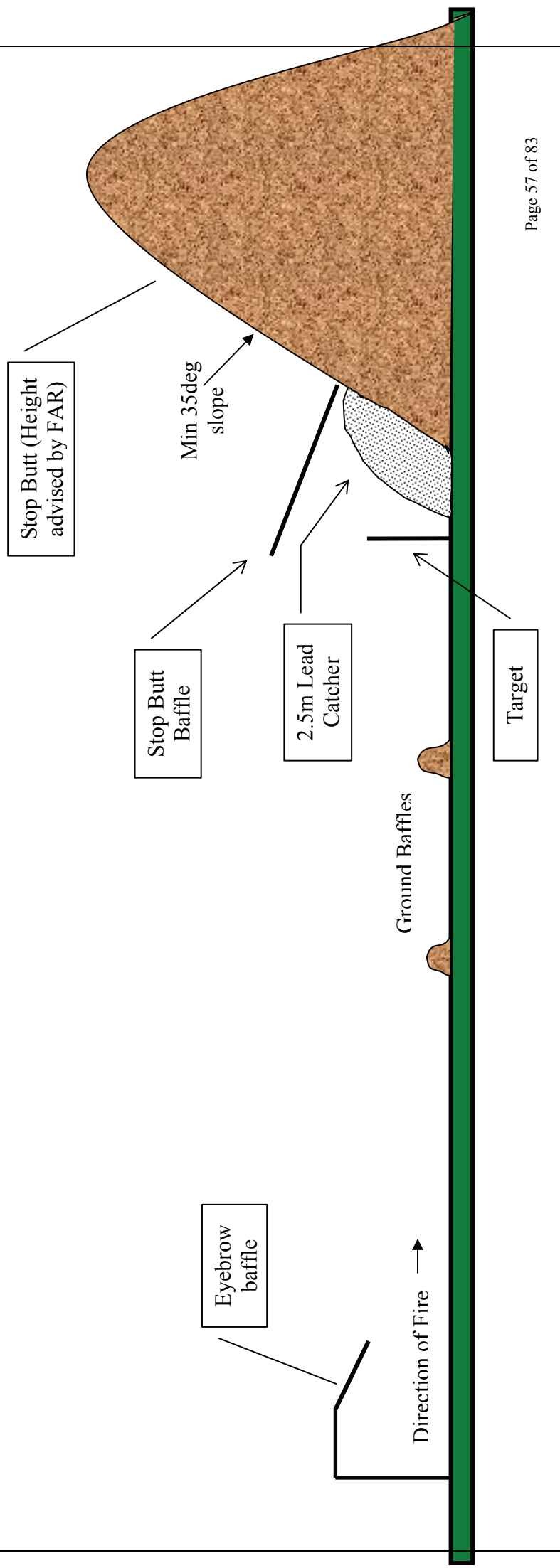
Note 1 – Not to Scale

Note 2 – Stop butt height will be dependent on the type of range, ammunition and firearm considerations.

Note 3 – Eyebrow baffle should remove visibility of the sky from the end of the barrel.

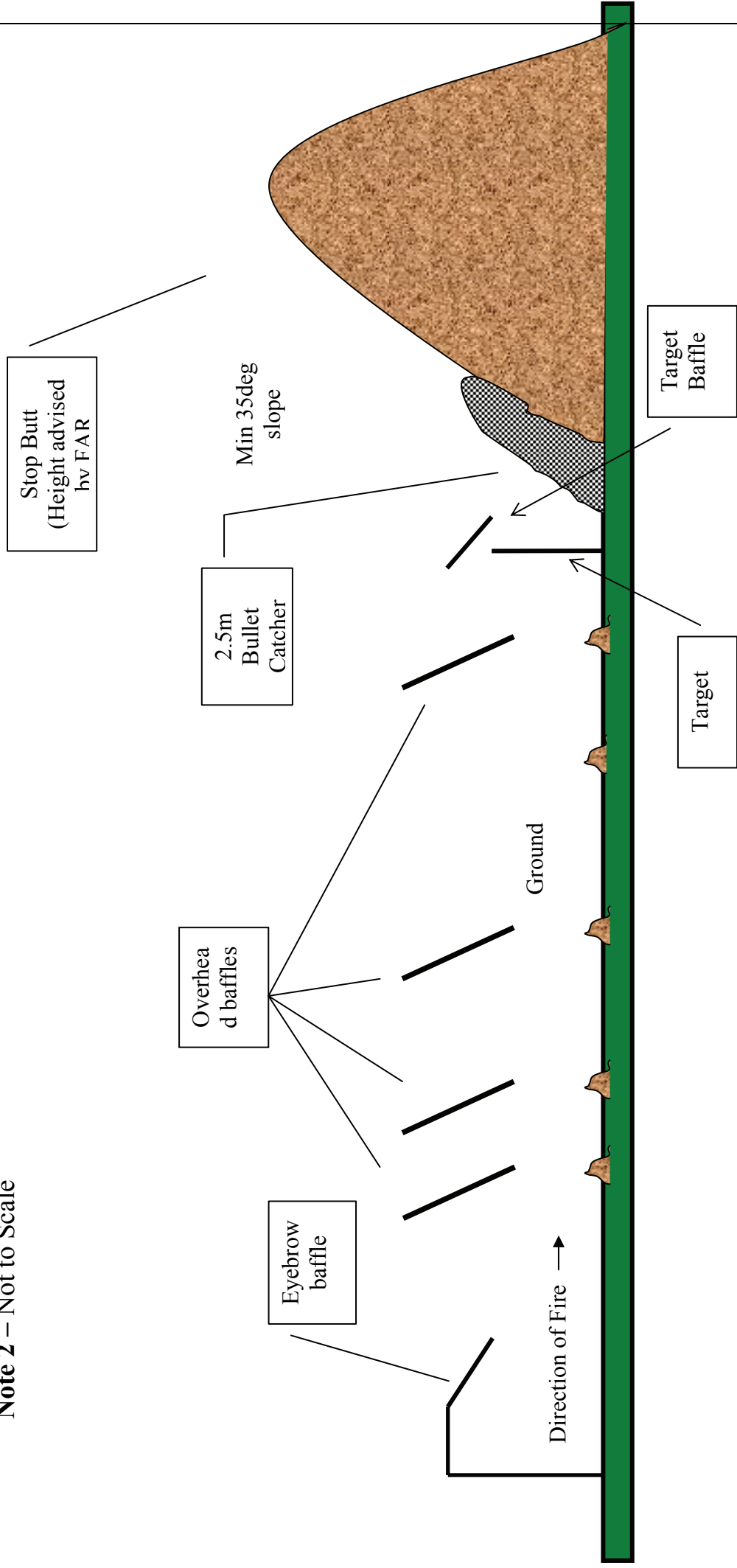
Note 4 – Ground baffles should remove visibility of the range surface – normally 25m from firing line forward.

Note 5– Stop Butt canopy required on ranges with insufficient pop over distance. These canopies are to capture ricochets from the stop butt. If targets and frames are likely to produce ricochets, the canopy is to extend over the targets.



100m FIXED FIRING POINT RANGE
DISPENSATION ON STOP BUTT HEIGHT
(INDICATIVE VIEW ONLY)

Note 1 – Stop butt height will be dependent on the type of range, ammunition and firearm considerations.
Note 2 – Not to Scale



CHAPTER 9 INDOOR RANGES

SECTION 1. INTRODUCTION TO INDOOR RANGES

This Chapter deals with indoor ranges designed for use with pistols and rifles. These Ranges are characterised by the following features.

- a. They are fully enclosed within a building.
- b. They do not require a safety area exterior to the building in which they are located.
- c. They have a bullet trap that all rounds culminate in.
- d. They have a ventilation system to remove air contamination created by the act of shooting.

There are a number of ways to achieve the aims of this Chapter. This is particularly true in the selection of materials to construct the building the Range is enclosed in. The selection of alternate materials and construction methods are acceptable as long as they provide an equivalent level of safety to the requirements described in this Chapter. The onus to provide the evidence of at least equal protection rests with the operator of the Range.

Indoor ranges consist of firing lines, an active range area with a down range Protected Zone (PZ), a ventilation system and a bullet trap (backstop) all of which are contained in a building designed not to allow the escape of any product of shooting a firearm. To operate, the range should also have various other equipment and facilities such as target arrays, waiting areas, etc. Indoor ranges are typically laid out with a number of firing points and firing lines located at specific distances from the target line. This chapter has been formatted with this basic design in mind. The use of the entire active range area by a single shooter will need to be negotiated with the FAR.

This chapter contains information on pistol and rifle usage only and should information be required on the use of shotguns contact will need to be made with the Range Inspectors of the FAR.

SECTION 2. SAFETY CONSIDERATIONS

Safety considerations for indoor ranges fall into two broad categories, ballistic and environmental. The ballistic issues are concerned with bullet trajectory, containment and lead backsplash. The environmental issues are concerned with range ventilation and lead contamination.

This Chapter will deal mainly with ballistic issues. Environmental issues will only be looked at briefly. Indoor range users must consult the relevant State Acts, Regulations and Standards on environmental issues such as ventilation and the control of lead contamination. Some of those references are:

The National Inorganic Lead Control Standard & Code of Practice (NOHSC(1994)).
Workcover NSW OH&S Workplace Amenities Code of Practice 2001.

Notwithstanding the deferral of environmental issues to other Government Agencies the following information is made available for information.

- a. That all individuals involved in the design, approval, operation and the usage of indoor ranges should make themselves fully aware of the health hazards posed by lead contamination associated with indoor shooting ranges.
- b. The Range Operators should develop a lead contamination control plan to minimise the hazards posed by lead contamination.
- c. Food or drink should not be allowed to be consumed on the range apart from properly designed food consumption areas after the shooter has ensured they have decontaminated themselves.
- d. The active areas of the range should be regularly cleaned using either a vacuum system specifically designed to capture lead residues (eg, a HEPA vacuum) or a wet wash system. The use of dry broom techniques (traditional sweeping) or standard commercial vacuum cleaners is strongly discouraged.
- e. If lead contamination is determined to be a hazard the risk may be lowered or even negated through exclusive use of lead free (non-toxic) ammunition. The availability of ammunition with lead free primers may be an initial problem but with general acceptance of its use will become freely available.

SECTION 3. RANGE DESIGN & CONSTRUCTION GUIDELINES

The main aim of this Section is to ensure the safe containment within the Range of all projectiles (and any subsequent ricochets or backsplash) generated from the act of shooting in accordance with the range conditions imposed by the way of the Range Approval.

The limitations of the bullet trap design and construction must be made available to the FAR to assist in the drafting of the mandatory conditions that are imposed on the Range Approval. The requirements provided in this Section are based on ammunition that is copper alloy jacketed (FMJ, JHP, JSP etc) or a lead alloy bullet construction. This Chapter is not intended to accommodate any of the following ammunition natures:

- a. Armour Piercing,
- b. Tracer,
- c. Incendiary,
- d. Steel Cored &
- e. Hardened Metal Penetrator Bullet Designs (Solid Slugs)

Protected Zone: To ensure the containment of bullets fired within the building, all indoor ranges shall have a downrange Protected Zone (PZ). This area surrounds the bullet trap and a significant portion of the downrange area. In the majority of cases the building construction will already afford the necessary protection to ensure bullet containment, in other cases additional features will have to be added.

The PZ of an indoor range is the area forward of the firing line from which an errant shot or ricochet cannot escape the range confines. The PZ does not necessarily extend back to the most distant firing line.

The minimum extent of the PZ is determined by horizontal and vertical angular measurements taken from the intended firing positions (eg. prone, kneeling or standing) at all firing locations. The limits of the downrange PZ are defined by the angular measurements depicted in the following table. PZ angles are measured from the line of sight from the shooter to the targets. Their application is shown in Annex A to this Chapter.

	Rimfire Rifle	Rimfire Pistol	Centre Fire Rifle & Pistol
Vertical	10°	15°	15°
Horizontal	6°	10°	15°

- All of the downrange areas outside the bullet trap are to be protected by baffles or the building material in that zone is to be such that no bullet can penetrate the structure and leave the confines of the range.
- There shall not be any doorways or access points into the active range area, forward of the firing line(s) that can be opened from the exterior of the active range.
- All range fixtures (eg. lights, sprinklers, pipes etc) within the PZ are to be protected from damage from firing by baffles or similar features.
- **Adjoining Rooms/Floors:**
Rooms that adjoin the active range area that are forward of the most distant firing line and that may be occupied whilst the range is in use (eg. Office, toilet block etc) shall be protected as if they did constitute a part of the range complex. Should these adjoining rooms or floors not be able to be protected the access to these areas is to be denied during live firing.
- **Range Waiting/Spectator Areas:**
The range facility may be equipped with a waiting room and/or a spectator area. They shall be separated from the active range area and it shall be ventilated so that the range air is not able to enter these areas whilst the range is in use.
- Any doors that separate the waiting/observation areas from the active range area shall be fitted with weather stripping or equivalent fittings that will prevent the intrusion of lead contaminated air from the active range area into these areas.

Active Range Area

- **Floor:**
The floor of the active range area shall be constructed to minimize bullet backsplash and to facilitate cleaning, keeping in mind lead contamination. The surface of the floor should not have any impedance built into it that would deflect a bullet from a natural firing path.
- Where practical, it is highly advantageous that the active range floor be of poured concrete or similar material. If the floor is of wooden floorboard construction all joints are to be filled and sealed to prevent build up of contaminants.
- The use of pervious materials (sand, dirt etc) as the floor material is not recommended again due to containment and the subsequent difficulty of removing contaminants.

- When cleaning the range of contaminants the Range Operator is to ensure that they are able to collect all residue and dispose of it in accordance with any statutory requirements that are in place.
- **Ceiling Height & Line of Sight Clearance (LofS):**
The ceiling or roof in the active range area shall be of sufficient height to provide safe firing. All roof members, trusses, baffles, pipes, sprinkler heads etc are to be positioned above the required minimum clear LofS between the firing line and the target line.
- The clear **LofS** shall be a minimum of 60cm above the maximum firing height at the firing line and 25cm above the top of the target at the bullet trap. The height of the LofS at the firing line is determined by the shooters firing position (eg. prone etc).

Firing Lines/Firing Points

- The firing lines shall be constructed so that they are parallel to the bullet trap.
- Each firing line and the distance to the targets is to be permanently marked (eg. painted) on the range walls and/or floor.
- Each lane should be 1.5 metres in width, but not less than 1 metre. A firing line regardless of the number of lanes is to have the provision to accommodate a “Range Officer” to oversee all shooting.
- The firing line shall exceed the outside edges of the flank (1st and last) target lanes by 0.5 metres.
- The depth of the firing lines will be at least 3 metres in depth where prone shooting is done and at least 2 metres in depth where kneeling or standing shooting occurs. As previously stated consideration must be also given to accommodating a Range Officer.
- The use of firing point separators between firing points is strongly encouraged. These separators are primarily designed to provide each shooter with a defined firing area. Another reason for their existence is to protect shooters from being struck by ejected cartridge cases originating from adjoining lanes. The separators are to:
 - a. Not significantly obstruct air flow,
 - b. Be fitted with small tables to assist shooters to rest firearms; and
 - c. Can be fitted with sound absorbing materials to dampen the report of the firearm.

Active Range Construction

- This section pertains to the design, construction, and the selection of materials for the active range area. The requirements of this section are to be considered as additional to the design and construction requirements imposed by local building codes, Australian Standards and Shooting Association Rules.
- **Range Design & Construction Guidelines:**
The use of concrete as the material for the construction of the walls, floors and ceilings of the active range area of an indoor range should be seen as the normal and should always be seen as the first option. When concrete is used as the sole

construction material the requirements for the PZ are most likely afforded without any further structural requirements.

- **Protected Zone Construction Materials:**

The minimum structural requirements for a PZ are shown in the following table.

Firearm Type	Concrete	Brick	Concrete Block	Hardwood	Softwood
Rimfire	75mm	103mm	100mm	125mm	150mm
C/F Pistol	150mm	215mm	215mm	175mm	200mm
C/F Rifle	200mm	215mm	330mm	250mm	375mm

- The use of hollow core construction blocks (eg. Besser) are to be avoided as they do not sustain damage well from glancing or direct strikes. If used it is a requirement that they be clad with additional materials in accordance with the above table.

- **Protection Zone Baffles:**

Overhead or side wall baffles in the PZ can be used to augment or to provide primary protection against the escape of bullets from the active range area.

- There are a number of construction materials that can be used to construct baffles. The determination of any particular baffle suitability is its ability to stop the ammunition being fired on the range. If baffles are used to provide ballistic protection within the PZ, they shall meet or exceed the requirements of the following table.

Firearm Type	Steel Thickness (<i>Note 1</i>)
Rimfire Rifle/Pistol	5mm
Centrefire Handgun	8mm
Centrefire Rifle	11mm

Note 1. Mild steel (0.15 – 0.25% Carbon)

- All baffles shall be clad in 5cm timber on the firing line side. The backs of the baffles shall be visible for inspection purposes.
- Baffles within 10 metres of a firing line shall be angled at approximately 25° to 30° from the horizontal to minimise backslash and to deflect ricochets or bullet fragments downrange instead of back towards the firing line.

Bullet Traps

The bullet trap is located behind the most distant target line. Bullet traps are intended to safely contain bullets and the attendant ricochets or fragments of shots fired on the range. There exists many trap designs, some are better suited to specific uses than others. The bullet trap specifications must be able to handle the intended range usage (eg. Maximum calibre, bullet type, shooting event and firing angles). A number of companies produce commercial bullet traps and they should provide specifications as to the limits of the trap. If a commercial bullet trap is used those specifications are to be provided on demand or when applying for the Approval of a Shooting Range.

Any non-commercial designed and manufactured bullet trap will require an engineer's certificate stating the design limitations such as maximum calibre and bullet type ratings of the trap.

- **Bullet Trap Designs:**

There are a number of common designs used for bullet traps on indoor ranges. Regardless of the design selected it is again stressed that the bullet trap must be:

- a. Rated to the maximum calibre of the firearms intended for use,
- b. Rated to the most robust bullet design (nature/type) intended for use, and
- c. Able to safely contain bullets, bullet fragments and ricochets.

- Regardless of the particular backstop design used, there are common construction requirements, which are:

- a. Edges of steel plates must be cleanly abutted with no gaps or protruding edges,
- b. Seams in the steel plates must be backed by equivalent thickness of steel plate at least 10cm wide running along the seam length and centred on the seam,
- c. Seams are not to be located behind the Mean Point of Impact (MPI) for any lane,
- d. Exposed screw heads/bolts must be flush with the steel plating,
- e. Bolt nuts are not to be exposed to bullet impact,
- f. Steel plates are to be adequately supported to ensure that they do not buckle, bow or waver as a result of their own weight or sustained use, and
- g. Edges of steel plates exposed to direct bullet impact shall be bevelled and have a fillet radius of no more than 1.5mm.

- The use of a sacrifice plate tack welded to the steel backstop over the MPI's is one method of improving the longevity of steel backstops. The steel sacrifice plate is placed on the backstop to sustain a high percentage of bullet impacts. Once the sacrifice plate is worn out it can be readily replaced and is a far less expensive method than having to replace the entire back plate.

- **45° Angled Steel Plate Design:**

One of the simplest bullet trap designs to construct is this angled plate design. This design utilises a steel plate angled at 45° (or less) to the direction of fire. Impacting bullets are intentionally ricocheted down into a water or sand trap located at floor level. Be aware that this type of design generates considerable amount of fine lead dust contamination resulting from the severe deformation of bullets impacting the angled steel plate.

- The steel impact plate angle shall not exceed 45° from the horizontal; the angle can be less than 45°. The steel plate is to meet or exceed the requirements of the following table.

Calibre	Bullet type	Min Steel Thickness	Steel Specs (Note 1)	Mild Steel Min Thickness (Note 2)	1T100 Armour Steel Min Thickness
.22 Long Rifle	Lead	7mm	AR 450	6mm	4mm
9mm Para.	FMJ	10mm	AR 500	12mm	8mm
.357 Mag	JSP	10mm	AR 500	12mm	8mm
.44 Mag	JSP	10mm	AR 500	12mm	8mm
.45ACP	FMJ	10mm	AR 500	12mm	8mm

Note 1. The steel specifications provided in the above table are provided as a minimum requirement. The use of alternative specification steel that exceeds these requirements is permitted.

Note 2. 0.15 – 0.25% Carbon mild steel, grades: 260W, 300W, 260WT, 300WT, 350WT, 380WT, 400WT, 350R, 400A, 480A, 700Q, 700QT or their equivalent.

- The sand trap shall be coarse and free of hard inclusions (eg. Stones). If water is used in the trap, it is to be replenished as required. This bullet trap design is to be used for all pistol or rimfire rifle only.
- The use of an anti backslash curtain is strongly recommended.
- **Vertical Steel Plate Design:**
The vertical plate design utilises a vertical steel plate to fragment fired bullets on impact. It is simple and reliable design for a bullet trap however it is only suitable for rimfire pistols or rifles. It generates considerable amounts of contamination in the form of fine lead dust resulting from the severe deformation of the bullets impacting the steel plate. The plate is to have a minimum thickness of 6mm for 0.15% to 0.25% carbon mild steel or 4mm thickness for 1T100 Armour Steel.
- The steel plate is to be enclosed within a wooden or sheet metal enclosure. The enclosure shall be fitted with an anti backslash curtain positioned at least 30cm in front of the steel backstop.
- Again it is stressed that this design can only be used for rimfire pistols and rifles firing lead alloy bullets.
- **Venetian Blind Design:**
This design utilises multiple angled steel plates arranged one above the other. The plates will be angled no more than 45° to the horizontal and shall be configured with an overlap so that the lip of one plate is positioned higher than the base of the plate above it. The steel plate shall meet or exceed the requirements of the table shown at 9.34. The use of an anti backslash curtain is strongly recommended.
- **Passive Snail™ Design:**
This design is one of a class of bullet trap designs that are able to capture fired bullets with as little deformation or damage as possible. Minimising bullet damage reduces the amount of fine lead dust originating from the bullet trap.
- The Snail design employs shallow angled steel plates to deflect incoming bullets into a circular deceleration chamber. In some designs the deflection plates and deceleration chambers are constantly sprayed with water-based liquids to entrap lead residues and to reduce friction between the bullets and the steel plate.

Note: The Snail trademark is held by the Savage Arms Corp of the USA.

- **Bullet Trap Maintenance:**

- The Range Operator is to inspect the bullet trap regularly to ensure that it is in good condition. Special attention is to be paid to impact plates especially in the MPI areas.

- The presence of impact plate perforation, sagging or other damage such as pitting is a significant safety concern, requiring immediate attention by the Range Operator. The Range Operator is “responsible” to ensure that all worn or damaged components of a bullet trap are repaired or replaced as required.

- **Bullet Trap Anti Backsplash Curtain:**

- The use of a bullet trap is to be used for all 45° angled metal impact plate bullet trap designs. Anti backslash screens are generally not required for:

- a. The Snail™ type designs,
 - b. Bullet trap designs with low (25° or less) angled impact plates, or
 - c. Other passive bullet trap designs.

- The primary function of the anti backslash curtain is to contain lead backslash within the bullet trap confines. It will also promote the containment of fine lead dust particles to the immediate area surrounding the trap.
- The curtain is to be located behind the targets and in front of the bullet trap and it shall cover the entire front of the bullet trap.
- There are various designs of anti backslash curtains which satisfy the same function, including:
 - a. Linatex™ panels or similar self-sealing rubber compounds.
 - b. Wood planking (eg. 25 x 150mm softwood) slid into vertical channels, which allow the shot out boards to be replaced.
 - c. Heavy layers of carpet or similar material and
 - d. Rubber industrial conveyor belting.
- Regardless of the material used in the anti backslash curtain, they will all be shot out eventually. All designs are to take this fact into account and all Range Operators should be prepared to replace or repair shot out curtains when necessary. The curtains should be configured in such a way that the Range Operator can still view the backstop with ease to allow regular inspection.

Warning Lights

There is to be a warning light system used to indicate the operational status of the range. They are to be visible to shooters in the active range area and to people entering the range. These lights are to be under the control of the Supervising/Senior Range Officer.

- The warning light system can be a combination of any of the following:
 - a. An illuminated “Warning Range In Use” sign.
 - b. Red and Green warning lights or,
 - c. Red or Green revolving beacons.

- The red colour will indicate there exists some Danger as there is firing in progress. The green colour will indicate the safe condition of the range as it is not in use and any firearm on the range is in the cleared mode.
- A sign explaining the light system is to be visible to anyone entering the range complex.
- **Range Ventilation:**
The minimum ventilation standards (e.g. Airflow velocity or volume) are dictated by appropriate Government Bodies such as local Councils and State Legislation. There are some basics that are to be observed regardless of the requirements of the above. They are:
 - a. The air supply to the range is to be behind the firing line. To ensure uniform air flow across the firing line the supply air should be provided from ducts located no more than 2 metres above the range floor and they are to be evenly spaced along the firing line.
 - b. To promote the efficient removal of firing gases from the firing line, the air supplied should be of a smooth laminar flow, not a turbulent flow. This turbulent flow can be generated by obstructions such as benches or by airflow velocities that are too high for the exhaust vents to handle.
 - c. To promote the efficient and the controlled removal of the lead contaminants/residues, the range is to be operated at a negative pressure i.e. The air exhaust system attempts to exhaust more air than is being supplied. Having negative air pressures on a range prevents lead residue from enveloping the firer and also prevents the escape of lead to adjacent areas devoid from that particular range.

Dependent on the intended range use, there are two common exhaust duct configurations that can be employed.

- a. The exhaust ducts can be located approximately 5 to 6 metres forward of the firing line and in the area of the bullet trap. The ducts located forward of the firing line should be calibrated to exhaust around 25% of the supplied air and the bullet trap exhaust the remaining 75% of the supplied air.
- b. The exhaust ducts can be located in the bullet trap area and are calibrated to exhaust all of the supplied air plus to ensure the negative air pressure.
- c. The exhaust ducts are to be evenly spaced across the width of the range to promote efficient and even air movement.

If the exhaust air from the range is filtered to remove lead or dust particles, then it is recommended that an air pressure alarm or indicator be fitted to the system to alert the Range Operator when the filters become clogged and need to be cleaned or replaced.

Targets

The selection of target types is at the discretion of the Range Operator.

The use of hard targets (eg. Steel targets) on an indoor range is to be closely monitored by the Range Operator. As the hard target may deflect bullets away from bullet trap, an eye must be kept on any areas of “splash” that may erode away the protection afforded by the range walls, ceiling etc. The use of hard targets will only be allowed under exceptional circumstances.

CHAPTER 10 OPEN RANGES

SECTION 1 INTRODUCTION TO OPEN OUTDOOR RANGES

Open ranges are those ranges that do not fall into the categories already described in this Manual. Their lengths normally vary between 25 and 300 metres and cater for different type of firearms such as pistols and rifles or in some cases a combination. These ranges have a formal structure such as defined firing points, target lines and a suitably marked active range area/s.

Selection of Sites

Selection of sites is discussed in Chapter 2. Where practical range designers should consider both short and long range shooting to cater for as many disciplines/events as possible and to also allow for future expansion.

SECTION 2 DESIGN REQUIREMENTS

Range Safety Templates

The purpose of the Range Safety Area is to provide a buffer zone between the ranges' shooting activities and local human activity. It provides an area in which overshoots and ricochets can intrude without causing any harm.

The Template/s to be deployed will depend on the style/type of firearms, ammunition, ballistics, the type of targets deployed and in some cases the topography of the range and its surrounds.

The Range Inspector of the FAR will be the sole authority as to what Template/s is deployed.

Stopbutts

It is a general requirement that all Ranges apart from shotgun ranges employ some form of stopbutt. Their use allows a firer to observe the fall of shot, they ensure that the majority of the lead is captured, simplify the removal of lead residue and the range is made inherently safer because stray bullets are kept to a minimum.

The minimum height required for a stopbutt on a 25 metre range is normally 3 metres whilst any range in excess of 25 metres it is 4 metres. At the crest the minimum thickness is to be no less than 1 metre. The crest of the stopbutt should extend for at least 1.5 metres past the last target before it starts to fall away. This distance maybe extended if the discipline/event being shot dictates that the line of fire is not 90° to the

face of the stopbutt. The slope of the forward slope is to be at least 30° but ideally 35° in relation to the range fairway

The material used in a stopbutt is normally debris free earth. Hard deflective material, such as rocks, is not to be used unless they are covered by at least 1 metre of debris free earth on the forward face. Exposed tyres are prohibited on the forward slope of any stopbutt.

Firing Point

Open ranges are to have defined and clearly marked firing points. It is increasingly common for ranges to construct some form of shelter over the firing point to protect the shooters from the elements. Under no circumstances are shelters to be erected along the length of the fairway where it would become necessary to shoot through those structures. It is not best practice but it is more practical to deploy mid range targets and shoot from a static firing line situated at the extreme distance from the stopbutt.

The minimum spacing for each firing bay on a rifle range is 1.5 metres. On a pistol range where the standing position is only used it is to be no less than 1 metre and where the prone position or a dividing barrier is used the distance is to be no less than 1.5 metres.

A Range safety Officer (RSO) should have an uninterrupted line of sight and access to all firing points. The length of some range's firing points may dictate that two RSOs may have to be employed with one of those Officers taking the dominant role.

One of the most important criteria of siting a firing line is to ensure that the line of fire is 90° to the face of the stopbutt. An error of up to 10° may be permitted by the FAR Range Inspector should particular circumstances permit it. This factor is most important and pertinent where a range is used to conduct pistol action events such as IPSC and NRA Action Matches where the firing line is not permanently defined and can vary from match to match.

Range Fairway (Floor)

Ideally the range fairway between the firing point/s and the target line should be:

- Be level as practical,
- Be free of any large obstructions,
- Be free of any large exposed rock outcrops,
- Not contain any unsheltered bodies of water or rivers/streams,
- Not contain any manmade structure and
- Be clearly marked or identifiable.

Range fairways are not to be used to store any unused targets or extraneous materials. The Range Operator is to ensure that areas devoid from the active range areas are allocated for this role.

Target Line

The target line should be as close as possible to the stopbutts to ensure all rounds are captured in that stopbutt. Where mid range targets are employed the targets are to be so positioned that all rounds that pass through the targets culminate in the stopbutts. If this criteria cannot be met then it may be necessary to provide ground baffles to capture these rounds to prevent them ricocheting over or to the sides of the stopbutts.

Where hard targets are employed it may be necessary to adopt larger templates that reflect their susceptibility of inducing ricochets. The use of hard targets will not normally be allowed within 15 metres of any shooter because of the inherent danger of lead backsplash. There are protective measures that may be taken if this practice cannot be dispensed with.

Earthen Berms/Dividing Walls

For the purpose of this Manual a berm is described as a man made mound of earth that is designed to perform some or all of the following roles:

- Prevent the casual movement of people/animals onto the active range area,
- reduce the possibility of an errant shot escaping the active range area,
- separate ranges and adjacent areas to protect people from the activities of an individual range and
- protect buildings or equipment (e.g. Target Sheds).

The materials used for construction are to be similar to that of a stopbutt and if they are to be used as dividing walls between adjacent ranges they must:

- have a minimum height of 2.4 metres (8ft) measured from the range floor,
- have a minimum face slope of 30° relative to the horizontal,
- have a minimum crest height of 1.5 metres and
- extend all the way into the stopbutt.

Earthen berms cannot be deployed on Limited or No Danger Area Ranges (safety ranges) as there is still a real possibility of a round leaving the range active area. On these types of ranges vertical walls are the only type acceptable.

Note: It is a common misconception that earthen berms negate the use of Range Safety Templates. This is not fact as earthen berms do not present an angle of at least 30° taken from the firing point and as such will most likely, **not** capture any round that inadvertently strikes it.

Dividing and side walls can be described as a vertical straight sided wall made out of materials such as concrete or timber. Where this type of wall is deployed on safety ranges and as dividing walls between ranges the structure of those walls must be such that they are impervious to any round that is licensed to be fired on that range. Their construction must allow a bullet to slide down the wall into the stopbutt unimpeded by any joins or supports.

SECTION 3 RED WARNING FLAGS & SIGNS

Red Warning Flags

Cloth Red Warning Flags of a minimum size 120 x 90 cm are to be flown on days of live firing at the entrance to the range complex, at the firing point and atop the stopbutts. Permanent red warning flags of any other shape or construction are to be removed or painted a different colour.

Signage & Fencing

The active range area should be fenced and warning signs as displayed in Chapter 11 provided. The signs should be placed on the fence at distances so set apart so that when standing at one sign, the signs to the left and right of that sign are visible. By doing this it is reasonable to assume that anyone approaching the fence will see at least one sign if not two. The fence should be that of the standard required of a normal rural fence. This standard can be lowered if the Range Operator can show just reason

It is strongly recommended that a sign depicting the Club's title and a warning "Caution When Red Flag is Flying Shooting is in Progress" is positioned at the entrance to the range to warn any unsuspecting person who inadvertently wanders into the area.

SECTION 4 FIELD RANGES

These types of ranges are normally only used by the Military. They are simply an area selected by the Military to conduct live firing and have no formal structure such as defined firing points or stopbutts. A separate set of Range Danger Area Templates are used in these situations and are normally the "free flight" maximum flight range series.

**CHAPTER 11 RANGE STANDING ORDERS AND
DANGER SIGNS - EXAMPLE**

Example Of Danger Signs For Range Boundary Fences



RANGE STANDING ORDERS EXAMPLE

The following pages provide a guide to operators producing Range Standing Orders (SO's).

Operators may delete non-applicable areas or provide more detail if required. When producing SO's it is recommended that members from the Executive discuss and note all those points they think would need to be raised with a person who had never been to the range or complex.

The people producing the SO's should physically walk the range/complex and attempt to envisage all the scenarios that may occur, especially with regard to safety issues.

SO's should be as long as they need to be, however they should also be concise. Human nature is such that, most people will only skim through a document if it is too long.

On complexes it may be advisable to have a section that covers all ranges and then annexes that go into more detail for each individual range.

The major points from SO's, in large print, should be placed in a prominent location to remind members and visitors of their responsibilities whilst on the range.

All Range Officers and range users are to sign below after reading these Standing Orders.

RANGE STANDING ORDERS

SECTION 1. GENERAL INFORMATION

These Range Standing Orders (SO's) cover the use of the range facility operated by the XXXXXX Shooting Club / Association.

All Range Officers and range users are required to read and sign these SO's yearly.

Requests for exemptions from any provisions of these SO's shall be submitted in writing to the Club Executive for consideration.

Revisions

These SO's have been published and revised on the dates listed below:

Original publication – August 1,200X
1st revision – 5 September 200X

SECTION 2. RANGE FACILITY

Range Description

This range complex has multiple ranges. The description of the operational ranges are listed below:

Range 1 – 5 lane, 900m full bore rifle range
Range 2 – 10 lane, 50m handgun range
Range 3 – 3 position, DTL and skeet shot gun range
Range 4 – 20 lane air pistol indoor range

RANGE 1

Location:	Extreme left hand range - refer to site plan
Description:	900m full bore rifle range
No. Firing Points:	5
Firing Distances:	900, 800, 700, 600,500, 400 and 300
Approved Firearms:	Bolt action rifles
Approved Targets:	Paper targets
Approved Ammunition:	No Ball/FMJ
Approved Muzzle Velocity	4100ft/sec (1250m/sec)
Approved Muzzle Energy	4182ft/lbs (5675joules)

RANGE 2

Location: At the end of Range Road, refer to site plan
Description: 50 m limited danger area handgun range
No. Firing Points: 10
Firing Distances: 50 and 25

Approved Firearms: Centre-fire handguns
Maximum Approved Calibres: Up to .38
Approved Targets: Paper targets and steel reactive targets within canopies

Special Considerations: Range 2 is a "Limited Danger Area Range." This means that the range relies on the construction mounds, walls and baffles to stop projectiles departing the range. It is essential that an extremely high standard of shooter discipline be maintained. Shooters must take all possible care to eliminate errant shots, including high shots and ricochets. Evidence of projectiles leaving the property will result in the closure of the range.

RANGE 3

Location: To the rear of Range 1, refer to site plan
Description: DTL and skeet range
No. of Firing Points: 3
Firing Distances: n/a
Approved Firearms: sporting shotguns
Maximum Ammunition: No larger than 7 1/2 shot
Approved Targets: Frangible targets

RANGE 4

Location: Northern end of Club House
Description: Indoor air pistol
No. of Firing Points: 20
Firing Distances: 10m
Approved Firearms: Air Pistols
Approved Targets: Paper targets

SECTION 3. PERSONNEL

Range Officer (RO)

The RO has complete authority on the range property to conduct authorised shooting practices and matches.

RO's must hold a current NSW firearms licence. The Range Officer's name is to be clearly displayed at any active range.

RO's have the responsibility to supervise all personnel (shooting and non-shooting alike) present on the range and may have members and/or non-members removed at his/her discretion.

Guests and Spectators

Guests (children and adults) are the responsibility of the adult club member (who they came with) and must remain under that persons control at all times.

Spectators are the responsibility of the RO. The RO may appoint another club member to assist in supervision of spectators.

SECTION 4. RANGE OPERATIONS

Flags

A RED flag must be flown from the flagpole at the main entrance to the complex when firing is being conducted on any range within the facility. Red flags are not to be flown when there is no shooting on the range. During night shoots, red flags are to be either clearly illuminated or replaced by red lights. Each individual range has specific flag(s), which must be flown when in use. They are:

RANGE 1

RED flag at the top of the stop butt

RED flag at the firing line

A RED flag (in addition to radio communications) is to be available in the Gallery in order to signal a check fire.

RANGE 2

RED flag at the entry to Range Road

RED flag at the rear of the firing line

RANGE 3

RED flag at entry to the range

RANGE 4

RED flag at entry door to the range

Targets

Range 1 – Paper targets positioned on frames in the gallery

Range 2 – Paper or steel reactive targets. Steel targets are to be enclosed within canopies.

Range 3 – Approved frangible clay targets

Range 4 – Paper targets

At no time is glass, soft drink cans or any other non-approved or impromptu targets to be used on the range facility without the clearance of the Club Committee.

Range Register

Each range is to have its own Range Register. This is to be maintained in accordance with the *Firearms Act 1996 and the Firearms Regulation 2006*. Range Officers are to pay particular attention to the additional recording requirements for handgun ranges.

Range Registers are to be tightly controlled to ensure that unauthorised people cannot access the details within them.

Ammunition

All spent cartridge cases or spent shells must be collected and disposed of in containers provided or removed from the range.

The use of tracer, incendiary, explosive or similar ammunition is prohibited.

The muzzle velocity and muzzle energy of ammunition is to conform to the conditions of the Range Approval/s.

Full metal jacket and ball ammunition are prohibited.

Permitted Arcs on Fire

The maximum permitted arcs of fire for each range are listed below:

RANGE 1

All shooting parallel to the centre line

RANGE 2

No greater than 1 bank of 5 targets

RANGE 3

As designated in ACTA rules for shotgun.

RANGE 4

All shooting parallel to the centre line.

Firing

The following firing guidelines are applicable to all ranges on the complex:

Shooting is only to occur between 9 AM and 6 PM except for Range 2 when shooting is permitted to 9 PM on Wednesday evenings.

No firing if target visibility is reduced as determined by the RO.

Shooters with loaded firearms must be under RO direction.

Firearms shall never be left unattended.

Any person who believes there may be a risk to people, livestock or property must call a cease-fire.

Also refer to the rules for closures described in paragraph 4.8.

Safety Zones

Each range has a safety (danger) area designed for specific firearms and calibres. These areas are out of bounds (no trespassing) areas designed to contain overshoot and ricocheting bullets. Every reasonable effort shall be extended by the RO to ensure that the safety area does not have people in it during range operations.

Road/Range Closure During Range Operations

Due to the configurations of the range complex specific road and range closures must be in effect during the operations of certain ranges. These closures are listed below:

<u>Active Range</u>	<u>Closure</u>
Range 1	Range 2 and adjoining road to be closed
Range 2	Range 1 to be closed
Range 3	Can be used concurrently with all ranges
Range 4	Can be used concurrently with all ranges

Handguns

All handguns must be holstered or cased except while on an active firing line or while in the inspection area.

Match Completion

At the conclusion of all matches or practices the RO will ensure that:

- all targets frames are returned to the storage shed;
- firing points are checked for brass and other debris;
- all flags are lowered; and
- buildings and entrance gate are locked

SECTION 5. RANGE SAFETY CONSIDERATIONS

Communications

Range 1. Instant radio or fixed line telephone communications are to be maintained between the Gallery and Range Officer at all times whilst shooting is being conducted on Range 1. Mobile telephones are not adequate, as they do not provide immediate and dedicated communications.

Spectators

Spectators will follow all directions given to them by the RO. Spectators must remain 5 meters behind any active firing line.

Hearing and Eye Protection

Hearing and eye protection for shooters and range staff in near proximity to an active firing line is mandatory.

Alcohol/Drugs

Any person deemed by the RO to be under the influence of alcohol or drugs will be excluded from the bounds of the Range.

Smoking

Due to the extreme fire hazard in the range area, smoking is not permitted on roadways or in wooded areas.

Smoking is not permitted on any firing point.

Smoking is only permitted in the designated areas.

Smokers should be encouraged to wash their hands after shooting and before smoking due to the hazard posed by the possible ingestion of lead.

All smoking materials (butts, etc.) are to be disposed of in the containers provided.

SECTION 6. EMERGENCY INFORMATION

Emergency Phone Numbers

The following are emergency contact numbers

Fire	-
<i>Ambulance</i>	-
<i>Police</i>	-
<i>Doctor</i>	-

A list of these emergency phone numbers is to be clearly displayed at the clubhouse and to the rear of the firing lines.