

Section 2 - OUTDOOR RANGE CONSTRUCTION (GENERAL)

2.1 Introduction

This section, and those that follow contain information to be used during; the design, construction, upgrading and operation of outdoor shooting ranges; or when assessing the ongoing suitability of existing outdoor ranges. This information is intended to be used in conjunction with information contained in other applicable sections of these guidelines.

2.2 Outdoor Range Types

There are a number of different range designs, the most commonly encountered of which are listed below and described in more detail in other sections of these guidelines. Outdoor range types are primarily differentiated based on their:

- intended use (e.g. shooting activity, firearm type, maximum calibre etc.)
- backstop construction
- amount of land available for a downrange danger area
- presence of significant associated features (e.g. topography, baffles or berms etc.)

For range types not listed below, or for hybrid range designs, contact the Pistol NZ Range Development Committee for more information.

Standard Range - A handgun or rifle range, which has a suitable backstop and an adequate danger area, but without a downrange shelter for target systems and/or target marking personnel.

Gallery Range - A handgun or rifle range, built to standard range specifications, with a downrange shelter for target systems and/or target marking personnel.

Baffled Range - A handgun or rifle range that has incorporated into its design a series of overhead and/or ground baffles, or similar construction features, that serve to contain fired bullets and ricochets to the active range area. This type of range may have a downrange shelter (gallery) for target systems and/or target marking personnel.

No Danger Area Range - A handgun or rifle range built with its direction of fire into an imposing natural (or man-made) feature that prevents overshoots and ricochets from escaping the immediate range area.

Skeet and Trapshooting Ranges - Are shotgun ranges designed for the discharge of shot at moving frangible targets thrown on fixed flight paths or within prescribed arcs.

Sporting Clay Range - A shotgun range designed for the discharge of shot at moving frangible targets thrown on fixed flight paths or within prescribed arcs. However, the range setting is one, which is designed to simulate hunting or field situations.

Field Firing Range - A handgun or rifle range that does not have any backstop (or has a backstop that is not adequate); however, the range has an adequate danger area.

An adequate downrange danger area is one that has the necessary depth and width to accommodate the appropriate safety template(s) needed for the intended range use.

2.3 Range Danger Areas

All safety issues raised in these guidelines are based on the underlying premise that the range users are competent shots, operating within normal human and equipment limits. *There are no provisions in these guidelines to account for unacceptable random or wild firing.*

Dependent on the range design and the intended range use, a downrange danger area may (or may not) be required. The decision whether or not a danger area is required, or how big the danger area needs to be, will be based on an assessment of the intended range operations and range construction. If the range design and intended operations are such:

- that fired projectiles or subsequent ricochets are able to leave the active range area (under normal operating conditions), then a downrange danger area is required; or
- that fired projectiles and subsequent ricochets will be contained within the active range area (under normal operating conditions), then a downrange danger area is not required. (Note, for *high velocity* ammunition a downrange pop-over danger area may be required)

Danger Area Definition

The danger area for an outdoor range is defined as the downrange area (forward of the firing point) that is designed to contain bullets that pass over, or beyond, the backstop under specified conditions. These bullets can be the result of high angle shots (overshoots) or bullets that ricochet off targets, the backstop and other range surfaces (e.g. range floor).

Danger areas are very important considerations in outdoor range design; however, they are concerned strictly with ballistic issues and do not address the issue of noise pollution.

Overshoot and Ricochet Projectiles

An overshoot is defined as a projectile that carries over, or beyond, a backstop, which was intended to stop it. By definition, an overshoot projectile will not have struck any downrange object before traveling beyond the backstop. Overshoots are distinctly different from ricochets.

Ricochets are bullets projectiles, which have struck a surface or object, and had their trajectory altered as a result. Ricochets may or may not clear the backstop; however, due to their unpredictability, a worst-case scenario will be applied.

COMPONENTS OF A CONE OF FIRE

Reference:

Ordnance Board Proceeding P125(1) – *Small Arms Range Safety Hazard Levels and Principles for Determining Small Arms Weapon and Range Danger Areas – Pillar Proceeding*, dated 7 Jul 98

Cone of Fire

The cone of fire is intended to contain, in the vertical and horizontal planes, fired projectiles that are to be allowed for in range design. It includes an allowance for acceptable firearm deviation, which is represented by 5 Standard Deviations and an

additional margin for firearm deviation that is considered unacceptable. The allowance made within the cone of fire for unacceptable firearm deviation is not a scientific prediction but reflects a desire by the user to mitigate as much of the unacceptable deviation as is practicable.

Acceptable Firearm Deviation

Acceptable firearm deviation is one which has been identified, quantified and subsequently allowed for procedurally or through the design, construction or layout of a range. Such deviations can be considered tolerable within a risk assessment and result from:

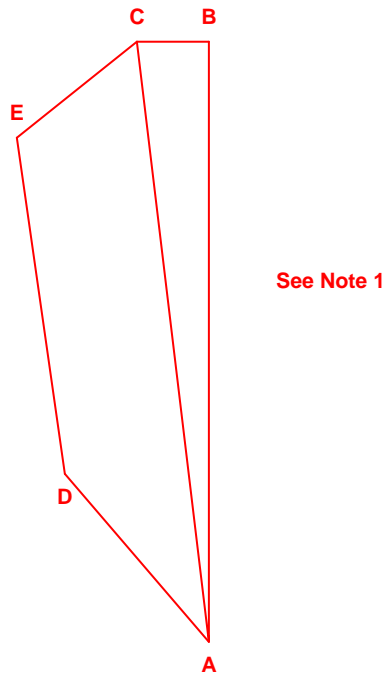
- a. **Firearm System Error.** Firearm system error is the acceptable margin of deviation from the intended point of impact for shots competently fired through a zeroed small arms firearm. The deviation is caused by errors associated with the firer and the manufacturing tolerances associated with the firearm and ammunition.
- b. **Predicted Firing Error.** Predicted firing error is the acceptable margin of deviation from the intended point of impact associated with competently fired shots with predictable yet unintentional aiming errors. Such error assumes a serviceable and correctly prepared small arms firearm, a satisfactory level of training and competence, and the application of range discipline.

Unacceptable Firearm Deviation

An unacceptable firearm deviation is one that is not allowed for in range design or firing procedures and may result in levels of hazard that are intolerable and which must be reduced to a level as low as is reasonable practicable. It is normally the result of a shot fired unintentionally or in contravention of range orders. Collectively, single shots fired with an unacceptable deviation are a small proportion of total shots fired. Unacceptable firearm deviation may result from:

- a. **Misdirected Firing Error.** Misdirected firing error is the deviation from the point of intended impact associated with competently fired yet misdirected shots.
- b. **Random Firing Error.** Random firing error results from single shots that are unintentionally fired with significant random deviation from the point of intended impact, but which are aligned about the general axis of the range by virtue of range discipline.
- c. **Wild Firing Error.** Wild firing error results from single shots that may be deliberately aimed or unintentionally fired in gross contravention of range discipline and which may impact anywhere inside the total energy area of the ammunition.

Designing an Ammunition Danger Area Template



Line A – B. Line A – B is a straight line between the firearm and the target, which has been extended to reach the maximum length of the ammunition danger area template. The maximum length of the ammunition danger area template is either:

- a. The maximum possible range of the projectile.
- b. The maximum possible range of the projectile with a quadrant elevation imposed, so long as this range is not shorter than the maximum ricochet range (see Note 2).

Line A – C. Line A – C is the cone of fire angle applied to Line A – B. Line A – C is the same length as Line A- B. The angle between Line A – B and Line A - C will vary depending on the cone of fire applied.

Line A – D. Line A – D is the opening ricochet angle and, unless empirical data exists to the contrary, it is always to be at an angle of 30 degrees (530mils) to Line A – C.

Line C – E. Line C – E is the closing ricochet angle and, unless empirical data exists to the contrary, it is always to be at an angle of 30 degrees (530mils) to Line A – C.

Line E – D. Line E – D is the ricochet boundary. Line E – D is to be one eighth of the maximum ricochet range from, and parallel to, Line A – C for ground targets (see Note 3). Line E – D is to be one quarter of the maximum ricochet range from, and parallel to, Line A – C for hard targets (see Note 4).

Notes:

1. **Completion of the Ammunition Danger Area Template.** Lines A – C, B – C, A – D, C – E and D – E are mirrored to the right of Line A – B to complete the ammunition danger area template.

2. **Maximum Ricochet Range.** Maximum ricochet range is the range corresponding to the angle of descent, which produces the critical angle if impact. For small arms ammunition, the critical angle of impact is considered to be 30degrees (530mils).
3. **Ground Target.** Ground targets, which are also known as soft targets, are all surfaces that will deform or break up when impacted at low angle.
4. **Hard Target.** Hard target refers to all material that possesses sufficient strength and surface hardness that suffer little or no deformity when impacted at low angle, in relation to a specific ammunition type.

Applying Danger Area Templates

As a start point a design plan, drawn-to-scale, is prepared for the range being developed or assessed. This includes the proposed firing points, firing areas, backstop(s), buildings and property boundaries.

Danger area templates can then be applied to the design plan. They are applied to all the firing point(s), parallel to the direction of fire. Outside boundary lines are traced from the template onto the plan or map. The resulting danger area 'trace' defines the maximum boundary of the range danger area, with nothing in place to reduce or eliminate this.

If an arc of fire (e.g. engaging divergent multiple targets from a single firing point) is planned, the danger area template is applied to all possible firing point-to-target combinations. The entire area that encloses the resulting danger area traces is the required danger area.

If a firing area is being assessed, perhaps for the purposes of a field firing range – where a shooter moves forward or laterally a significant distance – the danger area template is applied to the outside edges of the firing area in the direction(s) of fire. The resulting danger area traces mark the boundaries of the danger area, with nothing in place to reduce or eliminate this.

Range operators must beware the temptation of making the danger area 'fit' the land available to them, without any construction taking place to enable this.

Ricochet Air Danger Heights

Associated with outdoor ranges are safety considerations related to the height that ricochets will fly above the range. These ricochet Air Danger Heights (ADH) can be significant.

The issue of ADHs becomes most relevant when ranges are located in proximity to airports, and for the reduction of a range danger area using vertical danger height dispensation.

Backsplash

Backsplash is defined as fragmented bullet or target materials, or ground debris, thrown back towards the shooter as a result of bullet (or projectile) impact.

To protect shooters from hazardous backslash shooting organisations are responsible for developing and recommending minimum firing distances between shooter and target as part of any shooting discipline or activity, and the protective clothing to be worn if shooting takes places within the minimum firing distances.

Danger Area Design Criteria

The dimensions and shape of the danger area(s), when required, are produced using either a computer based probabilistic modeling software or a deterministic method and test data. Danger area design is dependent on a number of factors, including; the external ballistic characteristics of the ammunition, bullet design, range construction (site and design) and the planned shooting activities.

Converging adjoining ranges can maximize the land required for the danger area. Refer to Figure 1.

Unless otherwise specified, for centre-fire handgun & rifle ranges these guidelines will use lead core, copper alloy Full Metal Jacket (FMJ) bulletted ammunition as the given design premise.

Unless otherwise specified, for rim-fire rifle and rim-fire handgun ranges these guidelines will use lead alloy bulletted ammunition as the given design premise. If the use of bullets constructed with materials other than lead alloy is anticipated, then different safety area templates may need to be utilized. In those cases contact a Range Development Advisor for additional information.

Unless otherwise specified, for trapshooting, skeet and sporting clay ranges these guidelines will use #7½ size lead alloy pellets being fired at 396 m/sec (1300 ft/sec) as the given design premise. If the use of other ammunition that is more or less external ballistics capable (e.g. No.4 shot) is anticipated, different safety area templates may need to be utilized. If the required template or information is not provided in Appendix A contact a Range Development Advisor for more information.

The assessment of planned shooting activities is based on the Cone of Fire (CofF) concept. Each major type of shooting activity has a CofF assigned to it based on testing and experience. The resulting safety requirements (e.g. danger area template) are produced by modeling the interaction of projectiles fired within the CofF with the range design. Refer to Appendix H for specific CofF parameters.

Baffled Range Danger Area Exemption

Properly designed, constructed and operated baffled ranges do not require significant downrange danger areas.

Site Size

The size of the range site is defined as the total land area controlled (e.g. owned or leased) by the Range Operator as well as any other adjoining lands where a “land use” agreement is held. The site is considered to be the aggregate of these two types of land “holdings”.

The range site must be large enough to completely contain the active range area(s) and the danger area(s), if required.

Ownership/Control of the Range and Danger Area

The entire range facility and associated range danger area(s) must be under the control (formal or informal) of the Range Operator. If the range and danger area(s) are not formally controlled by the Range Operator, then informal control can be achieved through a “land use” agreement between the land owner(s), or their agent(s), and the Range Operator. The agreement must specifically provide for the “use” of the land as a range or range danger area.

A range will not receive its approval if the required land and the associated danger area(s) are not formally or informally under the control of the Range Operator.

It is to the Range Operator’s benefit to outright own, lease or otherwise formally control the required land for the range and the associated danger area(s). This is based on the realisation that, if the Range Operator controls the required land area outright then the issues of future encroachment and possible changing land use will not effect range operations.

If range encroachment and changing land use become issues in future years, arguments based on right-of-prior-use will not outweigh safety considerations and the requirements under Law.

Effect of Hills, Topography and High Backstops on Range Danger Areas

The presence of hills, local topography and high backstops can significantly influence range design, specifically the size of the required danger area. Many ranges have been built with their direction of fire into an imposing hill, mountain or other topographic feature, or into an unusually high man-made backstop. In many cases the sheer size and positioning of these topographic features (including man-made backstops) can eliminate or reduce the size and extent of the danger area needed.

Assessment of the value of the topographic feature, and how it alters the danger area requirements, is based on an examination of where bullet trajectories (either overshoots or ricochets, initial or subsequent) will impact the downrange topographic feature. The danger area will extend out to the furthest point of impact for overshoots or ricochets.

If the ground in the danger area slopes significantly upwards, the danger area can be reduced. However, if the topography slopes downwards the danger area would have to be extended. Refer to Figure 2.

The need for a significant danger area can be eliminated entirely if there is a steep hill, imposing topographic feature or imposing manmade backstop behind the targets. However, for this reduction to be warranted, the backstop must be of sufficient height, slope and length that overshoots and ricochets generated in the course of normal range operations will not pass beyond it. Refer to Section 5 of these guidelines for information on No Danger Area (NDA) Ranges.

If the downrange topographic feature is large enough to warrant at least some reduction in the danger area, but not large enough to qualify the range for an NDA exemption, the range shall be assessed on an individual basis. The size of the danger area will be determined by the intersection of the initial ricochet, or subsequent ricochet and overshoot envelope with the ground (topographic) profile. Refer to Figures 2, 3 and 4.

Effect of Trees in the Range Danger Areas

Heavy tree cover in a range danger area or atop a backstop is a desirable feature for any outdoor range. Trees add a great deal to the aesthetics of the facility and can serve to diminish noise signatures. However, trees are essentially transient features that can change with the seasons or they can be removed by cutting or burning etc. As a result, trees do not influence danger area considerations and do not augment the height of a backstop.

2.4 Danger Area Templates and Danger Area Traces

Danger area templates are used to determine the necessary danger area(s) for range designs that require one. Danger area templates (Refer to Appendix A) are drawings that represent the ground area designed to contain overshoot bullets and ricochets generated from a single shooter's firing point under conditions which are considered to be representative of normal range use. Each template will show the parameters (e.g. calibre and bullet design etc.) for which it was designed.

Applying Danger Area Templates

A design plan, drawn-to-scale, is first prepared for the range being developed or assessed. Ensure that all proposed firing points, firing areas, backstop(s), buildings and property boundaries are shown on the map, plot or drawing being used.

Danger area templates (Refer to Appendix A) are used to produce danger area traces on maps, plots or overlay. The selected template is first redrawn on Plexiglas, thick acetate or similar transparent media at the working scale (e.g. 1:50 000) of the plan drawing. Plexiglas and similar materials are used because they will not stretch or deform under normal use or with changes in humidity or temperature. Paper is not a suitable media for this task.

The transparent overlay can then be applied to the design plan, map or survey plot of the range. It is applied to all the firing point(s), parallel to the direction of fire. Outside boundary lines are traced from the template on to the map or plot. The resulting danger area "trace" defines the boundary of the range danger area.

If an arc of fire (e.g. engaging divergent multiple targets from a single firing point) is planned, then apply the safety area template to all possible firing point-to-target combinations. The entire area that encloses the resulting danger area traces is the required range danger area. Refer to Figure 5.

If a firing area is being assessed, as in the case where a shooter moves forward or laterally a significant distance, apply the template to the outside edges of the firing area in the direction(s) of fire. In some cases a large percentage of the active range area would be the firing area. The resulting danger area traces mark the boundaries of the range danger area.

It is essential that the correct template be utilized in range design and range assessment activities. The correct template to be used is the one that matches or exceeds the range conditions being assessed. Therefore, the template must match or exceed the most ballistically significant cartridge to be used on the particular range being assessed. Refer to the table in Appendix C that matches specific calibres to the template calibre groups.

Within the context of danger area templates, ballistic significance is determined by the maximum range of a specific bullet design, muzzle velocity and cartridge combination.

2.5 Ricochet Air Danger Heights

Associated with standard outdoor handgun & rifle ranges are safety considerations related to the height that ricochets will fly above the range. These ricochet Air Danger Heights (ADH) can be very significant and are related to the external ballistic capability of the cartridge and the bullet construction. Refer to Appendix D for the applicable Air Danger Heights.

The issue of ADH's becomes relevant when ranges are located in proximity to airfields and the reduction of Range Danger Area dimensions.

2.6 Range and Danger Area Signs

Range and danger area signage, similar to that described in this subsection, is required for all outdoor ranges. In all cases the signs shall be of durable construction so as to resist weathering. Recognizing the uniqueness of each range site, the specific locations for these signs is flexible as long as they serve to warn people approaching the site as to the presence of a shooting range and the associated dangers of approaching it.

Main Facility Sign

The range facility shall have a large, clearly visible, main sign. This sign shall be located at a commonly used access point (e.g. main gate area) and shall clearly identify the site as a shooting range. It shall also contain at least the following information:

- • Range facility name
- • Range Operator contact information (e.g. phone number or P.O. Box etc.)

Range Facility Sign

The range facility shall have a large, clearly visible sign, which indicates that the area is used as range facility. (e.g. "DANGER SHOOTING RANGE "). Refer to Figure 6, for an example sign.

It is recommended that this sign be located alongside the primary range facility access road, both for convenience of use and for maximum informational value.

Perimeter Signs (General)

The perimeter of the range is defined as the boundary that encloses all active range areas and all associated danger areas.

The perimeter of all outdoor range(s) shall be identified with appropriate warning signs. These signs are intended to alert members of the public as to the presence of an outdoor range and to help identify the range boundaries.

The perimeter warning signs shall instruct unauthorised persons not to enter the area.

It is recommended that the Range Operator cruise the perimeter at least once every year to ensure that all perimeter-warning signs are in good order.

Land Based Perimeter Signs

Warning signs are to be placed at regular intervals along the entire perimeter of the range

and wherever there exists likely access to the range or danger area (e.g. woods trails). They shall be located approximately 1.5 to 2.0 m above ground level. They shall be securely affixed to posts, trees or other similar permanent objects.

In wooded or brush areas, the warning signs shall be spaced at approximately 50 m intervals or less along the entire perimeter. If signs placed at 50 m intervals are not visible, one sign to the next due to local brush conditions, then the sign spacing interval shall be reduced. In open areas (e.g. large clearings) the signs shall be spaced at approximately 75 m intervals or less along the perimeter.

The posted signs shall face outwards away from the range(s).

The perimeter signs shall not be obscured by brush or tree growth. Growth that obscures the signs shall be cleared away as required. The signs shall always be visible, being replaced or repaired as required.

The warning signs can be placed along any convenient feature (e.g. existing survey line, property boundary, fence line or shore line) that defines or exceeds the range perimeter.

The signs shall be:

- ❑ approximately 40 x 30 cm (16 x 12 in.) in size, or larger;
- ❑ worded similarly to the example in Illustration 1, or utilize wording which conveys the same information;
- ❑ permanent in construction to resist weathering and exposure to the elements; and
- ❑ of a readily visible colour combination.

**DANGER
FIRING RANGE
KEEP OUT**

Illustration 1 - Sample Perimeter Warning Sign (Land)

Range Standing Orders Sign

Each individual range within a facility shall have a sign on which the key Range Operating Orders and safety rules are listed.

These signs shall be affixed to a building, post, frame or other permanent object. They shall be located behind the firing line, in a location clearly visible to all users as they approach the range and contain at least the following information:

- ❑ maximum calibre of firearms to be used on the range;
- ❑ prohibited bullet natures (e.g. tracer or armour piercing);
- ❑ types of targets permitted (e.g. paper) and those prohibited (e.g. glass);
- ❑ permitted shooting activities (e.g. firing positions, distances etc.);
- ❑ brief explanation of the warning flag or beacon system; and
- ❑ emergency contact phone numbers (e.g. police, ambulance etc.).

These signs are intended as a simple method of quickly reminding all users of the basic safe range operating procedures. They do not remove the requirement for the range facility to have a more detailed set of Range Standing Orders, For information on Range Standing

Orders refer to Section 13.

2.7 Perimeter Identification

The boundaries (perimeter) of the range shall be identified as clearly as is practical. The purpose of which is to draw the warning signs (Section 2.6 of these guidelines) to the attention of people In the area of the range (e.g. hunters) who could unknowingly cross onto the range and into a range danger area.

The perimeter identification shall occur in conjunction with the location of the warning signs.

The perimeter identification and warning signs can be located along any convenient feature (e.g. existing survey line, property boundary, fence line or shore line) that defines or exceeds the limits of range and the required range danger area(s).

Land

On land areas covered with trees and brush, local flexibility is permitted with regard to perimeter identification. The resulting perimeter identification shall be equivalent in visual impact to a fence line or survey line.

In wide-open terrain no additional perimeter identification beyond signage is required.

Fencing of the perimeter may not be required.

2.8 Range Flags- All Outdoor Rifle and Handgun Ranges

Each range on a facility shall use a large **RED or ORANGE** (including the option of fluorescent) range warning flag flown from a flagstaff at least 6 m tall (approximately) when the range is in use. The flag shall have minimum measurements of approximately 1200mm x 600mm.

This flagstaff shall be located in a conspicuous position, clearly visible to those approaching the range. The location of this flagstaff is dependent on the facility design and construction. It can be located atop the backstop, on a side berm or behind the most distant firing line.

The flagstaff shall not be placed in a location that poses a hazard to anyone operating the flags. As an example, the flagstaff shall not be located atop a backstop in the situation where, due to the presence of an adjacent range, the person operating the flags would be exposed to rifle/handgun fire from the adjacent range. The flagstaff shall not be located on a steep slope or in any other hazardous location.

When the range is not in use, no flag is to be flown from this flagstaff. Note, this range flag is meant to be changed when the range is opened or closed, not throughout the course of normal shooting activities.

Gallery Rifle Range Flags

If a target markers gallery is present, then a 1200mm x 600mm (approx.) **RED or ORANGE** (including the option of fluorescent) control flag shall be flown from either a portable pole, or from a fixed flagstaff, located at one end of the target gallery. The **RED** flag is to be flown when shooting has ceased and it is safe for the target markers to leave

the protection of the gallery. The **RED** flag is to be lowered when the target markers are undercover and protected indicating that firing may commence. There are two flags that can be used, one on the backstop to advise that the range is in use, and one at the markers gallery to advise shooters when it is safe or not safe to commence firing.

Note. If the target gallery is unmanned (e.g. electronically marked targets in use) or if the markers can enter and leave the gallery without ever being exposed to fire from the range, there is no requirement for a gallery flag as described above.

When a range has multiple firing lines spaced over a considerable distance (e.g. as with a gallery rifle range), RED control flags shall be flown from either a portable pole or a fixed flagstaff located at the firing line in use. The RED flag is to be flown when there is firing underway, this RED flag is then to be lowered when firing has ceased and the firing line is safe. No flag need be flown when the firing line is inactive. These firing line flags shall have minimum measurements of approximately 1200mm x 600mm.

Skeet and Trapshooting Ranges

These types of ranges can employ one of two flag arrangements listed below.

- a) If multiple fields are located adjacent to one another, then a single **RED or ORANGE** (including the option of fluorescent) range warning flag can be flown from a flagstaff at least 6 m tall (approximately) when one or more of the ranges are in use. The flag shall have a minimum measurement of 1200mm x 600mm (approximately).

This flagstaff shall be located in a conspicuous position, clearly visible to those approaching the ranges. The location of this flagstaff is dependent on the facility design and construction. The flagstaff shall not be placed in a location that poses a hazard to anyone operating the flags; or

- b) A 1200mm x 600mm **RED or ORANGE** (including the option of fluorescent) control flag shall be flown from either a portable pole or a fixed flagstaff located to the rear of each range (e.g. behind firing station No.4) when there is firing underway on the range.

Under either of the flag arrangements described above, when no ranges are operating no flag needs to be flown at all.

Sporting Clay Ranges

A 1200mm x 600mm RED control flag is to be flown from either a portable pole or a fixed flagstaff located at the start of the sporting clay course. The RED flag is to be flown when there is firing underway on the course. When the range is not operating, no flag needs to be flown at all.

If the sporting clay ranges are laid out as individual firing stations instead of an integrated course, each firing station shall have its own RED control flag in accordance with the paragraph above.

Field Firing Ranges

If the field firing ranges are laid out as part of an integrated course, a 1200mm x 600mm **RED or ORANGE** (including the option of fluorescent) control flag is to be flown from either a portable pole or a fixed flagstaff located at the start of the course. The RED flag is

to be flown when there is firing underway on the course. When the range is not operating no flag needs to be flown at all.

If the field firing ranges are laid out as individual ranges instead of an integrated course, each range shall have its own RED control flag in accordance with the paragraph above.

2.8.2 Beacon System

Under this system the beacon colour(s) has the following meaning:

Beacon Colour	Meaning
RED	Danger - Firing is in progress

The beacon can be of rotating or flashing design; they can also be a simple coloured light. The beacons shall be located in the immediate area of the firing line and clearly visible to all personnel on the range.

When the **RED** beacon is illuminated, it is an indication to the range users (subject to the Range Officer’s control) that firing is underway.

2.9 Wind Flags

Wind-indicating flags, streamers or similar devices are commonly used on outdoor ranges. There are numerous wind flag systems and designs, some of which are closely regulated by sports governing bodies. Any wind indicator system can be implemented as long as the general safety provisions of this subsection are met.

Wind indicators shall be of different shape and colour to all warning or range control flags in use on the range. This requirement is intended to minimize the potential for confusion over their meaning with the range users.

Range wind flags shall be located to ensure that that they do not interfere with shooters or obscure their view of the active range area, nor shall they obscure the Range Officer’s view of active range area.

2.10 Backsplash

Backsplash is defined as fragmented bullet or target materials, or ground debris, thrown back towards the shooter as a result of bullet (or projectile) impact.

To protect shooters from hazardous backsplash, it is recommended that the minimum firing distance on approved targets not be less than the distances shown in Table 1.

Calibre Class	Hard Target	Ground Impact
Rim-fire Handgun/Rifle	7 Metres	10 Metres
Centre-fire Handgun	7 metres	10 Metres
Centre-fire Rifle	50 Metres	25 Metres

Table I - Recommended Minimum Engagement Distances (Backsplash)

It is generally considered good practice for shooters and range staff to wear impact resistant eye protection (e.g. shooting/safety glasses) at all times. Anytime that target backsplash is likely, it is strongly recommended that shooters and range staff wear impact resistant eye protection.