



Range Design and Construction Guidelines

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ABOUT THIS DOCUMENT

These guidelines were written in September 1999 for the Canadian Firearms Centre, to assist in the administration of the firearms program in those provinces and territories where this responsibility has been delegated to the federal government (Alberta, Saskatchewan, Manitoba, Newfoundland, Yukon Territory, Northwest Territories and Nunavut).

“Range Design and Construction Guidelines” was edited by:

Technical Documentation and Graphics Section

Information Management Branch

IM/IT Business Solutions

CIO Sector

RCMP Headquarters

3000 Merivale Road, M-8

Ottawa, Ontario, Canada

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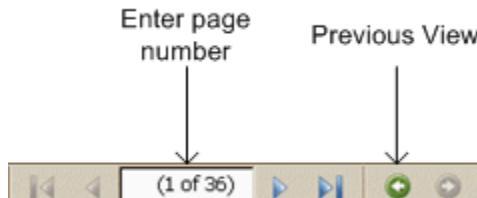
Fax: (613) 825-9617

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1 OUTDOOR RANGE CONSTRUCTION (GENERAL)

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

1.1 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 future sections of this document.

Outdoor range types are primarily differentiated based on:

- Intended use (e.g. shooting activity, firearm type, maximum calibre, etc.);
- Backstop construction;
- Amount of land available for a downrange safety area; and,
- Presence of significant associated features (e.g. topography, baffles or berms).

For range types not listed below, or for hybrid range designs, contact the Chief Firearms Officer (CFO) for more information.

Standard Range

A rifle or handgun range that has a suitable backstop and an adequate safety area, but which does not have a downrange shelter for target systems and/or target marking personnel.

Gallery Range

A 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 whose design has incorporated a series of overhead and/or ground baffles, or similar construction features, that serve to contain all 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 Safety 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

Shotgun ranges designed for shot to be discharged at moving frangible targets thrown on fixed flight paths or within prescribed arcs.

Sporting Clay Range

A shotgun range designed for shot to be discharged at moving frangible targets thrown on fixed flight paths or within prescribed arcs. However, the range setting is one that is designed to simulate hunting or field situations.

Field Firing Range

A rifle or handgun range that does not have any backstops (or has a backstop that is not adequate); however, the range has an adequate safety area.

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

1.2 RANGE SAFETY 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 safety area may (or may not) be required. The decision about whether or not a safety area is required, or how big the safety 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 safety area is required; or,
- Fired projectiles and subsequent ricochets will be contained within the active range area (under normal operating conditions), then a downrange safety area is not required.

1.2.1 SAFETY AREA DEFINITION

The safety 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. the range floor).

Safety 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.

1.2.2 OVERSHOOT AND RICOCHET PROJECTILES

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

Ricochets are bullets (or projectiles) that 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.

1.2.3 SAFETY AREA DESIGN CRITERIA

The dimensions and shape of the safety area(s), when required, are produced using computer-based ballistic modelling software and test data. Safety 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 safety area; refer to *Figure 1: Safety Area Orientation for Adjoining Ranges*.

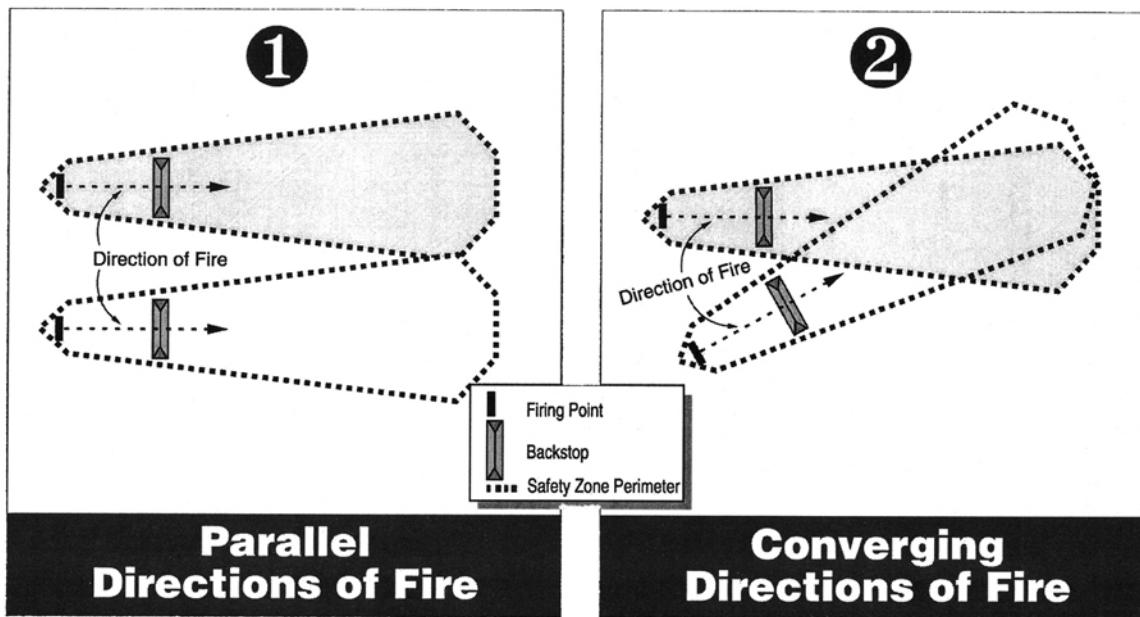


Figure 1: Safety Area Orientation for Adjoining Ranges

Unless otherwise specified, these guidelines will use lead core, copper alloy Full Metal Jacket (FMJ) bullet ammunition as the given design premise for centre-fire rifle and handgun ranges. If armour piercing or *steel jacketed* ammunition use is anticipated, different safety area templates will likely need to be utilized. In those cases, contact the CFO for additional information.

Unless otherwise specified, these guidelines will use lead alloy bullet ammunition as the given design premise for rim-fire rifle and rim-fire handgun ranges. 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 the CFO for additional information.

Unless otherwise specified, these guidelines will use #7½ size lead alloy pellets being fired at 396 m/sec (1,300 ft/sec) as the given design premise for trapshooting, skeet and sporting clay ranges. 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 D: Safety Area Templates](#), contact the CFO 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. safety area template) are produced by modelling the interaction of projectiles fired within the CofF with the range design. Refer to [Appendix B: Cone of Fire Design Parameters](#) for specific CofF parameters.

1.2.4 BAFFLED RANGE SAFETY AREA EXEMPTION

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

1.2.5 HUMAN ACTIVITY INSIDE A RANGE SAFETY AREA

The purpose of a safety area is to provide a buffer zone between the range's shooting activities and local human activity. It provides an area in which overshoots and ricochets can land without causing harm. In general, human activity in any safety zone should be avoided; however, circumstances arise on certain occasions which do not make this total exclusion practical.

Safety areas cannot overlap onto areas of human habitation or regular human activity. Human habitation and regular activity are defined as the presence of dwellings, buildings, businesses or human activity sites (e.g. public camp ground) that are used on a regular basis when the range is in use.

If the assessed risk to humans participating in an activity within a safety zone is no higher than the risk to the general population outside of the range safety area, the CFO may authorize the operation of the range while this activity occurs. Human activity that has a limited duration and relatively few people involved may be permitted in the safety area because these factors mitigate the risk.

If approval is not granted by the CFO, then the range must cease operations while the human activity occurs in the safety area; or conversely, efforts must be made to ensure that no human activity occurs within the safety zone when the range is in operation.

The amount of human activity permitted in the safety area *while the range is operating* is determined by a number of factors, which include the following:

- Likelihood of overshoots and ricochets for the range design and intended use;
- Average frequency of range use and the nominal quantity of ammunition fired during range use;
- Planned duration of the human activity within the safety area;
- Location of the planned human activity within the safety area; and,
- Topography, forest cover and other related features of the safety area.

The CFO may apply the following decision criteria for these risk assessments:

- If the potential risk is determined to be no higher than the risk present outside of the safety area, then occasional human activity may occur in the safety area; or,
- If the potential risk is determined to be higher than the risk present outside of the safety area, then reasonable efforts must be made to keep the safety area free of human activity when the range is in use.

These risk assessments must be made on a case-by-case basis.

The underlying premise in this determination is the acknowledgement of the potential hazards that ranges pose within the context of the risks that they actually present to humans in the immediate area. If a situation exists where projectiles are likely to escape from the active range area (e.g. a standard outdoor rifle/handgun range), then a hazard exists, but not necessarily a significant risk to human health. If such a hazard exists, but the likelihood of hitting and injuring a human with a projectile is low, then the overall *risk* to humans is considered low.

1.2.6 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 safety area(s), if required.

1.2.7 OWNERSHIP / CONTROL OF THE RANGE AND SAFETY AREA

In accordance with the *Shooting Clubs and Shooting Ranges Regulations (SOR/98-212)*, s. 4(a)(i), the entire range facility and associated range safety area(s) must be under the control (formal or informal) of the Range Operator. If the range and safety 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 safety area.

A range will not receive its approval if the required land and the associated safety 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 safety area(s). This is based on the realization that, if the required land area is controlled outright by the Range Operator, then the issues of future encroachment and possible change in land use will not affect range operations.

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

1.2.8 EFFECT OF HILLS, TOPOGRAPHY AND HIGH BACKSTOPS ON RANGE SAFETY AREAS

The presence of hills, local topography and high backstops can significantly influence range design, specifically the size of the required safety 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 safety area needed.

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

If the ground in the safety area slopes significantly upwards, the safety area can be reduced. However, if the topography slopes downwards, the safety area has to be extended; refer to *Figure 2: Effect of Topography*.

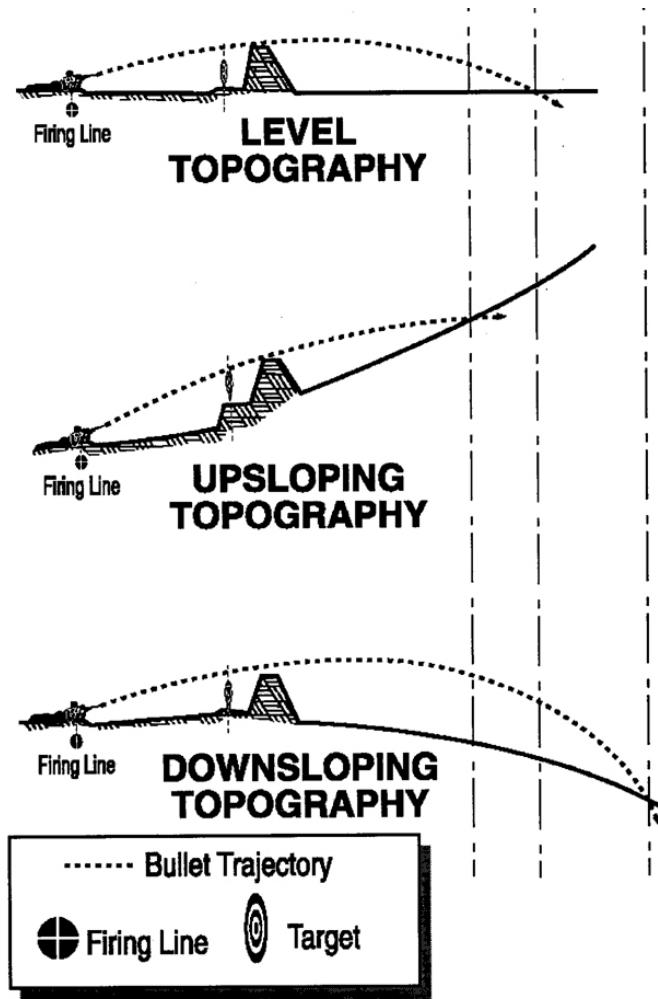
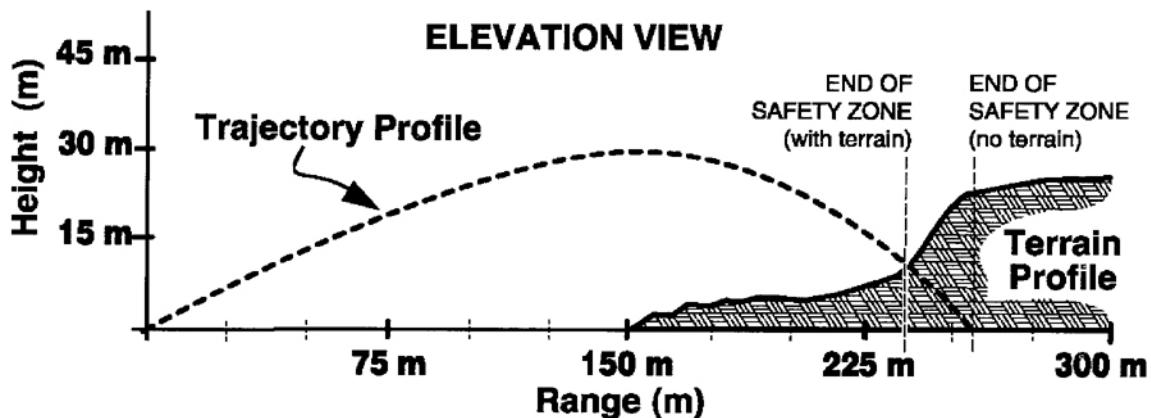


Figure 2: Effect of Topography

The need for a significant safety area can be eliminated entirely if there is a steep hill, an imposing topographic feature or an imposing man-made backstop behind the targets. However, in order for this reduction to be warranted, the backstop must be of sufficient height, slope and length such that overshoots and ricochets generated in the course of normal range operations will not pass beyond it; refer to [section 4 No Safety Area Ranges](#) for information.

Ranges are assessed individually, if the downrange topographic feature is large enough to warrant some reduction in the safety area, but not large enough to qualify the range for an NSA exemption. The size of the safety area will be determined by the intersection of the ricochet/overshoot envelope with the ground (topographic) profile; refer to figures 2: *Effect of Topography*, 3: *Effect of Topography on a Safety Zone* and 4: *Effective Backstop Height* for graphical representations of the effects of topography and shooting uphill when firing in a range.



NOTE: Trajectory profile is for a Skeet Range (#7½ shot, MV 396 m/sec)

Figure 3: Effect of Topography on a Safety Zone

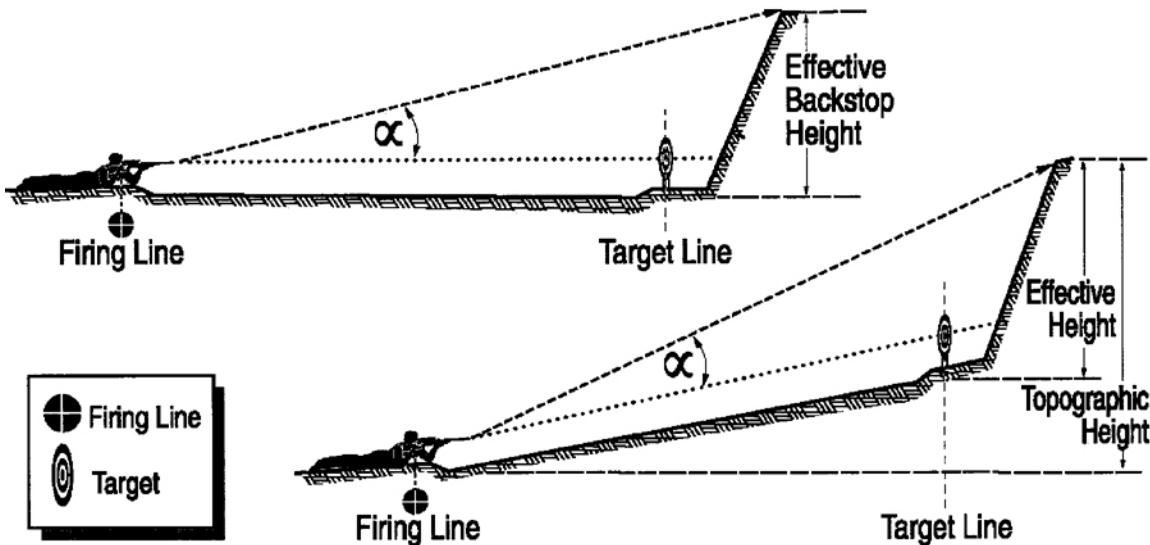


Figure 4: Effective Backstop Height

1.2.9 EFFECT OF TREES IN THE RANGE SAFETY AREAS

Heavy tree cover in a range safety 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 safety area considerations and do not augment the height of a backstop.

1.3 SAFETY AREA TEMPLATES AND SAFETY AREA TRACES

Safety area templates are used to determine the necessary safety area(s) for range designs that require one. Safety area templates (refer to [Appendix D: Safety Area Templates](#)) 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, environmental conditions, etc.) for which it was designed.

Safety area templates are not applicable to properly designed and constructed baffled ranges.

Under certain target-specific conditions (e.g. steel targets) limited size safety area template(s) are applicable to [No Safety Area \(NSA\) ranges](#).

1.3.1 ENVIRONMENTAL CONDITIONS

Environmental conditions, such as wind speed and direction, affect bullet and ricochet flight. The safety area templates in [Appendix D: Safety Area Templates](#) have been developed using specific wind, barometric pressure and air temperature factors. These factors have been derived from a multi-year analysis of Canadian weather patterns and are representative of the extreme conditions (from an external ballistics perspective) of the climate with a high degree of confidence.

Refer to [Appendix G: Safety Area Template Design Factors](#) for applicable environmental conditions.

1.3.2 APPLYING SAFETY 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.

Safety area templates are used to produce safety 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. 1:10,000) 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 onto the map or plot. The resulting safety area "trace" defines the boundary of the range safety area.

If an arc of fire is planned (e.g. engaging divergent multiple targets from a single firing point), then the safety area template is applied to all possible firing point-to-target combinations. The entire area that encloses the resulting safety area traces is the required range safety area; refer to *Figure 5: Single Target vs. Multiple Arcs of Fire*.

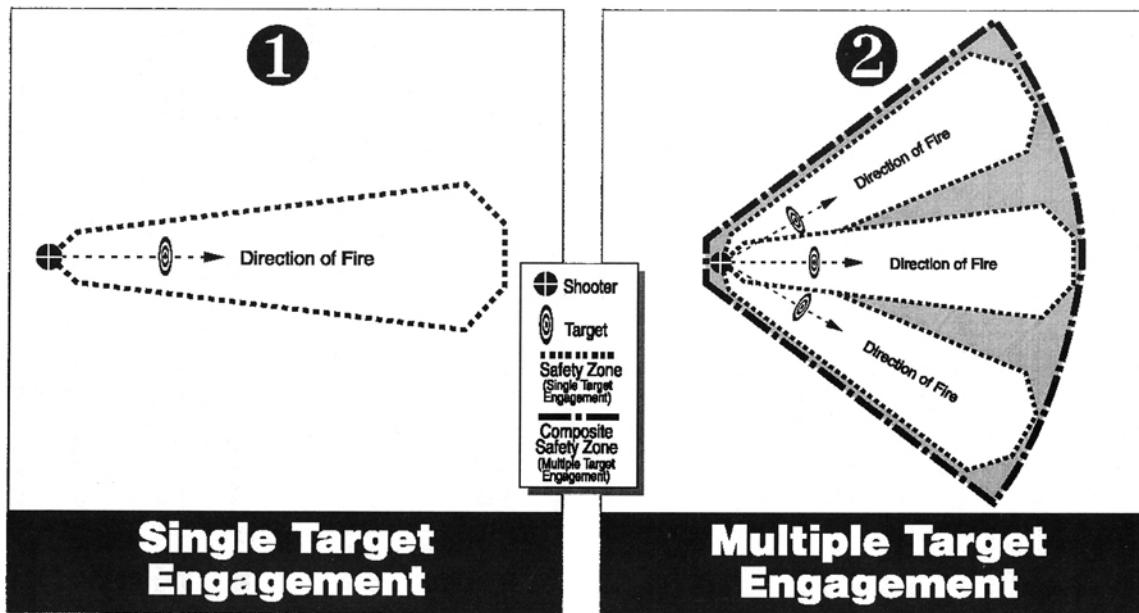


Figure 5: Single Target vs. Multiple Arcs of Fire

If a firing area is being assessed, as in the case where a shooter moves forward or laterally a significant distance, the safety area template is applied 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 will be the firing area. The resulting safety area traces mark the boundaries of the range safety 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 [**Table 19: Templates Table of Equivalencies**](#) in [**Appendix E: Templates Table of Equivalencies**](#) which matches specific calibres to the template calibre groups.

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

1.4 RICOCHET AIR DANGER HEIGHTS

Associated with standard outdoor rifle and handgun 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 F: Ricochet Air Danger Heights**](#) for the applicable Air Danger Heights.

The issue of ADHs becomes relevant when ranges are located in proximity to federally-controlled airports. Refer to [**section 2.1 Backstop Design and Construction**](#) for more information.

1.5 RANGE AND SAFETY AREA SIGNS

Range and safety area signage, similar to that described in this section, is required for all outdoor ranges. In all instances, the signs shall be of durable construction so that they can 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 about 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; and,
- Range Operator contact information (e.g. phone number or P.O. Box, etc.)

Range Facility Status Sign

The range facility shall have a large, clearly visible sign indicating the operating status of the range facility (e.g. "CAUTION RANGE IN USE" or "RANGE CLOSED"); refer to *Figure 6: Range Facility Status Sign*, for a sample sign.

Folding Sign Design

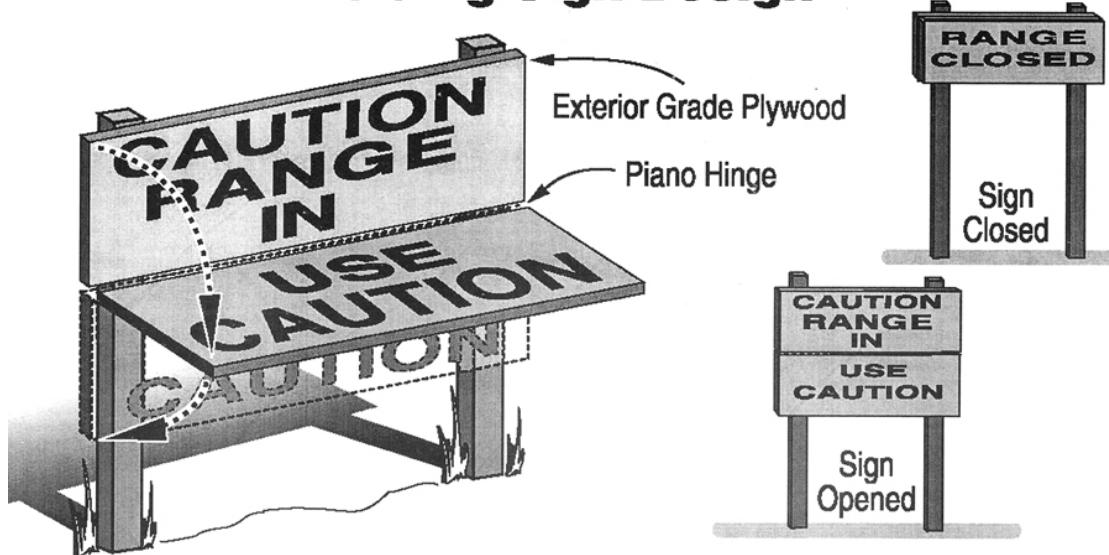


Figure 6: Range Facility Status Sign

It is recommended that this "Range Facility Status" 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 safety areas.

The perimeter of all outdoor ranges 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 unauthorized persons not to enter the area.

It is recommended that the Range Operator cruise the perimeter at least once every two years 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 safety area (e.g. woods trails). They shall be located approximately 1.5 m to 2.0 m above ground level, or above the level of prevailing snow pack (whichever is greater). 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 from 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 or prairie), 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 and be 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 cm x 30 cm (16 in. x 12 in.) in size, or larger;
- Worded in English and/or French and/or other language (e.g. Inuktitut), as dictated by local linguistic profile(s) or provincial/territorial signage requirements;
- Worded similarly to the example in *Figure 7: Sample Perimeter Warning Sign (Land)*, or utilize wording that conveys the same information;
- Permanent in construction to resist weathering and exposure to the elements (e.g. rain, snow, wind, sun/UV rays, etc.); and,
- Of a readily visible colour combination.

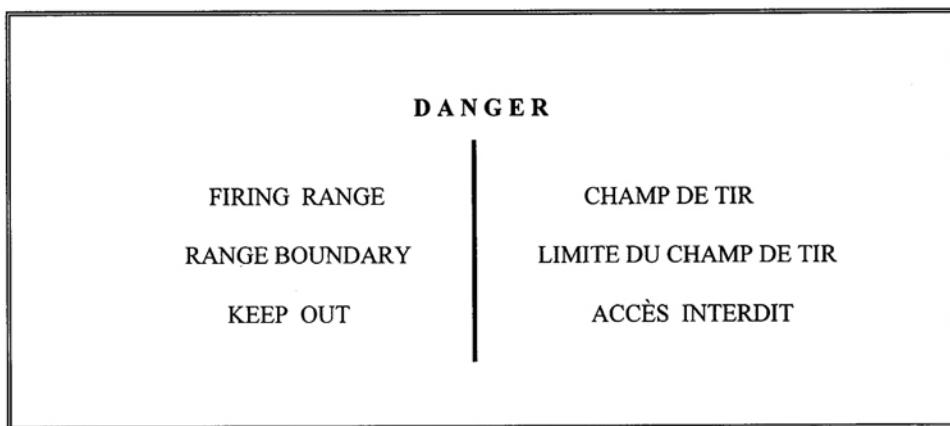


Figure 7: Sample Perimeter Warning Sign (Land)

Water-Based Perimeter Signs

In the event that a range safety area extends over oceans, lakes, swamps or marshes, and where adequate support for sign posts is not practical, a bottom-anchored buoy system is required. Water-based perimeter buoys serve the same purpose as their land-based equivalents.

The buoys shall be:

- Approximately 30 cm (12 in.) in size, or larger;
- In English and/or French and/or other language (e.g. Inuktitut), as dictated by local linguistic profile(s) or provincial/territorial signage requirements;
- Worded similarly to the example in *Figure 8: Sample Perimeter Warning Sign (Water)*, or utilize wording that conveys the same information;
- Permanent in construction to resist weathering and exposure to the elements; and,
- Of a readily visible colour combination.



Figure 8: Sample Perimeter Warning Sign (Water)

The buoys are to be spaced at approximately 75 m intervals, or less. In the case where multiple languages are required for a buoy system and the buoys are too small to accommodate the lettering, alternating language specific buoys is acceptable (e.g. English – French – English).

Where the buoy line reaches shore, there is to be a large warning sign. These signs are to be approximately 1 m x 1 m in size and lettered in accordance with the perimeter warning signs. These larger signs are to face out (towards the water), and are to be as visible as is practical (e.g. in location and colour combination).

Buoys placed in fresh water where freezing will occur can be removed just prior to freeze up. If the range is to be used during the winter, then temporary sign posts shall be erected along the line of buoy anchor points, spaced at practical intervals, after the ice has formed. These sign posts should be in accordance with the water-based sign requirements described above. Upon the return to open-water conditions in the spring, the buoys can be returned to their original positions.

Range Safety Rules Sign

In accordance with the *Shooting Clubs and Shooting Ranges Regulations (SOR/98-212)*, s. 4(1)(d), each individual range within a facility shall have a sign on which the key operating 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, EMT, hospital, etc.).

These signs are intended to be 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 Operating Instructions. For more information, refer to [section 11 Range Operating Instructions](#).

1.6 PERIMETER IDENTIFICATION

The boundaries (perimeter) of the range shall be identified as clearly as is practical. The purpose of this is to draw the warning signs (refer to [section 1.5 Range and Safety Area Signs](#)) to the attention of people in the area of the range (e.g. hunters) who might *unknowingly* cross onto the range and into a range safety 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 the range and the required range safety area(s).

1.6.1 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 (e.g. prairie areas), no additional perimeter identification beyond signage is required.

Fencing of the perimeter *is not* required.

In the case of boundaries defined by water courses, regularly spaced warning signs placed above the high water mark will suffice.

1.6.2 WATER

The buoy requirements listed in [Water-Based Perimeter Signs](#) will suffice.

1.7 WARNING FLAGS AND BEACONS

Separate ranges within a facility shall have their own system of warning flags or beacons. The purpose of this is to inform and control range users and others in the immediate vicinity of the range(s).

The colours of the flag or beacon systems are **RED** and **GREEN**.

1.7.1 FLAG SYSTEM

Under this system, the flag colours have the following meaning:

- **Red** = Danger – Range in use, firing underway;
- **Green** = Safe – Range not in use, all firearms cleared.

Range Flags – All Outdoor Rifle and Handgun Ranges

Each range on a facility shall use a large **RED** 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 2 m x 1 m.

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 a 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, either a **GREEN** flag or no flag at all shall 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.

Firing Line Flag – Standard Rifle and Handgun Ranges (Optional)

As an optional feature (at the Range Operator's discretion) for standard rifle and handgun ranges, **RED** and **GREEN** control flags can be flown from either a portable pole or a flagstaff located at the firing line. The **RED** flag is to be flown when there is firing underway; the **GREEN** flag is to be flown when firing has ceased and the firing line is safe.

If used, these firing line flags shall have minimum measurements of approximately 1 m x 0.75 m.

Gallery Rifle Range Flags

If a target markers gallery is present, then 1 m x 0.75 m (approx.) **RED** and **GREEN** control flags 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 the target markers are undercover and protected, while the **GREEN** flag is to be flown when shooting has ceased and it is safe for the target markers to leave the protection of the gallery.

Note: If the target markers gallery is unmanned (e.g. electronically marked targetry is 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 the gallery flags as described above.

When a range has multiple firing lines spaced over a considerable distance, as with a gallery rifle range, **RED** and **GREEN** 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 and the **GREEN** flag is to be flown when firing has ceased and the firing line is safe. No flag needs be flown when the firing line is inactive. These firing line flags shall have minimum measurements of approximately 1 m x 0.75 m.

Skeet and Trapshooting Ranges

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

1. If multiple fields are located adjacent to one another, then a single **RED** 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 approximately 2 m x 1 m.
2. 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,
3. A 1 m x 0.75 m **RED** 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.

In each of the flag arrangements described above, when no ranges are operating, either a **GREEN** flag can be flown from the flagstaff or no flag needs to be flown at all.

Sporting Clay Ranges

A 1 m x 0.75 m **RED** control flag shall be flown from either a portable pole or a fixed flagstaff located at the start of the sporting clay course. The **RED** flag shall be flown when there is firing underway on the course. When the range is not operating, either a **GREEN** flag can be flown or no flag needs to be flown at all.

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

Field Firing Ranges

If the field firing ranges are laid out as part of an integrated course, a 1 m x 0.75 m **RED** control flag shall be flown from either a portable pole or a fixed flagstaff located at the start of the course. The **RED** flag shall be flown when there is firing underway on the course. When the range is not operating, a **GREEN** flag can be flown or no flag needs to be flown at all.

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

1.7.2 BEACON SYSTEM

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

- **Red** = Danger – Firing is in progress;
- **Green** = Safe – Range not in use, all firearms cleared.

The beacons 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.

When the **GREEN** beacon is illuminated, it is an indication to the range users (subject to the Range Officer's control) that firing has ceased and the firearms on the firing line have been cleared.

1.8 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 section are met.

Wind indicators shall be of *different shapes and colours* than all warning or range control flags in use on the range. This requirement is intended to minimize the potential for range user confusion over their meaning.

Range wind flags are located to ensure 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 the active range area.

1.9 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 not be less than the distances shown in *Table 1: Recommended Minimum Engagement Distances (Backsplash)*.

Table 1: Recommended Minimum Engagement Distances (Backsplash)

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

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.

2 STANDARD OUTDOOR RIFLE RANGES

The standard outdoor rifle range can have different configurations, dependent on the intended shooting activities. These ranges have a firing line(s), a target area, a suitable backstop and a downrange safety area. They may also have other features, such as covered firing points, target mechanisms, etc.; refer to *Figure 9: Standard Rifle Range*.

Standard outdoor rifle ranges can be configured to have traditional firing lines, such as those used for ISU-style shooting; or they can be configured to have the active range area used as a more extensive firing area, such as is used for IPSC-style rifle shooting. In many cases, standard outdoor rifle ranges are used for both purposes. Except where noted, all the requirements of this section apply to both range configurations. If the rifle range is used *solely for action shooting* (e.g. IPSC rifle), then [**section 2.2 Firing Points / Firing Lines / Firing Lane Marking**](#) does not apply; in this case, [**section 2.4 Firing Areas and Target Areas**](#) does apply however. If the range is used for both fixed firing line activities and for action shooting, then all requirements of this section apply.

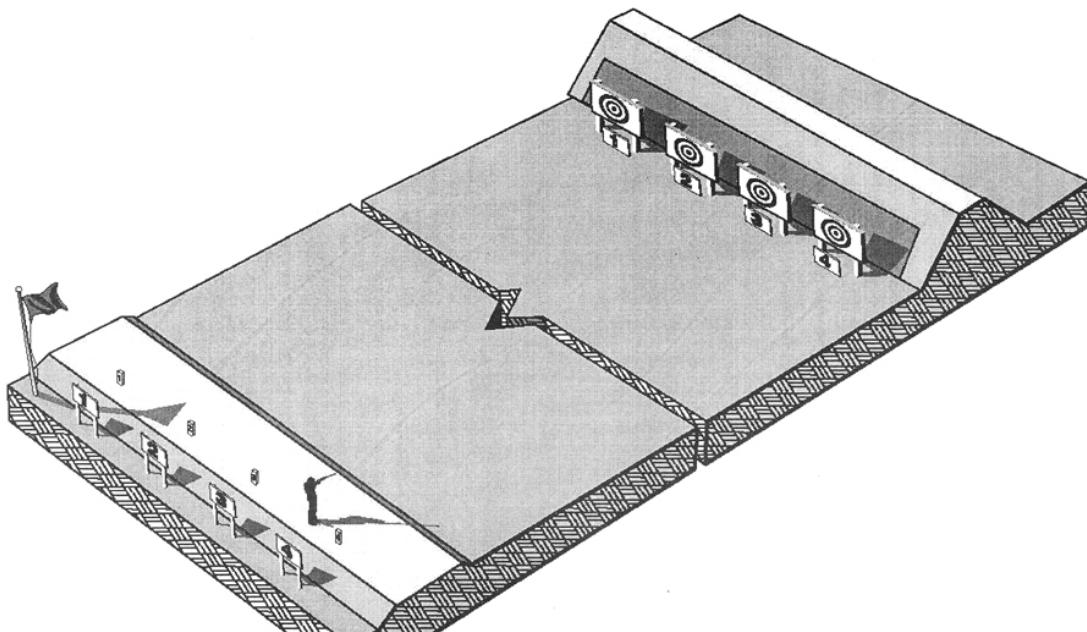


Figure 9: Standard Rifle Range

2.1 BACKSTOP DESIGN AND CONSTRUCTION

Backstops are designed to capture as many fired bullets and low flight ricochets as possible. Those bullets that pass beyond the backstop (overshoots and ricochets) shall be contained within the downrange safety area, within the design limits of the range.

A backstop consists of a raised mound of earth, or a suitable natural feature, behind the target(s). The design and construction of the backstop must meet criteria, which have been established to promote bullet capture. The dimensions, construction and location of the backstop are of critical safety concern to the design of this type of outdoor range.

2.1.1 BACKSTOP HEIGHT

The required minimum height of the backstop is related to the CofF and the intended firing distance(s).

The top of the backstop is referred to as the “crest.” The backstop height is measured from the crest to where the range floor meets the backstop base. *Table 2: Minimum Rifle Range Backstop Heights* outlines the minimum backstop heights versus the intended firing distances.

Table 2: Minimum Rifle Range Backstop Heights

Firing Distance	Minimum Backstop Height
25 m or less	3.0 m
50 m	4.0 m
75 m	5.0 m
100 m or more	6.0 m

In cases where a planned firing distance falls between two distances in *Table 2: Minimum Rifle Range Backstop Heights*, then the requirements for the next longest firing distance applies. For example, if the planned firing distance for a particular range is 40 m, then the requirement for a 50 m firing distance applies.

The crest of the backstop shall meet or exceed the required minimum height over its entire length.

If the Line of Sight (LofS) from the firing points to the targets slopes significantly uphill, or if the base of the backstop is significantly distant from the target line (e.g. greater than 20 m), then the minimum height of the backstop *may* have to be adjusted upwards to accommodate these differences. In these cases, the LofS from the lowest intended firing position (e.g. prone) at any firing line is projected through the top of the target to the backstop. This projected line shall meet the backstop at least 2 m below its crest; refer to *Figure 10: Projected Line of Sight for Significant Uphill Slopes and Distant Backstops*.

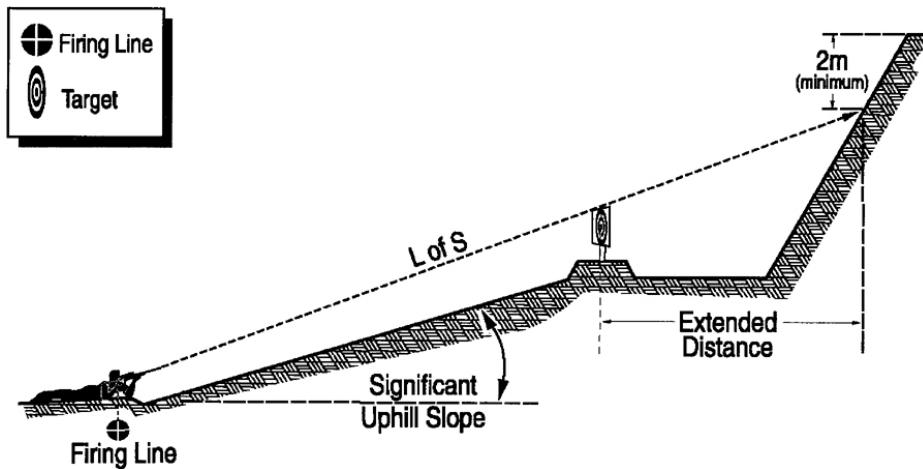


Figure 10: Projected Line of Sight for Significant Uphill Slopes and Distant Backstops

Grass, shrubs and trees do not augment the height of a backstop. All measurements are based on ground levels, not vegetation levels.

The crest of the backstop shall be as level as is practical. If a significant cross-fall (elevation change) exists along the target line, then the backstop shall be stepped up or down as required in accordance with the following provisions:

- The minimum height requirement at any particular target is maintained; and,
- The higher backstop crest is to be extended past the cross-fall by at least the flank extension distance, as listed in *Table 3: Rifle Range Crest Flank Extensions*.

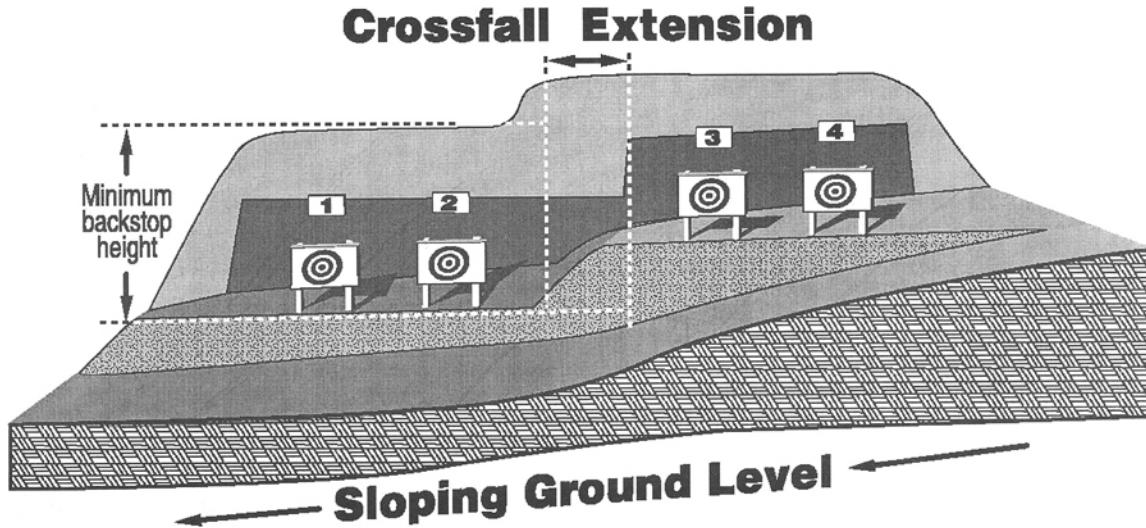


Figure 11: Target Line Cross-fall

2.1.2 BACKSTOP CREST LENGTH

The length of the backstop crest must exceed the *outside edge* of left and right flank (outside) target lanes, or in the case of action shooting only ranges - the active range area. The amount that it must exceed the outside edge of the flank target lanes is dependent on the distance to the backstop (from the firing line) and the CofF. Refer to *Table 3: Rifle Range Crest Flank Extensions* for flank extension distances. *Figure 12: Backstop Crest* presents a visual layout of the backstop crest.

Table 3: Rifle Range Crest Flank Extensions

Firing Distance	Maximum Distance to Backstop	Minimum Flank Extension
25 m or less	28 m or less	1.0 m
50 m	53 m	2.0 m
75 m	78 m	3.0 m
100 m or more	103 m or more	4.0 m

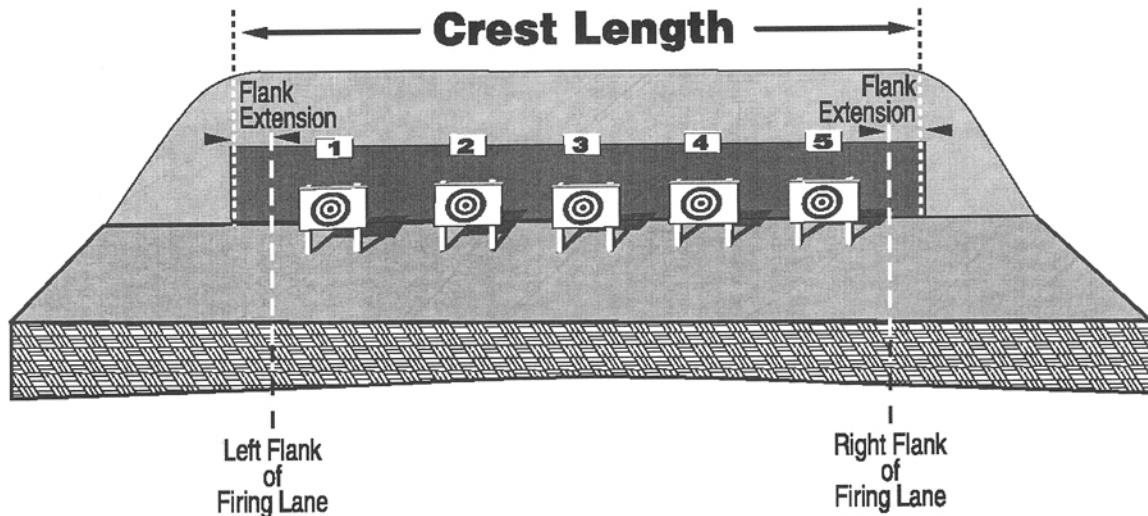


Figure 12: Backstop Crest

2.1.3 BACKSTOP CREST THICKNESS

The thickness of the backstop at the required minimum height shall be at least 1.5 m.

2.1.4 BACKSTOP SURFACE SLOPE

For new construction, the forward (impact) face of the backstop should be built with an incline, relative to the horizontal, of at least 34° (refer to *Figure 13: Backstop Slopes*). Through erosion and time, this backstop slope will subside slightly.

Note: A slope of 34° can be expressed as a vertical rise of 2 m in a horizontal run of 3 m, as a slope of 2 in 3, or as 2:3.

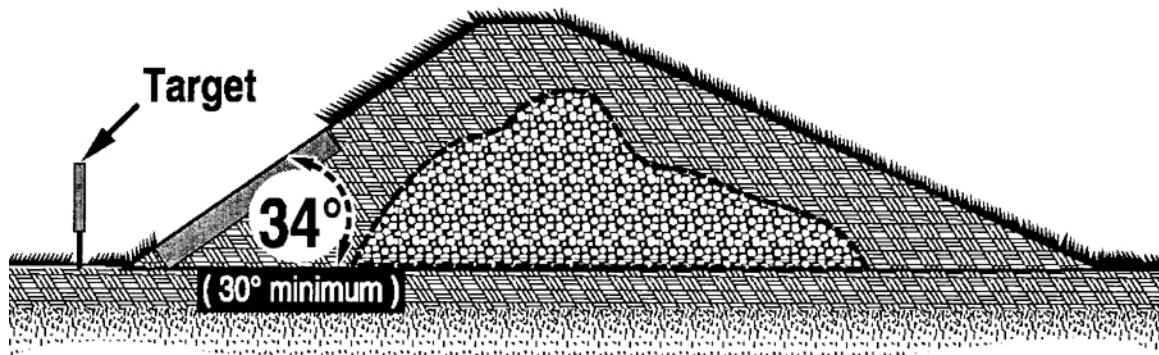


Figure 13: Backstop Slopes

All backstop face slopes must be maintained at an angle of at least 30° to minimize the probability of ricochets.

The backstop sides and rear surfaces can taper to the ground from the crest at the natural angle for the prevailing soil conditions.

2.1.5 BACKSTOP CONSTRUCTION

The core of the backstop can be constructed from any solid material, including soils, roots, rock or asphalt. However, if the backstop core is composed of hard materials (e.g. rock rubble), then the forward face of the backstop shall have at least a 1 m thick layer of soil covering it.

Tires, when used as a backstop core, are to be treated in accordance with hard materials due to their construction and composition. The use of large quantities of tires in backstop construction is strongly discouraged because of the potentially negative environmental impact they can have (e.g. pollution generated by a tire fire).

The face of the backstop can be terraced to accommodate local soil conditions or site features. If terraced, the horizontal step surfaces must slope toward the rear (into the backstop) at an angle of approximately 5° (1:12) or more. This will aid in drainage and prevent ricochets off of these surfaces. Although optional, the use of at least one terrace on a large backstop is recommended; refer to *Figure 14: Terraced Backstops*.

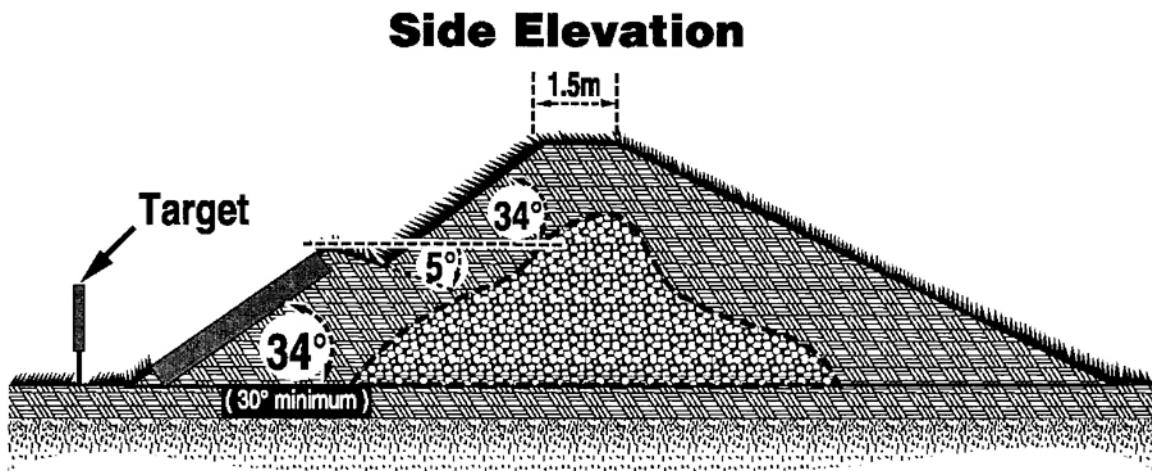


Figure 14: Terraced Backstops

Fascines (e.g. wooden timbers) can be used to stabilize the backstop; however, they should not be exposed to a large number of direct bullet impacts. Therefore, the fascines should not be used immediately behind the target area due to the bullet damage they will sustain, which will result in their subsequent structural weakening.

The forward face of the backstop must be free of major outcroppings of rock or other hard materials.

The growth of ground cover (e.g. grass, clover or similar vegetation) should be encouraged on backstops to reduce erosion effects. Due to the absence of ground water, backstops tend to be very dry. Therefore, the vegetation that is used as ground cover should be hardy enough to survive the dry conditions it will encounter.

2.1.6 BULLET CATCHERS

The use of inclined bullet catchers, which are similar to large inclined sand boxes, on the forward face of the backstop is optional; however, it is recommended. If used, bullet catchers are to be filled with coarse, loose sand. They will serve as the primary bullet impact areas.

Bullet catchers are intended to minimize degradation (e.g. loss of slope) of the backstop due to bullet impacts and to ease the backstop maintenance (e.g. reshaping of the backstop face when bullet tunnelling starts to occur) that is required periodically. They also ease the de-mining of lead and copper alloys from the backstop.

The bullet catchers shall be at least 2.5 m in height, or exceed the maximum target height by at least 0.5 m, whichever is greater; refer to *Figure 15: Bullet Catchers*.

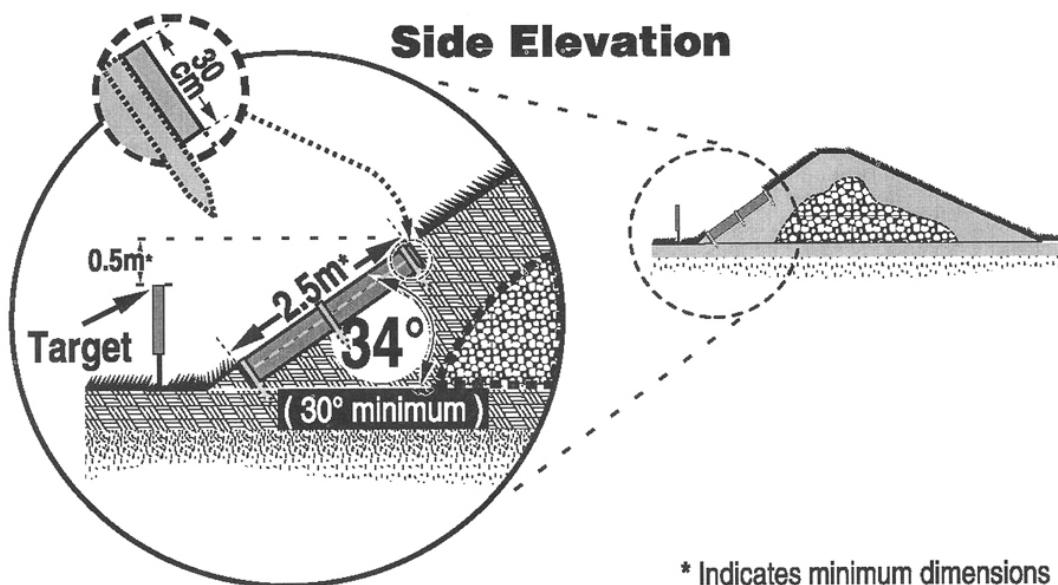


Figure 15: Bullet Catchers

Bullet catchers can either run continuously along the length of the backstop or be built for each target position. In either case, they shall exceed the target edges by at least 0.5 m.

If employed on a backstop, bullet catchers:

- Can be made from timber planking or logs;
- Cannot be made of steel, concrete or similar hard materials; and,
- Should be at least 30 cm deep and filled with loose sand.

For ranges used in the winter time, mixing saw dust and/or road salt into the bullet catcher sand is recommended to reduce the number of ricochets caused by bullet impact with frozen sand or soil. A 1:1 mixture ratio (by volume) of sand to saw dust is recommended.

2.1.7 DISTANCE BETWEEN TARGET LINE AND BASE OF THE BACKSTOP

Targets should be placed as close as is practical to the base of the backstop. However, this does not preclude placing targets forward of the backstop if the shooter's fire is directed into the backstop and **not into the range floor or over the top of the backstop**.

2.2 FIRING POINTS / FIRING LINES / FIRING LANE MARKING

Firing points are the specific locations from which individual shooters engage their targets. They are intended to control the location from which shooters fire and help to direct their firing.

A firing line is a group of individual firing points with a common attribute (e.g. distance to the targets).

2.2.1 FIRING LINE DISTANCES

Firing lines can be located at any distance from the targets, as dictated by the shooting discipline that the range was designed to accommodate.

Shooting can occur from distances other than specifically defined firing lines, unless prohibited by the [Range Operating Instructions](#) or the Range Approval.

2.2.2 FIRING LINE MARKING

Each major firing line must be clearly marked with a distance marker, which indicates the distance to the targets (e.g. 100 m). The marker must be clearly visible to shooters using the firing line.

2.2.3 FIRING POINTS AND TARGET NUMBERS

All firing points and target positions shall be numbered. The numbering is intended to:

- Assist shooters in locating their correct target and firing point;
- Reduce the possibility of unintentional cross-firing between lanes; and,
- Reduce the possibility of firing outside of the approved horizontal firing arc.

The firing point and target “numbers” can be either composed of numbers or letters, as long as each firing point is uniquely identified. When the range is organized into multiple banks of similar numbered targets, then each bank must also have a unique identifier (e.g. target “A5” – target bank A, target 5).

Each firing lane shall be marked with clearly visible numbers located at the target line and at least one firing line, usually the most distant one. These numbers must be large enough to be readily visible with the unaided eye (e.g. not requiring the use of a spotting scope) from the distance at which they will normally be viewed from. Therefore, the firing point numbers can be relatively small, as they will be viewed from a close distance by the shooters. However, the target line numbers must be larger to allow them to be viewed at the distance for which the range was designed (e.g. 100 m).

Although optional, the use of different coloured numbers to assist target identification is recommended for situations where the numbers will be viewed from long distances (e.g. a 900 m rifle range).

Target numbers cannot be situated on a backstop such that any part of them is above the backstop crest. It is recommended that they be placed in front of the targets or immediately above them.

2.2.4 FIRING POINT SPACING

The spacing of firing points along the firing line must be large enough so that:

- Shooters do not interfere with each other during firing; and,
- The Range Officers can conduct their duties (e.g. supervise shooters, clear firearms or to otherwise assist shooters as needed).

However, the firing point spacing must not be so large that the Range Officer cannot maintain adequate control of the firing line.

Having the correct firing point spacing for the intended range use will minimize shooter errors (e.g. cross-firing) while promoting the optimum use of range facilities.

Firing point spacing is the measured *centre-to-centre* distance between adjacent firing points.

STANDARD OUTDOOR RIFLE RANGES

There are competition regulations from various shooting organizations that have minimum spacing requirements that specify the minimum allowable distance between adjacent firing points. Those requirements may be different from the spacing recommendations provided in *Table 4: Recommended Minimum Firing Point Spacing (Rifle Range)*.

Table 4: Recommended Minimum Firing Point Spacing (Rifle Range)

Firing Point Use	Recommended Minimum Spacing
Bench Rest	1.50 m
Rim-fire Rifle	1.25 m
Centre-fire Rifle	1.60 m

2.2.5 FIRING LINE HEIGHT (ELEVATION)

When practical, given the overall range design and intended range use, the firing lines can be elevated above the range floor. This elevation serves to keep the individual firing points dry and improve visibility of the target area.

If the firing lines are elevated, they shall be constructed in such a way as to provide for the safe movement of shooters onto and off of them.

2.2.6 FIRING LINE LENGTH

The firing line shall extend at least 1 m beyond the flank edges of the outside left and right firing points.

2.2.7 FIRING LINE DEPTH

Each firing line shall be deep enough to accommodate the shooters, their equipment and provide space for the Range Officer (or Range Officials) to function behind them without any impediments.

Firing line depth is the distance measured from the front edge of the firing line to the rear edge of the firing line.

There are competition regulations from various shooting organizations that have minimum firing line depth requirements. Those requirements may be different from the spacing recommendations provided in *Table 5: Recommended Firing Line Depths (Rifle Range)*.

Table 5: Recommended Firing Line Depths (Rifle Range)

Firing Point Use	Recommended Minimum Firing Point Depth	Recommended Minimum Range Officer Area	Recommended Minimum Total Depth
Bench Rest	2.0 m	1.0 m	3.0 m
Rim-fire Rifle	2.5 m	1.0 m	3.5 m
Centre-fire Rifle	2.5 m	1.0 m	3.5 m

2.2.8 FIRING LINE ALIGNMENT WITH THE BACKSTOP

The firing line shall not be more than 10° out of parallel alignment with the backstop.

2.2.9 FIRING LINE SURFACE

The firing line surfaces shall provide the shooters with as firm footing under adverse weather conditions as is practical. The use of asphalt, concrete or gravel is recommended.

2.2.10 COVERED FIRING LINE

The firing line can be covered with a weather shelter, if so desired. However, if one is provided it shall be of such height and construction that it will not interfere with the shooters or the Range Officer during any part of their activities on the firing line (e.g. preparation, firing, supervision, etc.).

The firing point cover shall not obscure the shooter's or the Range Officer's view of the active range area.

2.3 RANGE FLOOR

The floor of a range is defined as the space between the firing line(s) and the most distant target line.

The range floor (between firing line and target line) shall:

- Be as level as is practical;
- Not contain any large obstructions (excluding backstops);
- Not contain any large exposed rock outcroppings; and,
- Not contain unsheltered standing bodies of water or rivers/streams.

If the range floor contains a body of water that cannot be drained or diverted from the active range area, then a berm or shelter shall be constructed to protect the water from being struck by a shot fired from any intended firing location.

The range floor may slope downwards towards the target line. This serves to move the CofF intersection point with the range floor further downrange, which will help direct ricochets into the backstop and not over the top of it.

2.4 FIRING AREAS AND TARGET AREAS

If the range is configured solely for action shooting (e.g. IPSC rifle events), this section applies and supersedes [**section 2.2 Firing Points / Firing Lines / Firing Lane Marking**](#). In this case, the range is configured to have all, or a portion, of the active area used for a firing area and a target area instead of specific firing lines and target lines.

In this configuration, the active range area does not have defined firing lines or target lines; however, there are requirements that must be met to ensure that the range limits are not unintentionally exceeded by range users.

The perimeter of the active range area shall be marked to the rear, at the backstop and on both sides. The side markers shall be at intervals no greater than 1/5 the maximum firing distance (e.g. for a 100 m range, the maximum marking interval is 20 m). They shall indicate the distance from the backstop. The rear and backstop markers shall be at no more than 5 m intervals and shall indicate the distance from one (reference) side of the range.

These markers are to assist shooters and Range Officers in ensuring that all shooting occurs within the acceptable arc(s) of fire for the range.

The CofF of all shooting shall be directed into a backstop, not beyond the flanks of the backstop, nor over the top of the backstop. The [Range Operating Instructions](#) reflect these horizontal and vertical restrictions. These restrictions shall be reduced to simple angle or distance operating rules that can be applied by shooters using the range (e.g. +/- 2 targets at 50 m and +/- 1 target at 10 m).

Targets shall be placed as close to the backstop as is practical.

The intended firing area(s) shall provide the shooters with secure footing.

For the purposes of determining backstop flank extensions, the left and right edge of the active range area are equivalent to the outside edges of the flank firing lanes.

2.5 BERMS

2.5.1 EARTHEN BERMS

For the purposes of these guidelines, a berm is defined as a significant raised mound of earth associated to a range. Berms are usually intended to:

- Prevent movement of people/animals onto the active range area;
- Reduce the likelihood of an errant shot escaping the active range area;
- Separate adjacent ranges and protect people in areas adjacent to the range; and,
- Protect buildings or equipment (e.g. a target shed).

Berms do not serve as backstops. If the planned arcs of fire are such that the CofF will cover a berm, then a properly constructed backstop is required in that location.

The core of a berm can be constructed from any solid materials, including soils, roots, rock or asphalt. However, if the berm core is composed of hard materials (e.g. rock rubble), then the face of the berm shall have at least a 1 m thick layer of soil covering these materials.

If tires are used in berm construction, then they are to be treated in accordance with hard materials and covered. Due to their construction, tires can cause ricochets and dangerous backsplash. The use of large quantities of tires in berm construction is strongly discouraged because of the potential environmental impact that they can have (e.g. pollution generated by a tire fire).

The berm face can be terraced to accommodate local soil conditions or site features. If terraced, the horizontal step surfaces must slope toward the rear (into the berm) at an angle of approximately 5° (1:12) or more. This will aid in drainage and prevent ricochets off of these surfaces; refer to [Figure 14: Terraced Backstops](#) for an example of a terraced surface.

Fascine, such as wooden timbers, can be used to stabilize a berm. The berm face must be free of major outcroppings of rock or other hard materials.

The growth of ground cover (e.g. grass, clover or similar vegetation) should be encouraged on berms to reduce erosion effects.

If used to separate *adjacent* ranges, earthen berms shall:

- Have a minimum height of 2.5 m, measured from the range floor;
- Have a minimum face slope of 30°, relative to the horizontal;
- Have a minimum crest thickness of 1.5 m; and,
- Join to at least one backstop.

Side berms can also be used to shelter adjacent areas where people or equipment are likely to be. If used to protect *adjacent* areas, earthen berms shall:

- Have a minimum height of 2.5 m, measured from the range floor;
- Have a minimum face slope of 30 °, relative to the horizontal;
- Have a minimum crest thickness of 1.5 m; and,
- Be of sufficient length to shelter the adjacent area.

If used to separate adjacent range areas or to shelter adjacent areas, the crest of the berm shall not have any trees, poles or other similar features positioned such that a ricochet could be directed into the adjacent area.

2.5.2 MAN-MADE MATERIAL BERMS

Man-made material berms are frequently used for the same reasons as earthen berms. However, they are primarily made from man-made materials, such as wood or concrete. They can also be used in conjunction with earthen berms to augment the overall height or length.

If used to separate adjacent ranges, man-made material berms shall:

- Rise vertically; and,
- Have a minimum height of 2.5 m, measured from the range floor.

Man-made material berms shall be of such construction that they will defeat the maximum calibre of cartridge for which the range was designed. There shall not be any gaps in protection along the length of a man-made material berm.

Man-made berms constructed of hard materials (e.g. concrete) shall be sheltered by Linatex™ (or similar material) or wood cladding at least 5 cm thick.

The use of *unsheltered* tires for man-made material berms is not permitted due to the hazard they pose from bullet backsplash and ricochet. If such tires are used, they shall be completely sheltered by Linatex™ (or similar material) or wood cladding at least 5 cm thick.

Note: Linatex is the registered trademark of the Linatex Corporation of America.

If tires are used for man-made material berms, then the tires shall be:

- Arranged in columns;
- Staggered and overlapped to provide uniform, gap-free coverage;
- Filled with soil or sand;
- Securely supported and configured to prevent toppling, sagging or leaning; and,
- Clad with Linatex™, wood cladding or similar materials.

2.6 SAFETY AREA TEMPLATES

The safety area templates that can be applied to this type of range are located in [Appendix D: Safety Area Templates](#).

2.7 TARGETS AND TARGET HOLDERS

For this type of range, the choice of targets and target holders rests with the Range Operator.

Notwithstanding the above provision, to reduce the probability of bullet ricochet and backsplash off of the target holders, it is recommended that when practical:

- Low ricochet materials, such as plastic or wood, be the primary construction materials; and,
- They not be constructed of unsheltered metal members (metal fittings can be used however).

For sample target holder designs, refer to, *Figure 16: Target Holder Designs* and *Figure 17: Target Holder Designs (Removable Frame)*.

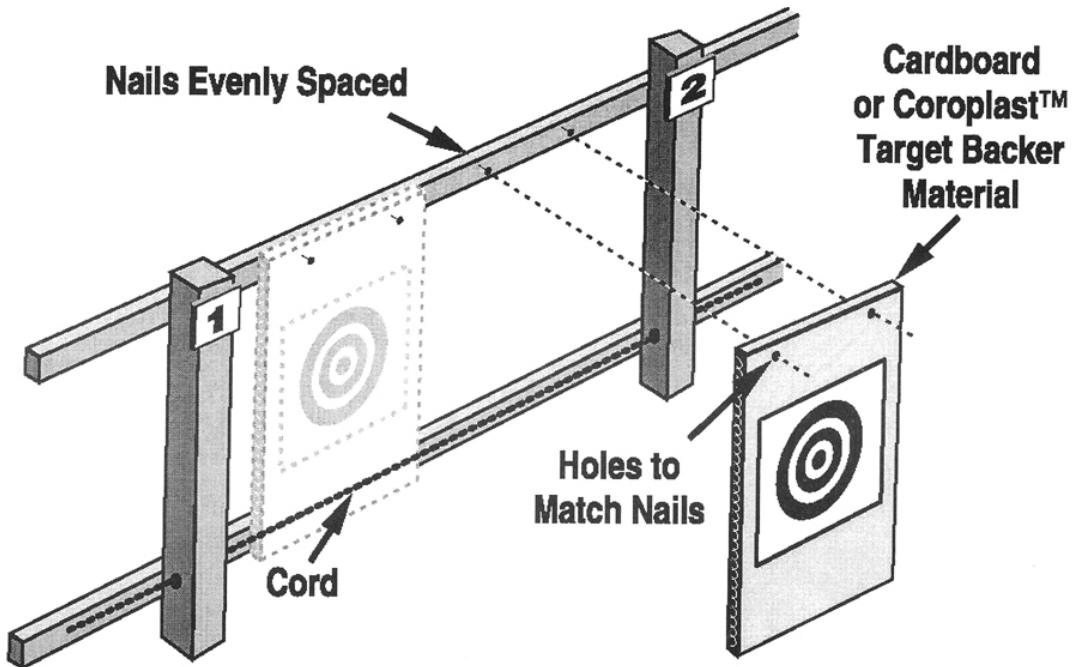


Figure 16: Target Holder Designs

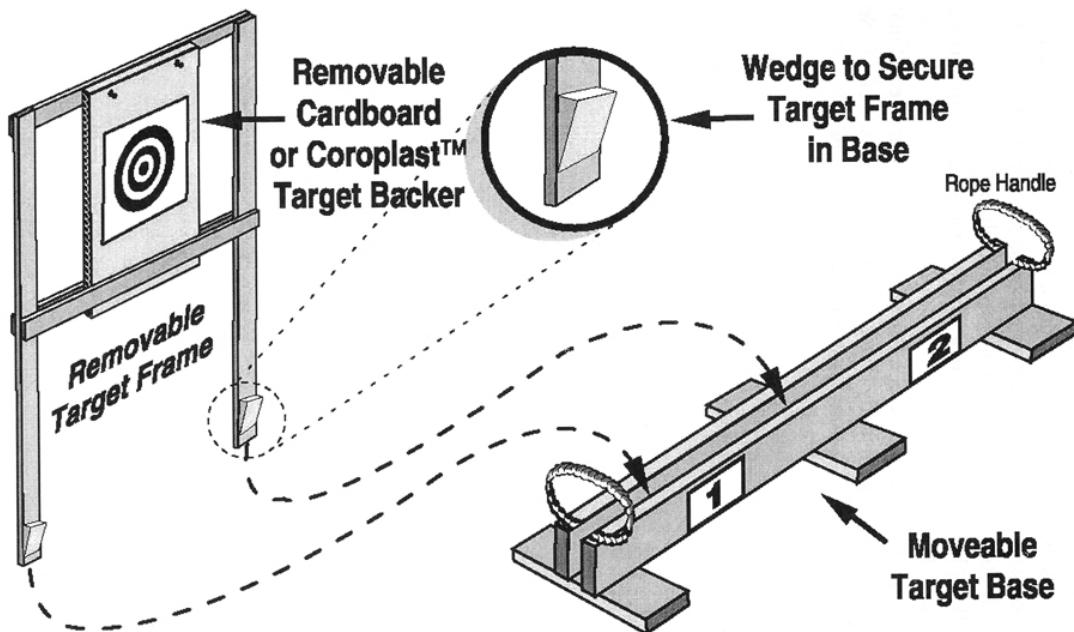


Figure 17: Target Holder Designs (Removable Frame)

When practical, it is recommended that the target backers be made of Coroplast™, plywood, heavy cardboard or similar materials.

If hard material targets (e.g. steel targets) are used:

- The range users must be aware of the minimum safe firing distance from these targets. Firing at distances less than the safe limit will expose shooters to the risk of injury from bullet backsplash; refer to [section 1.9 Backsplash](#);
- The targets shall not have a design style (e.g. concave) that will direct ricochets or backsplash towards the shooters; and,
- It is recommended that the targets be of a flat steel design, constructed of materials of sufficient hardness, so that they do not significantly crater from bullet impacts. Refer to [section 9.6 Bullet Traps](#) for information about steel specifications for indoor range backstops. This information can be applied to steel target specifications.

3 STANDARD OUTDOOR HANDGUN RANGES

The standard outdoor handgun range can have different configurations, dependent on the intended shooting activities. These ranges have one or more firing lines, a target area, a suitable backstop and a downrange safety area. They may also have other features, such as covered firing points, target mechanisms, etc.; refer to *Figure 18: Standard Pistol Range*.

Standard outdoor handgun ranges can be configured to have traditional firing lines, such as those used for ISU-style shooting; or they can be configured to have the active range area used as a more extensive firing area, such as is used for IPSC-style handgun shooting. However, in many cases outdoor handgun ranges are used for both purposes.

Except where noted, all the requirements of this section apply to both range configurations. If the outdoor handgun range is used solely for *action shooting* (e.g. IPSC), then [**section 3.2 Firing Points / Firing Lines / Firing Lane Marking**](#) does not apply; in this case, [**section 3.4 Firing Areas and Target Areas**](#) does apply however. If the range is used for both fixed firing line activities and for action shooting, then all requirements of this section apply.

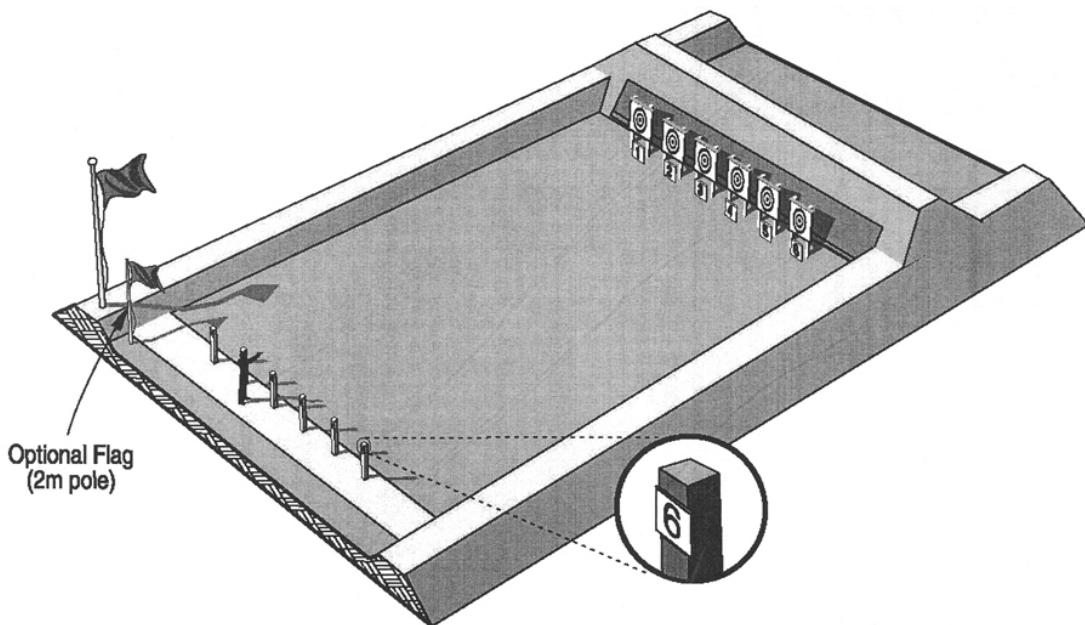


Figure 18: Standard Pistol Range

3.1 BACKSTOP DESIGN AND CONSTRUCTION

Except as noted below, the requirements of this section are in accordance with [section 2.1 Backstop Design and Construction](#).

3.1.1 BACKSTOP HEIGHT

Due to the CofF requirements for handgun shooting, it is generally not feasible to attempt to fully confine the CofF to the backstop at all distances. Minimum backstop heights are outlined in *Table 6: Outdoor Handgun Range Minimum Backstop Heights*.

Table 6: Outdoor Handgun Range Minimum Backstop Heights

Maximum Firing Distance	Minimum Backstop Heights
15 m or less	3 m
25 m	4 m
50 m or more	6 m

3.1.2 BACKSTOP CREST LENGTH

The length of the backstop crest must exceed the *outside edge* of both the left and right flank (outside) target lanes. The amount that it must exceed the centre of the flank target lanes is dependent on the distance to the backstop (from the firing line). Refer to *Table 7: Outdoor Handgun Range Minimum Crest Flank Extensions* for flank extension distances. Refer to [Figure 12: Backstop Crest](#) for a visual layout of the backstop crest.

Table 7: Outdoor Handgun Range Minimum Crest Flank Extensions

Firing Distance	Maximum Distance to Backstop	Minimum Flank Extension
15 m or less	18 m or less	1.5 m
20 m	23 m	2.0 m
25 m	28 m	2.5 m
50 m or more	53 m or more	4.5 m

3.1.3 BACKSTOP CREST THICKNESS

The thickness of the backstop, at the required minimum height, must be at least 1.0 m.

3.2 FIRING POINTS / FIRING LINES / FIRING LANE MARKING

This section is in accordance with [section 2.2 Firing Points / Firing Lines / Firing Lane Marking](#), except for the associated minimum firing point dimensions specific to handgun shooting, as listed in *Table 8: Recommended Minimum Firing Point Spacing (Handgun Range)* and *Table 9: Recommended Firing Line Depth (Handgun Range)*.

Table 8: Recommended Minimum Firing Point Spacing (Handgun Range)

Firing Point Use	Recommended Minimum Spacing
Standing	1.0 m
Kneeling	1.5 m
Barricade	1.5 m
Prone	2.0 m

Table 9: Recommended Firing Line Depth (Handgun Range)

Firing Point Use	Recommended Minimum Firing Point Depth	Recommended Minimum Range Officer Area	Recommended Minimum Total Depth
Rim-fire Handgun	1.5 m	1.0 m	2.5 m
Centre-fire Handgun	1.5 m	1.0 m	2.5 m

3.3 RANGE FLOOR

This section is in accordance with [section 2.3 Range Floor](#).

3.4 FIRING AREAS AND TARGET AREAS

This section is in accordance with [section 2.4 Firing Areas and Target Areas](#).

3.5 BERMS

This section is in accordance with [section 2.5 Berms](#).

3.6 SAFETY AREA TEMPLATES

The safety area templates that can be applied to this type of range are located in [Appendix D: Safety Area Templates](#).

3.7 TARGETS AND TARGET HOLDERS

This section is in accordance with [section 2.7 Targets and Target Holders](#).

4 NO SAFETY AREA RANGES

No Safety Area (NSA) ranges are outdoor handgun or rifle ranges that have been built with the direction of fire **into an imposing topographic feature** (e.g. a mountain). This type of range relies on the sheer size of the topographic feature to capture overshoots and ricochets; refer to *Figure 19: No Safety Area Range*.

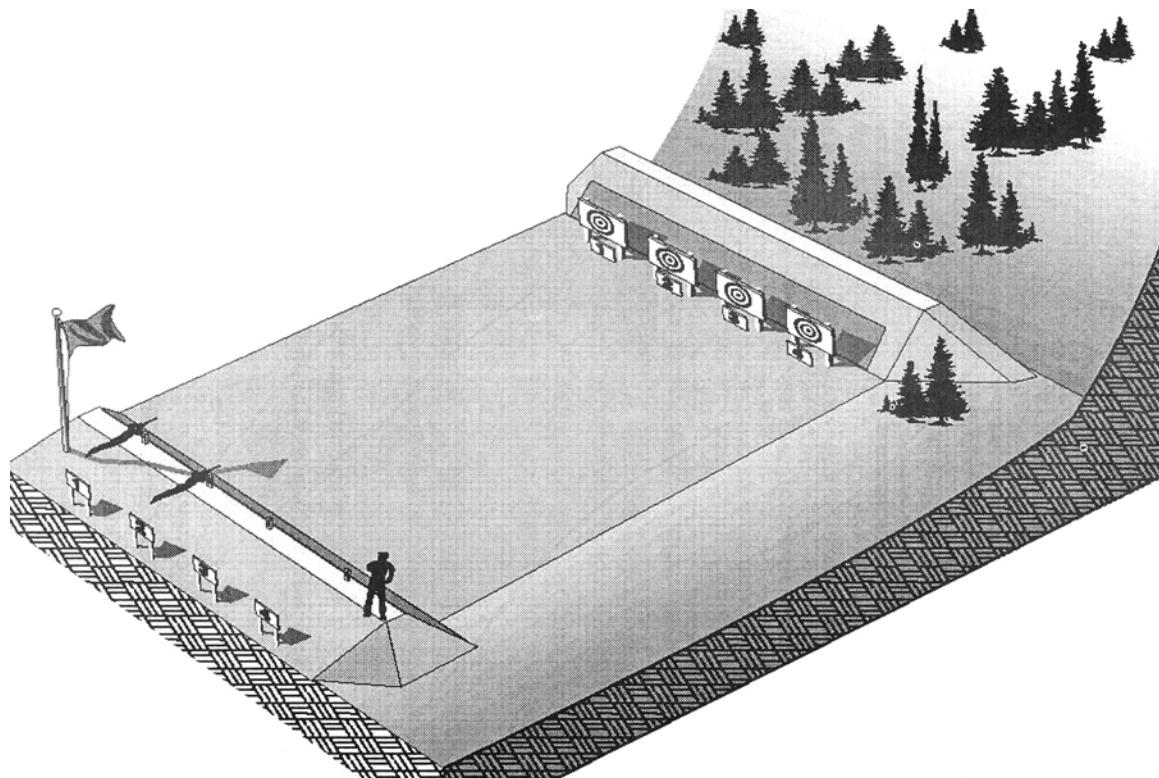


Figure 19: No Safety Area Range

The downrange safety area is generally defined as a specific elevation on the topographic feature. However, if unsheltered hard (e.g. steel) targets are used on the range, a limited downrange safety area is required.

Due to their nature, NSA ranges shall be designed and assessed on an individual basis. This section provides the tools needed to design and assess these ranges, rather than provide simple absolutes.

Though similar in purpose to baffled ranges, NSA ranges differ in their construction and design. For information on baffled ranges, refer to [**section 8 Baffled Rifle and Handgun Ranges**](#) of this document.

Figures 20: *Calculating Total Backstop Heights (Flat Range Floor)*, 21: *Calculating Total Backstop Heights (Downward Sloping Range Floor)* and 22: *Calculating Stop Butt Flank Width* provided in [**section 4.1 Topographic Feature Characteristics**](#) are used to assist in the design and assessment of NSA ranges.

No calibre-specific considerations are involved in NSA range design or assessment; however, the type of firearm to be used on the range (e.g. handgun vs. rifle) is an important factor.

It is usually impractical, or not cost-effective, to construct NSA ranges on sites that do not have an existing imposing topographic feature (e.g. hill, ravine, mountain, etc.).

In general, NSA ranges consist of one or more firing lines, an active range area, a fixed location target line, a backstop and an imposing topographic (or man-made) feature behind the targets. They may also have a variety of equipment and structures required for the intended range use (e.g. a target shed, covered firing points, target mechanisms, etc.).

The presence of an imposing topographic (or man-made) feature does not prevent an errant shot (overshoot), generated by operating the range beyond its design limitations (e.g. a wild shot with a high firing angle), from leaving the active range area. Such a shot will certainly leave the range and will pose a hazard to people beyond the range area. **Proper range usage is an essential element to maintain safety** on any range and it is especially critical on NSA ranges.

Provisions for the use of the active range area as an extensive *target area*, as described in [**section 2 Standard Outdoor Rifle Ranges**](#) and [**section 3 Standard Outdoor Handgun Ranges**](#) are not provided in this section. If a target area is planned in lieu of a single fixed target line, contact the CFO for more information.

The active range area can be used as a firing area in lieu of traditional fixed firing lines.

4.1 TOPOGRAPHIC FEATURE CHARACTERISTICS

This guideline assumes that an imposing topographic (or man-made) feature is present behind the targets. The requirements in this section are equally applicable to an imposing man-made backstop of equivalent size and location.

NSA ranges require an imposing feature (topographic or man-made) that is capable of capturing all overshoots and all ricochets generated on the range during the course of normal use. It must be of such construction (e.g. slope and composition) that it does not cause primary or secondary ricochets that can leave the range area. Therefore, the design, construction and natural attributes of the topographic feature are of primary concern to the design and assessment of NSA ranges.

The exact configuration of the backstop (if present) and the topographic feature is flexible, as long as the overall design requirements are met. As a result, NSA ranges can have different configurations, which include:

- Only a large man-made feature;
- A backstop with an imposing topographic feature immediately behind it; and,
- Only a large topographic feature.

The slope of the forward (impact) face of the topographic feature is an important design and assessment feature of NSA ranges. The lowest acceptable slope anywhere within the required height and width on the forward face of the topographic feature is 30° (slope fall ratio of 2:3). An ideal slope for this surface is 56° (slope fall ratio of 3:2).

The steeper the slope of the topographic feature's forward face the better, as it will better capture direct shots and ricochets. All things held equal, the forward face with the steeper slope will require less overall height than the one with the shallower slope, as the steeper slope intersects escaping bullet trajectories sooner in their upward flight.

The information in Figures 20: *Calculating Total Backstop Heights (Flat Range Floor)*, [**21: Calculating Total Backstop Heights \(Downward Sloping Range Floor\)**](#) and [**22: Calculating Stop Butt Flank Width**](#) can be used to determine the required topographic feature height and width.

The minimum required height for the topographic feature is the lesser of the ADH (refer to [Appendix F: Ricochet Air Danger Heights](#)) or the height calculated in accordance with Figures 20: Calculating Total Backstop Heights (Flat Range Floor) or [21: Calculating Total Backstop Heights \(Downward Sloping Range Floor\)](#).

The overall required height of the topographic feature is influenced by the height of the firing position (shooting stance and any elevation of the firing point). It is also strongly influenced by any upward or downward slope of the range floor. The overall required height can be reduced by elevating the shooter, restricting the firing heights (e.g. eliminating prone shooting) or sloping the range floor away from the firing line (downward).

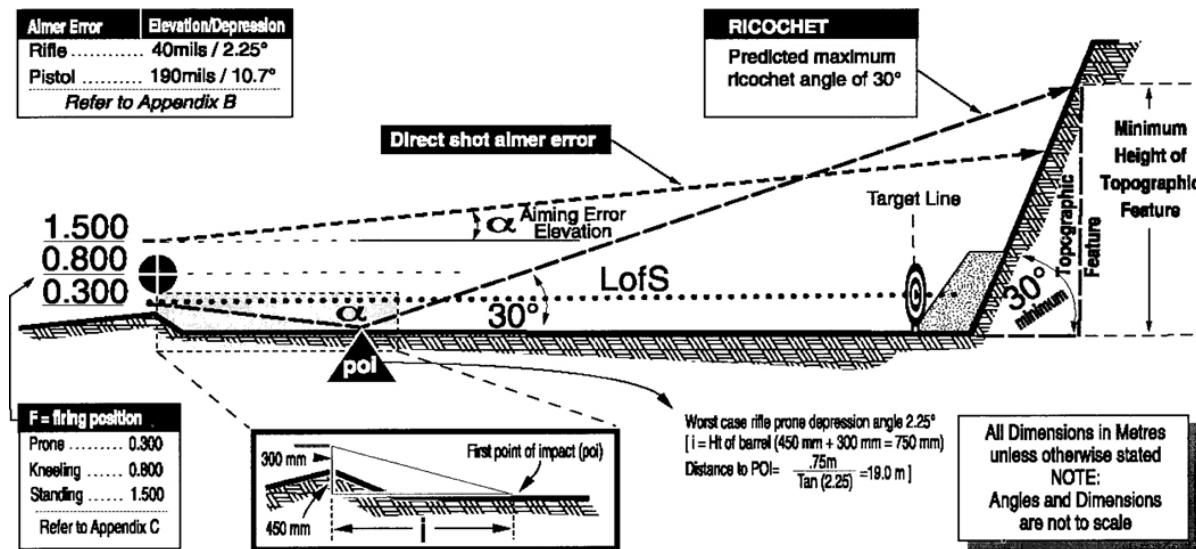


Figure 20: Calculating Total Backstop Heights (Flat Range Floor)

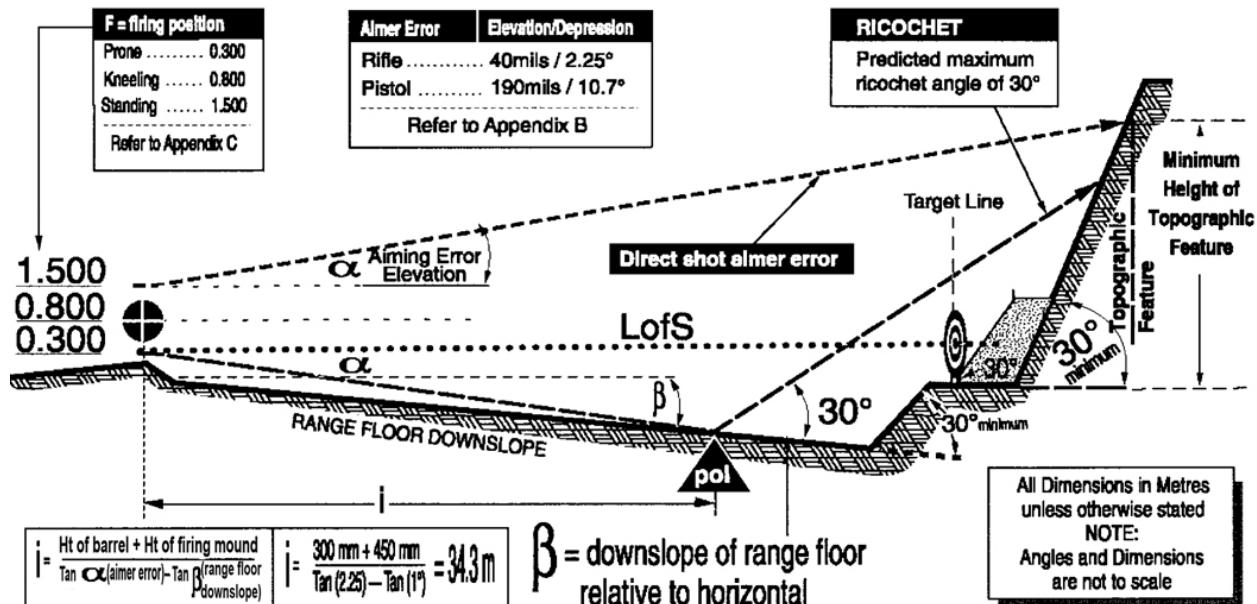


Figure 21: Calculating Total Backstop Heights (Downward Sloping Range Floor)

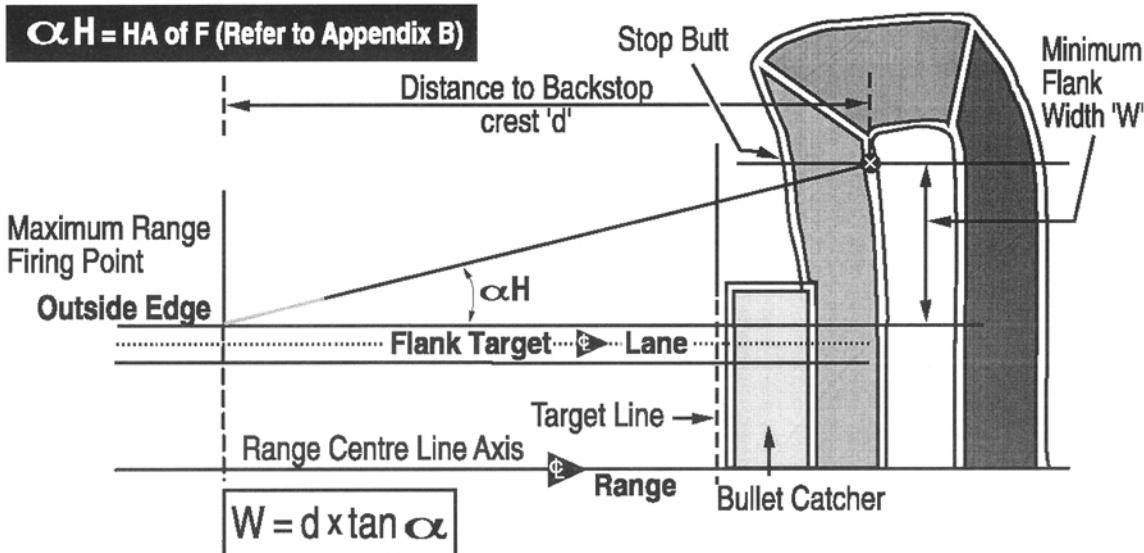


Figure 22: Calculating Stop Butt Flank Width

Topographic features (or backstops) can be augmented by constructed features that serve to raise their overall height. In those cases where the augmentation is of earthen construction, the normal backstop construction provisions apply. In those cases where the augmentation is not of earthen construction (e.g. a barrier wall of concrete or timber), the following provisions apply.

The barrier wall must:

- Rise vertically to the required height;
- Be of sufficient construction and thickness to prevent bullets from passing through them; and,
- Be of a design and construction that can contain ricochets.

It must be remembered that grass, shrubs and trees do not augment the height of the topographic feature. All measurements are based on ground levels, not vegetation levels.

The thickness of the topographic feature at the required minimum height must exceed 1.0 m for handgun or 1.5 m for rifle.

The forward face of the topographic feature shall be free of major exposed rock outcroppings or other hard ricochet-producing surfaces, within the required width and height.

Generally, a reduction in the safety area is *not* justified if the imposing topographic feature or backstop does not meet the above criteria. The effectiveness of the topographic feature (as a natural backstop) is sometimes overestimated because:

1. It is regarded as a natural backstop for bullets fired accidentally with undue elevation, and not in relation to the trajectory of projectiles ricochetting off the hill's face, targets or other range features, which also constitute a significant hazard.
2. Its height is usually measured from the target level; however, the actual *effective* height is the perpendicular distance from its crest to the *line of sight* (between the firing point and the targets). If the range slopes uphill, the effective height will be reduced. Refer to [Figure 4: Effective Backstop Height](#). Or,
3. The slope of the forward face of the topographic feature is not steep enough to warrant the reduced safety area, due to the increased risk of ricochets off of it.

When a range appears to justify some reduction in its safety area, and does not fall within one of the above categories, the case will be examined on an individual basis by the CFO.

4.2 BACKSTOP DESIGN AND CONSTRUCTION

Although optional, it is recommended that NSA ranges have at least a small purpose built backstop area. This feature will aid with range maintenance activities, such as the removal of lead and bullet jacket material accumulations (de-mining) and slope maintenance.

If present, backstops will satisfy the requirements of [section 2.1 Backstop Design and Construction](#), except as noted below.

4.2.1 BACKSTOP HEIGHT

The minimum backstop height shall be 2.5 m, measured from the range floor.

4.2.2 BACKSTOP CREST LENGTH

The length of the backstop crest shall exceed the outside edges of the active range area.

4.2.3 BACKSTOP CREST THICKNESS

The thickness of the backstop, at its crest, shall be at least 1.5 m for rifle and 1.0 m for handgun.

4.2.4 BULLET CATCHERS

Although bullet catchers are optional, they are recommended; refer to [section 2.1.6 Bullet Catchers](#).

4.3 FIRING POINTS / FIRING LINES / FIRING LANE MARKING

This section is in accordance with [section 2.2 Firing Points / Firing Lines / Firing Lane Marking](#) or [section 3.2 Firing Points / Firing Lines / Firing Lane Marking](#), except as noted below.

4.3.1 FIRING LINE HEIGHT (ELEVATION)

It is recommended, when practical and when appropriate for the intended range use, that the firing line be elevated above the range floor. This elevation serves to keep the firing line dry and improve visibility of the target area. It also serves to move the CofF point of impact with the range floor towards the topographic feature. This will help to reduce the required height of the topographic feature.

4.4 FIRING AREAS AND TARGET AREAS

This section is in accordance with [section 2.4 Firing Areas and Target Areas](#).

4.5 FIRING ARCS

All firing arcs shall be controlled so that the CofF is directed into the backstop (or topographic feature) area and does not exceed the outside edges of the range floor (e.g. the active range area).

4.6 RANGE FLOOR

This section is in accordance with [section 2.3 Range Floor](#), except as noted below.

When practical, it is recommended that the range floor slope downward towards the targets. This serves to move the intersection point between the CofF and the range floor further downrange and helps direct ricochets into the backstop or topographic feature at a lower height.

4.7 BERMS

This section is in accordance with [section 2.5 Berms](#).

4.8 TARGET LINE

In general, NSA ranges have one fixed target line, which is located close to the front of the backstop or large topographic feature.

If a target area is planned in lieu of a single fixed target line, contact the CFO for more information.

4.9 TARGET HOLDERS

This section is in accordance with [section 2.7 Targets and Target Holders](#), except as noted below.

To reduce the probability of bullet ricochet off of the target holders, it is recommended that targets not be constructed of *unsheltered* metal structural components; however, metal fittings can be used. Sheltering of the metal target holders can be provided by wood cladding or similar materials.

If unsheltered metal *structural* components are used in the target holder's construction, the downrange safety area provisions for hard targets, provided in [section 4.10 Targets](#), apply.

4.10 TARGETS

NSA ranges can accommodate the use of hard targets (e.g. steel targets) if a limited downrange safety area is present. The safety area template is illustrated by [Figure 77: Safety Area Template T1](#) in [Appendix D: Safety Area Templates](#). This template shall be applied to all hard target locations on the NSA range.

If a suitable downrange safety area is not available, *unsheltered* hard targets shall not be used on NSA ranges. However, hard targets can be used if they are placed within target shelters designed to capture ricochets from them. For an example of a target shelter, refer to [Figure 47: Steel Target Revetments](#). Target shelters of alternate designs are acceptable, as long as they serve to capture ricochets from the hard targets.

Reactive targets made from self-sealing rubber (or equivalent designs) are commercially available. They provide the Range Operator with alternative target systems that do not require sheltering or the provision of a limited safety area.

5 OUTDOOR GALLERY RIFLE RANGES

Gallery ranges are often used for long range (beyond 200 m) rifle or handgun shooting. They have a suitable backstop, a target markers sheltered gallery, one or more firing lines and an adequately sized downrange safety area capable of containing the safety area template(s) being applied; refer to *Figure 23: Gallery Range*.

Due to the extended distances between the shooters and their targets, outdoor gallery ranges are designed to use target marking systems in the downrange area. The target marking systems can be manual, electronic or a combination of both types.

This type of range can have different configurations, dependent on the intended shooting activities.

Gallery rifle ranges can be configured to have one or more firing areas instead of traditional firing lines. If the range is configured with firing areas, [section 5.8: Gallery Range Firing Areas](#) is applicable in lieu of [section 5.4 Firing Points / Firing Lines / Firing Lane Marking](#).

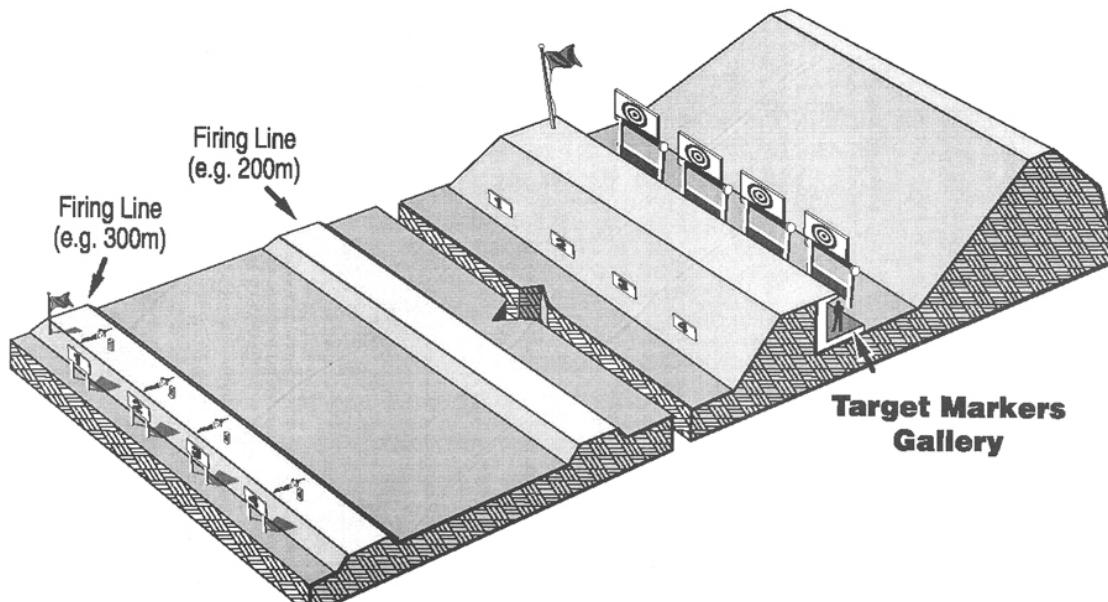


Figure 23: Gallery Range

5.1 SAFETY CONSIDERATIONS

The protection of any personnel (e.g. markers) in the downrange sheltered gallery is one of the key safety considerations for this type of range. The markers must be protected from hazards posed by direct bullet impact, bullet ricochets off of targets or other surfaces, and bullet backsplash from the backstop.

The Range Operator shall maintain all construction aspects of the gallery as required to ensure the safety of personnel who work in the gallery.

5.2 BACKSTOP DESIGN AND CONSIDERATION

This section is in accordance with [section 2.1 Backstop Design and Construction](#).

5.3 TARGET MARKERS GALLERY

If electronic target marking equipment is used exclusively on this type of range, then this section is not applicable (refer to [section 5.7 Electronic Target Marking Equipment Gallery](#)).

However, if personnel are present in the target markers gallery when firing is underway, then the requirements of this section are applicable.

The use of manual target marking on this type of range requires that the target markers be in close proximity to the targets to fulfil their job. The purpose of the target markers gallery (hereafter referred to as the gallery) is to shelter these target markers from the firing being conducted on the range. Therefore, the design and construction of the gallery shall be such that the target markers can mark their targets and conduct their other duties in the gallery without being exposed to hazardous fire or ricochets.

The target markers gallery is composed of the following elements:

- Mantlet;
- Gallery;
- Target carriers; and,
- Protective wall (if required).

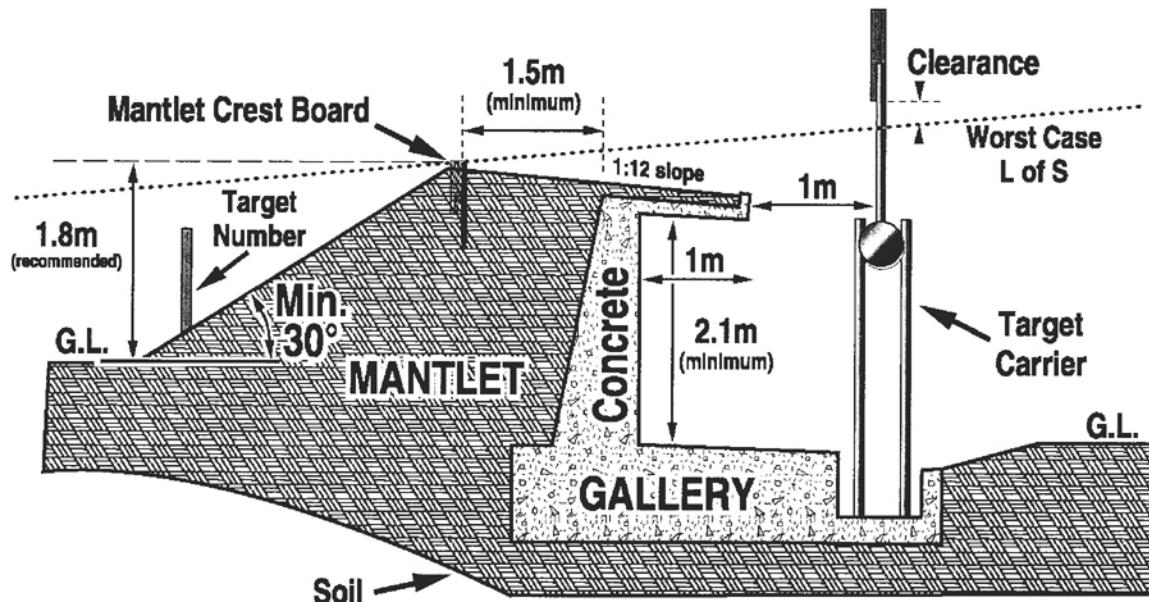


Figure 24: Target Markers Gallery

5.3.1 MANTLET

The mantlet is an earthen berm banked up against the gallery itself. The mantlet is designed to capture low shots and low ricochets, and to provide additional protection to the gallery by sheltering it from repeated bullet strikes.

The core of the mantlet can be constructed from any solid material, including soil, roots, rock or asphalt. However, if the mantlet core is composed of hard materials (e.g. rock rubble), then its forward face shall have at least a 1.5 m thick layer of soil covering the hard materials.

The forward face of the mantlet must be free of major rock outcroppings or other hard materials. The minimum thickness of the mantlet over the gallery construction shall be at least 1.5 m.

The forward face of the mantlet shall have a slope not less than 30° (relative to the horizontal). This slope angle shall be maintained as required. The mantlet at either end of the gallery can taper to ground level at the natural angle for the prevailing soil conditions.

The growth of ground cover (e.g. grass) on the mantlet shall be encouraged to reduce erosion effects.

The mantlet crest shall exceed the outside edges of the extreme left and extreme right target positions by at least 2 m.

The mantlet crest shall have embedded timbers running the full length of the gallery. The purpose of these timbers is to define the crest and prevent tunnelling of the mantlet from repeated low grazing shots. These mantlet crest timbers shall be at least 50 mm x 250 mm (2 in. x 10 in.), buried into the crest of the gallery mantlet, and supported by pickets; refer to Figures 25: *Mantlet Crest Board* and 26: *Mantlet Crest Tunnelling*.

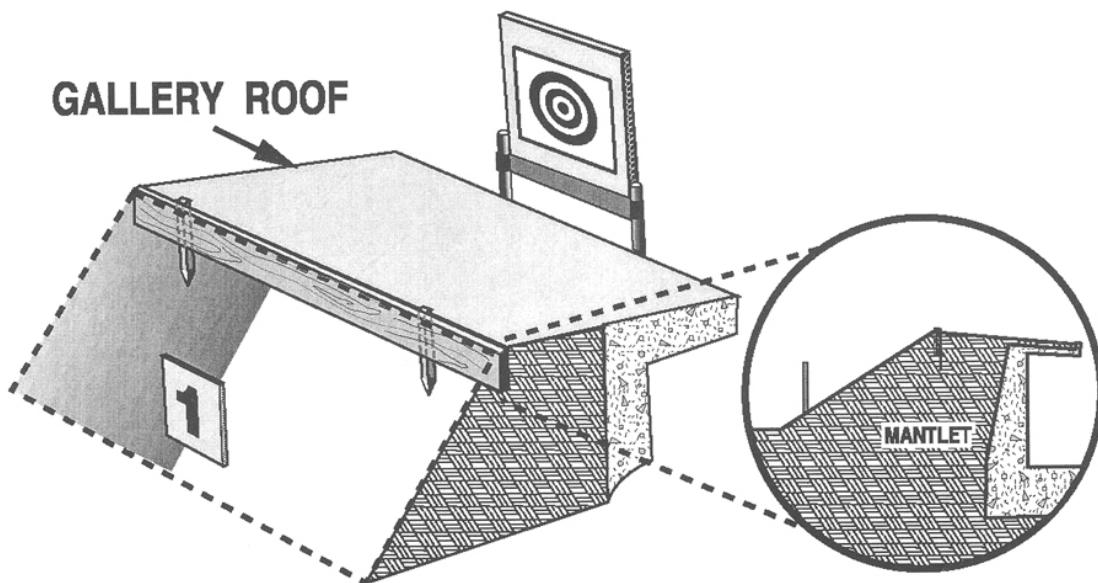


Figure 25: Mantlet Crest Board

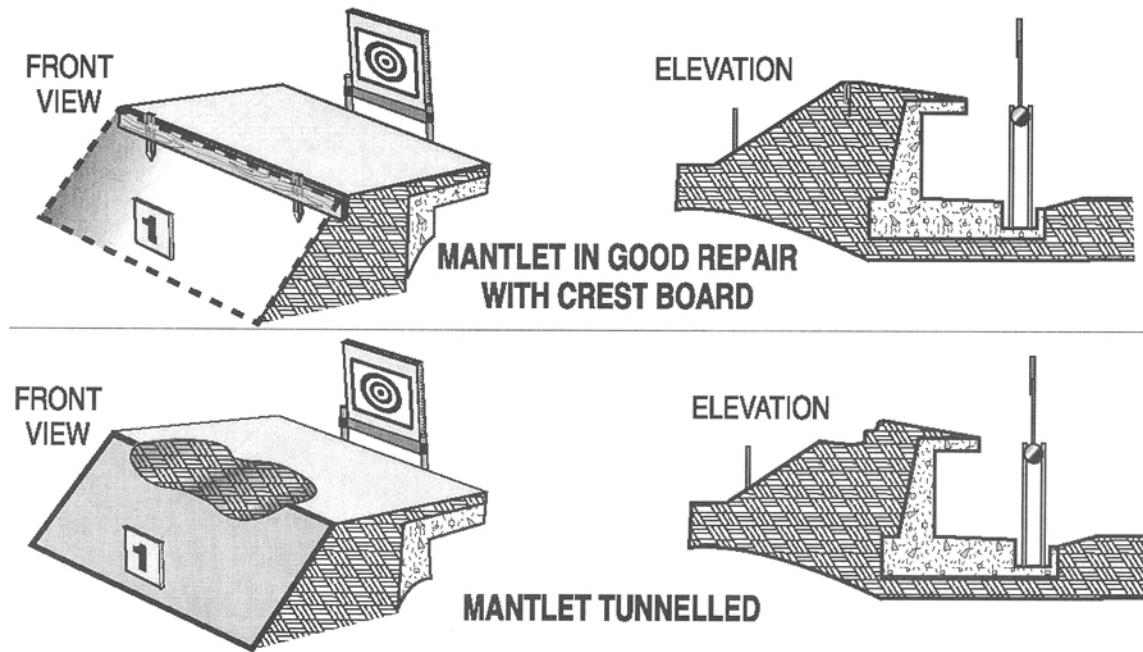


Figure 26: Mantlet Crest Tunnelling

The mantlet crest shall be constructed to ensure that the targets are completely visible from all planned firing heights at all planned firing distances. This requirement is promoted by ensuring that a small gap (10 cm approximately) is visible beneath the targets from all firing distances.

When practical, it is recommended the target numbers be placed on the forward face of the mantlet. From the shooter's perspective, they will appear immediately beneath their respective target. Refer to the information on target numbering in [section 2.2 Firing Points / Firing Lines / Firing Lane Marking](#).

When practical, it is recommended that the gallery be constructed with the mantlet crest approximately 1.8 m above ground level. By raising the gallery above ground level, low shots and low ricochets can be readily captured.

The top of the mantlet (and the gallery roof) shall be constructed to reduce the likelihood of bullet strikes and to be adequately drained. This can be accomplished by:

- Sloping the mantlet top and gallery roof downward from the crest; or,
- Forming the mantlet crest above the mantlet top and providing drainage.

If the mantlet top and gallery roof are sloped downward, the required slope angle is at least 5° (1:12), relative to the horizontal; refer to [Figure 24: Target Markers Gallery](#).

If the mantlet crest is raised, it shall be constructed to extend upwards approximately 16 cm above the mantlet top and the gallery roof; refer to [Figure 27: Raised Mantlet Crest](#).

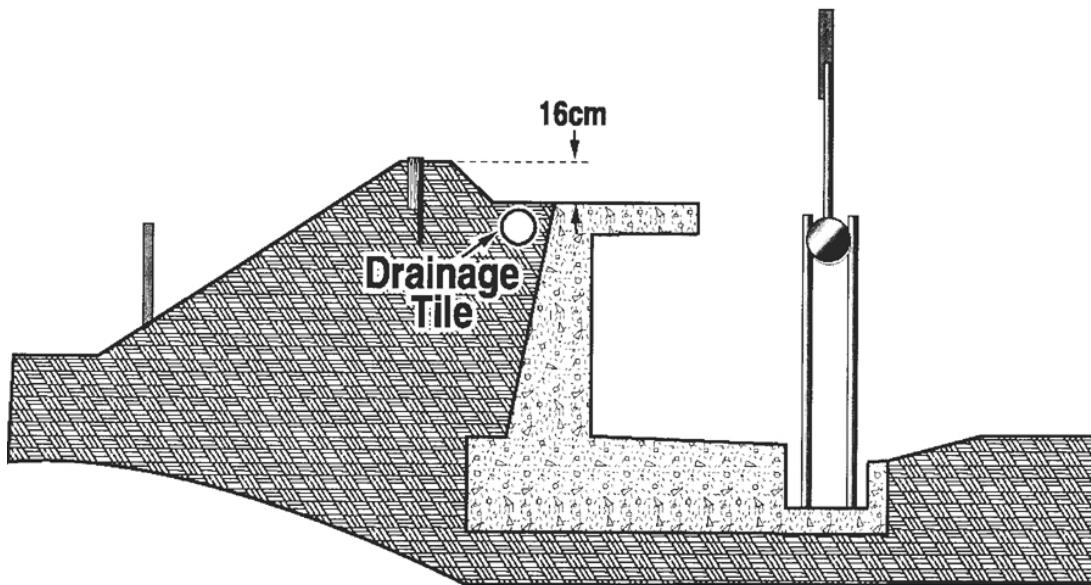


Figure 27: Raised Mantlet Crest

5.3.2 GALLERY CONSTRUCTION

The gallery provides the markers a sheltered area in which they can mark targets safely. It is a substantial structure designed to provide uninterrupted protection from bullets and ricochets along its length. The gallery is usually designed to house target mechanisms (target carriers), which serve to raise targets above the mantlet and to lower them into the gallery for marking.

There are a number of designs and materials which can be used in the construction of the gallery itself. Poured concrete or pre-fabricated concrete are commonly used techniques for producing durable structures capable of providing excellent security to the target markers. However, other more cost-effective techniques can be employed if they provide a comparable level of safety to the markers.

Alternate construction techniques for the gallery include the use of brick, corrugated steel or rock-filled gabions, etc. Regardless of the technique used, the gallery shall be designed to maintain its integrity against all structural loads, including those imposed by the earthen mantlet. If any doubt as to the structural suitability of the gallery construction exists, the CFO shall require the Range Operator to obtain a report from a Professional Engineer, licensed in the province or territory in which the range is located, attesting to the structural suitability of the gallery design.

The gallery design shall provide for water drainage.

The gallery requires a roof capable of protecting the markers from glancing ricochets and high impact angle projectiles. The roof can be a fully cantilevered design or it can be supported along its length as required.

If the mantlet top and gallery roof are sloped downward, the required slope angle is at least 5° (1:12), relative to the horizontal. Refer to [Figure 24: Target Markers Gallery](#).

There are a number of different construction techniques that can be used in the roof design. Examples of acceptable roof construction techniques are provided below. Alternate techniques can be employed if they provide equivalent levels of security to the markers in the gallery.

Acceptable gallery roof construction techniques include:

1. Reinforced aggregate concrete of minimum 20 N/mm^2 (3000 psi) strength and minimum thickness 75 mm, overlaid with at least 150 mm of soil.
2. Reinforced aggregate concrete of minimum 20 N/mm^2 (3000 psi) strength and minimum thickness 150 mm.
3. Heavy gauge corrugated (or non-corrugated) steel panels overlaid with at least 150 mm of soil. And,
4. Timber, minimum thickness of 150 mm, overlaid with at least 150 mm of soil.

The use of corrugated steel in the gallery roof *without* an adequate overlying layer of soil is not permitted.

The design of the gallery roof shall provide at least 1 m of overhead cover for the marker's area.

The gallery should have a working area for the markers, which is at least 2 m wide.

The gallery should be approximately parallel to the firing line(s) and to the backstop; however, up to a 10° misalignment is permitted.

5.3.3 PROTECTIVE BARRIER

If the target markers gallery is within 25 m of the *base* of the backstop, the gallery shall be fitted with a timber, concrete, brick or steel barrier wall or an earthen berm to protect the markers from bullet backsplash out of the backstop. The construction of the barrier wall is flexible if it protects the markers from bullet backsplash. If wood is used in the barrier wall, it shall be of timber construction at least 5 cm thick.

There shall not be any voids or gaps in the barrier wall. However, viewing ports used to observe the backstop can be fitted into the barrier wall, if constructed of 2 panes of 6 mm thick Plexiglas (or thicker) separated by an air space or of an equivalent design.

The protective barrier design shall run the entire length of the gallery, matching the length of the mantlet crest. It shall be placed as close as is practical behind the target carrier. The height of the barrier shall be determined by the gallery and target carrier design; however, it shall rise to a height sufficient to fully shelter the markers in the gallery.

If the gallery range uses exclusively electronic targetry and if personnel are not in the gallery at any time when the range is in use, then there is no requirement for a protective barrier.

5.3.4 TARGET CARRIERS

Gallery ranges are often fitted with moveable target carriers, located in the gallery. They serve to raise the targets above the mantlet where they are shot at and then to lower the targets completely into the gallery where they can be marked without exposing the marker to rifle fire or ricochets.

There are a significant number of acceptable target carrier designs, including the following: Hythe, Cantilevered and "F" designs. The primary safety considerations for target carriers are that:

- The targets can be completely raised or lowered without exposing the markers; and,
- No metal components are exposed to fire from the range during normal operation.

The Range Operator shall determine which target carrier design best suits their intended application, subject to the requirements above; refer to *Figure 28: Target Carrier Designs*.

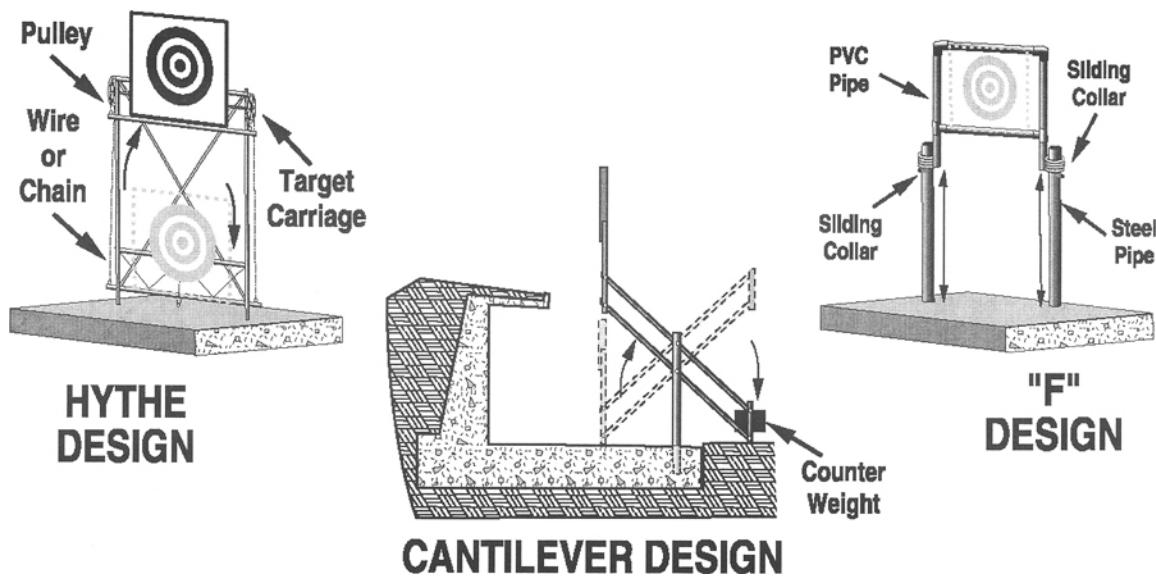


Figure 28: Target Carrier Designs

5.4 FIRING POINTS / FIRING LINES / FIRING LANE MARKING

This section is in accordance with [section 2.2 Firing Points / Firing Lines / Firing Lane Marking](#), except as described below.

5.4.1 ELEVATED FIRING LINES

When practical, the elevation of firing lines on gallery ranges above ground level is encouraged. This is intended to improve visibility of the target gallery and to help keep the firing lines dry.

In order to reduce the possibility of ricochets from the rear surface of elevated firing lines, the minimum slope of the rear surface of the firing line shall be 30° . The slope of the forward surface of the firing line is determined by the Range Operator; however, in general terms the steepest slope practical, given the soil conditions and intended use, is encouraged; refer to *Figure 29: Gallery Range Elevated Firing Line*.

The top surface of elevated firing lines can be level or slightly sloped to the rear. A shallow slope to the rear is often preferable from the shooter's perspective and it aids in draining the firing line.

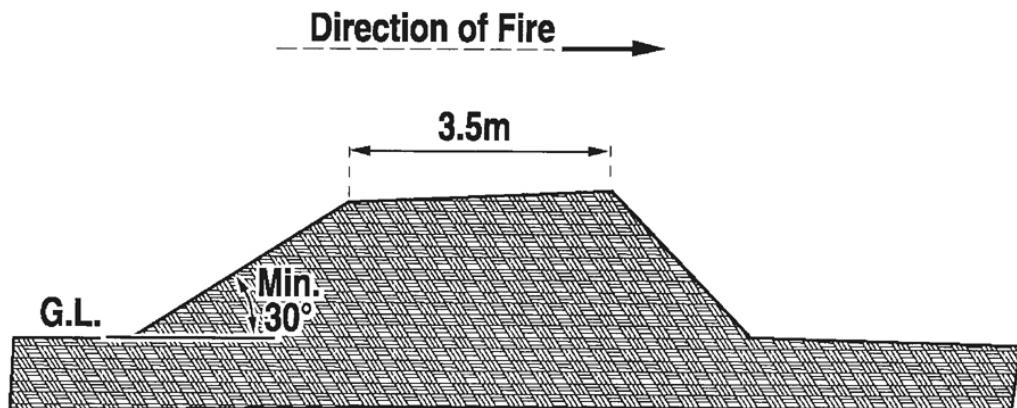


Figure 29: Gallery Range Elevated Firing Line

5.4.2 COVERED FIRING LINE

If the range is configured to have one or more firing lines in the active range area of a more distant firing line (e.g. a range having firing lines at 300 m, 500 m and 900 m), it is recommended that only the most distant firing line be equipped with an overhead weather shelter.

5.5 TARGETS

When target markers are used in the range gallery, the use of targets or target frames containing any metal is prohibited (except *small* fittings, such as nails, etc.). This is due to the close proximity of personnel to potential backsplashes, ricochets or spalling, originating from the targets or their frames. This requirement is not applicable to electronic target systems if personnel are not in the gallery when the range is in use.

It is recommended that low ricochet materials, such as wood, plastic tubing, Coroplast™, plywood, canvas, etc. be used in the construction of target frames and targets.

5.6 SAFETY AREA TEMPLATES

The “standard range” safety area templates located in [Appendix D: Safety Area Templates](#) are to be applied to this type of range.

5.7 ELECTRONIC TARGET MARKING EQUIPMENT GALLERY

Some gallery ranges are designed to include electronic target marking equipment, which completely removes the need to have personnel in the downrange area to mark targets. If a range uses this equipment exclusively, then the gallery requirements of section [5.3 Target Markers Gallery](#) do not apply; however, the requirements of this section do apply.

5.7.1 MANTLET

To reduce the occurrences of ricochets, it is recommended that the electronic targetry be placed on top of a 1.8 m high mantlet when practical. The mantlet should be constructed in accordance with the applicable requirements of [5.3 Target Markers Gallery](#); refer to *Figure 30: Electronic Targetry Gallery*.

If the electronic targetry is part of a mobile trailer-based system, then the mantlet shall be configured to shelter the trailer and meet the intent of the requirements of the preceding paragraph.

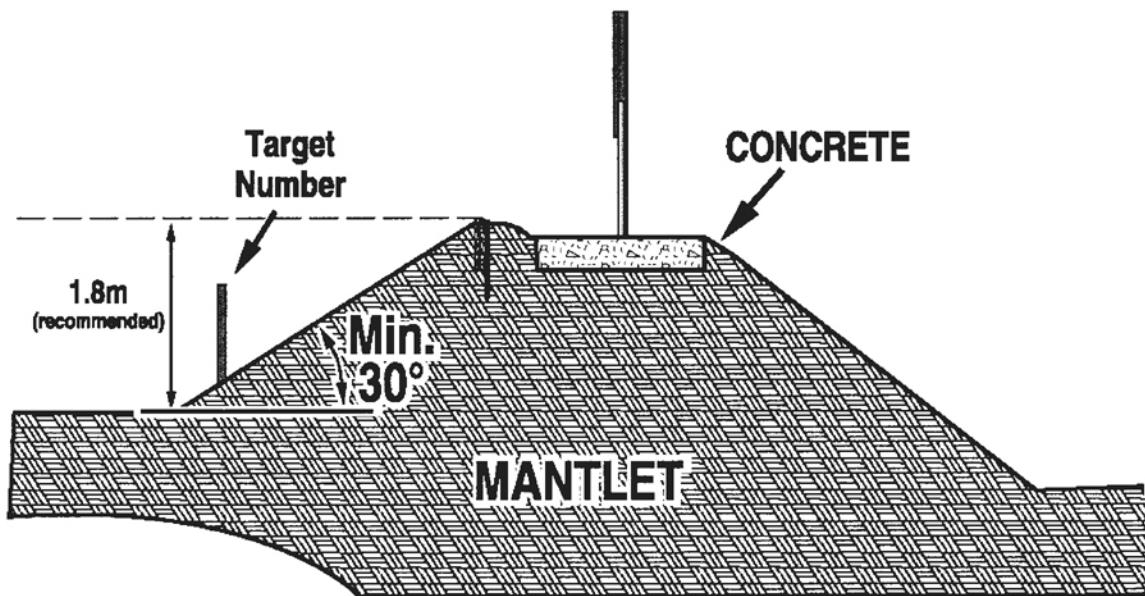


Figure 30: Electronic Targetry Gallery

5.8 GALLERY RANGE FIRING AREAS

Any portions of a gallery rifle range that are configured as firing areas in lieu of traditional firing lines are required to comply with this section; the requirements listed in [section 5.4 Firing Points / Firing Lines / Firing Lane Marking](#) are superseded.

The perimeter of the firing area shall be demarcated with pylons, posts or similar marking symbols. These markers shall be clearly visible to shooters and Range Officers. They are intended to assist range users in identifying the acceptable firing areas of the range.

The CofF of all shooting shall be directed into a backstop, not beyond the flanks of the backstop, nor over the top of the backstop. The [Range Operating Instructions](#) reflect these horizontal and vertical restrictions. These restrictions shall be reduced to simple angle or distance operating rules that can be applied by shooters using the range (e.g. +/- 2 targets at 300 m and +/- 1 target at 100 m).

Targets shall be placed in the gallery target carriers or otherwise held within the gallery.

6 TRAPSHOOTING AND SKEET RANGES

This section pertains to standard Trapshooting and Skeet ranges. It does not pertain to shotgun zeroing (patterning) ranges or shotgun ranges where other activities (e.g. practical shotgun) are conducted.

Trapshooting and Skeet ranges have mechanical mechanisms (traps) to throw frangible targets (clay targets) and an arrangement of shooting stations from which shooters engage these targets. The targets are thrown on fixed flight paths or within prescribed arcs.

These ranges require a downrange safety area to contain fired shots. Refer to [Appendix D: Safety Area Templates](#) for the required safety area templates.

The Amateur Trapshooting Association (ATA) and National Skeet Shooting Association (NSSA) are sport governing bodies that publish rules and facility requirements (layouts) for Trapshooting and Skeet shooting. In addition, other commercial and sporting organizations have published guidelines for the construction and operation of Trapshooting and Skeet ranges, which supply more application-specific and detailed information about construction than does this section. The appropriate rules and guidelines should be consulted by Range Operators to ensure that their ranges comply with the sport rules. This section is primarily concerned with safety issues and does not address in detail the regulatory issues relevant to the sport.

In matters of safety, the requirements of this section must be met. However, in areas that pertain to regulatory sport governing rules, the requirements of the sport governing body can take precedence.

6.1 SAFETY CONSIDERATIONS

These types of ranges require a downrange safety area that is able to contain the fired shot produced through normal range operations. The safety area templates produced for Trapshooting and Skeet ranges are based on CofFs, as listed in [Appendix B: Cone of Fire Design Parameters](#).

6.1.1 HUMAN ACTIVITY – SAFETY AREA

The general allowance of human activity within a range safety area, as provided under [section 1.2 Range of Safety Areas](#), cannot be afforded to shotgun ranges. Human activity should not be approved within the safety area of a shotgun range when it is in operation.

For the purposes of this section, mechanical target throwers are deemed to be functional if they throw targets reliably on the intended flight paths or within the intended arcs. It is recognized that malfunctions in thrower operations are permitted, as long as the correct target flight is achieved when a target is thrown.

Target throwers are to be repaired as required to maintain functionality.

A range may combine Trapshooting and Skeet fields in one layout. If a range is laid out for both Trapshooting and Skeet, the range will be assessed for both disciplines.

The safety area templates provided in [Appendix D: Safety Area Templates](#) are for shotshell ammunition loaded with No. 9 and 7 sized lead alloy shot pellets fired at a velocity of 396 m/sec (1,300 ft/sec). These templates can also be utilized for shotshell ammunition of equivalent or less external ballistic capability (e.g. maximum range) to the ammunition specified above.

If larger diameter shot (e.g. No. 4) or higher velocity ammunitions are to be fired on the range, then different safety area templates may have to be utilized. Contact the CFO for more information.

6.2 RANGE LAYOUT

6.2.1 ACTIVE RANGE AREA

The active range area for Skeet and Trapshooting fields includes the area of the shooting stations and trap houses. It also includes the area forward of the shooting stations to a depth equivalent to the flight distance of the thrown targets, which is approximately 65 m.

This area should be relatively level and free of tall brush, trees or any other major obstructions.

6.2.2 SKEET RANGE

Range Configuration

A Skeet field has two houses, a “high” and a “low” house, from which targets are thrown. These houses are located at either end of a segment on a circle having a radius of 19.2 m. Seven shooting stations are located on this circle segment. An eighth shooting station is situated in the centre of the field, midway between the *high* and *low* houses; refer to *Figure 31: Typical Skeet Range Layout*.

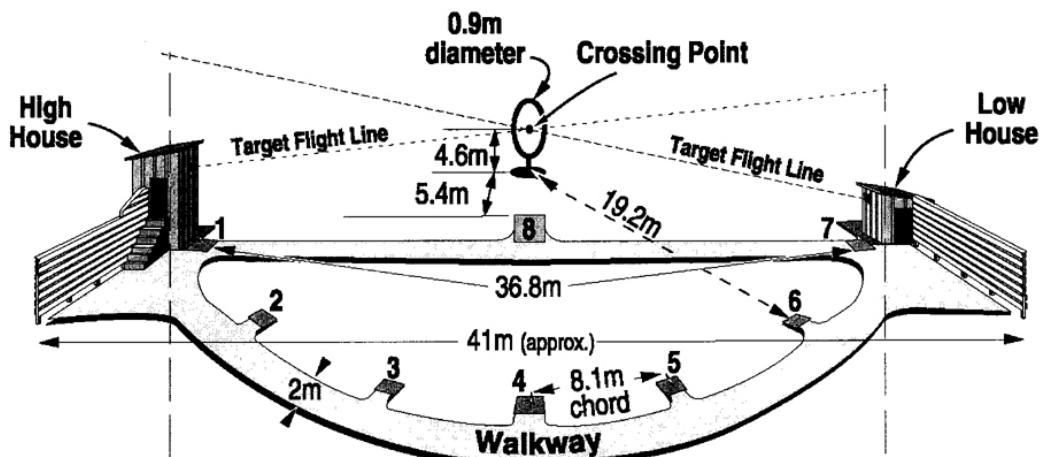


Figure 31: Typical Skeet Range Layout

Skeet Houses

Skeet houses are located on opposite sides of the skeet field. The *high* house is at the left end and the *low* house is at the right end of field, separated by approximately 38.8 m (refer to Figures 31: *Typical Skeet Range Layout* and 32: *Skeet Range*). These structures are used to house target throwing mechanisms and target supplies, if desired.

On range facilities with adjacent Skeet fields, the skeet houses can be configured as joint *high* and *low* houses.

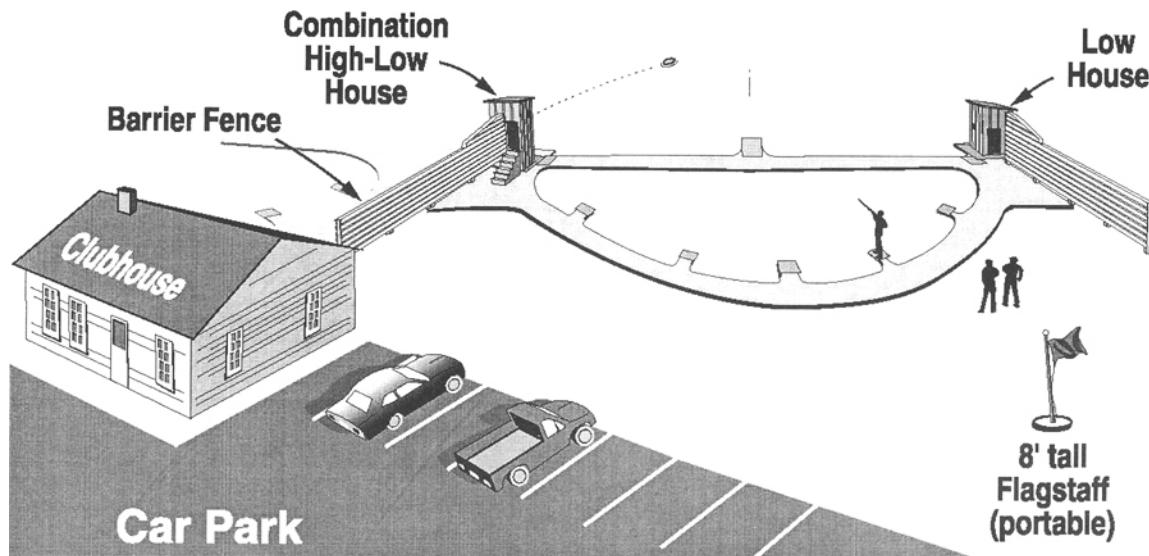


Figure 32: Skeet Range

The exterior of the skeet houses can be painted beige or an off-white colour so that the thrown targets can be more readily seen by the shooters.

Skeet houses are designed to accommodate either manual or self-loading traps. Critical dimensions (e.g. height or width) for these houses are user, or sport governing body, specified. Construction details can usually be obtained directly from the sport governing body, from trap manufacturers or ammunition manufacturers.

Unmanned skeet house construction shall be user specified.

Skeet houses with manually operated target throwers require human operators. Construction requirements for this type of skeet house are specified below and are intended to protect the operator.

1. The side and back walls, including a door if present, of the skeet house:
 - Shall be pellet-proof in the operator's work area to a height of 2.5 m above the floor;
 - If the construction is of normal wood frame, it shall be overlaid with two overlapped layers of 5 cm (nominal) thick planking or construction that meets or exceeds this requirement; and,
 - If the construction is concrete or cinder block, no additional protection is required.
2. If the trap operator is visible in their normal operating position from Stations 1, 7 or 8, there shall be a sheet metal chute affixed to the exterior of the skeet house to protect the operator from misdirected shot pellets. This chute shall be configured so that the operator, in their normal operating position, is not exposed to pellets fired into the skeet house from any shooting station.
3. Excluding the doorway and the opening through which skeet are thrown, there shall be no windows or openings into the operator's area of the skeet house.
4. There shall be a prominently displayed warning sign inside the operator's area of the skeet house instructing the operator:

- Not to look out of the skeet chute when the range is operating;
- Not to reach into the skeet chute when the range is operating; and,
- Not to leave the sheltered operator's area of the skeet house until given permission by the Range Officer.

Each manually operated skeet house is to be equipped with a **YELLOW** flag (approximately 30 cm x 45 cm) mounted to a short pole. This flag is intended to be used by the skeet house operator to signal to the Range Officer and shooters when shooting must be stopped (e.g. trap breakdown or target supply exhausted).

Shooting Stations

The shooting stations of the skeet range must:

- Be clearly marked; and,
- Be level and provide firm footing for the shooters under adverse weather conditions. The use of gravel, asphalt or concrete pads/pathways is recommended.

It is recommended that the shooting stations be approximately 90 cm square (e.g. 90 cm x 90 cm).

The typical arrangement of shooting stations is shown in [**Figure 31: Typical Skeet Range Layout**](#). The specific positioning of these stations shall be in accordance with sport governing rules. A field firing skeet range is shown in [*Figure 33: Field Firing Skeet Range*](#)

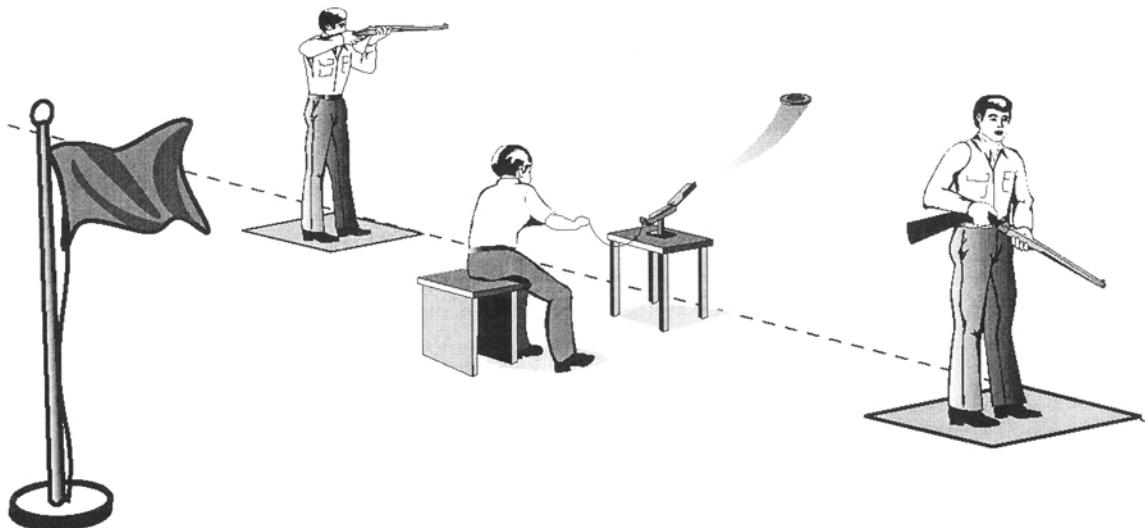


Figure 33: Field Firing Skeet Range

Skeet Target Mechanisms

The target-throwing mechanisms shall be functional (refer to [**section 6.1 Safety Considerations**](#)) and capable of throwing the targets reliably on the intended flight path. Maintaining consistency of target flight direction and height is an important consideration for a Skeet field. To assist in verifying target flight, a stake or post should mark the crossing point for targets thrown from the *high* and the *low* houses. This stake should be located approximately 5.5 m forward of Station No. 8.

The shooting boundaries should also be marked with posts or stakes placed at 40.25 m from each skeet house. This distance is measured in a straight line from each skeet house through the crossing point.

The traps should be adjusted to obtain target flight paths in accordance with the sport governing body's rules.

Note: As an example, ATA rules require the traps to reliably throw the targets from the low and high houses through a 0.9 m (approximately) diameter hoop located 4.6 m (approximately) above the crossing point; refer to [Figure 31: Typical Skeet Range Layout](#).

Barrier Wall - Adjacent Skeet Ranges

In situations where two or more Skeet fields are adjoining, they shall be separated by a barrier wall. This wall is intended to protect shooters on adjoining ranges from errant targets and misdirected shots. The barrier wall shall meet or exceed the construction requirements; refer to [Figure 34: Skeet Range Barrier Fence](#).

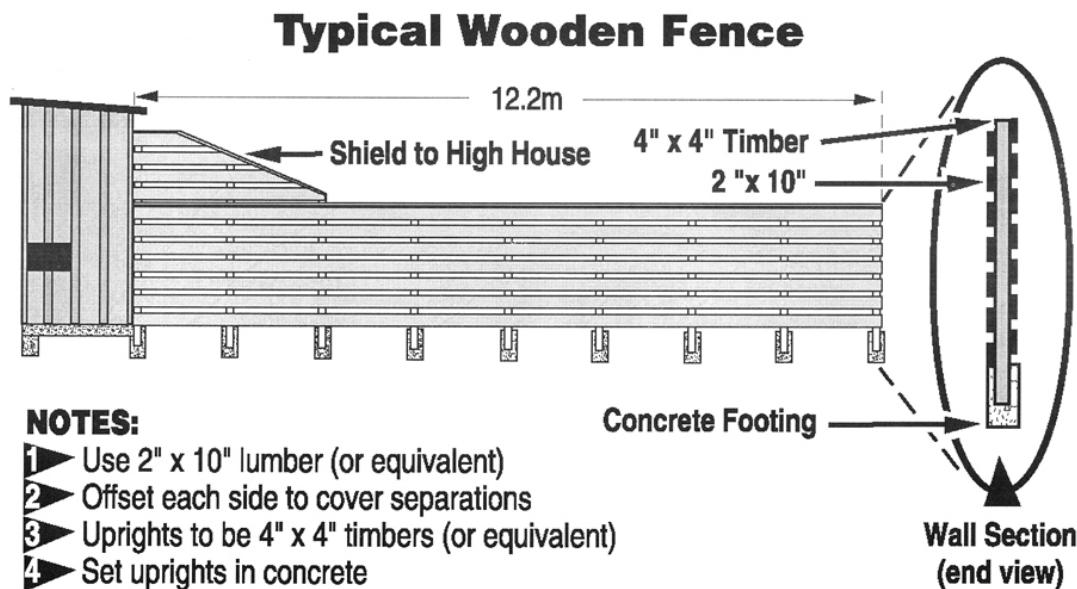
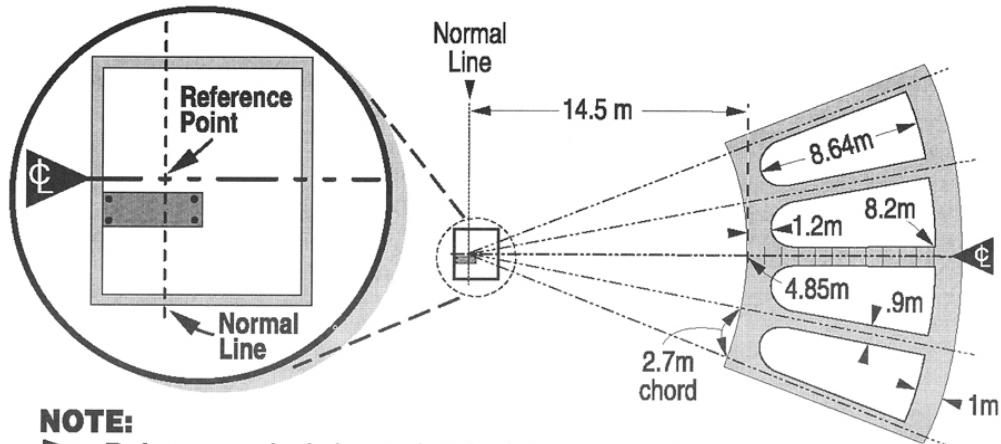


Figure 34: Skeet Range Barrier Fence

6.2.3 TRAPSHOOTING RANGE

Range Configuration

A standard ATA Trapshooting range has a single target house, located forward of a series of shooting stations, configured in a triangular shape; refer to *Figure 35: Typical Trap Field Layout*.



NOTE:

- Reference point is located at the intersection of the normal line and the centerline of the trap house.

Figure 35: Typical Trap Field Layout

Trap Houses

The trap house is located in accordance with *Figure 35: Typical Trap Field Layout*. The purpose of this structure is to house target throwing traps and target supplies.

Trap houses are designed to accommodate either manually operated or self-loading traps. The floor area of a typical trap house is approximately 2.4 m square. The trap house can be built on grade, or with part or all of it below grade. The necessary dimensions for the trap houses (e.g. height and width) are user, or sport governing body, specified. Refer to *Figure 36: Sample Trap House* for an example of one style of trap house. Unmanned trap house construction can be user specified.

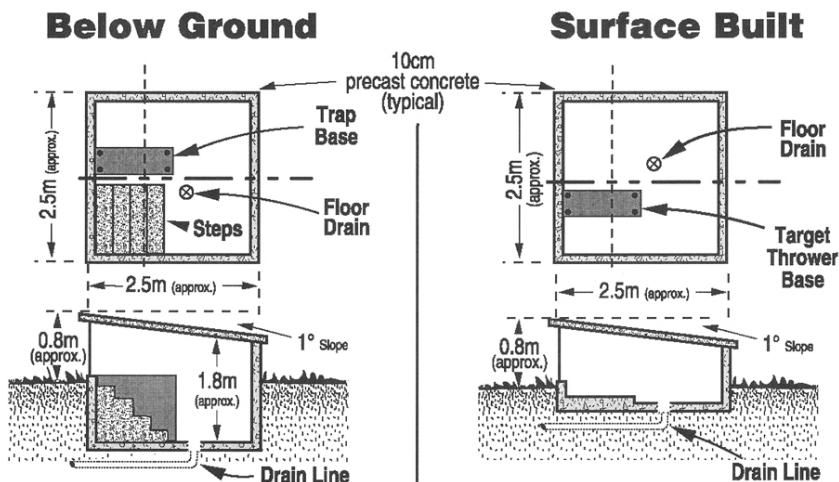


Figure 36: Sample Trap House

Trap houses with manual traps require human operators. Construction requirements for this type of trap house are specified below. The primary concern of these requirements is the protection of the operator.

1. The exposed roof, side and back walls of the trap house shall be pellet-proof. They shall be constructed of 10 cm thick poured concrete, or of a construction design that meets this requirement (e.g. cinder block). It is recommended that the roof be of a reinforced concrete design.
2. There shall be no windows or openings on the sides or rear of the trap house.
3. There shall be a prominently placed warning sign inside the operator's area of the trap house instructing the operator not to emerge from the trap house until given permission by the Range Officer.

Each manually operated trap house shall be equipped with a **YELLOW** flag (approximately 30 cm x 45 cm), mounted to a short pole. This flag is to be used by the trap operator to signal to the Range Officer and shooters that shooting must be stopped (e.g. trap breakdown or target supply exhausted).

Shooting Stations

The shooting stations of the trapshooting field must:

- Be clearly marked; and,
- Be level and provide firm footing for the shooters under adverse weather conditions. The use of gravel, concrete or asphalt pads/pathways is recommended.

It is recommended that the shooting stations be approximately 90 cm square. The typical arrangement of shooting stations is shown in [**Figure 35: Typical Trap Field Layout**](#).

Trap Target Throwing Mechanisms

The target throwing mechanisms shall be functional as described in [**section 6.1 Safety Considerations**](#).

6.2.4 FIELD FIRING SKEET RANGE

Range Configuration

This type of *ad hoc* Skeet range is very simple to construct and operate. It consists of a manually powered and operated target thrower or a mechanical trap, and one or more shooting stations; refer to [**Figure 33: Field Firing Skeet Range**](#).

Shooting stations

The shooting stations of the field firing Skeet range must:

- Be clearly marked;
- Shall be abreast of the target thrower; and,
- Be level and provide firm footing for the shooters under adverse weather conditions. The use of gravel, concrete or asphalt pads/pathways is recommended.

It is recommended that the shooting stations be at least 90 cm square.

Trap Mechanisms

The mechanical traps shall be functional as described in [section 6.1 Safety Considerations](#).

If a manual target thrower is utilized, the operator shall be familiar with its operation and aware of the limits of the safety area.

6.3 SAFETY AREA TEMPLATES

6.3.1 SKEET

The standard Skeet range safety area templates are illustrated by [Figure 73: Safety Area Template S1 – Skeet Range Safety Area](#) in Appendix D: Safety Area Templates.

6.3.2 TRAPSHOOTING

The standard Trapshooting range safety area templates are illustrated by [Figure 74: Safety Area Template S2 – Trap Range Safety Area](#) in Appendix D: Safety Area Templates.

6.3.3 FIELD FIRING

The field firing Skeet range safety area templates are illustrated by [Figure 76: Safety Area Template S4 – Field Firing Skeet Safety Area](#) in Appendix D: Safety Area Templates.

7 SPORTING CLAY RANGES

Sporting clay ranges are established with different shooting scenarios configured to simulate hunting-type settings. The typical sporting clay range consists of various shooting stations laid out in a circuit or configured around multi-station towers. Each station consists of a shooting position and target thrower(s) designed to throw frangible targets on a specific flight path or within an intended arc.

Sporting clay shooting is popular for a number of reasons. Its courses-of-fire are challenging, imaginative and flexible, and they are changed periodically. Assessments of this type of range must take these factors into account.

There are sporting organizations that have established operating and facility construction rules for sporting clay ranges. These sport governing body guidelines are very useful and should be consulted by range builders, as they supply more application specific and detailed construction information than does this section. This section of the guidelines is primarily concerned with safety issues and does not address regulatory issues relevant to sport governing (competition) rules.

In matters of safety, the requirements of this section must be met. However, in areas that are not safety-related and that pertain to regulatory sport governing rules, the requirements of the sport governing body can take precedence.

7.1 SAFETY CONSIDERATIONS

The design and construction of a sporting clay range often makes use of the local terrain and tree/brush foliage. Each shooting station is unique. In order not to make the safety area requirements prohibitive, the actual shooting conditions for each station must be determined and the safety area matched to those specific requirements.

Acknowledging that the shooting stations are moved periodically, **the Range Operator is not required to notify the CFO of every change in shooting station location or design.**

However, the Range Operator is required to maintain a small scale site plan of the range area with the shooting stations and their safety zones clearly indicated. The limits of the range property and sites of human activity shall be clearly indicated on the site plan.

The site plan shall be clearly displayed at a common meeting place at the range (e.g. a clubhouse) and shall be updated as required. A copy of this plan shall be made available to the CFO upon request.

The use of Global Positioning System (GPS) technology is useful for fixing the location of firing stations and direction of fire from those stations.

Note: GPS users must be aware of the position locating errors inherent in the instrument and take these errors into account when siting the shooting stations. The positional errors inherent with GPS' designed for civilian use can be +/- 30 m, or larger.

7.1.1 HUMAN ACTIVITY – SAFETY AREA

The general allowance of human activity within a range safety area, as described in [**section 1.2 Range of Safety Areas**](#), cannot be afforded to sporting clay ranges. Human activity should not be approved within the safety area of a sporting clay range when it is in operation.

7.2 SAFETY AREAS

The determination of the safety area requirements for each sporting clay station is based on the particular course-of-fire planned for that shooting station. The safety areas are essentially “pie”-shaped. The depth of the safety area is determined by the distance the pellets will travel given the Vertical Angle of Fire (VAoF) of the shotgun as the target is engaged, the velocity of the pellets, and their size (weight).

There are three safety area templates available for use on sporting clay ranges, which have been combined in Template S3; refer to [Figure 75: Safety Area Template S3 – Sporting Clay Safety Area](#) in **Appendix D: Safety Area Templates**. Each of these templates is designed for a different VAoF, as measured from the horizontal. For each station, a VAoF is selected based on the height of the target’s flight path (relative to the shooter) at which it *can be reasonably* engaged by the shooter.

For simplicity, the VAoFs are categorized as being low, medium or high angles of fire. Refer to *Table 10: Vertical Angles of Fires* and *Figure 37: Vertical Angle of Fire for Sporting Clay* for more information.

Table 10: Vertical Angles of Fire

Category	VAoF
Low	-5 to 5 degrees ¹
Medium	>5 to 60 degrees ²
High	>60 to 90 degrees

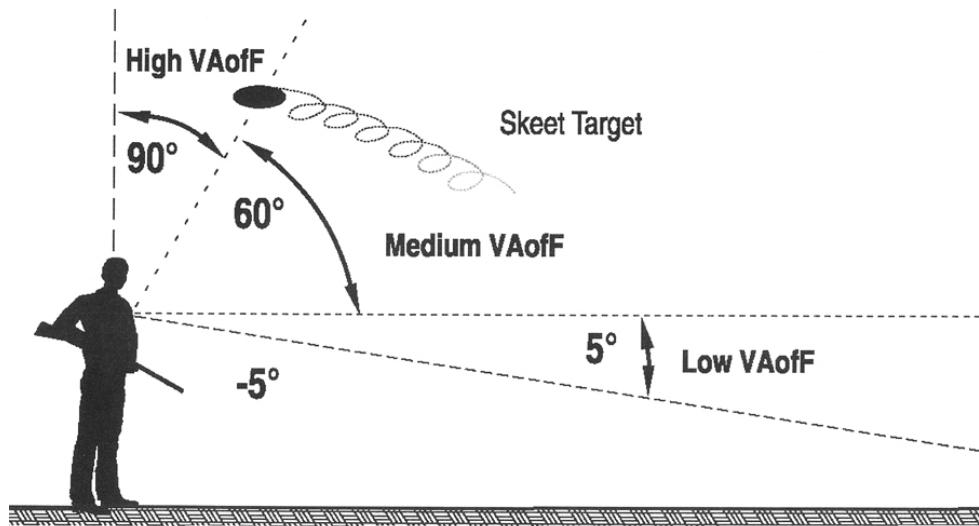


Figure 37: Vertical Angle of Fire for Sporting Clay

¹ Angles are measured from the horizontal, 0° being horizontal and 90° being vertical.

² “>” is the symbol for “greater than.”

If the target paths, when they can reasonably be engaged, span more than one vertical angle category (e.g. high and medium), then the template with the greatest safety distance shall be the one applied.

After selecting the correct template, based on the target's flight height, the angular width of the template must be determined. The Horizontal Angle of Fire (HAoF) is determined by one of the two methods listed below:

1. In the case where a shooting stall is utilized to restrict the shooter's swing of the shotgun, the HAoF is defined by the design of the shooting stall. The HAoF is the horizontal arc that an average shooter, *properly positioned* in the stall, will attain; refer to *Figure 38: Sporting Clay Horizontal Angle of Fire (Shooting Stall)*.
2. When no shooting stall is utilized, the HAoF is defined by the horizontal arc through which the shooter can fire at their target, plus 3.4° (60 mils) to the left and right of that arc; refer to *Figure 39: Sporting Clay Horizontal Angle of Fire (Without a Shooting Stall)*.

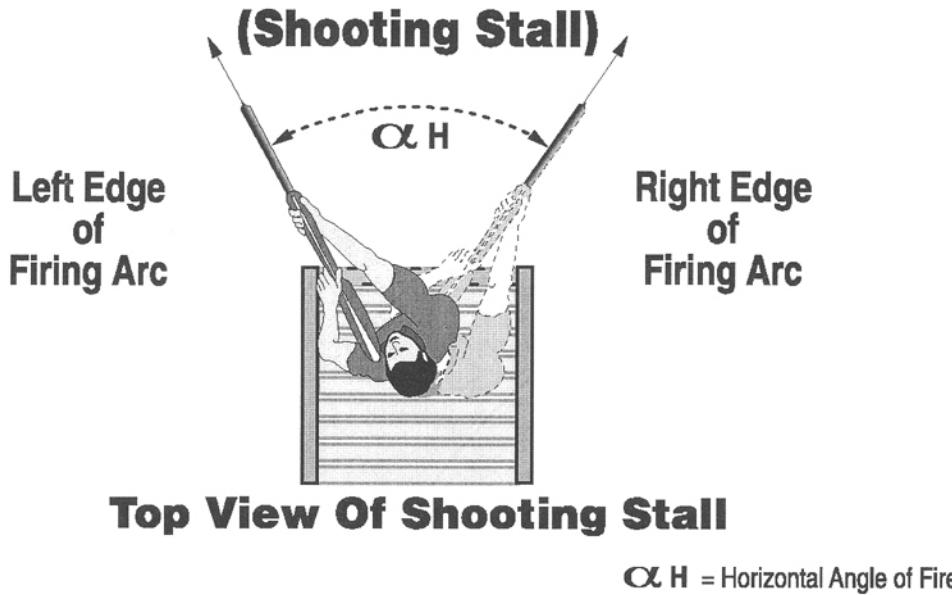


Figure 38: Sporting Clay Horizontal Angle of Fire (Shooting Stall)

(Without A Shooting Stall)

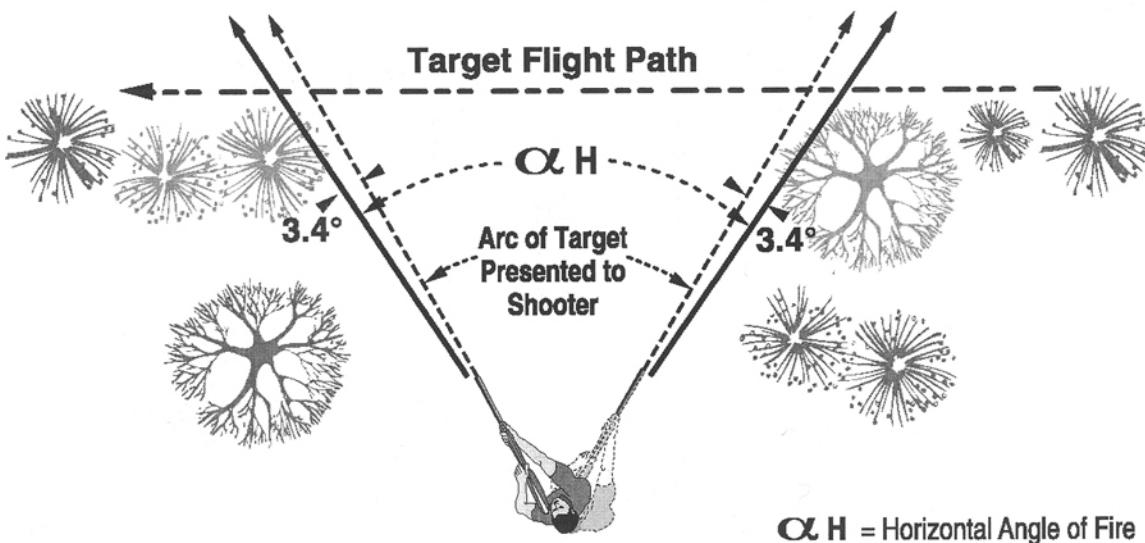


Figure 39: Sporting Clay Horizontal Angle of Fire (Without a Shooting Stall)

7.2.1 AMMUNITION

The safety area templates provided in [Appendix D: Safety Area Templates](#) are for shotshell ammunition loaded with a variety of different sized lead alloy shot pellets fired at a velocity of 396 m/sec (1,300 ft/sec). The correct template to use is the one for the largest diameter of the shot pellets being used on the range. If the templates provided in [Appendix D: Safety Area Templates](#) do not match (or exceed) the intended range use, contact the CFO for more information.

Note: Velocity measurements are to be taken within 1.5 m of the shotgun muzzle.

An elaborate shooting stall is not required to restrict the shooter's CofF (horizontal and/or vertical angles of fire). It can be effectively controlled with a simple arrangement of poles or framing, as long as the poles are sturdily constructed and the shooter's firing position is clearly marked.

7.2.2 REDUCED SAFETY AREAS

Trees, brush and shrubs do not provide barriers that can be used to reduce the safety template requirements.

Hills and similar topographical features within the trajectory envelope can be used to reduce safety template requirements; refer to [section 1.2 Range of Safety Areas](#).

7.3 RANGE LAYOUT

Whenever possible, range safety areas from any shooting station should not overlap other shooting stations, walking trails or areas likely to be frequented by people. However, sometimes this situation cannot be avoided and range safety areas do overlap other range areas when those areas are in use. In those situations, a flag, beacon or similar warning system shall be installed. This warning system shall be used to prevent firing onto the downrange area when it is in use. The colour designation for the warning system shall be in accordance with [section 1.7 Warning Flags and Beacons](#).

The layout of a sporting clay range is flexible and user defined, provided that the requirements of this section are satisfied and that all range safety areas are confined to the land area formally or informally controlled by the Range Operator, in accordance with [section 1.2 Range of Safety Areas](#).

7.4 RANGE EQUIPMENT

7.4.1 SHOOTING STATIONS

There is a variety of shooting station designs that can be utilized on a sporting clay range. The designs can be simply marked stations, shooting stalls or more elaborate scenario-based ones, such as a duck boat simulation.

This subsection is intended to provide general guidance with regard to shooting stations. Each particular configuration will have to be individually assessed using discretion and a common sense approach.

Marked Shooting Stations

The shooting stations shall:

- Be clearly identified with a reference number that can be related to a site plan;
- Be clearly marked with the planned course-of-fire from that station (e.g. 25 yd bounding rabbit or “fur and feather,” etc.); and,
- Provide firm footing for the shooters under adverse weather conditions. The use of gravel, asphalt or concrete pads/pathways is recommended.

It is recommended that the shooting stations be approximately 1 m x 1 m.

Shooting Stalls

The use of shooting stalls is permitted and encouraged when it is practical. They are an excellent method of restricting the shooter's HAoF, and/or the VAoF, and thereby reducing the land area required for a safety area; refer to *Figure 40: Sporting Clay Shooting Stall* for a shooting stall example.

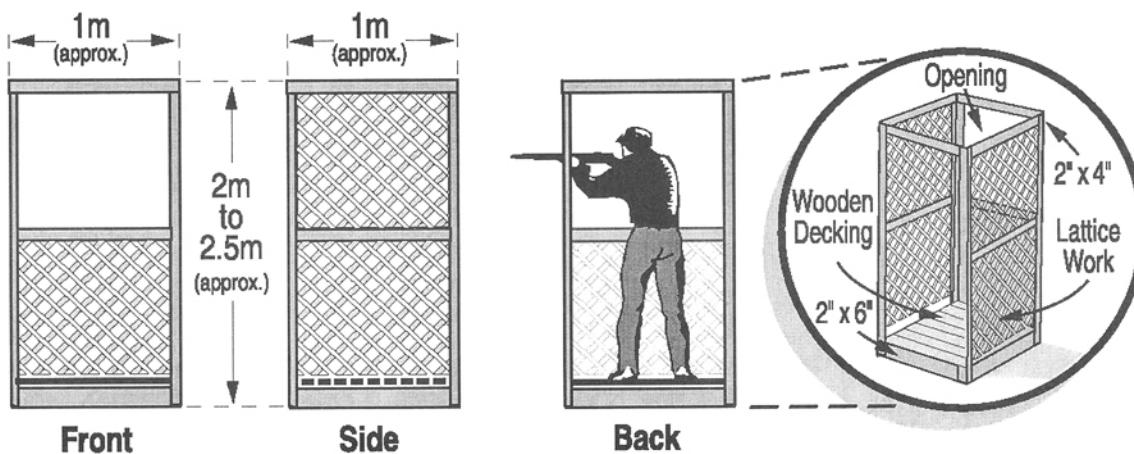


Figure 40: Sporting Clay Shooting Stall

Shooting stalls shall:

- Be of sturdy construction;
- Be properly situated to ensure that they are stable and do not wobble or tilt when used;
- Provide firm footing for the shooter;
- Be clearly identified with a reference number that can be related to the site plan; and,
- Be clearly marked with to the planned course-of-fire from that station (e.g. 25 yd bounding rabbit).

Scenario Shooting Stations

This style of shooting station is more elaborate in nature and is intended to simulate, as close as possible, particular hunting situations (e.g. goose blind). These stations may have an intentional degree of instability (e.g. a floating duck boat) as a result of their design and construction. Shooting station instability is acceptable, as long as it is intentional and adequate safety provisions are in use to ensure that unintentional discharges or misdirected shots do not occur as a result.

The permission for shooting station instability is limited to specifically designed scenario shooting stations. **It is not a substitute for poor construction or design.**

Scenario shooting stations shall:

- Be of sturdy construction;
- Be clearly identified with a reference number that can be related to the site plan;
- Be clearly marked with the planned course-of-fire from that station (e.g. overhead duck); and,
- Have clearly defined safety procedures for the use of the station (e.g. when to enter the shooting station and when to load, etc.).

7.4.2 EQUIPMENT PROTECTION

It is recommended that any range equipment within the HAoF be protected by earthen berms, planking or similar construction.

7.4.3 OPERATOR PROTECTION

Whenever equipment operators (e.g. a target thrower operator) are *forward* of the shooting station while firing is conducted, they shall be adequately sheltered from direct pellet impact, pellet ricochet and target fragmentation. The forward area is defined as any area within a 180° arc of the shooting station; refer to *Figure 41: Sporting Clay Horizontal Angle of Fire*.

If the operator's location is outside of the CofF for the shooting station, they shall be sheltered by two layers of overlapped 5 cm planking or other construction materials affording equivalent or greater protection.

If the operator's location is within the CofF for the shooting station, they shall be sheltered by 10 cm of poured concrete or other construction materials (e.g. cinder block) that afford equivalent or greater protection.

The *entire* operator's area will be sheltered from shotgun fire from the shooting station.

Ensure that there are no ricochet surfaces present, which could direct pellets into the operator's sheltered area.

There shall be a prominently displayed sign in the operator's area cautioning them to remain under cover until instructed to emerge by the Range Officer.

Each trap operator or operator's station shall be equipped with a **YELLOW** flag (approximately 30 cm x 45 cm) mounted to a short pole. This flag shall be used by the trap operator to signal to the Range Officer and shooters when shooting must be stopped (e.g. due to trap breakdown or exhausted target supply).

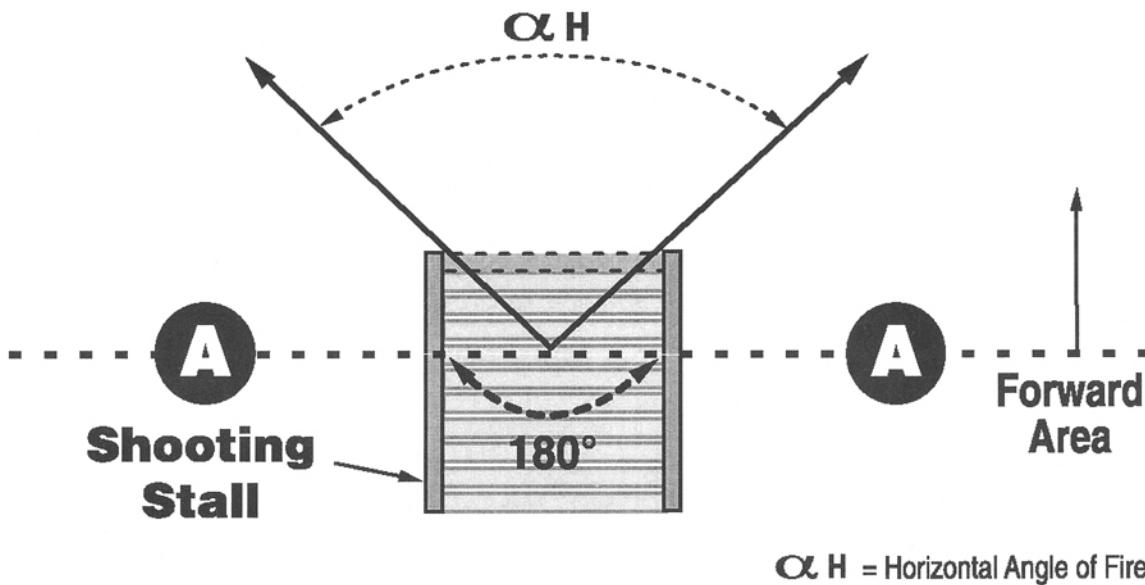


Figure 41: Sporting Clay Horizontal Angle of Fire

8 BAFFLED RIFLE AND HANDGUN RANGES

This section pertains to rifle and handgun ranges that have a system of overhead baffles and side berms (or baffles) that are used to contain all fired bullets and ricochets to the active range area. By definition, when properly designed and constructed, this type of range does not require a downrange safety area.

Baffled rifle and handgun ranges consist of one or more firing lines, an active range area, one or more target lines, a backstop and a network of overhead baffles and side berms or side baffles. They may also have a variety of range equipment and structures required for its intended use (e.g. target sheds, overhead firing point cover, target mechanisms or target markers gallery); refer to *Figure 42: Type II Baffled Handgun Range* for a layout of the baffled handgun range.

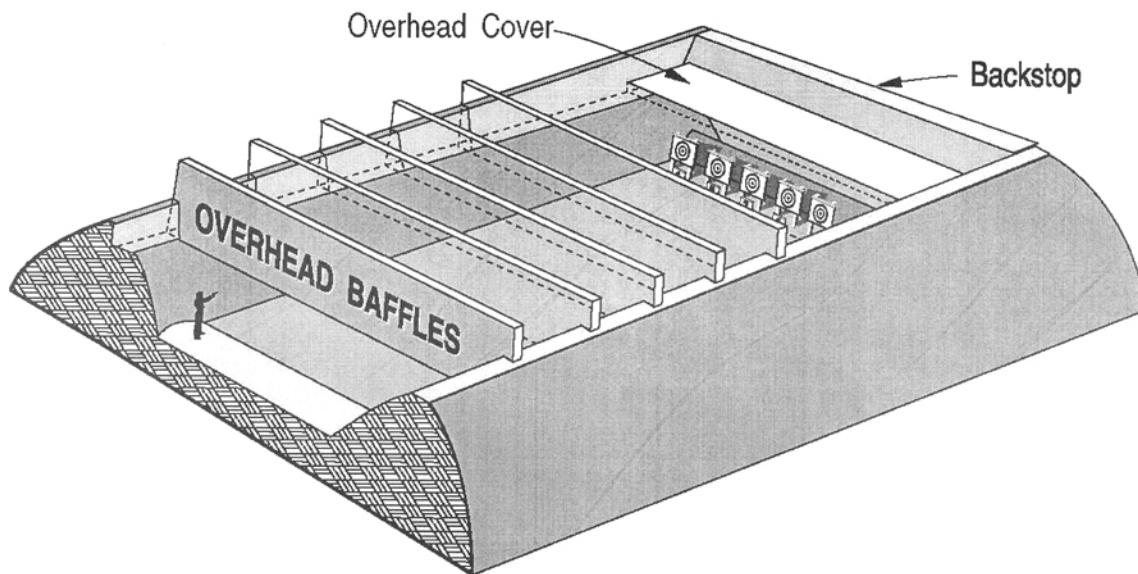


Figure 42: Type II Baffled Handgun Range

There are a number of ways to achieve the aims of this section. This is particularly true in the selection of construction materials. Alternate materials and configurations are acceptable, as long as they provide a comparable level of safety to the requirements described in this section.

There are different requirements for baffled ranges that are used for handgun shooting only, as opposed to those that are used for both rifle *and* handgun shooting. These differences arise from the different penetration capabilities of the different calibre groups.

This section considers handgun and rifle usage on baffled ranges. For more information about shotgun usage on these ranges, contact the CFO.

8.1 SAFETY CONSIDERATIONS

The absence of any significant downrange safety area makes the complete containment of all shots and ricochets to the active range area the primary safety issue for baffled ranges. As a result, diligent care must be taken in the design, construction, approval and operation of baffled ranges.

The courses-of-fire planned for the range must be taken into account when designing and constructing a baffled range. Range safety can be compromised by conducting courses-of-fire for which the range was not designed. Therefore, the [Range Operating Instructions](#) and the planned courses-of-fire are important considerations for all baffled ranges.

The more complex the course-of-fire requirements are for a baffled range, the more complex the construction requirements are likely to be.

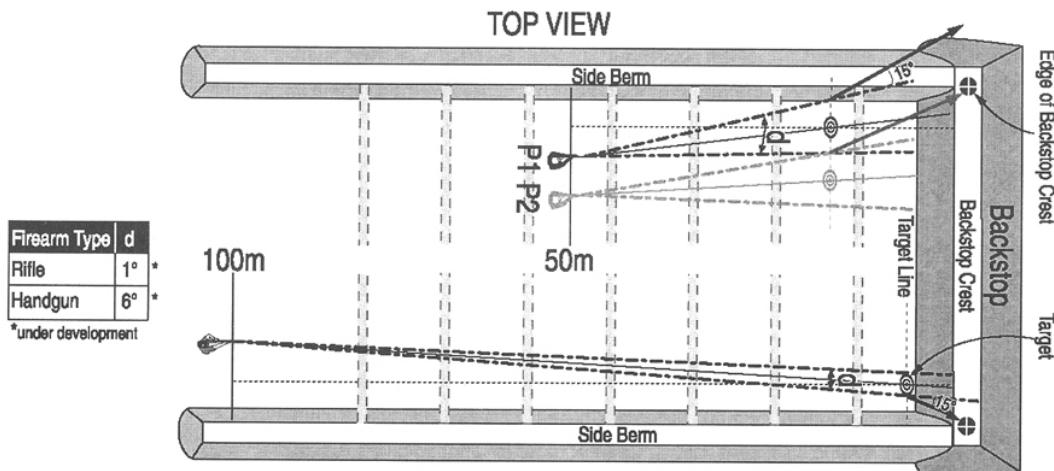
Due to construction limitations, it is not generally practical to baffle a rifle range with a firing distance longer than 300 m.

For baffled ranges, steel or similar high-ricochet surfaces in the active range area, which are exposed to rifle or handgun fire (e.g. baffle supports), pose an unacceptable ricochet risk. Therefore, these surfaces shall be clad in timber or other similar materials designed to contain or prevent ricochets, or placed behind shelters designed to contain ricochets.

If the use of steel targets is planned for a baffled range, care must be taken to ensure that ricochets from these targets are contained within the range. This can be accomplished by sheltering the targets within revetments or within a structure designed to capture or direct all ricochets.

If any doubt exists as to the penetration protection provided by any baffle system or construction, the key system components (e.g. the baffles) can be tested; refer to [section 8.11 Safety Area](#).

Cross-range firing at extreme angles dramatically increases the chance of bullets escaping from a typical baffled range. Therefore, it is good practice to ensure that the left and right deviation of the arc of fire is constrained. When courses-of-fire do not require engaging targets to be directly in front of the shooter, refer to *Figure 43: Cross-Range Shooting on a Baffled Range* for information on how to determine the maximum allowable left/right deviation between the target and the shooter.



Note 1: Target location or shooter repositioning required (See P2)

Note 2: Two shooters shown in their respective positions for illustration purposes only.

Figure 43: Cross-Range Shooting on a Baffled Range

8.2 RANGE LAYOUT

A baffled range is designed to virtually contain all fired projectiles and ricochets generated in the course of normal range operations. This is accomplished through a network of baffles, a backstop and range side berms or side walls.

There are two basic designs for baffled ranges (Type I and Type II). These two types of baffled ranges are primarily differentiated by the presence (or absence) of ground baffles and the configuration of the overhead baffles; refer to Figures 44: *Type I Baffled Range* and 45: *Type II Baffled Range*. Baffled range features are listed in *Table 11: Baffled Range Types*.

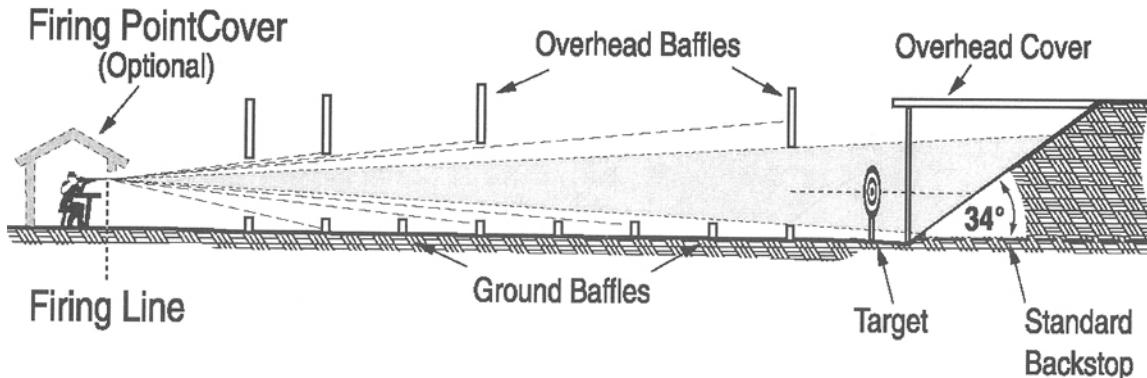


Figure 44: Type I Baffled Range

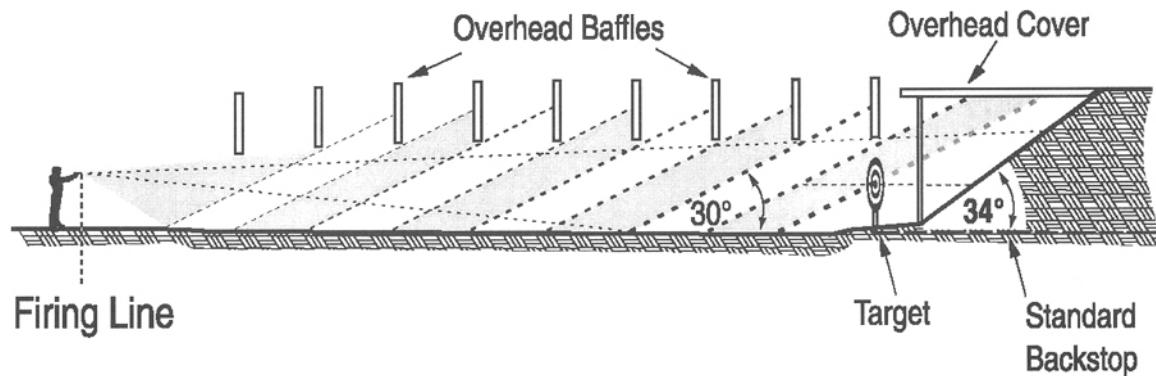


Figure 45: Type II Baffled Range

Table 11: Baffled Range Types

Range Feature	Type I Range	Type II Range
Overhead Baffles	Yes	Yes
Ground Baffles	Yes	Optional
Defined Firing Lines	Yes	No
Firing Area	No	Yes
Side Berms/Walls	Yes	Yes

Range Feature	Type I Range	Type II Range
Firing Point Overhead Cover	Optional	Optional
Backstop Cover	Yes	Yes

8.2.1 RANGE ORIENTATION

The existence of overhead and side baffles will likely diminish the amount of wind *and light* entering the active range area in comparison to standard outdoor ranges. Therefore, the range can be oriented in any direction; however, care should be taken to ensure that the orientation selected will maximize the amount of sunlight entering the active range area.

8.3 BACKSTOPS

This section is in accordance with [section 2.1 Backstop Design and Construction](#), except as noted below.

8.3.1 BACKSTOP HEIGHT

The minimum backstop height is determined by the individual range and baffle design. The height of the backstop shall be sufficient to ensure that its crest is not visible beneath any baffle, from any intended firing height, at any intended firing position.

8.3.2 BACKSTOP CREST LENGTH

The length of the backstop crest must exceed the crest of the left and right flank, range side berms or the peak of the range side walls.

8.3.3 OVERHEAD BACKSTOP COVER

The backstop shall have an overhead cover (roof). This feature is designed to prevent the escape of projectiles that ricochet off of the targets or the backstop itself from leaving the active range area.

Due to the diminished penetration performance of the projectiles that can ricochet in to it, the overhead backstop cover shall meet (or exceed) 25% of the requirements for the most bullet-resistant baffle on the range.

The overhead backstop cover shall:

- Not be exposed to direct bullet impacts;
- Project forward to cover the base of the backstop; and,
- Run the length of the backstop crest.

Different construction specifications are expected and acceptable for overhead backstop covers due to varying structural requirements (e.g. snow loading, drainage, etc.).

No portion of the overhead backstop cover (excluding supports) shall be visible from any intended firing location at any intended firing height. In addition, the backstop cover shall be embedded into the backstop such that no gaps exist between its base and the crest of the backstop.

8.3.4 BULLET CATCHERS

The use of inclined bullet catchers on the backstop of a baffled range is optional; however, it is recommended. If present, bullet catchers shall be built in accordance with [section 2.1.6 Bullet Catchers](#), except as noted below.

Steel bullet traps and related technologies are available from commercial manufacturers for outdoor ranges. They can be used in lieu of the backstop bullet catchers on baffled ranges. If they are employed, then the calibre/bullet nature rating of the trap shall match the maximum calibre/bullet nature intended to be fired on the range. Documentation describing the bullet trap ratings shall be provided to the CFO during the Range Approval application process.

8.4 OVERHEAD BAFFLES

Overhead baffles are required to prevent a bullet from leaving the active range area, as they can intercept a high or wide shot, capture a ricochet and intercept the bullet before it can ricochet.

There are three types of baffles: overhead, ground and side baffles.

Overhead baffles are vertical or inclined panels suspended above the range floor. They are designed to capture unintentional high elevation shots and ricochets.

All baffles must be constructed in such a way as to prevent bullet perforation. Perforation is defined as the complete penetration (and exit) of a baffle by a bullet. Therefore, baffle designs must be matched with the penetration capabilities of the ammunition being fired on the range. Baffles are categorized as being able to contain:

- Rim-fire rifle and rim-fire handgun calibres;
- Centre-fire handgun calibres; and,
- Centre-fire rifle calibres.

Unless otherwise specified, the bullet nature designs used in this section of the guidelines shall be: for centre-fire cartridges, lead alloy core with copper alloy jacket, FMJ; and for rim-fire cartridges, lead alloy construction. Contact the CFO for additional information, if armour piercing, steel jacketed or high penetration (solid core or tungsten penetrator, etc.) bullets are to be fired.

Due to the fire risk to range structures (e.g. baffles) posed by tracer and incendiary ammunition, their use is not recommended on baffled ranges.

8.4.1 LOCATION OF OVERHEAD BAFFLES

Type I baffled ranges have an arrangement of overhead baffles that is somewhat concentrated near the intended firing line(s). The baffles are spaced more closely together, nearer to the planned firing lines, and they are spaced further apart, the greater the distance downrange at which they are placed.

The first baffle forward of any intended firing line shall be located no more than 5 m forward of that firing line. Subsequent downrange baffles are placed such that “no blue sky” is visible beneath the first baffle from all intended firing height(s), at all intended firing locations; refer to [Figure 44: Type I Baffled Range](#).

Type II baffled ranges enjoy the flexibility of a firing area instead of specific firing lines; however, they have more overhead baffles. This type of baffled range requires an arrangement of overhead baffles that are regularly spaced over the entire active area of the range. The overhead baffles start at a point no more than 5 m forward of the most distant firing line and end less than 5 m from the base of the backstop.

Type II baffled ranges do not require ground baffles. However, the overhead baffles must be of sufficient height and placed to ensure that they capture any ricochets achieving a 30° angle of departure from the range floor. In addition, these baffles are positioned such that “no blue sky” is visible from any intended firing height, from anywhere in the firing area; refer to [**Figure 45: Type II Baffled Range**](#).

The positioning of overhead baffles is dependent on their specific overall height. In general, the taller the baffles are, the greater the permissible spacing between them.

The overhead baffles on the range should be positioned to have approximately 2.5 m, or more, clearance between their underside and the surface of the range floor. This separation allows for the free movement of shooters and range staff over the range floor and helps to ensure that the baffles are hit only infrequently by direct shots.

The design and placement of all baffles must be assessed against all the intended firing line(s) and firing height(s).

8.4.2 CONSTRUCTION OF OVERHEAD BAFFLES

Overhead baffles shall have a minimum vertical dimension of 1.25 m.

Overhead baffles shall be supported by columns properly embedded in the ground, in accordance with local building codes. All support columns shall be located between firing lanes.

If the overhead baffles become vertically misaligned (e.g. by frost heaving of supports), such that gaps in the overhead or ground baffle coverage occur, the Range Operator shall cease using the range immediately. When repairs have been made to realign the baffles, the range can be returned to service.

Overhead baffles can use any of the following materials (in any combination) in their construction: timber, concrete, steel or gravel. The thickness of the baffles shall be sufficient to prevent perforation by the maximum calibre and bullet nature for which the range was designed; refer to *Table 12: Recommended Baffle Construction* for recommended materials and thicknesses.

Table 12: Recommended Baffle Construction

Materials	Rim-fire Handgun and Rim-fire Rifle	Centre-fire Handgun	Centre-fire Rifle
Timber ³	150 mm	200 mm	375 mm
Concrete ⁴	75 mm	150 mm	200 mm
Steel ⁵	5 mm	8 mm	11 mm
25 mm (1 inch) Gravel	100 mm	150 mm	300 mm

Alternate construction materials for baffles are acceptable, as long as they provide equivalent or greater ballistic protection. If materials or construction techniques used in the fabrication of overhead baffles are different from those listed in *Table 12: Recommended Baffle Construction*, then they shall be approved for use in accordance with [**section 8.12 Baffle Design, Approval and Testing.**](#)

The face of the baffles exposed to the shooters shall be overlaid with at least 5 cm of planking or similar material to reduce bullet backsplash. This timber (or equivalent) outer layer shall be constructed with at least a 5 cm air gap between it and the baffle itself.

The air gap between the baffle core and the exterior cladding is used to:

- Reduce the backsplash effect of impacting bullets;
- Improve the sound absorption properties of the baffles; and,
- Allow periodic inspection of the baffle core.

Inspection of the baffle cores should be conducted regularly. This inspection is undertaken to ensure that the baffle cores have not been significantly damaged by bullet impacts or degraded by weathering. Degraded or damaged baffles shall be repaired as required.

The overhead baffles shall run the width of the range and shall meet or exceed the crest of the range side berms or the peak of the side walls.

8.5 GROUND BAFFLES

Ground baffles are required for Type I baffled ranges; they are not required for Type II baffled ranges. Ground baffles are utilized to intercept low shots before they can make contact with the ground, thus eliminating a source of ricochets.

Type I baffled ranges use ground baffles in conjunction with overhead baffles to provide a very effective means of bullet capture. However, shooters are constrained to specific firing lines, as they are blocked from moving freely over the active range area.

The number and location of the ground baffles is determined by their height above the ground level. The taller the ground baffles are, the fewer of them are required. The ground baffles can be located beneath the overhead baffles or at another interval.

³ Softwood Timber

⁴ Aggregate Concrete – min. 20 N/mm² (3000 psi) strength, 20 mm aggregate

⁵ Mild Steel (0.15%-0.25% Carbon)

Ground baffle height and placement shall be such that the ground surface of the range floor cannot be visible more than 5 m forward (towards the targets) from any intended firing location, at the intended firing height.

Ground baffles shall rise vertically from the ground. They shall meet the construction requirements of the overhead baffles. As an option, ground baffles can be backfilled with soil for additional support.

Ground baffles shall be fitted with an angled timber (or equivalent material) cap piece. The downward slope of the cap piece shall be sufficient to prevent bullets ricocheting off of the top of the ground baffle. It is recommended that this surface have a downward slope of at least 5°; refer to *Figure 46: Ground Baffle Design*.

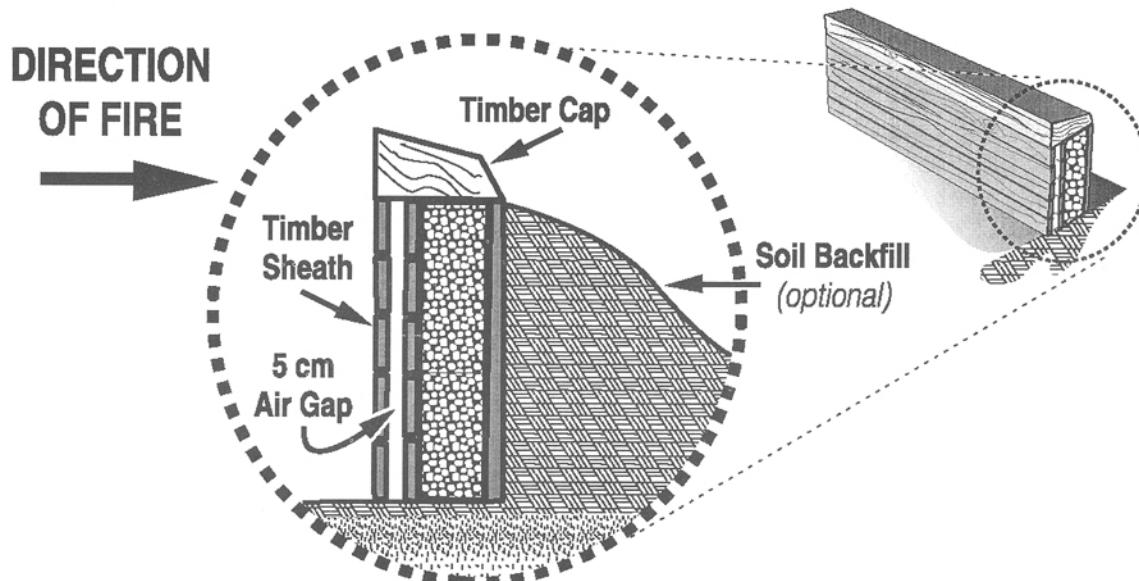


Figure 46: Ground Baffle Design

The baffle cap shall not be considered as part of the baffle when assessing baffle placement or height.

Targets are not to be placed on the top of the ground baffles.

An example of steel target revetments is illustrated in *Figure 47: Steel Target Revetments*.

The ground baffle cap pieces are to be repaired or replaced as soon as they have become significantly damaged from bullet impacts.

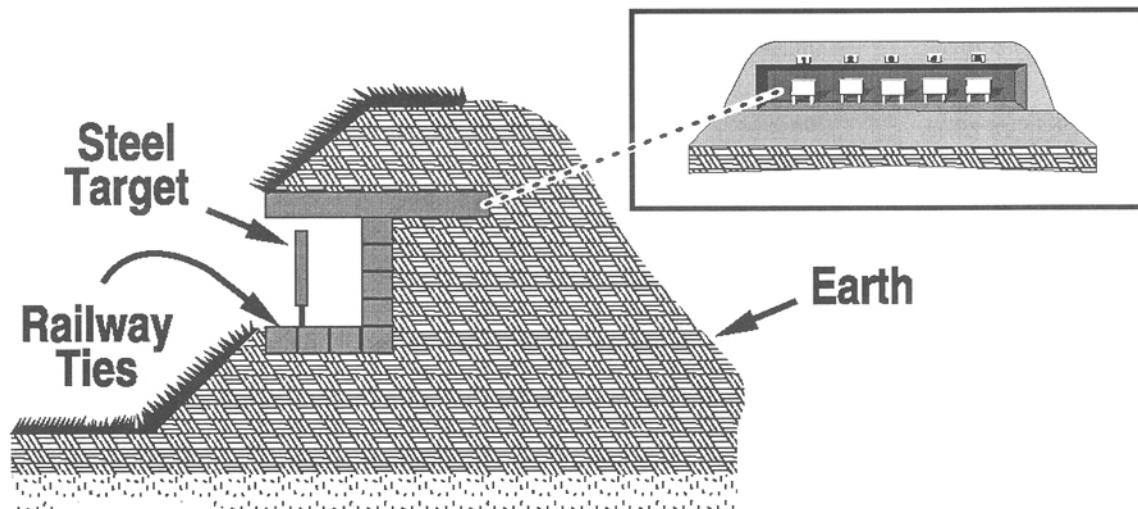


Figure 47: Steel Target Revetments

8.6 SIDE BERMS / SIDE WALLS / SIDE BAFFLES

The side berms or side walls shall run the length of the active area of the range. They shall begin at least 1 m behind the most distant firing line. They shall be joined to the backstop.

All baffled ranges shall have side berms or side walls. They shall have a minimum height of 3 m above the range floor. Their minimum height shall also exceed the height of the overhead baffle underside by at least 50 cm.

Side walls can be combined with side berms to achieve the necessary heights.

8.6.1 SIDE BERMS

Unless otherwise specified in this subsection, side berms shall be in accordance with [section 2.5 Berms](#).

If side berms are used, their base shall be located at least 2 m away from the outside edge of the flank target lanes.

8.6.2 SIDE WALLS

Side walls shall rise vertically from the range floor.

They shall meet or exceed 70% of the construction requirements (by thickness) of overhead baffles, described in [Table 12: Recommended Baffle Construction](#).

8.6.3 SIDE BAFFLES

If the side berms do not meet the requirements (e.g. slope, composition, etc.) of [section 2.5 Berms](#), the range shall be fitted with vertical side baffles. The side baffles are designed to shelter the side berm from direct fire impacts from any intended firing distance; refer to [Figure 48: Overhead / Side Baffles](#).

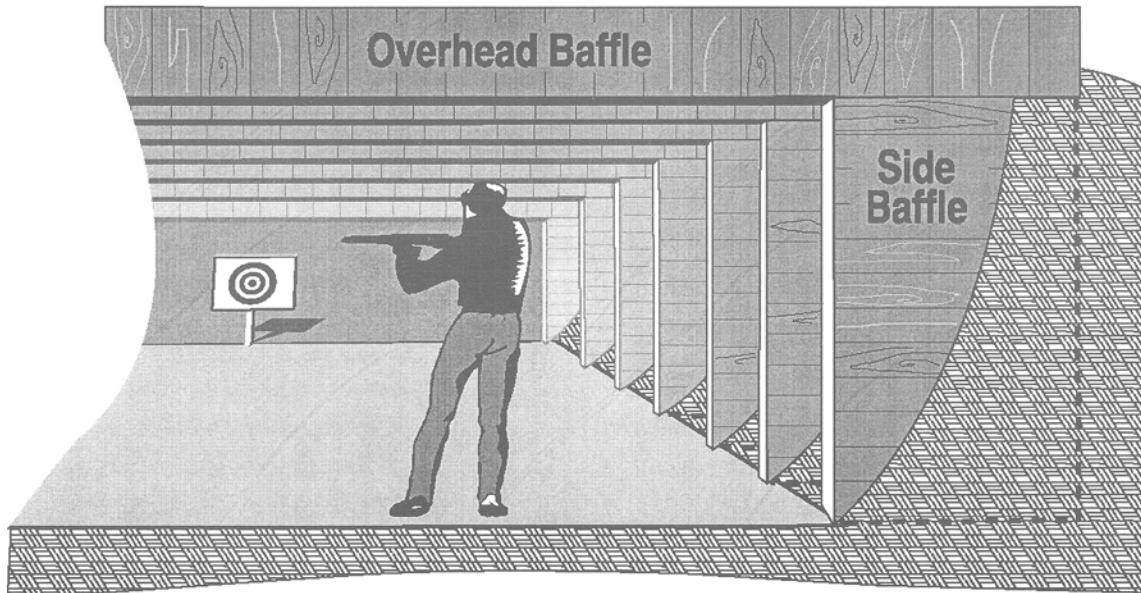


Figure 48: Overhead / Side Baffles

In general, side baffles shall be located in places that ensure the side berm is sheltered from direct bullet impacts initiated from any intended firing distance. The side baffles will be placed so that the adjacent side berm is not visible from the outside two firing lanes closer than a point that is 5 m forward of the intended firing position.

The specific locations of the side baffles will depend on the intended firing distance and the width of the side baffles. Refer to the method for locating overhead baffles for Type I baffled ranges in [**section 8.4.1 Location of Overhead Baffles**](#).

To reduce the probability of repeated bullet impacts on the side baffles, there shall be at least 1 m clearance between the inside edge of all side baffles and the outside edge of the adjacent flank firing lane or firing location.

If the side baffles are co-located with the overhead baffles, they shall rise vertically from the range floor to meet the underside of the overhead baffle.

If the side baffles and the overhead baffles are not co-located, then the side baffles shall rise to the height necessary to:

- Provide the required sheltering of the side berm(s); and,
- Prevent any gaps between the overhead and side baffles.

The side baffles shall meet the applicable construction requirements of overhead baffles; refer to section [**8.4.2 Construction of Overhead Baffles**](#).

8.7 RANGE FLOOR

This section is in accordance with [**section 2.3 Range Floor**](#).

8.8 FIRING POINTS / FIRING LINES / FIRING LANE MARKING

This section is in accordance with [section 2.2 Firing Points / Firing Lines / Firing Lane Marking](#) or [section 3.2 Firing Points / Firing Lines / Firing Lane Marking](#), except as noted below.

Type I baffled ranges shall be designed for specific firing locations (distances).

Type II baffled ranges have more flexibility inherent in their design; therefore, firing locations are relatively flexible within the active range area.

8.9 TARGET HOLDERS

To reduce the probability of bullet ricochet and backsplash off of the target holders, they shall not be constructed of *unsheltered* metal structural components; however, metal fittings can be used. Sheltering of the metal target holders can be provided by wood cladding or similar materials.

8.10 TARGETS

This section is in accordance with [section 4.10 Targets](#) and the following provisions:

- Targets are not to be placed on the top of ground baffles;
- Soft targets used on a baffled range (e.g. paper, cardboard, etc.) can be moved forward and back to accommodate different firing distances. This can be accomplished with moveable target bases or with an overhead track suspended from the overhead baffles; and
- The use of *unsheltered* hard (e.g. steel) targets on baffled ranges is not permitted.

Hard targets are considered to be sheltered if:

- They are designed to capture or direct (into the backstop) all ricochets; or if:
- The range has an overhead backstop cover constructed in accordance with [section 8.3 Backstops](#);
- The targets are placed beneath the overhead cover; and,
- The targets are placed in the centre third of the target line.

8.11 SAFETY AREA

There is no requirement for a downrange safety area that extends beyond the backstop for a properly constructed and operated baffled range.

8.12 BAFFLE DESIGN, APPROVAL AND TESTING

The use of alternate materials and designs to those provided in [Table 12: Recommended Baffle Construction](#), are acceptable, provided that the alternate design provides the same (or greater) level of bullet/ricochet ballistic protection.

Where baffle construction differs from the requirements of [Table 12: Recommended Baffle Construction](#), the baffle design shall be approved by a Professional Engineer licensed to practice engineering in the province or territory in which the range is located.

The Professional Engineer is required to attest that the planned baffle design and construction will, *in all probability*, prevent perforation by the occasional bullet impact from calibres of ammunition and bullet natures that are *intended to be fired* on the range. It is recommended that the Professional Engineer's work involve the testing of the baffle design by live firing to affirm its suitability.

When a baffle is tested by live firing, it shall be tested:

- At the same distance(s) and orientation(s) under which it would be struck by bullets in accordance with the range design;
- Using the most ballistically significant cartridge that the range is designed for; and,
- Using the most robust bullet nature (construction) for which the range was designed.

9 INDOOR RANGES

This section pertains to indoor ranges used for rifle and handgun shooting. These ranges are characterized by the following features:

- Fully enclosed within a building;
- Do not have a safety area exterior to the building in which they are located;
- Have a bullet trap; and,
- Have a ventilation system to remove air contaminated by firing.

There are a number of ways to achieve the aims of this section. This is particularly true in the selection of construction materials. **Alternate materials and arrangements are acceptable, as long as they provide a level of safety that is equivalent to the requirements described in this section.**

Indoor rifle and handgun ranges consist of one or more firing lines, an active range area with a downrange Protected Zone (PZ), a ventilation system and a bullet trap (backstop), all of which are contained within a suitable building. The range may also have a variety of additional equipment and structures required for operations (e.g. target carriers, waiting area, etc.); refer to *Figure 49: Indoor Range*.

Indoor ranges are typically laid out with a specific number of firing points and firing lines located at specific distance(s) from the targets. These guidelines have been written with this design in mind; however, the use of the active range area as a more expansive firing area for a single shooter is certainly acceptable.

This section contains information for handgun and rifle usage on indoor ranges. For more information concerning shotgun usage on these ranges, contact the CFO.

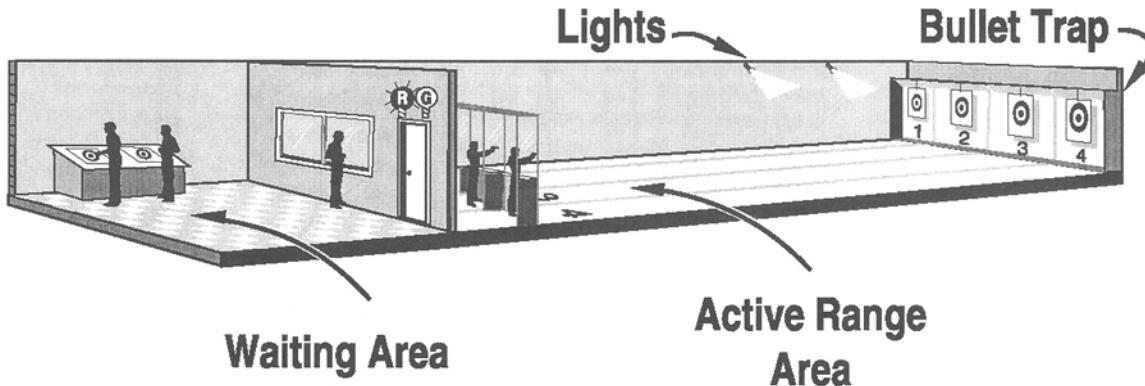


Figure 49: Indoor Range

9.1 SAFETY CONSIDERATIONS

There are a number of safety considerations for indoor ranges, which fall into two broad categories: ballistic and environmental. The ballistic issues are concerned with bullet containment and backsplash. The environmental issues are concerned with range ventilation and lead contamination.

This section deals primarily with ballistic issues; discussion of environmental issues is very limited. Users of these guidelines must refer to instructions from provincial or territorial agencies (e.g. Dept. of Health or Dept. of Labour) for detailed guidance on environmental issues and requirements applicable to their specific jurisdiction. Contact the CFO to obtain information about the specific agency to be contacted for these requirements.

The underlying goal of this section is the safe containment within the range of all projectiles (and any subsequent ricochets or backsplash) generated in the course of firing conducted in accordance with the [Range Operating Instructions](#). This requirement, in conjunction with the calibres of firearms intended to be fired and the intended use (shooting activities) of the range, will dictate the selection of construction materials and the range design.

9.1.1 AMMUNITION

Bullet construction and calibres used on an indoor range must be matched with the bullet trap and Protected Zone design and construction.

The requirements provided in this subsection are based on copper alloy jacketed (FMJ, JHP, JSP, etc.) or lead alloy bullet natures (construction). They are not intended to accommodate the following ammunition natures: armour piercing, tracer, incendiary, solid metal core bullets (e.g. steel cored) or hardened metal penetrator bullet designs. Should a requirement to use these ammunition natures on indoor ranges exist, contact the CFO for more information.

9.1.2 LEAD CONTAMINATION / DECONTAMINATION

Notwithstanding the deferral of environmental issues to provincial or territorial authorities, the following general recommendations are made with regard to lead contamination:

1. All individuals involved in designing, approving, operating or using indoor ranges should make themselves fully aware of the health hazards posed by the lead contamination associated with operating indoor ranges.
2. Range Operators should develop a lead control plan to minimize the hazards posed by lead contamination.
3. If the active areas of indoor ranges are used for non-shooting activities (e.g. dog training), then these secondary activities should be scrutinized by the Range Operator to ensure that the individuals involved are not exposed to hazardous lead residues from the range.
4. Food or drink should not be consumed in the active range area unless the range is thoroughly lead decontaminated beforehand.
5. The active range area(s) should be regularly cleaned using either a vacuum system specifically designed to capture lead residues (e.g. a HEPA vacuum) or a wet-wash system. The use of dry broom techniques (e.g. traditional sweeping) or standard commercial vacuum cleaners is strongly discouraged.

If lead contamination is identified as a hazard on an indoor range, the risk may be removed or significantly reduced through the exclusive use of lead-free ammunition. Range Operators are advised to thoroughly research lead-free ammunition before undertaking expensive facility (e.g. ventilation) upgrades.

9.2 PROTECTED ZONE

To ensure the containment of bullets fired in accordance with the [Range Operating Instructions](#) 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 some cases, the building construction will 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(s) from which an errant shot or ricochet will not escape the range. 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 (e.g. prone, kneeling and/or standing), at all the planned firing locations. The limits of the downrange PZ area are defined by the angular measurements listed in *Table 13: Indoor Range Protected Zone Angles*.

Table 13: Indoor Range Protected Zone Angles

Direction	Rim-fire Rifle	Rim-fire Handgun	Centre-fire Handgun and Rifle
Vertical	10°	15°	15°
Horizontal	6°	10°	15°

Note: PZ angles are measured from the line of sight from the shooter to the target, at all planned firing heights. Refer to *Figure 50: Indoor Range Protected Zone (Vertical Angle)* and *Figure 51: Indoor Range Protected Zone (Horizontal Angle)*.

All downrange area that is outside of the bullet trap and within the PZ shall be sheltered by baffles or a wall/ceiling/floor construction, designed such that no projectile or ricochet can perforate the materials and escape the active range area.

There shall not be any doorways or other access points into the active range area forward of the most distant firing line, which can be opened from the exterior of the active range area.

All range fixtures (e.g. lights, sprinkler heads, pipes, etc.) within the PZ shall be sheltered from projectiles fired from the firing line(s), which may strike them, by baffles or other similar features.

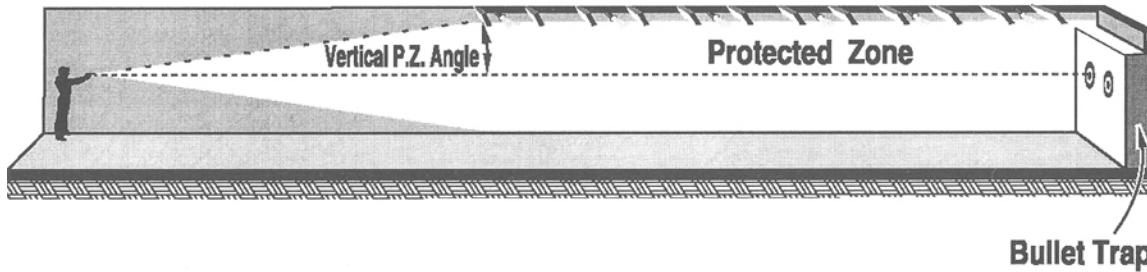
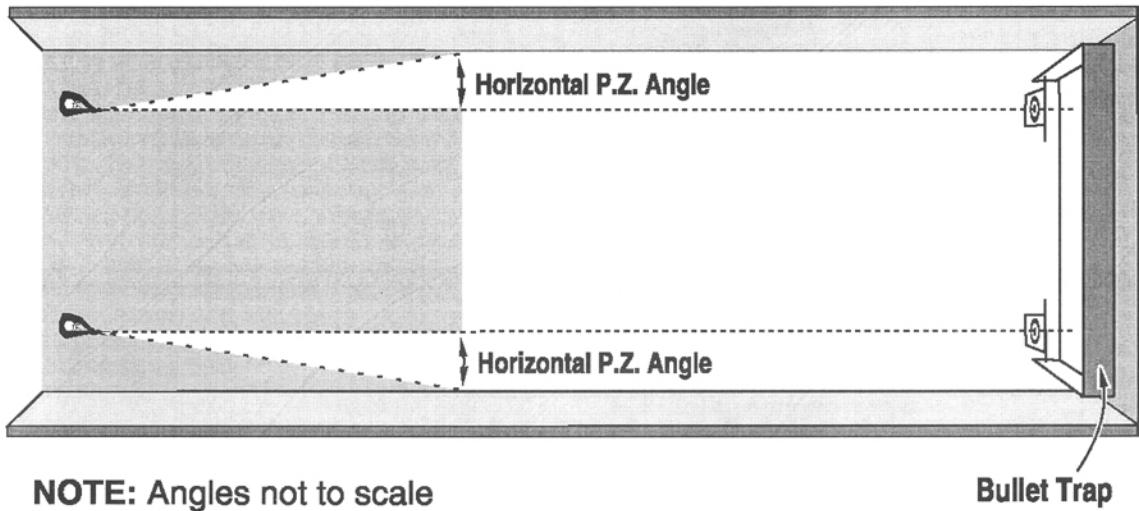


Figure 50: Indoor Range Protected Zone (Vertical Angle)



NOTE: Angles not to scale

Bullet Trap

Figure 51: Indoor Range Protected Zone (Horizontal Angle)

9.2.1 ADJOINING ROOMS / FLOORS

Rooms that adjoin the active range area, that are forward of the most distant firing line and that may have use during range operations (e.g. an office), shall be protected from shots fired from the firing line(s) within the range by the construction of intervening walls. This requirement does not apply to secured rooms or other spaces not used when the range is in operation. The provisions of this subsection also apply to rooms or spaces above or below the active range area.

The protection of adjoining space(s) shall be accomplished by baffles or a suitable wall, floor or ceiling construction that is impenetrable by a shot fired from the firing line(s); refer to [section 9.5 Active Range Construction Area](#) for information about construction materials.

9.2.2 RANGE WAITING / OBSERVATION AREA

The range facility may be equipped with a waiting or observation area. If the range has a waiting area, it shall be separate from the active range area and it shall be ventilated such that range air is not able to freely enter the waiting/observation area when the range is operating.

Any doors that separate the waiting/observation area from the active range area shall be fitted with weather stripping or an equivalent fitting intended to impede the exfiltration of lead contaminated air from the active range area when the range is operating.

9.3 ACTIVE RANGE AREA

9.3.1 FLOOR

The floor of the active range area shall be constructed in such a way as to minimize bullet backsplash and to facilitate cleaning (lead decontamination). The floor shall not have any sharp angular surfaces or edges facing the firing line that could generate bullet backsplash.

When practical, it is recommended that the active range area floor be of poured concrete or of an equivalent construction. If the floor is of plank construction (or similar), plank joints shall be filled and sealed.

The use of soil, sand or gravel, etc. as the exposed floor surface in the active range area is not recommended due to the problems these materials pose when lead decontaminating the area.

When employing wet-wash methods to clean and decontaminate the active range area, it is recommended that the floor be sloped to provide effective drainage and that a waste water collection system be provided.

The Range Operator is to ensure that lead contaminated materials collected in the course of range cleaning (e.g. floor washing run-off) are disposed of in accordance with any applicable environmental requirements for the jurisdiction in which the range is located.

9.3.2 CEILING HEIGHT AND LofS CLEARANCE

The ceiling (or roof) of the active range area shall be of sufficient height to provide for safe firing. All roof members, trusses, baffles, pipes, sprinkler heads, etc. must be above the required minimum clear Line of Sight (LofS) between the firing line(s) and the targets.

The clear LofS shall be a minimum of 60 cm above the maximum firing height at the firing line(s) and 25 cm above the top of the target at the bullet trap; refer to *Figure 52: Clear LofS – Indoor Range*. The height of the LofS at a firing line is determined by the shooter's required firing position for the intended range use (e.g. prone, kneeling or standing).

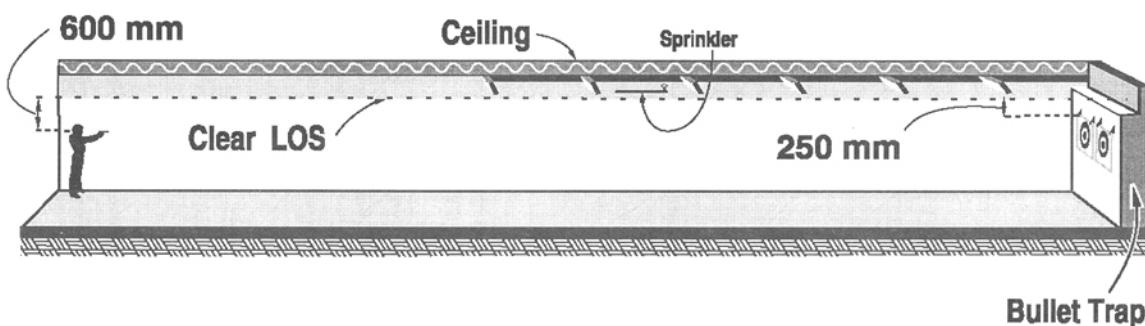


Figure 52: Clear LofS – Indoor Range

9.3.3 LIGHTING

There shall be an emergency lighting system within the active range area that is in accordance with local fire or municipal regulations. The emergency lighting shall be configured so that the active range area will be automatically illuminated in the event of a power failure.

The active range area shall be equipped with a lighting system that provides adequate illumination. There can also be local (or spot) lighting systems to provide additional illumination to the targets and to the firing line(s).

All lighting fixtures and equipment within the PZ shall be sheltered to prevent them from being struck by a direct shot from the firing line(s).

9.3.4 RANGE SIGNAGE

There shall be a “Range Safety Rules” sign, in accordance with [section 1.5 Range and Safety Area Signs](#), located in a common area (e.g. the range waiting area) or near the primary range access door. This sign shall be clearly visible to all range users.

It is recommended that separate signs be displayed within the active range area that advises users:

- To wear hearing protection;
- Not to smoke within the active range area; and,
- Not to eat or drink within the active range area.

9.3.5 TARGET HOLDERS

Target holders shall be designed to ensure that they do not generate ricochets that might exit the range or endanger the range users.

The use of low ricochet materials, such as wood, plastic or Coroplast™, or similar materials, is recommended for use in target holder construction, when practical. If metal is used in target holder construction, it should be sheltered by timber or angled to deflect ricochets into the bullet trap or into the range floor.

Note: Coroplast is a trademark of Coroplast, Granby Que.

Target holders shall be constructed such that targets can be held at the various heights (above the range floor) needed to accommodate the various firing heights for which the range was designed (e.g. prone, kneeling and standing). This is to promote the shooter's engagement of the targets with an angle-of-fire that is as close to being horizontal to the range floor as is practical.

9.3.6 TARGET CARRIERS AND MECHANISMS

To facilitate efficient range operations and to reduce the exposure of shooters to lead contaminants that collect on the range floor, the use of a target carrier system to move the targets forward and back from the firing line to the target line is encouraged when practical.

If provided, the target carriers and associated target mechanisms shall be constructed to minimize bullet backsplash and ricochet. This can be accomplished by sheltering the metal surfaces with wood or by angling any flat metal surfaces downward.

9.4 FIRING POINTS / FIRING LINES / FIRING LANE MARKING

The provisions of this section shall apply for indoor ranges with multiple lane operations. Refer to [section 2.2 Firing Points / Firing Lines / Firing Lane Marking](#) for general requirements for firing lines and firing points.

9.4.1 FIRING LANES

The range shall be laid out with the concept of individual firing lanes applied.

9.4.2 FIRING LINE(S)

The firing line(s) shall be parallel to the bullet trap.

Each firing line and the distance to the targets shall be permanently marked (e.g. painted) on the range walls and/or floor.

It is recommended that the firing line(s) depth be in accordance with [Table 5: Recommended Firing Line Depths \(Rifle Range\)](#) or [Table 9: Recommended Firing Line Depth \(Handgun Range\)](#) as applicable.

Each firing line shall have a provision for a Range Officer area. It is recommended that this area be in accordance with [Table 5: Recommended Firing Line Depths \(Rifle Range\)](#) or [Table 9: Recommended Firing Line Depth \(Handgun Range\)](#) as applicable.

The firing line shall exceed the outside edges of the flank (first and last) target lanes by 0.5 m.

9.4.3 FIRING POINTS

Except as noted below, firing points shall be in accordance with [section 2.2 Firing Points / Firing Lines / Firing Lane Marking](#).

The minimum spacing (centre-to-centre) between adjacent firing points is recommended to be at least 1.0 m.

Where practical, the use of firing point separators between adjacent firing lanes is recommended. These separators are intended to provide each shooter with a defined firing area. They also serve to protect the shooters from being hit by ejected (fired) cartridge cases originating from other lanes. If employed, the separators:

- Shall not significantly obstruct air flow;
- Can be fitted with small tables to assist shooters; and,
- Can be fitted with sound-absorbing materials to dampen the firing noises.

9.5 ACTIVE RANGE AREA CONSTRUCTION

This section pertains to the design, construction and the selection of materials for the active range area. The requirements listed here are to be considered as supplementary to the design and construction requirements imposed by local building codes, regulations and practices.

When practical, the use of concrete as the structural material for the floors, walls and ceiling of the active range area is encouraged. When concrete is used as the main structural material, the protection provided by the PZ is likely already afforded by the building structure itself.

9.5.1 PROTECTED ZONE CONSTRUCTION MATERIALS

If structural construction materials are used within the PZ to provide ballistic protection, then they shall meet or exceed the standards listed in *Table 14: Protected Zone Construction Materials*.

Table 14: Protected Zone Construction Materials

Calibre Class	Concrete ⁶	Brick ⁷	Concrete Block ⁸	Hardwood Timber	Softwood Timber
Rim-fire Rifle and Rim-fire Handgun	75 mm	103 mm	100 mm	125 mm	150 mm
Centre-fire Handgun	150 mm	215 mm	215 mm	175 mm	200 mm
Centre-fire Rifle	200 mm	215 mm	330 mm	250 mm	375 mm

⁶ 20 N/mm² (3000 psi) strength, 20 mm Aggregate Concrete

⁷ Void-free construction bricks

⁸ Dense aggregate solid concrete blocks

The use of unprotected hollow core construction blocks (e.g. cinder blocks) is not recommended, as they do not sustain damage well from glancing or direct bullet strikes. If used, it is recommended that they be clad with additional materials in accordance with [Table 14](#) above.

9.5.2 PROTECTED ZONE BAFFLES

Overhead or side wall baffles in the PZ can be used to augment or provide primary protection against the escape of projectiles 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 in [Table 14: Protected Zone Construction Materials](#) or [Table 15: Indoor Range Baffle Construction](#), as applicable.

All baffles shall be clad in 5 cm timber on their firing line side. The backs of the baffles shall be visible for inspection purposes.

Baffles within 10 m of a firing line shall be angled at approximately 25° to 30° from the horizontal to minimize backsplash and to deflect ricochets or bullet fragments downrange instead of back towards the firing line (shooters).

Baffles designed of steel shall meet or exceed the requirements in [Table 15: Indoor Range Baffle Construction](#).

Table 15: Indoor Range Baffle Construction

Firearm Calibre Class	Steel Thickness ⁹
Rim-fire Rifle and Rim-fire Handgun	5 mm
Centre-fire Handgun	8 mm
Centre-fire Rifle	In accordance with Table 12: Recommended Baffle Construction

9.5.3 PROTECTED ZONE INSPECTIONS

The PZ, including all baffles and interior surfaces, shall be inspected periodically by the Range Operator. Damage to protective surfaces within the PZ shall be repaired as required.

9.6 BULLET TRAPS

The bullet trap is located behind the most distant target line, at the end of the range. Bullet traps are intended to safely contain bullets and the attendant ricochets or fragments of shots fired in accordance with the [Range Operating Instructions](#). There are many different bullet trap designs; some are better suited to specific uses than others. The bullet trap must be matched to the intended range usage (e.g. maximum calibre, bullet nature and firing angles).

A number of companies produce commercial bullet traps. Each commercial bullet trap will be provided with specific calibre and bullet design information. If a commercial bullet trap is utilized, this information must be supplied with the Application for Approval of a Shooting Range.

⁹ Mild Steel (0.15-0.25% Carbon)

These guidelines will provide a limited number of examples of bullet trap construction and design. Additional information on bullet traps is readily available from a number of other sources (e.g. bullet trap manufacturers and sports governing bodies).

The information provided in this section is provided for the use of all stakeholders. It is not intended to prevent the use of bullet trap designs not discussed. Each bullet trap design must be considered on its own merits.

If bullet traps are designed and constructed with materials other than those listed in these guidelines, then a signed statement from a provincial or territorial licensed Professional Engineer is required for any *non-commercially* manufactured bullet trap, or any commercial bullet trap lacking the necessary documentation from the manufacturer. The Professional Engineer's report shall provide construction details for the trap and the maximum calibre and bullet nature ratings for the sustained operation of the bullet trap.

For more information on bullet traps designed for centre-fire rifle calibres, contact the CFO.

9.6.1 BULLET TRAP DESIGNS

There are a number of common designs used for bullet traps on indoor ranges. Regardless of the design selected for use, the bullet trap must be:

- Rated to the maximum calibre of firearm intended for use;
- Rated to the most robust bullet design (nature) intended for use; and,
- Able to safely contain projectiles, bullet fragments and ricochets generated by firing conducted in accordance with the [**Range Operating Instructions**](#).

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

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

The use of a sacrifice plate, tack-welded to the steel backstop over the MPIs, is one method of improving the longevity of steel backstops. The sacrifice plate is placed on the backstop to sustain a high percentage of bullet impacts. Once the sacrifice plate has been worn out, it can be readily replaced. This is a far less expensive method of backstop repair than having to repair the main backstop impact plate.

The sacrifice plate:

- Should be tack-welded to the backstop impact plate, over the MPI; and,
- The edges of the plate shall be bevelled to provide a smooth transition to the backstop impact plate.

45° Angled Steel Plate Design

One of the simplest bullet trap designs to construct is the Angled Steel Plate Design. This design uses a steel plate angled at 45° (or less) to the direction of fire. Impacting bullets are intentionally ricocheted downwards into a sand or water trap located at floor level; refer to *Figure 53: Angled Steel Plate Design*.

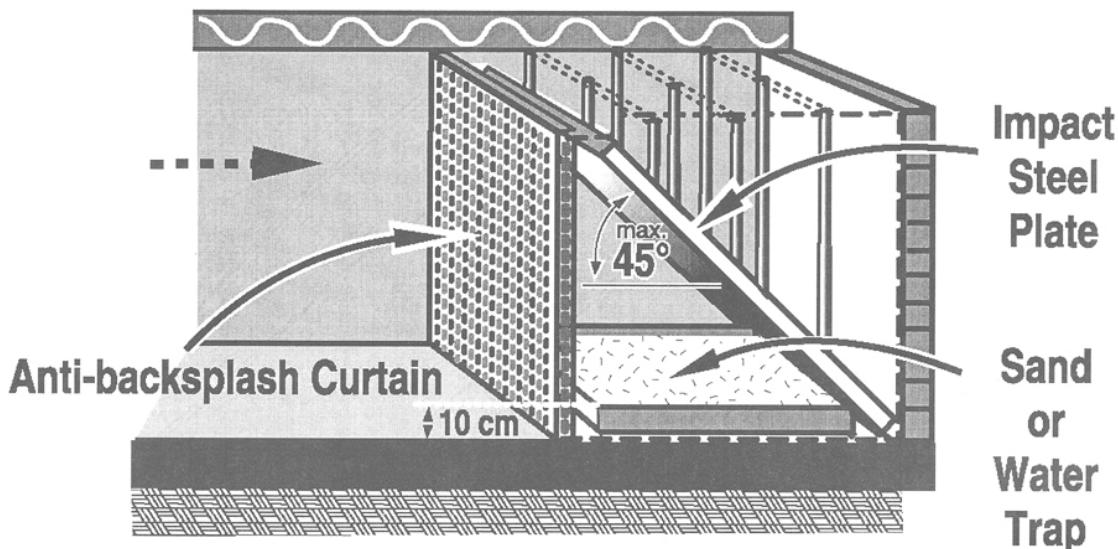


Figure 53: Angled Steel Plate Design

This design generates considerable amounts 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; however, it can be less than 45°. The steel plate shall meet or exceed the requirements in *Table 16: Angled Steel Plate Minimum Requirements*.

The sand or water trap beneath the impact plate shall be at least 10 cm deep. It shall completely cover the floor area beneath the steel impact plate.

The sand in the bullet trap shall be coarse and free of hard inclusions (e.g. stones). If water is used in the trap, it shall be replenished as required.

This bullet trap design may be used for centre-fire handgun and rim-fire rifle/rim-fire handgun calibres only.

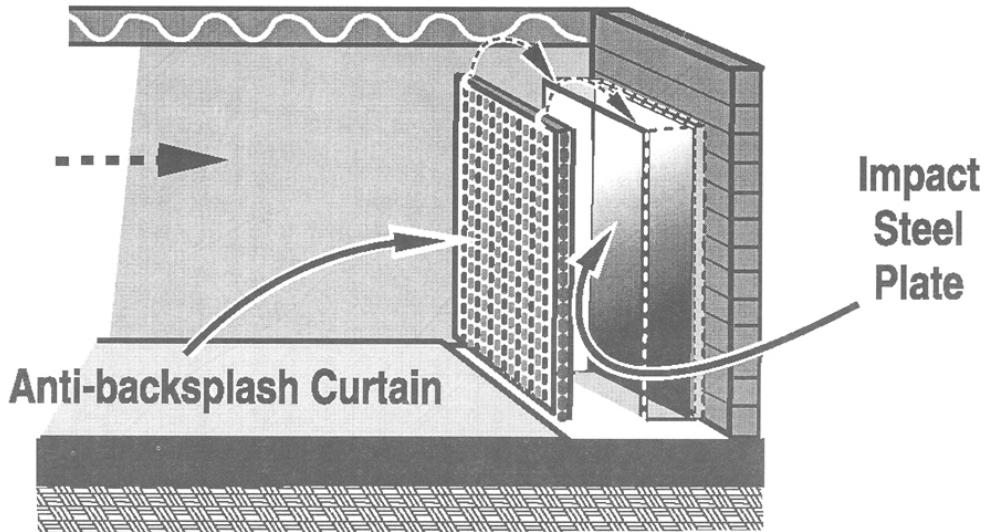
The use of an anti-backsplash curtain is recommended.

Table 16: Angled Steel Plate Minimum Requirements

Calibre	Bullet Nature	Min. Steel Thickness	Steel Specifications¹⁰	Mild Steel Min. Steel Thickness¹¹	1T100 Armour Steel Min. Thickness
.22 Long Rifle	Lead	7 mm	AR-450	6 mm	4 mm
9 mm Para.	FMJ	10 mm	AR-500	12 mm	8 mm
.357 Magnum	JSP	10 mm	AR-500	12 mm	8 mm
.44 Magnum	JSP	10 mm	AR-500	12 mm	8 mm
.45 ACP	FMJ	10 mm	AR-500	12 mm	8 mm
.50 AE	FMJ	10 mm	AR-500	12 mm	8 mm

Vertical Steel Plate Design

The Vertical Plate Design utilizes a vertical steel plate to fragment fired bullets on impact. This is a simple and reliable design for a bullet trap; however, it is suitable only for rim-fire calibre rifles and rim-fire calibre handguns. It also generates considerable amounts of contamination in the form of fine lead dust resulting from the severe deformation of bullets impacting the steel plate; refer to *Figure 54: Vertical Steel Plate Design*.

**Figure 54: Vertical Steel Plate Design**

¹⁰ The steel specifications are provided as a minimum requirement; the use of alternate steel specifications that exceed these requirements is permitted.

¹¹ 0.15-0.25% carbon mild steel, grades: 260W, 300W, 260WT, 300WT, 350 WT, 380WT, 400WT, 350R, 350A, 400A, 480A, 700Q, 700QT or their equivalent

The steel impact plate shall have a minimum thickness of 6 mm for 0.15% to 0.25% carbon mild steel or 4 mm minimum thickness for 1T100 armour steel.

The steel plate shall be enclosed within a wooden or sheet metal enclosure. The enclosure shall be fitted with an anti-backsplash curtain positioned at least 30 cm in front of the steel backstop.

This design may only be used for rim-fire calibre rifles and rim-fire calibre handguns firing lead alloy bullets.

Venetian Blind Design

The Venetian Blind Design utilizes multiple angle steel plates arranged one above the other; refer to *Figure 55: Venetian Blind Design*.

The steel plates shall be angled at no more than 45° to the horizontal and shall be configured with an overlap such 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 in [Table 16: Angled Steel Plate Minimum Requirements](#).

The use of an anti-backsplash curtain is recommended.

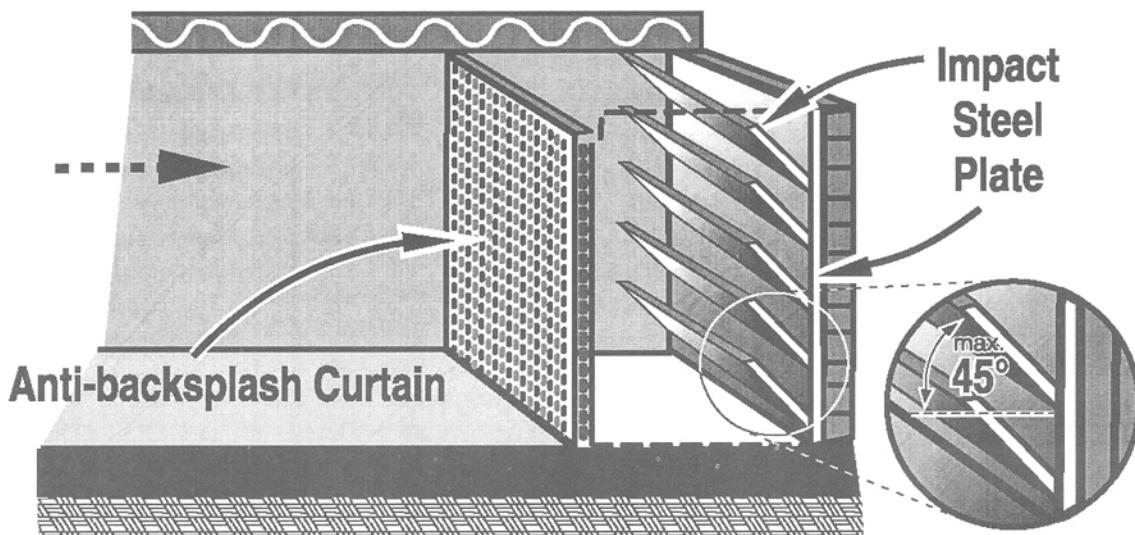


Figure 55: Venetian Blind Design

Passive Snail™ Design

The Snail Design is part of a class of bullet trap designs that is able to capture fired bullets with as little deformation or damage as possible. Minimizing bullet damage reduces the amount of fine lead dust originating from the bullet trap.

The Snail Design employs shallow angle steel plates to deflect incoming bullets into a circular deceleration chamber. In some designs, the deflection plates and deceleration chamber are constantly sprayed with a water-based liquid to entrap lead residues and reduce friction between the bullets and the steel plates.

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

9.6.2 BULLET TRAP MAINTENANCE

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

The presence of impact plate perforation, sagging or other damage (e.g. pitting), etc. are significant safety concerns, requiring repair actions by the Range Operator. The Range Operator is to ensure that all worn or damaged components of the bullet trap are repaired as required.

9.6.3 BULLET TRAP ANTI-BACKSPLASH CURTAIN

The use of a bullet trap anti-backsplash (safety) curtain is recommended for all 45° (approximately) angled metal impact plate bullet trap designs. Anti-backsplash screens are generally not required for:

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

The use of a bullet trap anti-backsplash curtain is required for any vertical steel impact plate design.

The primary function of the anti-backsplash curtain is to contain bullet backsplash within the bullet trap. It will also promote the containment of fine lead dust particles to the immediate area of the bullet trap.

This curtain is to be located behind the targets and in front of the bullet trap. It shall cover the entire front of the bullet trap.

There are various designs of anti-backsplash curtains, which satisfy the same function, including:

- Linatex™ panels or similar self-sealing rubberised or latex materials;
- Wood planks (e.g. 25 mm x 150 mm softwood boards) slid into vertical channels, which allow the shot-out boards to be replaced by less damaged boards that slide down into place from above; and,
- Heavy layers of carpet or similar material.

Regardless of the materials used in the anti-backsplash curtain, they will all become shot-out eventually. All designs should take this fact into account and provide for the repair or replacement of shot-out areas as required.

The anti-backsplash screens should be configured to allow easy viewing of the backstop. This will assist the Range Operator when inspecting the backstop.

9.7 WARNING LIGHTS

There shall be a warning light system used to indicate the operational status of the range. The warning lights shall be visible to shooters on the active range area and to people outside of the range. They shall be under the control of the supervising Range Officer.

The warning light system can be any of the following:

- An illuminated "Warning Range In Use" sign;
- RED and GREEN warning lights; or,
- RED and GREEN beacons.

A combination of the warning light systems described above is permitted, as long as their meaning is clear and in accordance with the **RED/GREEN** colour system described in [**section 1.7.2 Beacon System**](#).

9.8 RANGE VENTILATION

Minimum ventilation requirements (e.g. airflow velocity or volume) are determined by provincial and territorial agencies. Therefore, these guidelines do not establish minimum airflow requirements for indoor ranges. Contact the CFO for more information.

In addition to the requirement to meet provincial or territorial ventilation standards, the following is recommended:

1. The air supply to the range should be behind the firing line. To ensure uniform air flow across the firing line, the supply air should be provided from ducts located less than 2 m above the range floor, which are evenly spaced along the firing line.
2. To promote the efficient removal of firing gases from the firing line, the air supplied behind the firing line should be in a smooth laminar flow, not a turbulent flow. Turbulent airflow can be generated by obstructions in the air path (e.g. a table or bench) or by air flow velocities that are too high for the ventilation duct design.
3. To promote the efficient and controlled removal of the lead residues, the range should be operated at a *negative* pressure (e.g. the air exhaust system attempts to exhaust more air than is supplied). Having negative air pressure within a range prevents the escape of lead contamination air to adjacent areas.

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

1. Configuration 1 – Exhaust ducts are located approximately 5 m to 6 m forward of the firing line, as well as in the area of the bullet trap. The ducts located forward of the firing line should be configured to exhaust approximately 25% of the supplied air volume, while the bullet trap exhaust ducts remove the remaining 75% plus of the supplied air volume.
2. Configuration 2 – Exhaust ducts are located in the area of the bullet trap and are configured to exhaust all of the supplied air volume.

All supply and exhaust ducts should 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 range. This air pressure alarm is intended to signal to the Range Operator when the filters have become clogged and need to be replaced or cleaned. Clogged filters are an unavoidable consequence of air filtration and result in the impaired extraction of air from the range. This causes diminished air flows and the loss of the negative air pressure within the range.

9.9 TARGETS

The selection of target types for use on indoor ranges is at the discretion of the Range Operator.

The use of hard targets (e.g. steel targets) on an indoor range should be closely monitored by the Range Operator. The courses-of-fire using hard targets should be critically evaluated by the Range Operator to ensure that the range users and those exterior to the range are not put at risk as a result of the inappropriate use (e.g. placement, type and design) of these targets, given the range design.

Refer to [**section 1.9 Backsplash**](#) for recommended minimum engagement distances for hard targets.

10 FIELD FIRING RANGES

Field firing outdoor ranges can have different configurations, dependent on the planned shooting activities. The range can be configured in accordance with a standard rifle or handgun range (without the backstop or with an inadequate backstop) or it can be configured as an austere range built using existing natural features.

If the range is configured in accordance with a standard outdoor rifle or handgun range, *but it does not have an adequate backstop*, then the calibre-appropriate field firing safety area template(s) from [Appendix D: Safety Area Templates](#) shall be applied, along with the provisions of these guidelines for standard outdoor rifle (sections 2.2 to 2.7) or standard outdoor handgun ranges (sections 3.2 to 3.7).

An austere range is one that requires few constructed features, as it uses the natural attributes of the range site. This type of range also includes “jungle lane” type designs; refer to *Figure 56: Field Firing Pistol Range*.

For austere field firing ranges, the provisions of this section are applicable.

Austere field firing ranges have the following: firing area(s), target area(s) and a suitable downrange safety area. There is no requirement for this type of range to have a backstop.



Figure 56: Field Firing Pistol Range

10.1 SAFETY CONSIDERATIONS

10.1.1 HUMAN ACTIVITY – SAFETY AREA

The general allowance of human activity within a range safety area, provided under [section 1.2 Range of Safety Areas](#), cannot be afforded to field firing ranges. The risk profile of a field firing range is considerably more expansive than that for a standard outdoor range due to the absence of a suitable backstop. Therefore, human activity should not be approved within the safety area of a field firing range when it is in operation.

10.1.2 APPLYING SAFETY AREA TEMPLATES

The total field firing safety area is determined by applying the appropriate field firing template under “maximum” variability conditions possible for the shooter/target positioning, as determined by the range and course-of-fire design. The field firing safety area template is applied between the edges of all demarcated firing areas and the edges of all demarcated target areas with:

- The maximum possible horizontal arcs; and,
- The maximum possible up/down range positioning.

10.1.3 LOCATING RANGE(S)

The accurate siting of the firing and target areas is an important safety consideration. It is important that the firing arcs do not exceed the limits for which the range was designed. A great deal of flexibility is permitted, provided that the safety area traces for all shooter/target combinations are kept within the range property and in accordance with the Range Approval. The use of appropriate survey techniques to site these areas is recommended. The use of GPS and magnetic compass techniques are permitted, so long as the Range Operator makes the necessary allowances for the inaccuracies of the instruments used.

It is recommended that target areas not be located on the crest of hills or rises (e.g. on the skyline). It is recommended that, *when practical*, the VAoF for the shooter-target alignment be approximately horizontal or that it be depressed below the horizontal.

10.1.4 BACKSPLASH / RICOCHET HAZARDS

It is recommended that courses-of-fire be appropriate for the terrain of the firing area(s). The Range Operator should plan the courses-of-fire to reduce the likelihood of shooters firing into potentially hazardous ricochet or backsplash surfaces located close to them; refer to [section 1.9 Backsplash](#). The aim of this recommendation is to protect the shooter(s) and others from potentially dangerous bullet backsplash.

10.1.5 REDUCED SAFETY AREAS

Trees, brush and shrubs do not provide a barrier that can be used to reduce the safety template requirements.

Hills and similar topographical features within the trajectory envelope can be used to reduce safety template requirements; refer to [section 1.2 Range of Safety Areas](#).

10.2 RANGE LAYOUT

Field firing range safety areas should not overlap other ranges, walking trails or areas likely to be frequented by people *when the range is in use*. When having people in the safety area of a field firing range is likely, there shall be a flag, beacon or similar warning system installed. This warning system shall be used to prevent firing onto the downrange areas when it is in use. The colour designation for the warning system shall be in accordance with [section 1.7 Warning Flags and Beacons](#).

The layout of a field firing range is flexible and user defined, provided that the requirements of this section are satisfied and that all range safety areas are confined to the land area formally or informally controlled by the Range Operator in accordance with [section 1.2 Range of Safety Areas](#).

10.3 BACKSTOP DESIGN AND CONSTRUCTION

Although backstops are not required for field firing ranges, the presence of even a small backstop can dramatically reduce the occurrence of projectiles and ricochets travelling into the downrange area. Backstops can be provided at the discretion of the Range Operator.

Refer to [**section 2.1 Backstop Design and Construction**](#) for information on backstops.

If a backstop is provided:

- The height and crest length shall be determined by the Range Operator;
- The slope of the backstop's forward (impact) face should be steeper than 30°; and,
- The forward face of the backstop shall be free of major outcroppings of rock or other hard materials.

Bullet catchers are not required for field firing ranges; however, if they are provided they shall be constructed in accordance with [**section 2.1 Backstop Design and Construction**](#), with the dimensions to be determined by the Range Operator.

10.4 FIRING AREAS

Firing areas are the defined areas from which shooters can engage (fire) at their target(s). They can be as expansive as is required by the course-of-fire.

Firing areas shall be clearly demarcated with posts, pegs, pylons or other similar markers to ensure that shooters can readily identify the intended firing area.

If more than one shooter at a time is to be in the same firing area, then provisions (e.g. procedural or facility) shall be made to prevent shooters from endangering or interfering with each other.

10.5 TARGET AREAS

Target areas are the defined areas in which targets can be placed. They can be as expansive as is required by the course-of-fire.

Target areas shall be clearly demarcated with posts, pegs, pylons or other similar markers to ensure that the targets can be reliably placed in the appropriate area.

10.6 TARGETS AND TARGET HOLDERS

This section is in accordance with [**section 2.7 Targets and Target Holders**](#).

11 RANGE OPERATING INSTRUCTIONS

Range Operating Instructions are an important requirement for all ranges. They are to be used to physically describe the range(s) and to detail the usage conditions for which each range was designed. As an analogy, they can be compared to the owner's manual for a car.

In accordance with the Safety Training instruction of the *Shooting Clubs and Shooting Ranges Regulations* (SOR/98-212), s. 4, all range users must read the Range Operating Instructions, or be informed of their content. All range users must be fully familiar with range operating procedures. It is recommended that the Range Operator keep a record attesting to the fact that individual range users and the Range Officer(s) have read the Range Operating Instructions, or that they have been informed of their contents.

An example of a set of Range Operating Instructions is in [Appendix I: Sample Range Operating Instructions](#).

A copy of the Range Operating Instructions shall be available to all range users and Range Officers at the range site.

The Range Operator shall ensure that range users and Range Officers are made aware of significant changes to the Range Operating Instructions. It is recommended that range users and Range Officers read the Range Operating Instructions at least on an annual basis.

11.1 AIM

The aim of the Range Operating Instructions is to promote safe range operations, and to protect the shooters and the non-shooting public alike from potentially hazardous and preventable incidents or activities.

The Range Operating Instructions are prepared with the intent of clearly describing to all range users and Range Officers the acceptable activities that will keep the range use within the scope of the Range Approval. They will also outline to all users and Range Officers the major unacceptable activities (e.g. those that *may not be apparent*) that are not permitted on the range.

11.2 CONTENT

Just as each range is unique, each set of Range Operating Instructions is unique. They need not be complex; however, they must be detailed enough to clearly describe each range and its safe operation.

Range Operating Instructions shall be prepared for each range. Their content is flexible provided that the basic points listed below are addressed:

- Describe the key physical details of all ranges;
- Describe the hours/days of operation;
- List acceptable Range Officer and/or user qualifications;
- Describe acceptable firearm/calibre/bullet natures;
- Acceptable range activities (e.g. arcs of fire);
- Unacceptable range activities (e.g. a list of unauthorized targets);
- Review safety issues (e.g. hearing protection, eye protection, lead contamination, etc.);

- Provide emergency information (e.g. hospital location and phone numbers for police and the Range Operator); and,
- Define any non-standard abbreviations used, as well as all acronyms used.

11.3 FORMAT

The format of the Range Operating Instructions is determined by the Range Operator, provided that the information is presented clearly. Refer to [Appendix I: Sample Range Operating Instructions](#) for an example of a set of Range Operating Instructions.

11.4 UPDATING

The Range Operating Instructions shall be kept current. They shall be updated as required to reflect the range design, usage and the granted Range Approval applicable at any time.

It is the Range Operator's responsibility to ensure that an up-to-date copy of the Range Operating Instructions shall *always* be on file with the CFO. The Range Operator shall advise the CFO of any significant changes in the Range Operating Instructions, from one version to the next.

APPENDIX A: LIST OF ABBREVIATIONS

Abbreviation	Term
ACP	Automatic Colt Pistol
ADH	Air Danger Height
AP	Armour Piercing (bullet)
ATA	Amateur Trapshooting Association
BP	Black Powder
CAF	Canadian Armed Forces
CFO	Chief Firearms Officer
CofF	Cone of Fire
DCRA	Dominion of Canada Rifle Association
DFO	Department of Fisheries and Oceans
DND	Department of National Defence
DNR	Department of National Resources
EMT	Emergency Medical Treatment (Technician)
FMJ	Full Metal Jacket (bullet)
GPS	Global Positioning System
HAoF	Horizontal Angle of Fire
HP	Hollow Point (bullet)
HPBT	Hollow Point Boat-Tail (bullet)
IPSC	International Practical Shooting Confederation
ISU	International Shooting Union
JHP	Jacketed Hollow Point (bullet)
JSP	Jacketed Soft Point (bullet)
LofS	Line of Sight
LRN	Lead Round Nose (bullet)
Max	Maximum
Min	Minimum
MPI	Mean Point of Impact
N/A	Not Applicable

APPENDIX A: LIST OF ABBREVIATIONS

Abbreviation	Term
NSA	No Safety Area (range)
NSSA	National Skeet Shooting Association
psi	Pounds/in ²
PZ	Protected Zone
RCMP	Royal Canadian Mounted Police
RF	Rim-Fire (ammunition)
RN	Round Nose (bullet)
RO	Range Officer
RSV	Range Safety Vehicle
SC&SR	Shooting Clubs and Shooting Ranges
SFC	Shooting Federation of Canada
SMG	Submachine Gun
SP	Soft Point (bullet)
SWC	Semi-Wadcutter (bullet)
VAoF	Vertical Angle of Fire
WC	Wadcutter (bullet)

APPENDIX B: CONE OF FIRE DESIGN PARAMETERS

Table 17: Cone of Fire Design Parameters

Firearm Type	Firing Activity	Target Activity	Range Type	Horizontal Deviation		Vertical Deviation	
				mil “+/-”	degree “+/-”	mil “+/-”	degree “+/-”
Rifle	Static	Static	Standard	40	2.25	40	2.25
Rifle	Static	Moving	Standard	60	3.37	40	2.25
Rifle	Static	Static	Field Firing	60	3.37	60	3.37
Handgun	Static	Static	Standard	250	14.06	190	10.69
Shotgun	Skeet	Stn 1-7					15.0
Shotgun	Skeet	Stn 8					75 to 90
Shotgun	Trapshooting						9.0

Units of Measure

6400 mil = 360 degrees

1 mil = 0.05625 degrees

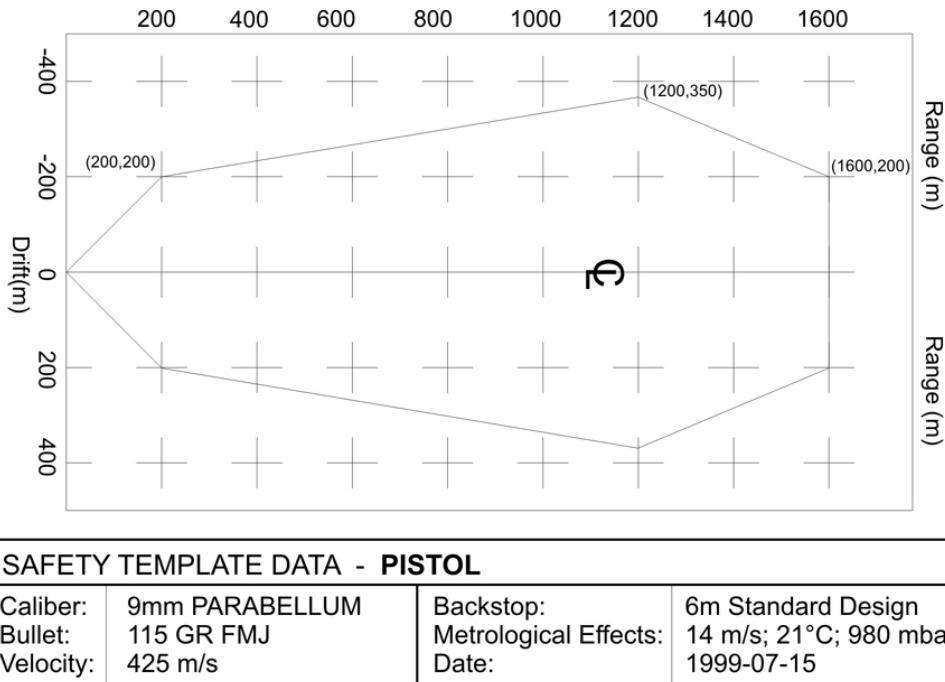
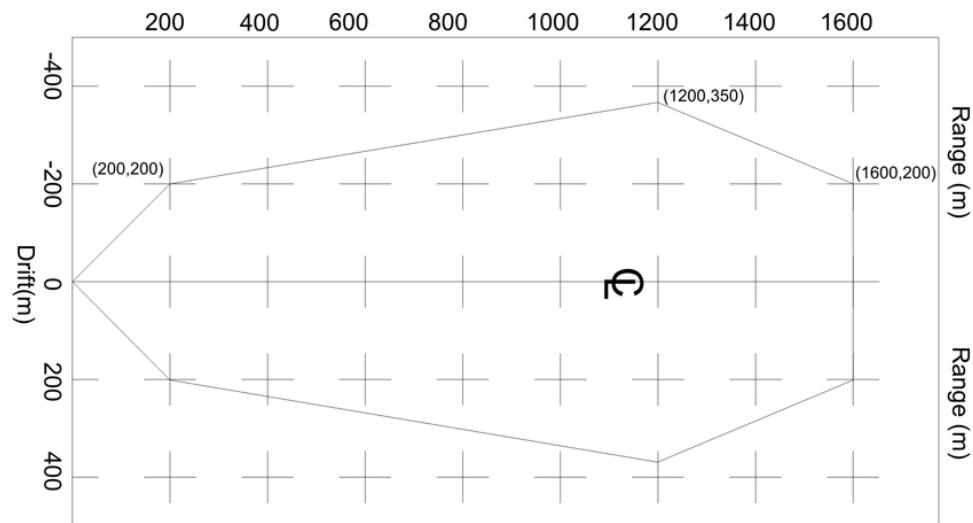
1 degree = 17.77778 mil

APPENDIX C: HUMAN ENGINEERING

Below are listed the nominal design firing heights utilized in these guidelines.

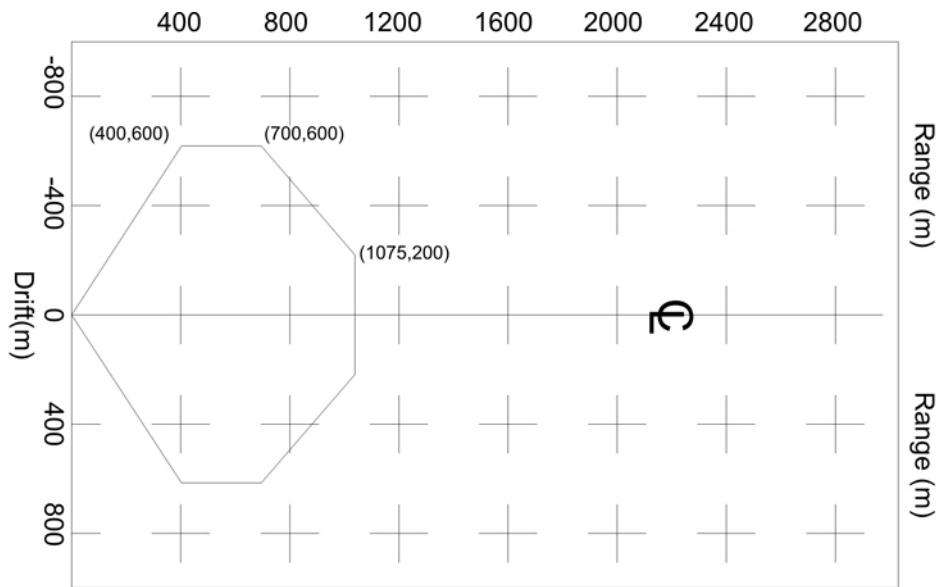
Table 18: Firing Heights

Firing Position	Height Above Ground Level
Standing	150 cm
Shooting Bench	120 cm
Kneeling	80 cm
Prone	30 cm

APPENDIX D: SAFETY AREA TEMPLATES**Figure 57: Safety Area Template P1**

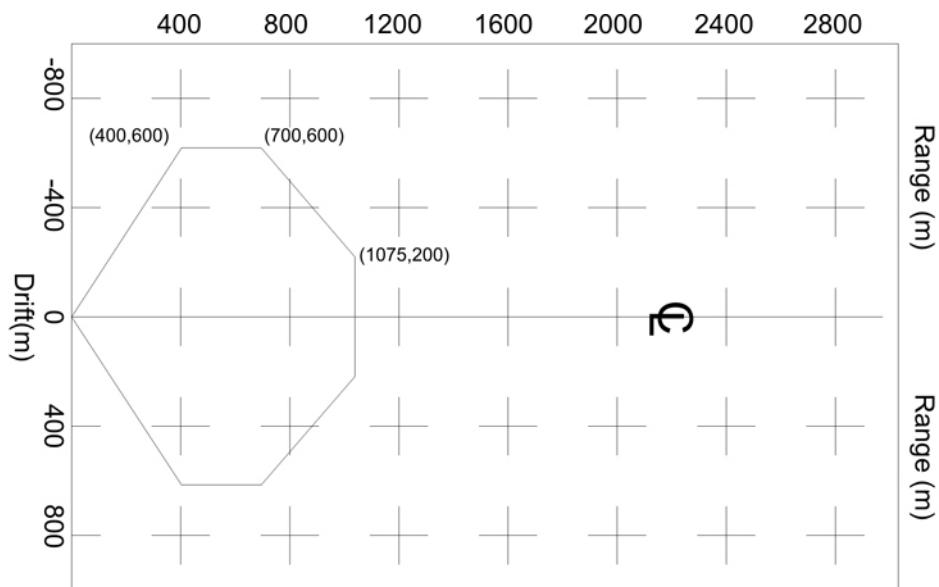
SAFETY TEMPLATE DATA - PISTOL			
Caliber: Bullet: Velocity:	9mm PARABELLUM 115 GR FMJ 425 m/s	Backstop: Metrological Effects: Date:	6m Standard Design 14 m/s; 21°C; 980 mbar 1999-07-15

Figure 58: Safety Area Template P2



SAFETY TEMPLATE DATA - PISTOL			
Caliber:	.22 LR	Backstop:	Ø;Field Firing Range
Bullet:	40 GR	Metrological Effects:	14 m/s; 21°C; 980 mbar
Velocity:	360 m/s	Date:	1999-07-15

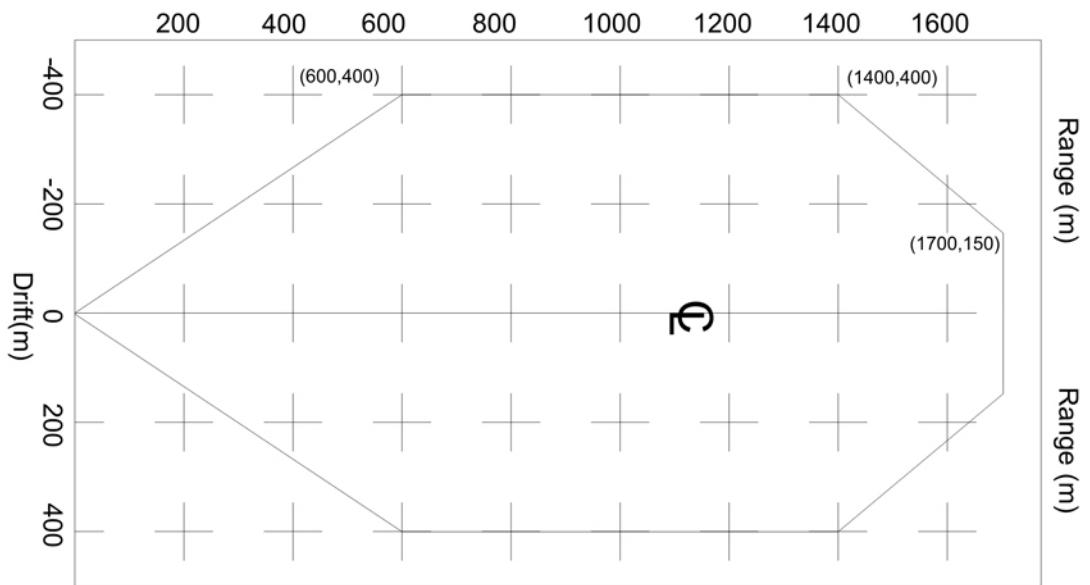
Figure 59: Safety Area Template P3



SAFETY TEMPLATE DATA - PISTOL			
Caliber:	.22 LR	Backstop:	Ø;Field Firing Range
Bullet:	40 GR	Metrological Effects:	14 m/s; 21°C; 980 mbar
Velocity:	360 m/s	Date:	1999-07-15

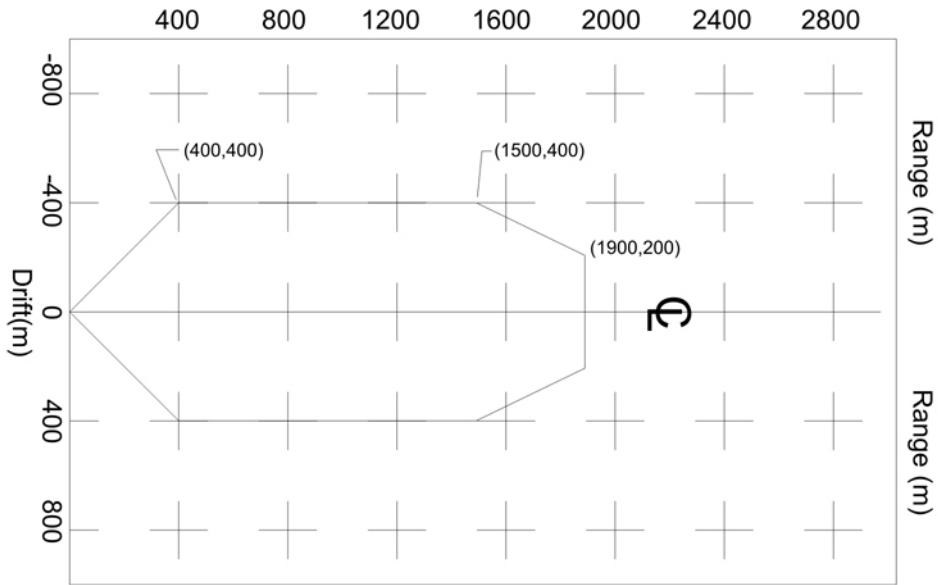
Figure 60: Safety Area Template P10

APPENDIX D: SAFETY AREA TEMPLATES



SAFETY TEMPLATE DATA - PISTOL			
Caliber: Bullet: Velocity:	9mm PARABELLUM 115 GR FMJ 425 m/s	Backstop: Metrological Effects: Date:	Ø;Field Firing Range 14 m/s; 21°C; 980 mbar 1999-07-15

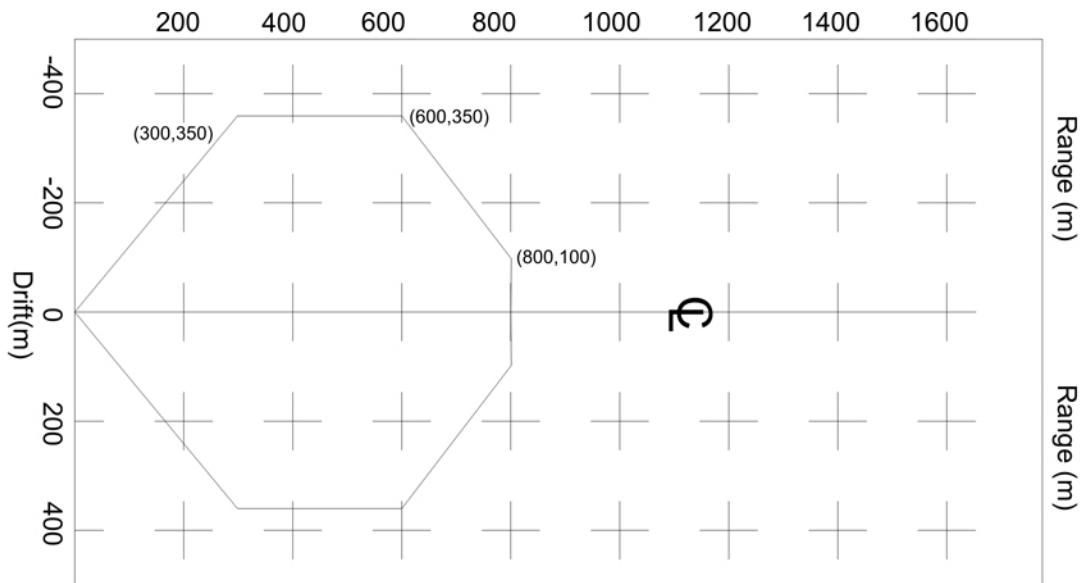
Figure 61: Safety Area Template P11



SAFETY TEMPLATE DATA - PISTOL			
Caliber: Bullet: Velocity:	.357 S&W MAGNUM 158 GR FMJ 450 m/s	Backstop: Metrological Effects: Date:	Ø;Field Firing Range 14 m/s; 21°C; 980 mbar 1999-07-15

Figure 62: Safety Area Template P12

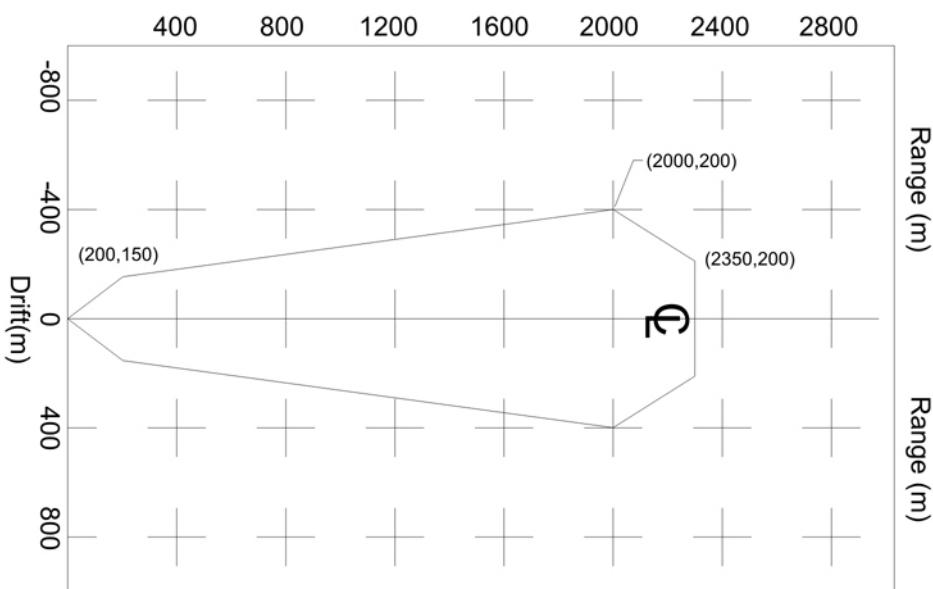
APPENDIX D: SAFETY AREA TEMPLATES



SAFETY TEMPLATE DATA - RIFLE

Caliber:	.22 LR HV	Backstop:	6m Standard design
Bullet:	40 GR	Metrological Effects:	14 m/s; 21°C; 980 mbar
Velocity:	360 m/s	Date:	1999-07-15

Figure 63: Safety Area Template R1

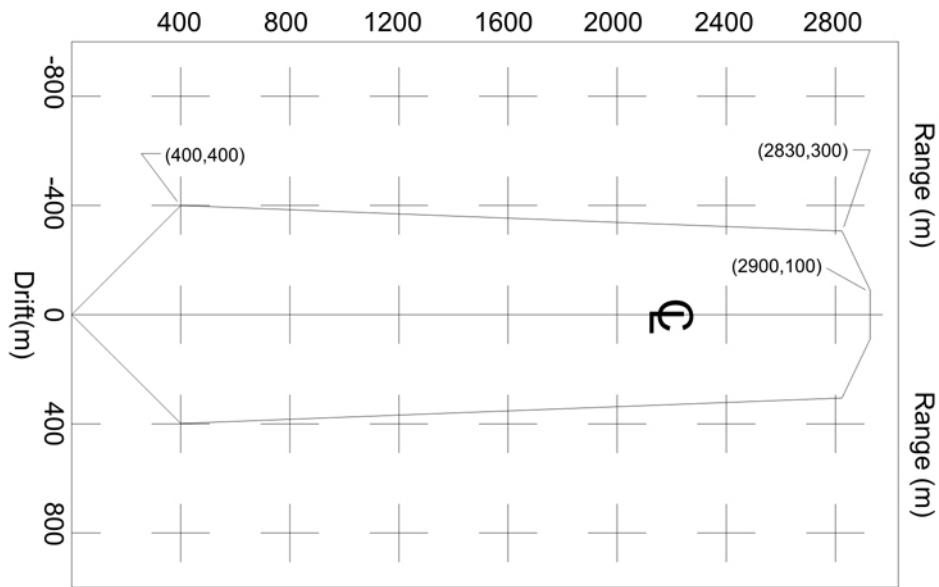


SAFETY TEMPLATE DATA - RIFLE

Caliber:	.223 REMINGTON	Backstop:	6m Standard Design
Bullet:	62 GR FMJ	Metrological Effects:	14 m/s; 21°C; 980 mbar
Velocity:	940 m/s	Date:	1999-07-15

Figure 64: Safety Area Template R3

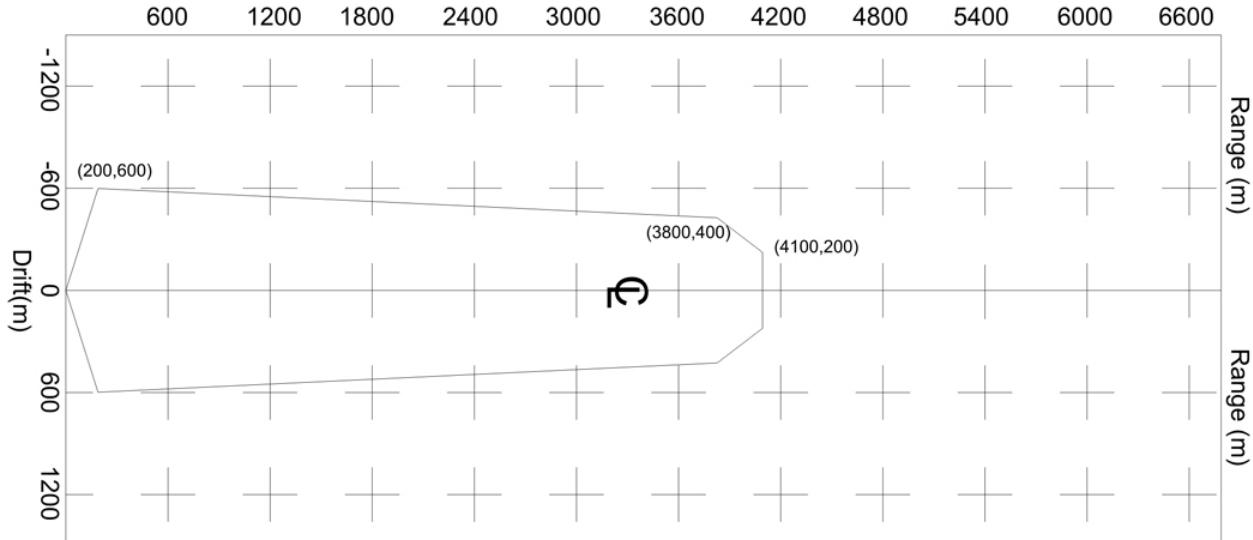
APPENDIX D: SAFETY AREA TEMPLATES



SAFETY TEMPLATE DATA - RIFLE

Caliber:	.308 WINCHESTER	Backstop:	6m Standard Design
Bullet:	147 GR FMJ	Metrological Effects:	14 m/s; 21°C; 980 mbar
Velocity:	850 m/s	Date:	1999-07-15

Figure 65: Safety Area Template R4



SAFETY TEMPLATE DATA - RIFLE

Caliber:	.338 LAPUA MAGNUM	Backstop:	6m Standard Design
Bullet:	250 GR FMJ	Metrological Effects:	14 m/s; 21°C; 980 mbar
Velocity:	920 m/s	Date:	1999-07-15

Figure 66: Safety Area Template R5

APPENDIX D: SAFETY AREA TEMPLATES

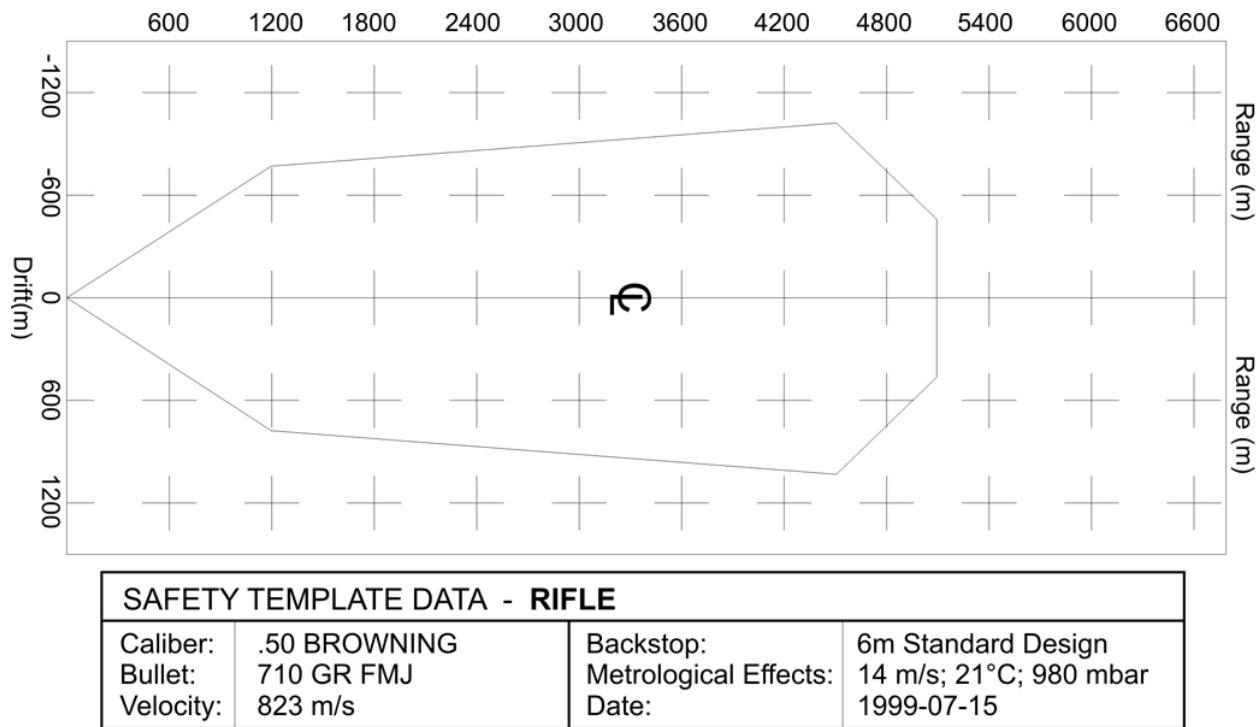
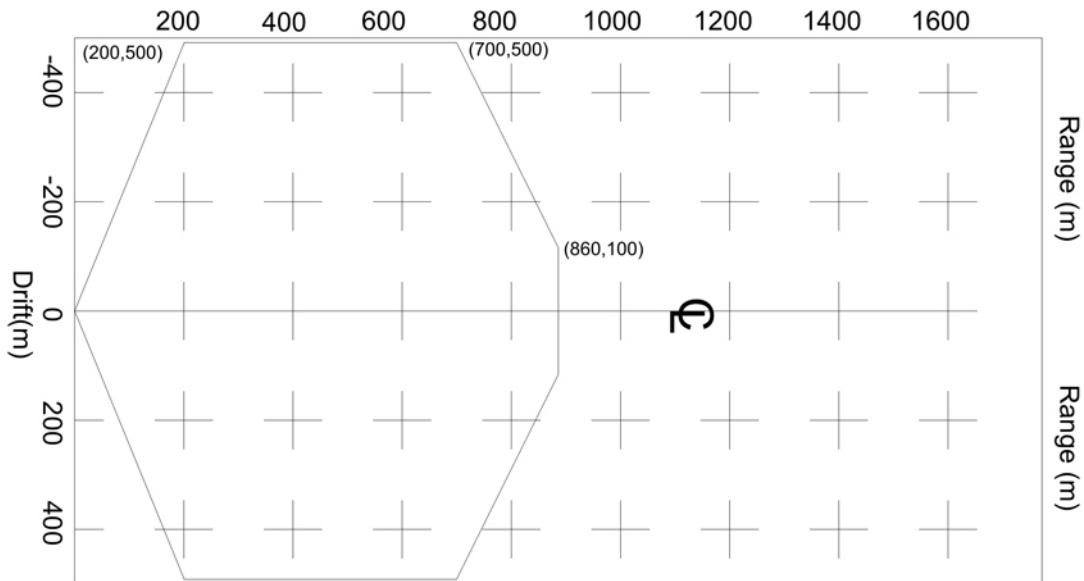


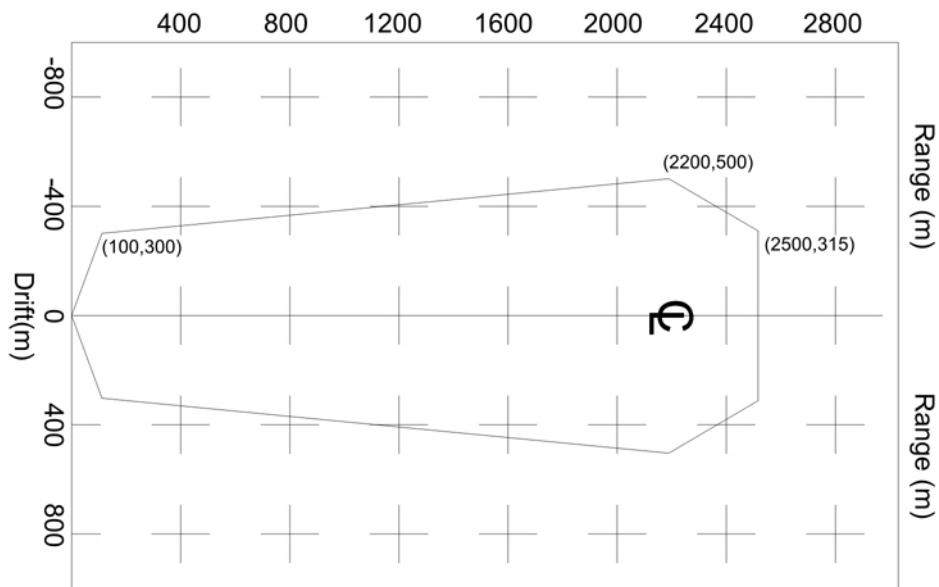
Figure 67: Safety Area Template R6



SAFETY TEMPLATE DATA - RIFLE			
Caliber:	.22 LR HV	Backstop:	Ø; Field Firing Range
Bullet:	40 GR	Metrological Effects:	14 m/s; 21°C; 980 mbar
Velocity:	360 m/s	Date:	1999-07-15

Figure 68: Safety Area Template R10

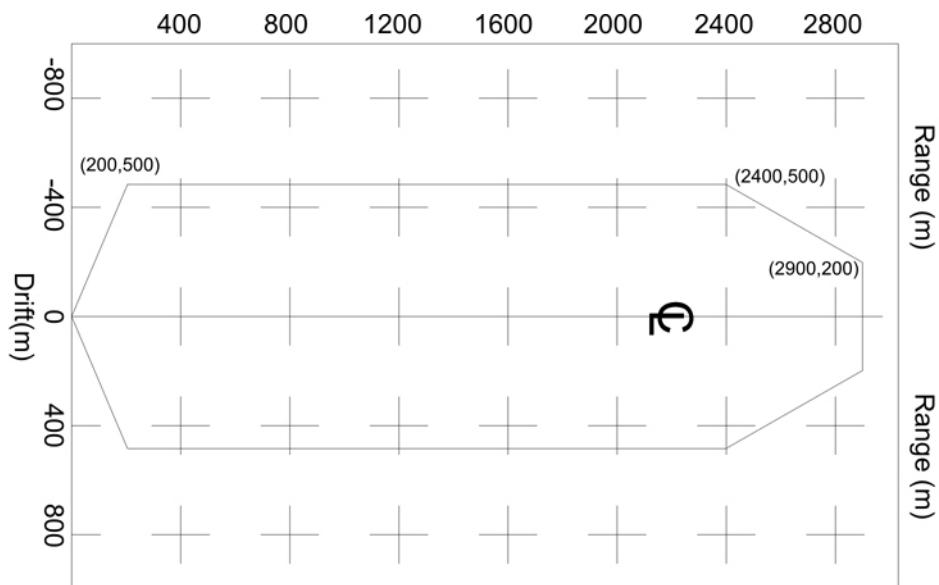
APPENDIX D: SAFETY AREA TEMPLATES



SAFETY TEMPLATE DATA - RIFLE

Caliber:	.223 REMINGTON	Backstop:	Ø;Field Firing Range
Bullet:	62 GR FMJ	Metrological Effects:	14 m/s; 21°C; 980 mbar
Velocity:	940 m/s	Date:	1999-07-15

Figure 69: Safety Area Template R12



SAFETY TEMPLATE DATA - RIFLE

Caliber:	.308 WINCHESTER	Backstop:	Ø;Field Firing Range
Bullet:	147 GR FMJ	Metrological Effects:	14 m/s; 21°C; 980 mbar
Velocity:	850 m/s	Date:	1999-07-15

Figure 70: Safety Area Template R13

APPENDIX D: SAFETY AREA TEMPLATES

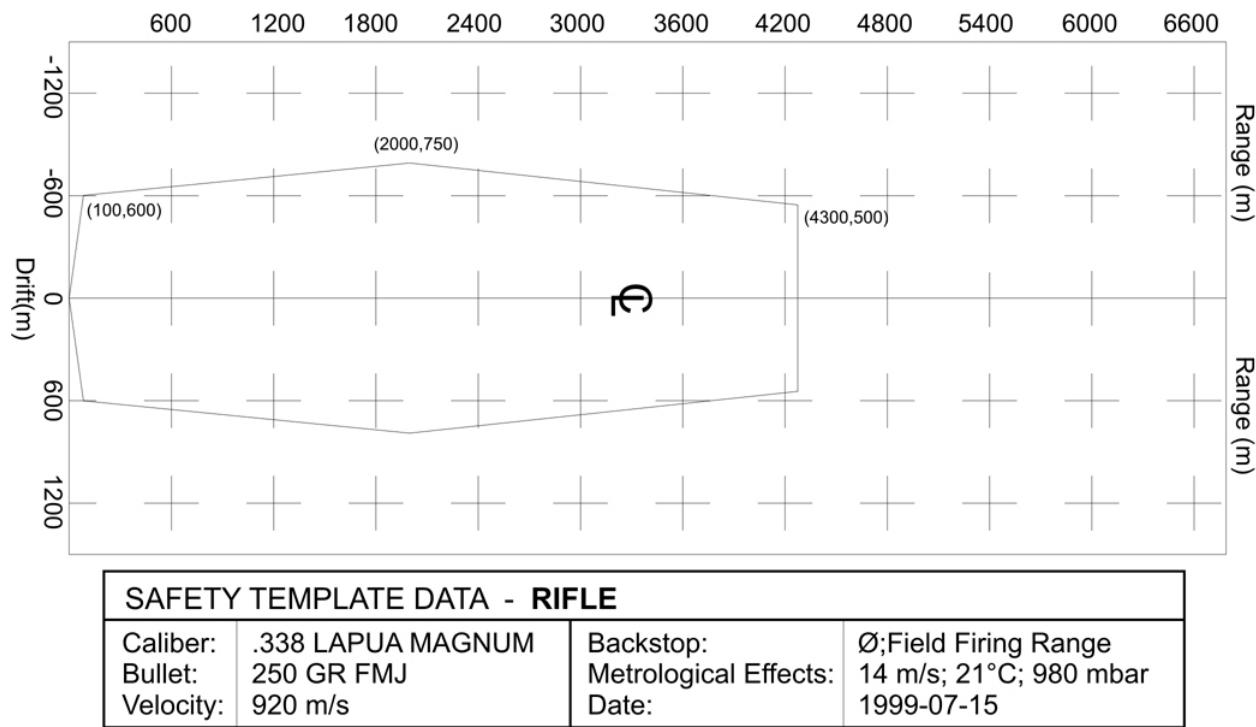


Figure 71: Safety Area Template R14

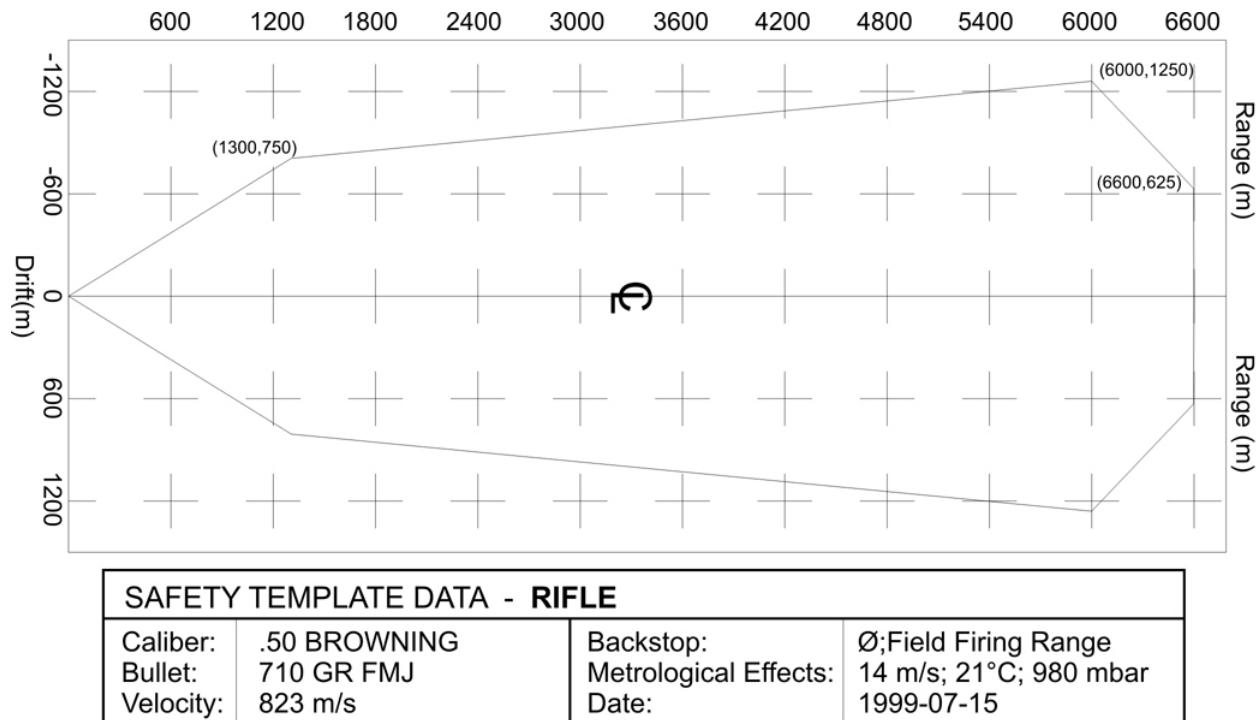


Figure 72: Safety Area Template R15

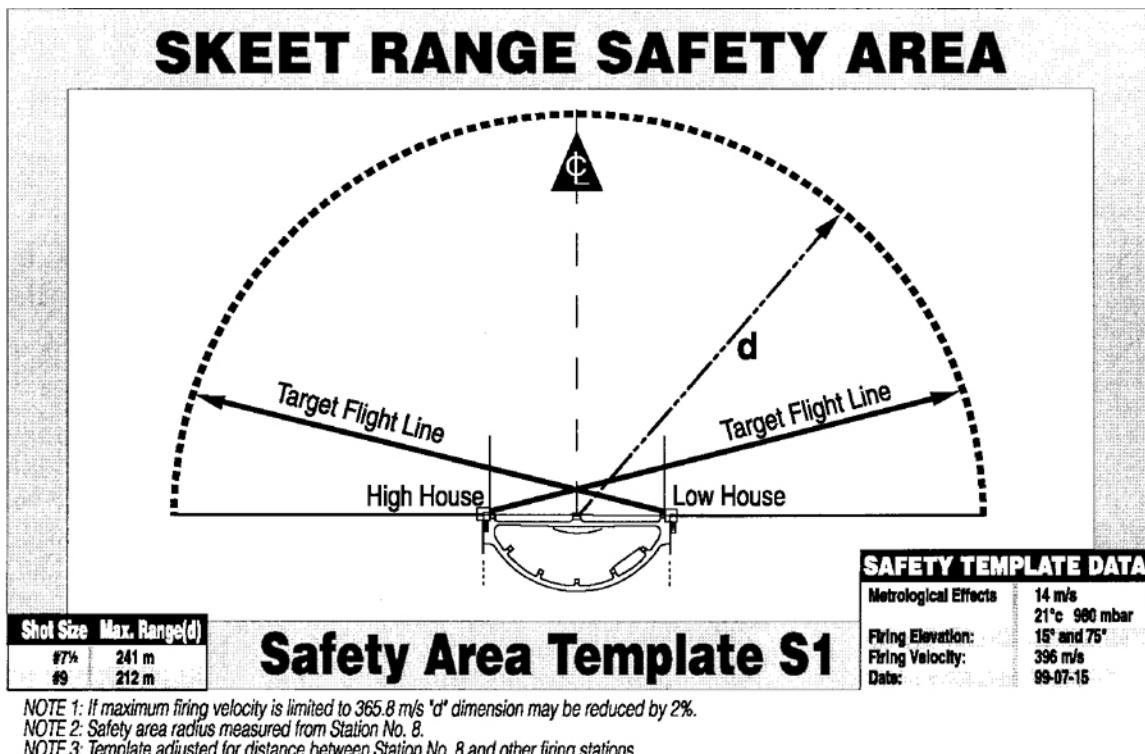


Figure 73: Safety Area Template S1 – Skeet Range Safety Area

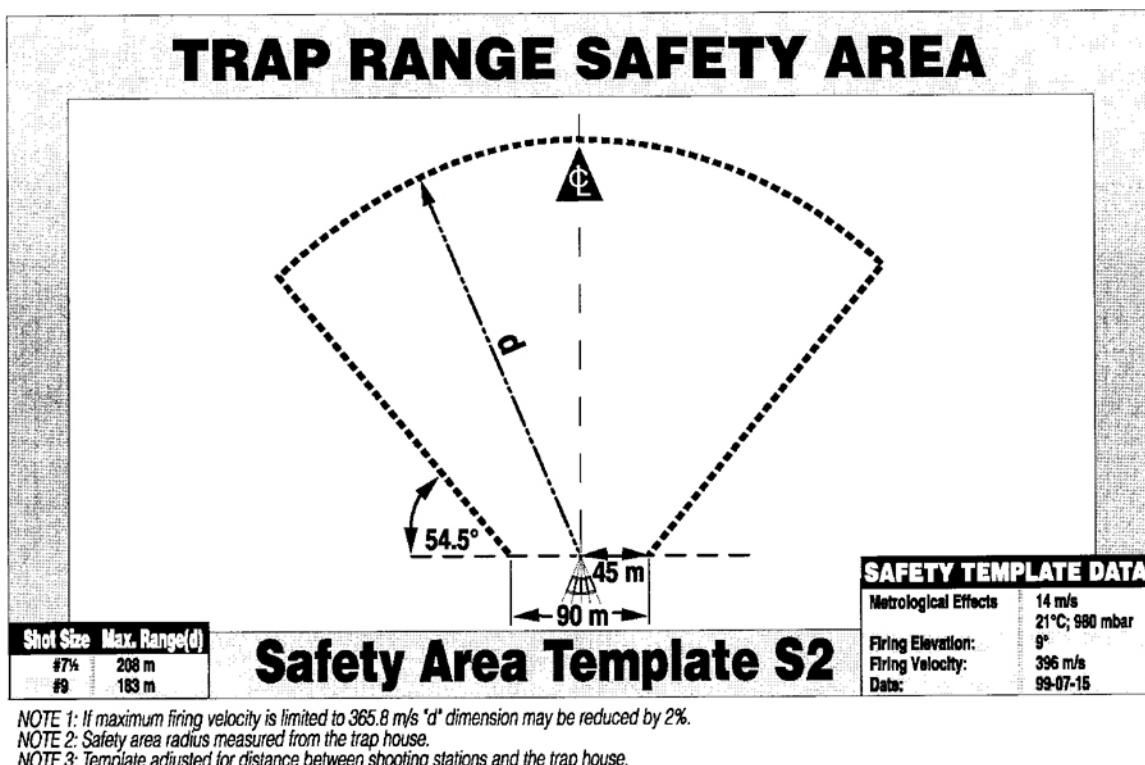


Figure 74: Safety Area Template S2 – Trap Range Safety Area

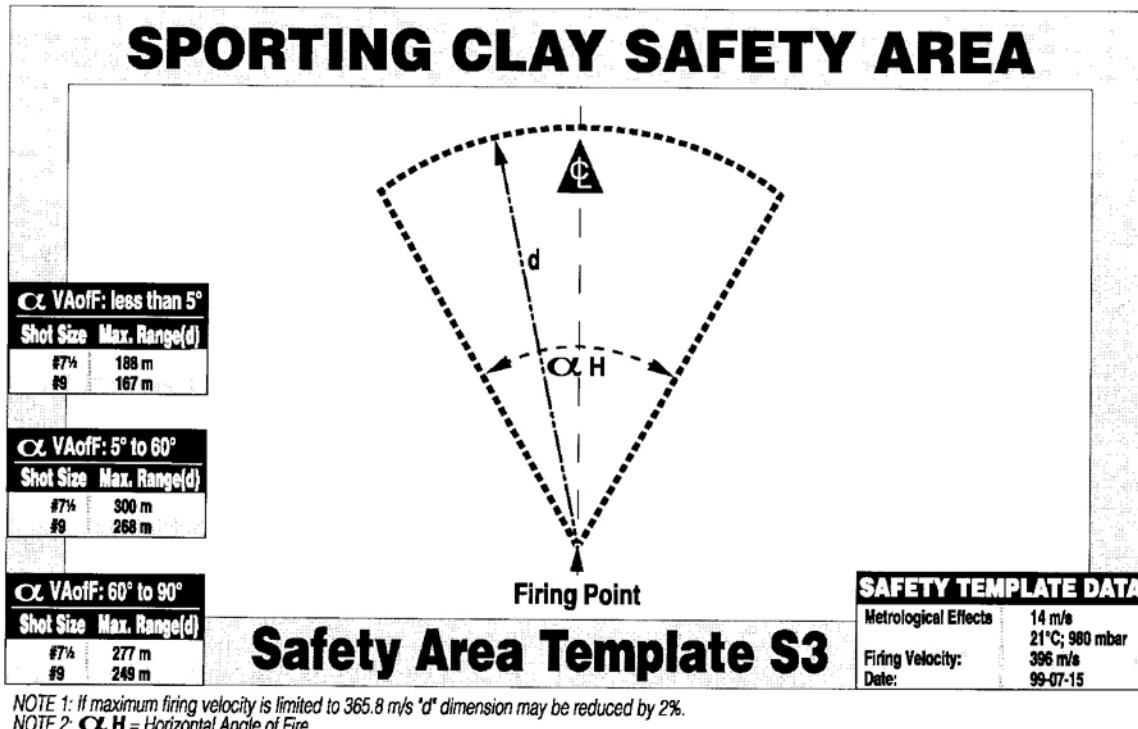


Figure 75: Safety Area Template S3 – Sporting Clay Safety Area

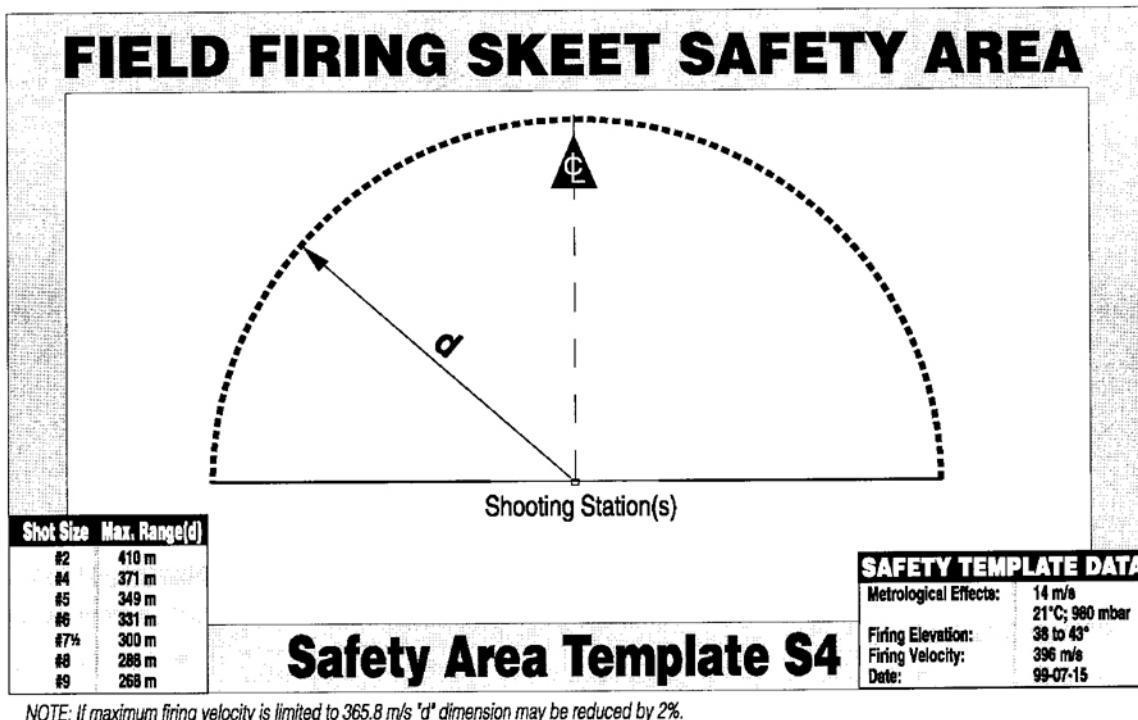


Figure 76: Safety Area Template S4 – Field Firing Skeet Safety Area

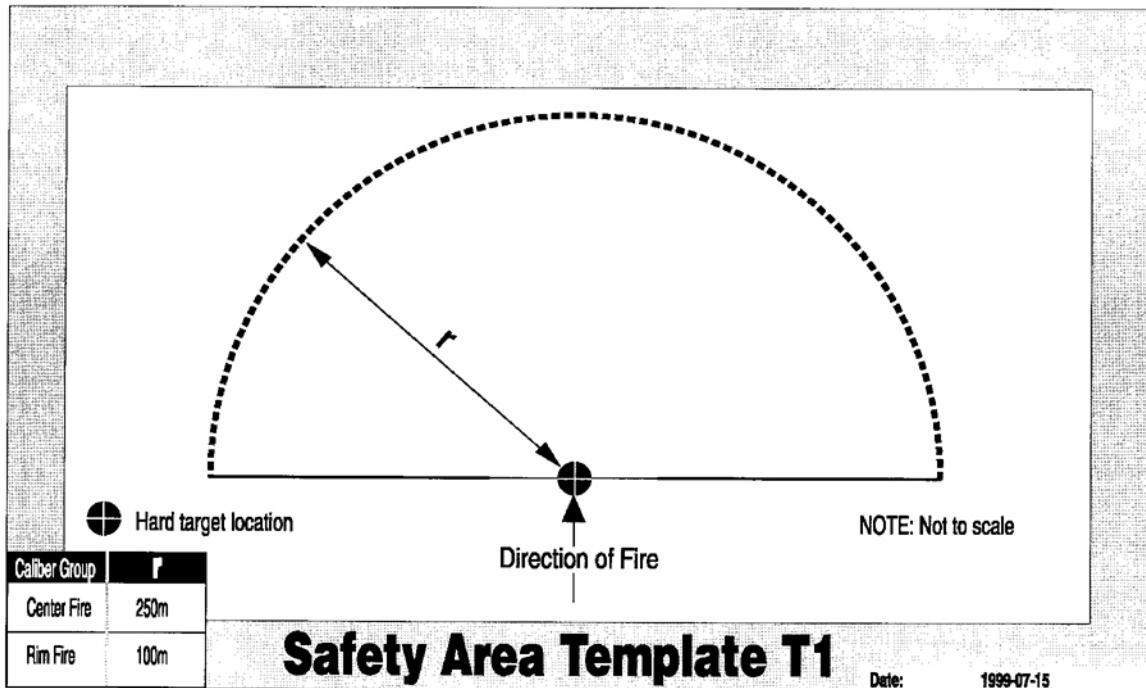


Figure 77: Safety Area Template T1

APPENDIX E: TEMPLATES TABLE OF EQUIVALENCIES

Table 19: Templates Table of Equivalencies

Template Group	Templates	Nominal Max. Range	Included Calibres	
.50 Browning Calibre	R6 & R15	7216 m (900 m/s @ 40 deg.)	.50 Browning Calibre	
.338 Lapua Magnum	R5 & R14	6322 m (900 m/s @ 39 deg.)	.338 Lapua Magnum	.300 H&H Magnum
			7 mm Remington Magnum	.338 Winchester Magnum
			.300 Winchester Magnum	.340 Weatherby Magnum
			.300 Weatherby Magnum	.358 Norma Magnum
			.308 Norma Magnum	.350 Remington Magnum
			.375 H&H Magnum	.378 Weatherby Magnum
			8 mm Remington Magnum	
.308 Winchester	R4 & R13	4359 m (845 m/s @ 36 deg.)	.308 Winchester	6.5X61 Mauser
			.30-06 Springfield	7X57 Mauser
			7 mm-08 Remington	7X57R Mauser
			6.5X55 Swedish Mauser	6.5X50 Arisaka
			6.5X54 Mannlicher-Schoenauer	6.5X52 Mannlicher-Carcano
			6.5X57 Mauser	6.5X53R Mannlicher
			6.5X57R Mauser	.250 Savage
			6.5X58R Sauer	.257 Roberts
			6.5X58 Portuguese Vergueiro	.307 Winchester

APPENDIX E: TEMPLATES TABLE OF EQUIVALENCIES

Template Group	Templates	Nominal Max. Range	Included Calibres	
			6.5X58R Krag-Jorgensen	.303 British
			8 mm Mauser (8X57 JS)	.350 Remington Magnum
			.270 Winchester	.300 Savage
			.358 Winchester	
.223 Remington	R3 & R12	4121 m (1050 m/s @ 36 deg.)	.223 Remington	7.62X39 Russian
			.22 Hornet	.30-30 Winchester
			.220 Swift	.222 Remington
			.22-250 Remington	.25-20 WCF
			.223 Remington Magnum	.25-35 Winchester
			.30 Remington	.256 Winchester Magnum
			.303 Savage	.50-90 Sharps
			.32 Winchester Special	.32-20 Winchester
			.35 Remington	.44-40 Winchester
			.38-55 Winchester	.444 Marlin
			.38-40 Winchester	.44 Ball
			.30 MI Carbine	.375 Winchester
			.348 Winchester	.45-70 U.S. Government
			.351 Winchester	.458 Winchester
			.356 Winchester	6 mm Lee Navy
			.22 Savage Hi-Power	.30-40 Krag
			.25 Remington	

APPENDIX E: TEMPLATES TABLE OF EQUIVALENCIES

Template Group	Templates	Nominal Max. Range	Included Calibres	
.357 S&W Magnum	P3 & P12	2136 m (450 m/s @ 35 deg.)	.357 Magnum	
9 mm Parabellum	P2 & P11	2073 m (350 m/s @ 35 deg.)	9 mm Parabellum	.50 Caliber Muzzleloader, cast bullet
			.44 Magnum	
			.45 ACP	
			7.65 Parabellum (.32)	
.22 Long Rifle HV	P1 & P10 R1 & R10	1685 m (390 m/s @ 35 deg.)	.22 Long Rifle HV	.380 Short
			.22 Long Rifle Std. Velocity	.25 ACP
			.22 Long	.32 ACP
			.22 Short	
			.58 Calibre Muzzleloader Ball	
			.54 Calibre Muzzleloader Ball	
			.44 Calibre Muzzleloader Ball	
			.45 Calibre Muzzleloader Ball	
			.40 Calibre Muzzleloader Ball	
			.36 Calibre Muzzleloader Ball	
			.58 Calibre Muzzleloader Ball	

APPENDIX F: RICOCHET AIR DANGER HEIGHTS

Table 20: Ricochet Air Danger Heights

Calibre	Ricochet Air Danger Height
.22 Long Rifle	150 m
9 mm Parabellum	200 m
.357 S&W Magnum	200 m
.223 Remington	100 m
.308 Winchester	175 m
.338 Lapua Magnum	450 m
.50 Browning	800 m

Notes

1. ADHs for horizontal firing on standard ranges.
2. Ricochet height measured from target elevation.
3. All bullet designs are FMJ; for other bullet types, contact CFO.

APPENDIX G: SAFETY AREA TEMPLATE DESIGN FACTORS

The environmental conditions listed in the table below have been used to represent the Canadian climate, taken as a whole, with statistical confidence. The safety area templates referred to in these guidelines have utilized these conditions as design parameters.

Table 21: Safety Area Template Design Parameters

Environmental Effect	Value
Wind Speed	14 m/s
Barometric Pressure	98.0 kPa (980 mBar)
Air Temperature	21°C

APPENDIX H: CONVERSION FACTORS AND UNITS OF MEASURE

Weight

1 gram = 15.432 grains

1 gram = 0.03527 ounces

1 lb. = 7000 grains

1 kg = 2.205 lbs.

Distance

1 inch = 25.4 mm

1 ft = 0.3048 m

1 m = 1.0936 yds

1 km = 3281 ft

Velocity

1 m/s = 3.2808 ft/sec

1 ft/sec = 0.6818 miles/hr

Energy

1 Joule = 0.73757 ft.lbs.

Pressure

1 Mpa = 145.036 lb/sq.in. (psi)

Angular

360 degrees = 6400 mils

1 degree = 17.7778 mils

APPENDIX I: SAMPLE RANGE OPERATING INSTRUCTIONS

These Range Operating Instructions are provided as a sample document from the perspectives of format and content. Other formats are acceptable, as long as they clearly describe the correct range operating practices and procedures.

All Range operators and range users are to sign below after reading these Range Operating Instructions.

PRINT NAME	SIGNATURE	DATE

SECTION 1 – GENERAL

These Range Operating Instructions cover the use of the range facility operated by the XX Shooting Association.

All Range Officers (RO) and range users are required to read and sign these Range Operating Instructions yearly.

Requests for exemptions from any of the provisions given in these Range Operating Instructions shall be submitted in writing to the Range Operator for approval.

1. Revisions

These Range Operating Instructions have been published and revised on the dates listed below:

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

SECTION 2 – RANGE FACILITY

1. Range Descriptions

The range facility has multiple ranges. A description of each operational range is listed below:

- A Range – 5 lane, 900 m rifle ranges
- B Range – 24 lane, 50 m handgun/small bore rifle range
- C Range – 10 lane, 100 m rifle/handgun range
- D Range – 3 position, field firing shotgun Skeet range

A RANGE

Location: Immediately forward of B range (refer to *Site Plan*)

Description: 900 m rifle range

No. Firing Points: 5

Firing Distances: 900, 500, 300, 200 and 100 m

Approved Firearms: Bolt action and semi-automatic rifles

Maximum Approved Calibres: .308 Winchester

Approved Targets: Paper targets and steel reactive targets

Approved Ammunition: FMJ, SP and lead RN - No incendiary, tracer or armour piercing bullet designs

B RANGE

Location: Immediately behind A range (refer to *Site Plan*)

Description: 50 m handgun/rifle range

No. Firing Points: 20

Firing Distances: 50, 40, 25, 15, 10 and 7 m

Approved Firearms: Bolt action and semi-automatic rim-fire rifles, centre-fire handguns, all types, centre-fire handgun calibre SMG's (police only)

Maximum Approved Calibres: .357 S&W Magnum

Approved Targets: Paper targets and steel reactive targets

Approved Ammunition: FMJ, SP and lead RN - No incendiary, tracer or armour piercing bullet designs

C RANGE

Location: At the end of B range road (refer to *Site Plan*)

Description: 100 m rifle/handgun range

No. Firing Points: 10

Firing Distances: 100 m

Approved Firearms: Bolt action and semi-automatic rifles

Centre-fire handgun calibres

Maximum Approved Calibres: 338 Lapua Magnum

Approved Targets: Paper targets and steel reactive targets

Approved Ammunition: FMJ, SP and lead RN - No incendiary, tracer or armour piercing bullet designs

D RANGE

Location: To the left side of C range (refer to *Site Plan*)

Description: Field firing Skeet range

No. of Firing Points: 3

Firing Distances: N/A

Approved Firearms: Sporting shotguns

Maximum Approved Calibres: 12 Gauge

Approved Targets: Frangible skeet targets

Approved Ammunition: 1300 ft/sec #7½ sized lead or steel shot

SECTION 3 – PERSONNEL

1. Range Officer

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

ROs have the responsibility to supervise all personnel (shooting and non-shooting alike) present on the property and reserve the right to have members and/or non-members removed at their discretion.

All ROs operating the facility must have a valid Range Officer certification from a recognized agency. XX Shooting Association recognizes RO qualifications from the following agencies or groups:

- XX Shooting Association;
- SFC;
- IPSC;
- RCMP (Range Master course);
- Canadian Armed Forces Range Safety Officer training;
- DFO, Ports Canada Police or DNR; or
- Any other individual whose equivalent qualifications are deemed acceptable by the Range Operator.

2. Guests and Spectators

Guests (children and adults) or pets are the responsibility of the XX Association member who they came with and must remain under adult control at all times.

Spectators are the responsibility of the RO; the RO must take personal responsibility for them or delegate that responsibility to someone else, preferably a XX Shooting Association member.

SECTION 4 – RANGE OPERATIONS

1. Flags

A RED *Complex* flag must be flown from the flag pole at the main entrance when firing is being conducted on any range within the facility. Each range has specific flags that must be flown when in use. They are:

A RANGE

- RED flag at the top of the stop butt.
- RED flag at the firing line; green flag when firing has ceased.

B RANGE

- RED flag at the top of the stop butt.
- RED flag at the active firing line; green flag when firing has ceased.

C RANGE

- RED flag at the top of the stop butt.
- RED flag at 100 metre firing line; green flag when firing has ceased.

D RANGE

- RED flag behind Station No. 2.

2. Targets

Only XX Shooting Association approved paper targets, as described below, may be used:

- A Range – Paper or steel reactive targets
- B Range – Paper or steel reactive targets
- C Range – Paper or steel reactive (rim-fire calibres only)
- D Range – Frangible clay skeet targets

At no time can glass, pop cans or similar targets be used on the range facility.

3. Log Book

Each range has a usage *Log Book*, which must be filled out by the RO upon completion of each day's firing.

Attendance records must be kept for each person using the range and submitted to the Operations Director upon request.

4. Ammunition

All spent cartridge cases or shotshell hulls 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.

Only authorized calibres and types of ammunition may be used on any range.

5. Permitted Arcs of Fire

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

A RANGE

- Plus or minus (+/-) 1 firing point at all distances.

B RANGE

- +/- 1 firing point beyond 20 m.
- +/- 3 firing points between 5 m and 20 m firing line.

C RANGE

- +/- 1 firing point at all ranges.

D RANGE

- 75° between the signs demarcated by red/orange.

6. Firing

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

- No firing before 9 AM and no firing 10 minutes after sunset.
- No firing on any range unless two people are present, one of which is an approved RO.
- No firing if target visibility is reduced as determined by the RO.
- Shooters with loaded firearms must be under RO direction.
- Loaded firearms shall never be left unattended.

7. Firearm Type Approvals (By Range)

The following firearms types are approved for use on the ranges as indicated.

A RANGE

- Bolt action and semi-automatic rifles.

B RANGE

- Centre-fire and rim-fire calibre handguns, rim-fire calibre rifles, submachine guns, and shotguns.

C RANGE

- Centre-fire and rim-fire calibre handguns, centre-fire and rim-fire calibre rifles, submachine guns, and shotguns.

D RANGE

- Shotguns or shot handguns only.

8. Explosives

The detonation of explosive devices is prohibited on the range property.

9. Firearm Inspection Areas

Located on Ranges B and C are areas designed for the safe inspection of loaded or unloaded firearms. They are noted by signs stating, "Caution: Firearm Inspection Area." All firearms arriving at the range must be cleared at the firearm inspection area or remain cased and then cleared on an active firing line by an RO.

A RANGE

- Not applicable.

B RANGE

- The inspection area is a three-sided wooden beam emplacement located between the parking lot and the 50 metre firing point.

C RANGE

- The inspection area is a three-sided wooden beam emplacement located beside the office.

D RANGE

- Not applicable.

10. Hunting

Hunting on the range site is permitted under specific conditions, which are:

- With written authorization from the Range Director;
- Not on any of the range surfaces or roadways; and,
- While any range is being used.

11. 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.

12. Road/Range Closures during Range Operations

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

Active Range	Closure
A Range	B Range to be closed
B Range	A Range and adjoining road to be closed
C Range	D Range to be closed
D Range	C Range to be closed

13. Garbage

Burning of garbage is prohibited. All garbage is to be collected, bagged and taken to the garbage bin located at the main gate or otherwise removed from the range property.

14. Handguns

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

15. Match Completion

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

- All target frames are returned to the storage shed;
- Firing points are policed for brass and other debris;
- All flags are lowered; and
- Buildings and entrance gate are locked.

The RO is to report all noted deficiencies in the *Log Book* located on each range.

SECTION 5 – RANGE SAFETY CONSIDERATIONS

1. Range Safety Vehicle and Equipment

A Range Safety Vehicle must be designated for each active range. This vehicle must:

- Be located as close as is practical to the active range (firing line);
- Have the keys in the ignition;
- Be suitable to transport an injured party to the nearest medical facility; and
- Be provided with an emergency first aid kit.

In addition, telephone or radio communications equipment must be available on the range.

2. Spectators

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

3. Hearing and Eye Protection

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

Eye protection for shooters and range staff in near proximity to an active firing line is highly recommended.

4. Alcohol / Drugs

Any person deemed by the RO to be under the influence of alcohol or drugs will not be permitted to shoot.

5. 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 permitted in the assigned area, immediately around the provided smoking barrels.

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

1. Emergency Phone Numbers

Ambulance: 1-123-456-7890

Fire: 1-123-456-7890

RCMP: 1-123-456-7890

Poison Control: 1-123-456-7890

Department of Natural Resources: 1-800-123-4567 **or** 1-123-456-7890

Range Operations Director:

1-123-456-7890 (Home)

1-123-456-7890 (Work)

1-123-456-7890 (Pager)

2. Hospitals

The location of area hospitals is listed below:

Multi-Services Health Centre (Travel time – 20 minutes)

70 Blueberry Blvd., Your Town

1-123-456-7890 (emergency ward)

Note: This facility is not a 24 hr emergency service.

INCLUDE A SITE PLAN

APPENDIX J: SHOOTING CLUB AND SHOOTING RANGE REGULATIONS

1. INTERPRETATION

The definitions in this section apply to these Regulations.

“Act” – means the *Firearms Act*. (*Loi*)

“approved” – means approved under section 29 of the Act. (*agrément*)

“operator” – means a person approved under subsection 29(1) of the Act to operate either a shooting club or a shooting range. (*exploitant*)

“prohibited handgun” – means a handgun referred to in subsection 12(6) of the Act. (*arme de poing prohibée*)

“public service agency” – has the same meaning as in the Public Agents Firearms Regulations. (*agence de services publics*)

“range officer” – means an individual who oversees the shooting activities at the firing line of a shooting range. (*officier de tir*)

“shooting club” – means a non-profit organization whose activities include target practice or target shooting competitions using restricted firearms or prohibited handguns at an identified approved shooting range. (*club de tir*)

“shooting range” – means a place that is designed or intended for the safe discharge of firearms for the purpose of target practice or target shooting competitions. (*champ de tir*)

2. APPLICATION

These Regulations apply to:

- a) shooting clubs; and
- b) shooting ranges, subject to Subsections (1) and (2).

(1) A shooting range that is part of the premises of a licensed business is exempt from the application of these Regulations on the condition that it is used only by owners and employees of the business who hold a licence authorizing the holder to acquire restricted firearms.

(2) A shooting range that is used only by public officers within the meaning of subsection 117.07(2) of the *Criminal Code* is exempt from the application of these Regulations on the condition that each public officer uses the shooting range only in connection with his or her lawful duties or employment.

3. GENERAL

Request for Approval of Shooting Range

(1) A person who wishes to establish and operate a shooting range shall submit a request for approval to the Provincial Minister and provide the following information in the request:

- a) The applicant’s name, address, phone number and, if applicable, facsimile number and electronic mail address;
- b) The location of the shooting range, including road directions to reach it;
- c) The proposed hours of operation of the shooting range; and

- d) With respect to each operator, each owner of the shooting range and each employee of the shooting range who handles firearms:
 - i. His or her name, address and phone number; and
 - ii. The number of his or her licence to possess firearms or, if one does not exist, his or her date of birth.

(2) The request for approval of a shooting range must be accompanied by the following documentation:

- a) A survey report, location certificate or other similar document that shows the geographical location and layout of the shooting range and the portion of the surrounding area that might be affected by shooting on the shooting range, as well as the land use of that portion;
- b) A copy of the proposed safety rules;
- c) Subject to Subsection (3), evidence of at least \$2,000,000 of commercial general liability insurance with coverage on an occurrence basis;
- d) Evidence of compliance with applicable zoning laws;
- e) Copies of, and evidence of compliance with, any operating licences required by federal, provincial or municipal laws;
- f) Evidence that the design and operation of the shooting range meets at least the requirements set out in Section 4, Subsection (1); and
- g) Evidence that the shooting range complies with any federal, provincial or municipal legislation that applies to the establishment and operation of such a facility in regard to environmental protection.

(3) In the case of a shooting range operated by a public service agency, the agency shall provide evidence of liability indemnification with respect to the shooting range, of at least \$2,000,000, from a federal, provincial or municipal government.

Request for Approval of Shooting Club

(4) A person who wishes to establish and operate a shooting club shall submit a request for approval to the Provincial Minister and provide the following information in the request:

- a) The applicant's name, address, phone number and, if applicable, facsimile number and electronic mail address;
- b) With respect to each member or officer of the club:
 - i. His or her name, address and phone number; and
 - ii. The number of his or her licence to possess firearms or, if one does not exist, his or her date of birth; and
- c) The name and address of each approved shooting range that the shooting club uses for target practice or target shooting competitions.

(5) The request for an approval of a shooting club must be accompanied by the following documentation:

- a) The articles of incorporation of the shooting club or other documentation sufficient to demonstrate that it is a non-profit organization;
- b) Evidence of at least \$2,000,000 of commercial general liability insurance with coverage on an occurrence basis; and
- c) Evidence confirming that the shooting club has permission to use at least one shooting range referred to in Subsection (4), paragraph (c), or a shooting range maintained by the Minister of National Defence under the *National Defence Act*.

4. OPERATIONS

Compliance with Safety Standards and Other Obligations

(1) The operator of an approved shooting range shall ensure that the discharge of firearms on the shooting range does not endanger the safety of persons at the shooting range or in the portion of the surrounding area described in Section 3, paragraph (2)(a), by taking appropriate measures, including ensuring that:

- a) The design and operation of the shooting range:
 - i. Is such that projectiles discharged from firearms will not leave the shooting range if they are discharged there, in accordance with the safety rules; and
 - ii. Promotes the safety of all persons on the shooting range, by accommodating any adaptation that may be appropriate given the nature of the shooting activities that may take place and the type and calibre of firearms that may be used there;
- b) The shooting range has an adequate warning system to warn persons that they are entering a shooting range and to inform them, when such is the case, that shooting activities are taking place at that time;
- c) Appropriate shooting range safety rules are applied, which are consistent with the nature of the shooting activities that may take place and the type and calibre of firearms that may be used there;
- d) The safety rules are posted in a conspicuous place on the shooting range; and
- e) If more than one person is simultaneously engaged in shooting activities on the shooting range, a person acts as the range officer.

Requirements for Users

(2) No person may use a restricted firearm or prohibited handgun at a shooting range unless the person is:

- a) A member or an officer of an approved shooting club;
- b) A guest of a person referred to in paragraph (a); or
- c) An individual who ordinarily resides outside of Canada who is either a member of a recognized shooting organization or a guest described in paragraph (b).

Safety Training

(3) The operator of a shooting range shall ensure that every person who indicates an intention to use the shooting range for the first time is informed of the safety rules used at that shooting range.

(4) No person may use a shooting range for the first time without having received the information referred to in Subsection (3).

5. CONTINUING COMPLIANCE

Insurance

(1) The operator of a shooting club or a shooting range shall at all times maintain the insurance coverage referred to in Section 3, paragraphs (2)(c) and (5)(b).

Evidence

(2) Every five years after the date on which the approval of a shooting range was granted, the operator shall submit current copies of the documents set out in Section 3, paragraphs (2)(a) to (2)(c), as well as evidence of continuing compliance with the requirements, referred to in paragraphs (2)(d) to (2)(g) of Section 3, Section 4 – Subsection (1) and Section 5 – Subsection (1), to the Chief Firearms Officer.

(3) The Chief Firearms Officer may request an operator of a shooting range to provide evidence, as described in Subsection (2), no more than once in a calendar year.

(4) Despite Subsection (3), the Chief Firearms Officer may make a request more frequently if he or she:

- a) Has received, in the preceding 12 months:
 - i. A personal injury report in accordance with Section 6, Subsection (1), or
 - ii. A change report in accordance with Section 6, Subsection (3); or
- b) Has reasonable ground to believe that the continued operation of the shooting range may endanger the safety of any person.

6. REPORTS AND RECORDS

Personal Injury Report

(1) The operator of an approved shooting club or shooting range shall report any personal injury occurring on a shooting range that is caused by the discharge of a firearm:

- a) As soon as possible to the local police; and
- b) Within 30 days after the personal injury to the Chief Firearms Officer.

(2) The report referred to in Subsection (1) must include the following information relating to the personal injury:

- a) Its date, time and location;
- b) The names of the individuals involved;
- c) The name of any range officer who was on duty at the time;
- d) Whether or not medical attention was sought; and
- e) A general description of the incident, including the circumstances in which the personal injury occurred, if known.

Change Report

(3) The operator of an approved shooting range who proposes to make a change that affects the matters set out in the documentation submitted under Section 3, Subsection (2), shall give advance notice of the proposed change to the Chief Firearms Officer within sufficient time, given the nature and complexity of the proposed change, to allow the Chief Firearms Officer to evaluate it.

(4) The operator of an approved shooting range shall report immediately to the Chief Firearms Officer any change, other than one referred to in Subsection (3):

- a) To the shooting range or the portion of the surrounding area described in Section 3, paragraph (2)(a), that could endanger the safety of any person; and
- b) In operating permits or licences, issued under provincial or municipal laws, that may be relevant to the approval of the shooting range or its activities.

7. RECORDS

(1) The operator of an approved shooting club shall keep records, with respect to the following users of restricted firearms or prohibited firearms, which include:

- a) With respect to a member or officer of the club:
 - i. His or her name, address and phone number;
 - ii. His or her membership card number; and
 - iii. The number of his or her licence to possess firearms or, if one does not exist, his or her date of birth; and
- b) With respect to a guest of a member or officer of the club:
 - i. The information required in subparagraph (a)(i); and
 - ii. The number of his or her licence to possess firearms, if one exists.

(2) Every record made under Subsection (1) must be maintained for at least six years.

(3) At the Chief Firearms Officer's request, the operator of the approved shooting club shall submit to the Chief Firearms Officer a report containing all or any requested part of the information described in Subsection (1).

Participation of Officers, Members and their Guests

(4) The operator of an approved shooting club shall, on the request of a Chief Firearms Officer, supply a written description of the participation, if any, of a current or past member or officer of the shooting club or his or her guest, in target practice or target shooting competitions within the previous five years, where subsection 67(2) of the Act applies to the member, officer or guest.

(5) The operator of an approved shooting club shall, on the request of a current or past member or officer of the shooting club or his or her guest, supply to the requestor the description referred to in Subsection (4) that concerns the requestor.

Notice of Refusal or Revocation

(6) A notice of a decision by a Provincial Minister to refuse to approve a shooting club or shooting range or a notice to revoke an approval, pursuant to subsection 29(3) of the Act, is sufficiently given if the notice is addressed to the applicant for, or operator of, a shooting club or shooting range at the address of the person that is set out in the request for approval, or if the person has advised the Provincial Minister of a change of address, at the new address, and the notice is:

- a) Delivered personally:
 - i. If the applicant or operator is an individual, at any time that is reasonable in the circumstances; and
 - ii. If the applicant or operator is a business, during normal business hours;

- b) Sent by registered or certified mail or by courier; or
 - c) Transmitted by electronic means that can produce a paper record.
- (7) The notice is deemed to be received:
- a) On the day of delivery, if it is delivered personally;
 - b) On the fifth working day, excluding Saturdays and holidays, after:
 - i. The postmark date, if it is sent by mail; and
 - ii. The date of shipment on the waybill, if it is sent by courier; and
 - c) If it is sent by electronic means:
 - i. If the applicant or operator is an individual, on the day of the transmission; and
 - ii. If the applicant or operator is a business, on the day of the transmission, if that day is a working day or, if that day is not a working day, on the first working day after the day of transmission.

8. COMING INTO FORCE

These Regulations come into force on December 1, 1998.

MAP GLOSSARY

Editing Notes: Terms are sorted alphabetically.

Bearing

The angle, measured clockwise, that a line makes with a fixed zero line. Unless otherwise stated, the zero line is north; a bearing may be a true bearing measured from true north, a magnetic bearing measured from magnetic north or a grid bearing measured from grid north.

Contour

An imaginary line on the surface of the ground, which is at the same height above mean sea level throughout its length. Contour lines are drawn on maps to show the shape of the ground.

Grid

Lines forming squares drawn on a map as a basis for a system of map references. The lines are drawn on the paper parallel to north-south and east-west lines through a fixed origin.

Magnetic Variation or Declination

The angle between true north and magnetic north.

Orienting a Map

Placing a map so that its true north line points true north (or magnetic or grid north line points magnetic or grid north, respectively). Also used for air photographs. It is also called “setting a map.”

Resection

A method of fixing a position by observation of at least two previously fixed points.

True North

The direction of the North Pole from that point.

Magnetic North

The point in the far north of Canada to which a compass needle points.

Grid North

Except through the origin, grid lines do not lie true north and south nor east and west. Grid north is the direction of the north and south grid lines on a map.

Plotting

The process of transferring field observations and measurements to a map or sketch.

G.P.S.

Global Position System consists of receivers that obtain signals from satellites and resect these signals to give you a fix on your position.

Latitude

The north/south measurement of position, perpendicular to the earth's polar axis.

Longitude

An east/west measurement of position in relation to the Prime Meridian, an imaginary circle that passes through the North and South poles.

Navigation

The process of travelling from one place to another and knowing where you are in relation to your desired course.

Position

An exact unique location based on a geographic coordinate system.

Universal Transverse Mercator (U.T.M.)

A grid coordinate system that projects global sections onto a flat surface to measure position in specific zones.

AMMUNITION GLOSSARY

Editing Notes: All terms are sorted alphabetically. Definitions are from the Association of Firearms and Toolmark Examiners (AFTE) Glossary.

ACP

Abbreviation for Automatic Colt Pistol. Used with calibre designations, such as 25 ACP, 32 ACP, 380 ACP and 45 ACP.

Air Resistance

The resistance of air to the passage of a projectile in flight.

Altitude Effect

The effect on velocity and therefore projectile trajectory and shot pattern that is caused by changes in atmospheric density due to altitude.

Ammunition

One or more loaded cartridges consisting of a primed case, propellant, and with or without one or more projectiles.

Ammunition, Ball

A term generally used by the military for a cartridge with a full metal jacketed bullet or solid metal projectile.

Ammunition, Match

Ammunition made specifically for match target shooting, which is produced with special controls to assure maximum uniformity of cartridge performance.

Ammunition, Small Arms

A military term for ammunition for firearms with bores not larger than one inch.

Angle of Departure

The angle formed between a horizontal line and the centreline of the bore at the moment the projectile leaves the muzzle of the firearm.

Anvil

1. An internal metal component in a boxer primer assembly, against which the priming mixture is crushed by the firing pin blow. See "Primer."
2. A metal feature in the primer pocket of a Berdan-primed cartridge case, against which the priming compound is crushed by the firing pin blow.
3. The breech end of the chamber in a rim-fire firearm.

AP

Abbreviation for Armour Piercing ammunition.

Ballistic Coefficient

The ratio of the sectional density of the projectile to its coefficient of form (sometimes referred to as its form factor). It is an index of the manner in which a particular projectile decelerates in free flight due to resistance or drag of the atmosphere in which it is travelling.

Ballistic Table

A table of factors relating to the flight of a given projectile. Usually includes, but is not limited to, velocity and energy at various distances from the muzzle.

Ballistics

The study of a projectile in motion.

Ballistics, Exterior

The study of the motion of the projectile(s) after it leaves the barrel of the firearm.

Ballistics, Interior

The study of the motion of the projectile(s) within the firearm, from the moment of ignition until it leaves the barrel.

Ballistics Terminal

The study of the projectile's impact on the target.

Barrel

The part of a firearm through which a projectile or shot charge travels under the impetus of powder gases, compressed air, or other like means. It may be rifled or smooth.

Base

1. The portion of a cartridge case, which contains the primer, usually called the head.
2. The filler material that constitutes the lowest or base wad in the shotshell.
3. The rear or base portion of a bullet.

BB

The designation of spherical shot having a diameter of 180" used in shotshell loads. The term BB is also used to designate steel or lead air rifle shot of .175" diameter. Although the two definitions cause some confusion, they have co-existed for many years.

BB Cap

The abbreviation for Bulleted Breech Cap. Originally designated as a rim-fire cartridge for use in Flobert rifles in France, for indoor shooting.

Bullet

A non-spiral projectile for use in a rifled barrel.

Bullet, Armour Piercing

1. A bullet consisting of a hardened core or wholly composed of a substance other than lead or lead alloy.
2. Any bullet manufactured, represented or designed to be metal or armour piercing.

Bullet, Boat-Tail

A specific design of bullet having a tapered or truncated conical base.

Bullet, Cast

A bullet formed by pouring molten lead into a mould.

Bullet, Conoidal

A cone-shaped bullet.

Bullet, Copper-Jacketed

A bullet having an outer jacket of copper or copper alloy and containing a lead alloy core.

Bullet Core

The inner portion of a jacketed bullet, usually lead or lead alloy.

Bullet, Exploding

A bullet containing a primer or other explosive and designed to explode upon impact.

Bullet, Flat-Nosed

A bullet with a flattened front end at a right angle to its axis.

Bullet, Frangible

A projectile designed to disintegrate upon impact on a hard surface in order to minimize ricochet or spatter.

Bullet, Full Metal Jacket

A projectile in which the bullet jacket encloses the core, usually with the exception of the base. Also called Full Jacketed, Full Patch, and Full Metal Case.

Bullet, Gas Check

A lead alloy bullet with a copper or gilding metal cup pressed over the base.

Bullet, Hollow Base

A bullet with a deep base cavity.

Bullet, Hollow Point

A bullet with a cavity in the nose to facilitate expansion.

Bullet, Incendiary

A bullet containing a chemical compound which ignites upon impact to start fires.

Bullet Jacket

A usually metallic cover over the core.

Bullet, Metal-Cased Hollow Point

A bullet having a metal jacket enclosing a lead alloy core. The entire bullet is enclosed except for the nose, which has a cavity.

Bullet, Mushroom

A bullet that has expanded upon impact to a mushroom-like shape, or is designed to expand as such.

Bullet Ogive

The curved, forward part of a bullet.

Bullet, Partition

A bullet designed for controlled expansion having a jacket that is divided into two chambers, which enclose the forward and rear cores of the bullet. It is designed so that the first chamber expands and the rear chamber holds together for penetration.

Bullet Penetration

That distance which a bullet travels into a target material.

Bullet, Round Nose

An elongated projectile with a radiused nose. Technically, the radius of the nose is of the bullet's diameter.

Bullet, Semi-Jacketed Hollow Point

A bullet with a partial jacket exposing a lead nose with a cavity.

Bullet, Semi-Wadcutter

A projectile with a distinct, short truncated cone at the forward end.

Bullet, Soft Point

A design providing for exposure of a portion of the core at the nose of a jacketed bullet.

Bullet, Spire Point

A projectile with a conical nose profile.

Bullet Spin

The rotational motion imparted to a bullet by the rifling in the barrel.

Bullet, Spitzer

A bullet design having a sharp pointed, long ogive, usually of seven calibres or more (i.e. ogive radius length to bullet diameter ratio).

Bullet Splash

The spatter and fragmentation of a bullet upon impacting a hard surface.

Bullet, Steel-Jacketed

A bullet with steel used as jacket material.

Bullet, Swaged

A bullet that has been formed by compressing and forming the bullet material in a die.

Bullet, Tracer

A bullet that has a burning compound in its base which permits observation of its flight.

Bullet Trap

A means of safely stopping a bullet in flight when recovery is not the objective. Usually incorporates a steel plate set at an angle to deflect the bullet up or down into a pit or receptacle.

Bullet, Truncated

A design of a flat-nosed bullet having a conical-shaped nose, rather than a rounded nose.

Bullet, Wadcutter

A cylindrical bullet design having a sharp shouldered nose intended to cut target paper cleanly to facilitate easy and accurate scoring.

Calibre

1. Firearms: The approximate diameter of the circle formed by the tops of the lands of a rifled barrel.
2. Ammunition: A numerical term, without the decimal point, included in a cartridge name to indicate a rough approximation of the bullet diameter.

Cannelure

A circumferential groove generally of a knurled or plain appearance in a bullet or cartridge case. Three uses include crimping, lubrication and identification.

Cap, Percussion

A small, generally cylindrical metallic cup containing a primary explosive used to ignite the powder charge in muzzle-loading firearms.

Cartridge

A single unit of ammunition consisting of the case, primer and propellant, with or without one or more projectiles. Also applies to a shotshell.

Cartridge, Bottleneck

A cartridge case having a main diameter and a distinct angular shoulder stepping down to a smaller diameter at the neck position of the case.

Cartridge Case

The container for all the other components which comprise a cartridge.

Cartridge, Case Belted

A cartridge case design having an enlarged band ahead of the extractor groove. This type of construction is generally used on large capacity magnum type cartridges and serves to strengthen the case.

Cartridge Case Capacity

The amount, by weight, of a particular type of powder that can be inserted in a cartridge case with the bullet fully seated, without compressing the powder charge.

Cartridge Case Extractor Groove

An annular groove cut in rimless, semi-rimmed or belted cartridge cases, forward of the head, for the purpose of providing a surface that the extractor may grip to remove the case from the chamber.

Cartridge Case Head

The base of the cartridge case which contains the primer.

Cartridge Case Mouth

The opening in the cartridge case into which the projectile(s) is inserted.

Cartridge Case Neck

The cylindrical portion of a cartridge case, with a reduced diameter, extending from the top of the shoulder to the case mouth.

Cartridge Case Rebated

A centre-fire case whose rim diameter is smaller than the diameter of the body of the case.

Cartridge Case, Rimless

A centre-fire cartridge whose case head is of the same diameter as the body, having a groove forward of the head to provide the extraction surface.

Cartridge Case, Rimmed

A cartridge case having a rimmed or flanged head that is larger in diameter than the body of the case. May be either rim-fire or centre-fire.

Cartridge Case, Semi-Rimmed

A centre-fire cartridge case having a case head only slightly larger in diameter than the case body and an extractor groove just forward of the head.

Cartridge Case Shoulder

The section of a bottleneck cartridge case connecting the main body of the case and the smaller diameter neck.

Cartridge Case, Tapered

A case with the diameter reduced from head to shoulder or mouth.

Cartridge, Centre-Fire

Any cartridge that has its primer central to the axis in the head of the case.

Cartridge Designation – Metric

Most foreign and some American commercial cartridges are identified by their nominal bullet diameter and cartridge case length, both of which are given in millimetres: 8 x 57, 7 x 57, 6.5 x 54 mm, etc.

Cartridge, Dummy

An inert cartridge which cannot be fired.

Cartridge, Express

A cartridge that produces greater than standard velocity. The name is derived from cartridges developed in England around 1885.

Cartridge, Magnum

A term used to describe a rim-fire or centre-fire cartridge, or shotshell, that is larger, contains more shot or produces higher velocity than standard cartridges or shotshells of a given calibre or gauge. Rifles, handguns and shotguns that are designed to fire magnum cartridges or shells may also be described with the term "magnum."

Cartridge, Metallic

Ammunition having a metallic cartridge case.

Cartridge, NATO

A common designation for the 9 mm, 7.62 mm or 5.56 mm NATO military cartridges. Produced under the specifications of the North Atlantic Treaty Organization.

Cartridge, Rim-Fire

A flange-headed cartridge containing the priming mixture inside the rim cavity.

Cartridge, Shot

A centre-fire or rim-fire cartridge loaded with small diameter shot. Designed to be fired from any firearm other than a shotgun.

Cartridge, Wildcat

Cartridges that have never been manufactured commercially or made available publicly.

Case

Refers to cartridge case. The term is shortened through common usage.

Case Capacity

The volume available for propellant in a cartridge case with a fully seated bullet. It may be expressed in weight of water or a specific propellant.

Caseless Ammunition

Ammunition that has the propellant charge moulded to the base of the bullet and not enclosed in any type of cartridge case.

CB Cap

A low velocity .22 calibre rim-fire cartridge having a Conical Bullet (from which the name is derived) and no propellant other than the priming compound.

Chamber

The rear part of the barrel bore that has been formed to accept a specific cartridge. Revolver cylinders are multi-chambered.

Charge

1. The amount, by weight, of a component of a cartridge (i.e. priming weight, propellant weight, shot weight).
2. To load a firearm.

Charge, Maximum

A charge weight, in grains, of a particular propellant that may be used with other specified ammunition components without exceeding the safe, maximum, allowable pressure limit for the specific cartridge being loaded.

Choke

An interior constriction at or near the muzzle end of a shotgun barrel bore for the purpose of controlling shot dispersion.

Choke, Variable

An adjustable device attached to the muzzle of a shotgun in order to control the shot patterns.

Chronograph

An electronic device used to measure and record time intervals and time of flight projectiles. It is used to determine velocities of projectiles.

Coefficient of Form

A numerical term indicating the general profile of a projectile.

Deflagrate

To burn with intense heat and light. Gunpowder is said to deflagrate.

Discharge

To cause a firearm to fire.

Elevation

The term used to designate the vertical movement of an adjustable sight to cause the fired bullet to strike the point of aim at various ranges.

Energy, Bullet

The capacity of a projectile to do work, commonly expressed in the units, foot-pounds, joules or kilogram metres. Sometimes called Projectile Energy.

Energy, Muzzle

The energy of a projectile at the muzzle of the firearm from which it has been fired.

Flash Hole

1. A hole(s) pierced or drilled through the web in the primer pocket of a metallic cartridge case.
2. The hole in the end of a battery cup primer used in shotshells.
3. The hole in a percussion nipple.

Gauge

A term used in the identification of a shotgun bore. The number of round lead balls of bore diameter that equal one pound. Thus, 12 gauge is the diameter of a round lead ball weighing 1/12 of a pound.

Grain

1. A unit of weight (avoirdupois), 7000 grains equal one pound.
2. The grain unit is commonly used in American and English ammunition practice to measure the weight of components.

Gunpowder

Any of various powders used in firearms as a propellant charge.

Handloading

The process of assembling a cartridge case with primer, propellant and bullet or shot with hand operated tools.

Headstamp

Numerals, letters and symbols (or combinations thereof) stamped into the head of a cartridge case or shotshell to identify the manufacturer, calibre, gauge or give additional information.

Line of Sight

The straight line from the eye through the sights to the target or point of aim.

Load

1. The combination of components used to assemble a cartridge or shotshell.
2. The placing of cartridges into a firearm magazine or chamber.

Load, Field

A shotshell loaded for hunting small game animals and birds.

Loading Density

The relationship of the volume of the propellant to the available case volume. Usually expressed as a percentage.

Long Rifle

1. Originally, the term was used in reference to long-barrelled flintlock rifles.
2. The name given one type of a calibre 22 rim-fire cartridge.

Mephit

A term describing the blunt tip of a bullet, specifically its diameter.

Minute of Angle

The distance subtended by an angle, which is 1/60 of one degree. At 100 yards, 1 MOA is approximately 1.047 inches.

Muzzle

The end of a firearm barrel from which the bullet or shot emerges

Muzzle Energy

A projectile's energy at the time it leaves the muzzle of the firearm.

Nitro-Cellulose

Also known as "cellulose hexanitrate," the principal ingredient of single-base and double-base gunpowders.

Obturation

The sealing of powder gases. Obturation is an important factor in three specific areas at the time that a cartridge has been fired in a chamber:

1. Sealing the cartridge case to the chamber wall;
2. Preventing leakage between the primer and its retaining wall in the cartridge case; and
3. Ensuring that gas does not pass between the bullet and bore throughout the entire bore travel, or ensuring that gas does not bypass the wad column in a shotgun load during its travel throughout the bore.

Overall Length

Ammunition: The greatest dimension of a loaded cartridge (i.e. from face of the head to the tip of the bullet for centre-fire or rim-fire, or to the crimp for shotshells or blanks). Not to be confused with the uncrimped length of a shotshell.

Pellet

1. A common name for the small spherical projectiles loaded in shotshells. Also known as "shot."
2. A non-spherical projectile used in some air rifles and air pistols.

Point of Aim

The place or point on a target, which intersects the straight line generated by the alignment of the front and rear sights of a firearm.

Powder, Ball

A generally spherical type of smokeless powder first manufactured in 1933 by Western Cartridge Company. Ball powder is often further modified by a flattening process into forms known as Flattened Ball, Rolled Ball and Cracked Ball. Ball powder is sometimes found in an elongated form, which is called "irregular ball."

Powder Burning Rate

The speed with which a propellant burns. It is affected by both physical and chemical characteristics.

Powder Double Base

A propellant composed of colloided nitro-cellulose and nitro-glycerine as its base as opposed to single-base powder, which has colloided nitro-cellulose only as its base material.

Powder, Nitro-Cellulose

A smokeless propellant for ammunition whose principal ingredient is colloided nitro-cellulose. The nitrogen content of the nitro-cellulose is usually between 12.8% and 13.1%. Also known as Single-Base Powder.

Powder, Smokeless

A propellant containing mainly nitro-cellulose (single base) or both nitro-cellulose and nitro-glycerine (double base).

Pressure

In a firearm, the force developed by the expanding gases generated by the combustion of the propellant.

Pressure Curve

A graph of the relationship of chamber pressure to time or travel in a firearm when a cartridge is fired.

Primer

The ignition component of a cartridge.

Primer, Berdan

An ignition component consisting of a cup, explosive mixture and covering foil. The anvil is an integral part of the cartridge case head in the bottom of the primer pocket. One or more flash holes are drilled or pierced through the bottom of the primer pocket into the propellant cavity of the case.

Primer, Boxer

An ignition component consisting of a cup, explosive mixture, anvil and covering foil disc, which together form the completed primer ready for assembly into the primer pocket of a cartridge case. A central flash hole is pierced through the bottom of the primer pocket into the propellant cavity of the case. Used in modern commercial centre-fire ammunition made in Canada and the United States.

Primer, Centre-Fire

A cartridge initiator which is assembled central to the axis of the head of the cartridge case and which is actuated by a blow to the centre of its axis, as opposed to rim-fire which must be struck on the circumference.

Primer Pocket

A cylindrical cavity formed in the head of a metallic centre-fire cartridge case, or in the head of a shotshell, to receive an appropriate primer or battery cup primer assembly.

Primer, Rim-Fire

A primer system in which the priming mixture is found in the circumferential rim cavity of a particular type of ammunition.

Projectile

An object propelled by the force of rapidly burning gases or other means.

Propellant

In a firearm, the chemical composition, which when ignited by a primer, generates gas. The gas propels the projectile(s). Also called Powder, Gunpowder: Powder, Smokeless.

Pyrodex

Trade Name: A substitute for black powder with similar burning characteristics, but safer and designed to produce less fouling.

Reloading Components

Primers, propellant powder, bullets, shot, wads and cartridge cases.

Ricochet

The deflection of projectile(s) after impact.

Rifle

A firearm having rifling in the bore and designed to be fired from the shoulder.

Rifling

Helical grooves in the bore of a firearm barrel to impart rotary motion to a projectile.

Sabot

1. A lightweight carrier in which a sub-calibre projectile(s) is centred to permit firing.
2. An enclosure to facilitate the firing of shot usually in a rifled barrel.

Sectional Density

The ratio of a bullet's weight to its diameter.

Shot, Steel

Soft steel pellets made specifically for use in shotshells.

Shotgun

A smooth bore shoulder firearm designed to fire shotshells containing numerous pellets or sometimes a single projectile.

Shotshell

A cartridge containing projectiles designed to be fired in a shotgun. The cartridge body may be metal, plastic or paper.

Slug

A term applied to a single projectile for shotshells.

Velocity

The speed of a projectile at a given point along its trajectory.

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