



MANUAL OF RANGE DESIGN, CONSTRUCTION AND INSPECTION GUIDELINES

October 2009

INTRODUCTION

The purpose of this range manual is to meet the requirements that have been placed on shooting organisations by the New Zealand Police to develop range standards that are applicable to different firearm sports.

Extract; NZ Police Range Manual 2005

Shooting organisations in New Zealand, lead by the New Zealand Shooting Federation has taken the lead of shooter responsibility for range standards. As operators of ranges, Shooting organisations and clubs, and in some cases individuals have the responsibility to ensure that land promoted as a shooting range is safe for that purpose. Failure to do so may render the organisation, club or individual criminally liable under section 145 of the Crimes Act 1961.

Please make yourself aware of local authorities requirements as they may vary in different locations, also Fish and Game regulations under the Wildlife Act.

The New Zealand Clay Target Association in compiling this range manual has sourced information from the New Zealand Police Range Manual, Australian Clay Target Association, FITASC, and various other sources.

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1. TRAPSHOOTING AND SKEET RANGES

A. Introduction

This section pertains to standard Trap, Skeet, ISSF and Sporting ranges. It does not pertain to shotgun zeroing (patterning) ranges or shotgun ranges where other activities are conducted.

All Shotgun 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 shot. *Refer to Figures 1 to 4 for the required safety area templates.*

The New Zealand Clay Target Association (NZCTA) as the sport governing body publish rules and facility requirements (layouts) for Trapshooting and Skeet shooting. 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.

B Safety Considerations

All types of ranges require a downrange Safety Area that is able to contain fired shot produced through normal range operations. This safety area may be standard shotfall zone of 200 meters or be topographical eg a hill, or embankment.

Human Activity - Safety Area

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 targets throwers are deemed to be functional if they throw targets reliably on the intended flight paths or within the intended arcs. It is recognised 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 predictable 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 *Figures 1 to 4* are for shotshell ammunition loaded with 7 (2.4mm) sized lead alloy shot pellets 28g load fired at 396 m/sec (1300 ft/sec). These templates can be also utilised for shotshell ammunition of equivalent or less external ballistic capability (e.g. maximum range) to the ammunition specified above.

C Range Layout

C.1. Active Range Area

The active range area for Skeet, Trap and ISSF 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, approximately 65m from the firing line.

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

C.2. Skeet Range

C.2.1. Range Certification.

A Skeet field has two (2) houses, a “high” and a “low” house, from which targets are thrown. These houses are located at either end of a segment of a circle which has a radius of 19.2 m. Seven (7) 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 5.*

C.2.2. 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 the field, separated approximately 38.8 m. *Refer to Figures 5 and 6* . These structures are used to house target throwing mechanisms and target supplies, if desired.

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

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 from NZCTA.

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.

- a). Skeet houses should be constructed of a material suitable to not allow any shotgun shot to penetrate to within the operator’s area.
- b). 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 in order that the operator, in their normal operating position, is not exposed to pellets fired into the skeet house from any shooting station. As per NZCTA rule section 4, 2.3,e.
- c). Excluding the doorway and opening through which skeet targets are thrown, there shall be no windows or openings into the operator’s area of the skeet house.

Each skeet house to be equipped with a RED flag (approximately 30cm x 45cm) 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).

- d). There shall be a prominently displayed warning sign inside the operator's area of the skeet house instructing the operator:
- i) not to look out of the skeet chute when the range is operating;
 - ii) not to reach into the skeet chute when the range is operating; and
 - iii) not to leave the sheltered operator's area of the skeet house without displaying a Red Flag for sufficient time for competitors and range officials to discontinuing fire, or until given permission by the Range Officer.

C.2.3. Shooting Stations.

The shooting stations of the skeet range must:

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

The typical arrangement of shooting stations is shown in *Figure 5*. The specific positioning of these stations shall be NZCTA governing rules.

C.2.4.. Skeet Target Mechanisms.

The target throwing mechanism shall be functional (refer to section 2.) 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.

The traps should be adjusted to obtain target flight paths in accordance with NZCTA rules. Note: As an example, ISSF rules require the traps to reliably throw the targets from the low and high houses through a 0.9 m (approx.) diameter hoop located 4.6 m (approx.) above the crossing point (*Refer to Figure 5.*).

C.2.5.. Barrier Wall - Adjacent Skeet Ranges

For 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 shot.

The barrier wall shall meet or exceed the construction requirements as described in *Figure 7*.

C.3 Trapshooting Range.

C.3.1. Range Configuration.

A standard NZCTA trapshooting range has a single target house, located forward of a series of shooting stations configured in a triangular shape. *Refer to Figure 8.*

C.3.2.. Trap House.

The trap house is located in accordance with *Figure 8*. The purpose of this structure is to house a target throwing trap(s) and target supplies. As per NZCTA rules Section 3, 2.

Trap houses are designed to accommodate either manually operated or self-loading traps. The necessary dimensions for the trap house (e.g. height and width) specified. *Refer to Figure 9* for an example of one style of 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.

- a). The exposed roof, side and back walls of the trap house shall be pellet proof. It is recommended that the roof be of a reinforced concrete design.
- b). There shall be no windows or openings on the sides or rear of the trap house. Each manually operated trap house is to be equipped with a RED flag (approximately 30 cm x 45 cm) mounted to a short pole. This flag to be used by the trap operator to signal to the Range Officer and shooters when shooting must be stopped (e.g. trap breakdown or target supply exhausted).
- c). There shall be a prominently placed warning sign inside the operator's area of the trap house instructing the operator not to leave the sheltered operator's area of the trap house without displaying a Red Flag for sufficient time for competitors and range officials to discontinuing fire, or until given permission by the Range Officer.

C.3.3. Shooting Stations.

The shooting stations of the trapshooting field must:

- a) be clearly marked; and
- b) 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 1 metre square.

The typical arrangement of shooting stations is shown in *Figure 8*.

C.3.4.. Trap Target Throwing Mechanisms.

The target throwing mechanisms shall be functional as described in *Figure 10*, and as described in *Section 2*

C.3.5 Safety Areas

Skeet:

The standard skeet range safety area templates are illustrated in *Figure 1*.

Trapshooting:

The standard trap range safety area templates are illustrated in *Figure 2*.

C.4. Sporting clay range

C.4.1. Introduction.

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 a 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.

The NZCTA have established operating and facility construction rules for sporting clay ranges. The NZCTA guidelines are very useful and should be consulted by range builders as they will

supply more application specific and detailed construction information than will this section. This section of the guidelines is primarily concerned with safety issues and will 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.

C.4.2. 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 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 Range Inspection Officer (RIO) 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 such as club rooms, car parking, general access ways 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. clubhouse) and shall be updated as required. A copy of this plan shall be made available to the RIO upon request.

C.4.2.1. Human Activity - Safety Area.

Human activity should not be approved within the safety area of a sporting clay range when it is in operation.

C.4.2. 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 “segment” shaped. The depth of the safety area is determined by the distance the pellets will travel given the Vertical Angle of Fire (VAofF) of the shotgun as the target is engaged, the velocity of pellets and their size (weight).

There are three (3) safety area templates available for the use on sporting clay ranges; templates *Figure 3*. Each of these templates is designed for a different VAofF, as measured from the horizontal. For each station a VAofF is selected based on the height (Relative to the shooter) of the target’s flight path when it could be reasonably engaged by the shooter.

For simplicity the VAofF are categorised as being low, medium or high angles of fire. *Refer to Table 1 and Figure 11 for more information.*

Table 1 - Vertical Angles of Fire

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

Note2: > is the symbol for “greater than”.

If the target paths, when they could 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 to be applied.

After selecting the correct template (based on the targets 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 when a shooting stall is utilised to restrict the shooter's swing of the shotgun, the HAoF is defined by the design of the shooting stall. The HAoF will be the horizontal arc that an average shooter properly positioned in the stall will attain. Refer to Figure 12.
2. When no shooting stall is utilised, the HAoF will be 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 13.

C.4.3.1 Ammunition.

The safety area templates provided in *Figures 1 to 4* are for shotshell ammunition loaded with a maximum sized 7 lead alloy shot pellets fired at a velocity of 396 m/sec (1300 ft/sec). The correct template to be used is the one for the largest diameter shot pellets being used on the range. If the templates provided in *Figures 1 to 4* do not match (or exceed) the intended range use, contact the NZCTA 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 arrangements of poles or framing, as long as they are sturdily constructed and the shooter's firing position is clearly marked.

C.4.3.2. Reduced Safety Areas.

Trees, brush and shrubs do not provide a barrier, and will not be used to reduce safety requirements.

Hills and similar topographical features within the trajectory envelope can be used to reduce safety template requirements. (*A Range Inspection Officer can advise on this criteria.*)

C.4.4. 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 areas when it is in use. The colour designation for the warning system shall be a red flag when shooting is in progress and a green flag when there is no shooting.

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.

C4.5. Shooting Stations

There are a variety of shooting station designs that can be utilised 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.

The requirements of these guidelines are 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.

C.4.5.1. Marked Shooting Stations.

The shooting stations shall:

- a) be clearly identified with a reference number that can be related to a site plan;
- b) be clearly marked as to the planned course-of-fire from that station (e.g. 25 yd bounding rabbit or “fur and feather etc.”); and
- c) 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.

C.4.5.2. 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 HaofF (Horizontal angle of fire), and/or the VaofF (Vertical angle of fire), and thereby reducing the land area required for a safety area. *Refer to Figure 14* for an example.

Shooting stalls shall:

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

C.4.5.3.. 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:

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

C.4.5.4. Equipment Protection.

It is recommended that any range equipment within the HAofF be protected by earth berms planking or similar construction.

C.4.5.5. Operator Protection.

Whenever equipment operators (e.g. a target thrower operator) are forward of the shooting station when 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 15.*

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 which afford 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 material (e.g. cinder block) which 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 RED 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 when shooting must be stopped (e.g. trap breakdown or target supply exhausted).

2. RANGE STANDING ORDERS. (Example)

Range Standing Orders (RSO) are written to ensure that all Association members and users are aware of the conditions that apply to that particular range. These orders are to be made available to all and should be prominently displayed at the range. The following is a suggested layout which has been adapted from the New Zealand Firearms Range Manual.

Range Standing Orders.

General:

1. *The Xanadu branch is responsible for the control and maintenance of the Xanadu Range. All users of the range are to read these orders in conjunction with the Association Range Manual and the NZMS 1:50,000 map for the range site.*

Location:

1. *The range is located at grid reference 123456 on reference B, a copy of which is at annexe A.*
2. *The range has six target frames which can be used and mounds to 200 metres. There are two buildings, a club hut and a target shed located at the rear of the old 600 yard mound. The area has some scrub and is very dry during the summer season. Users of the range are to guard against the potential for scrub and grass fires at all times.*

Restrictions:

The range is restricted to the firing of shotguns only, up to 12g shot size 2.4mm, 28 gram load
Steel shot is not permitted.

Priority of use:

The following is the order of priority for the use of the Xanadu Branch range and no other individual may use the range unless they are authorised by the Branch Range Captain:

1. *Xanadu Branch members.*
2. *Local gun clubs by arrangements.*
3. *Service associations, including the Police, by arrangement.*

NB: The range is not to be used without the authority of the Branch Range Captain. At any live shoot there must be a Range Safety Officer present and the firing flags and other indicators displayed.

Range Flags and Signs:

Range flags and signs are to be positioned at the following points prior to commencement of firing. Refer to (indicate reference page etc in report)

The main gate entrance.

1. *The gate entrance to the range paddock.*
2. *The top of the hill behind the butts.*
3. *The pole at the south end of the range hut.*

Appointments:

There must be a Range Safety Officer in attendance at any shoot.

Safety Rules:

The following safety rules must be complied with on the range:

1. *No firearm may be loaded unless the user is at the firing point and then only when the "load" signal has been given by the Range Safety Officer.*
2. *Firearms may only be loaded when pointed down the range.*
3. *Actions must be open at all times except when loaded, at the direction of the Range Safety Officer.*
4. *Between events firearms must be safely secured.*
5. *No person, except under the direction of the Range Safety Officer or Range Captain, should shift or handle another persons firearm.*
- 6.

Application of range instructions:

All users of the Xanadu Branch Range are subject to these instructions.

It is the responsibility of any user, individual or group, to ensure that they are familiar with the instructions.

First Aid:

First Aid facilities are available in the range hut.

Fire precautions:

All reasonable precautions must be taken against fire and any fire quickly extinguished.

Range clearance:

All users are to ensure that all range material, including targets, is properly stored and that rubbish is removed from the range site.

(signed)

President

Xanadu Branch, NZCTA

Note: This is an example only and that a Range Inspection Officer could indicate other items to be listed in the RSOs.

3 STATUTES/ACTS/REGULATIONS

In the absence of legislation that directly control, and for the administration of ranges; there are a number of laws that can be applied to range control and safety. These cover enforcement to land use requirements. Whilst some are not particularly relevant, they still have to be considered.

Arms Act 1983, Arms Amendment Act 1992 & Arms Regulations 1992 (and any changes)

Police administer and enforce these. Objective is to see compliance but where the use of a range or the range itself is unsafe, they can close it. Arms Act 1983 states: “*An Act to consolidate and amend the law relating to firearms and to promote both the safe use and the control of firearms and other weapons*” In the absence of any thing else and in conjunction with the Oath of Office, this can provide Police with the necessary authority to act.

Police Act 1958

Section 37 Oath - Sworn members are required to take this oath. It gives authority under common law to protect life and property. It provides along with other statutes and regulations a legal duty to act.

Crimes Act 1961

Summary Offences Act 1981

Explosives Act 1957

Storage of ammunition.

Explosive Regulations 1959

Hazardous Substances and New Organisms Act 1996

Storage of ammunition.

Civil Aviation Regulations 1953

Safety of aircraft to be considered.

Health and Safety in Employment Act 1992

Ranges should conform to these. Organisations may be principals. Employers, or owners. Other organisations may require compliance.

Resource Management Act 1991

Land use and Noise considerations. Delegation to Local Authorities.

Local Government Act 1974

Purpose of local government. Recreation facilities, bylaws, land use etc.

Building Act 1991

Building Regulations 1992

Codes of practice, building use, safety etc.

Fire Service Act 1974

Fire Safety and Evacuation of Building Regulations 1992

Rural Fire, restrictions etc.

Fencing Act 1978

Important for stock and people control.

Historic Places Act 1993

Historic and cultural heritage etc.

Ways and Means Act 2000 (The date of this Act changes annually)

Often used by Police to resolve situations.

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4. TEMPLATES and FIGURES

| Figure | Description |
|--------|--|
| 1 | Skeet Range Safety Area Template |
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SKEET RANGE SAFETY AREA TEMPLATE

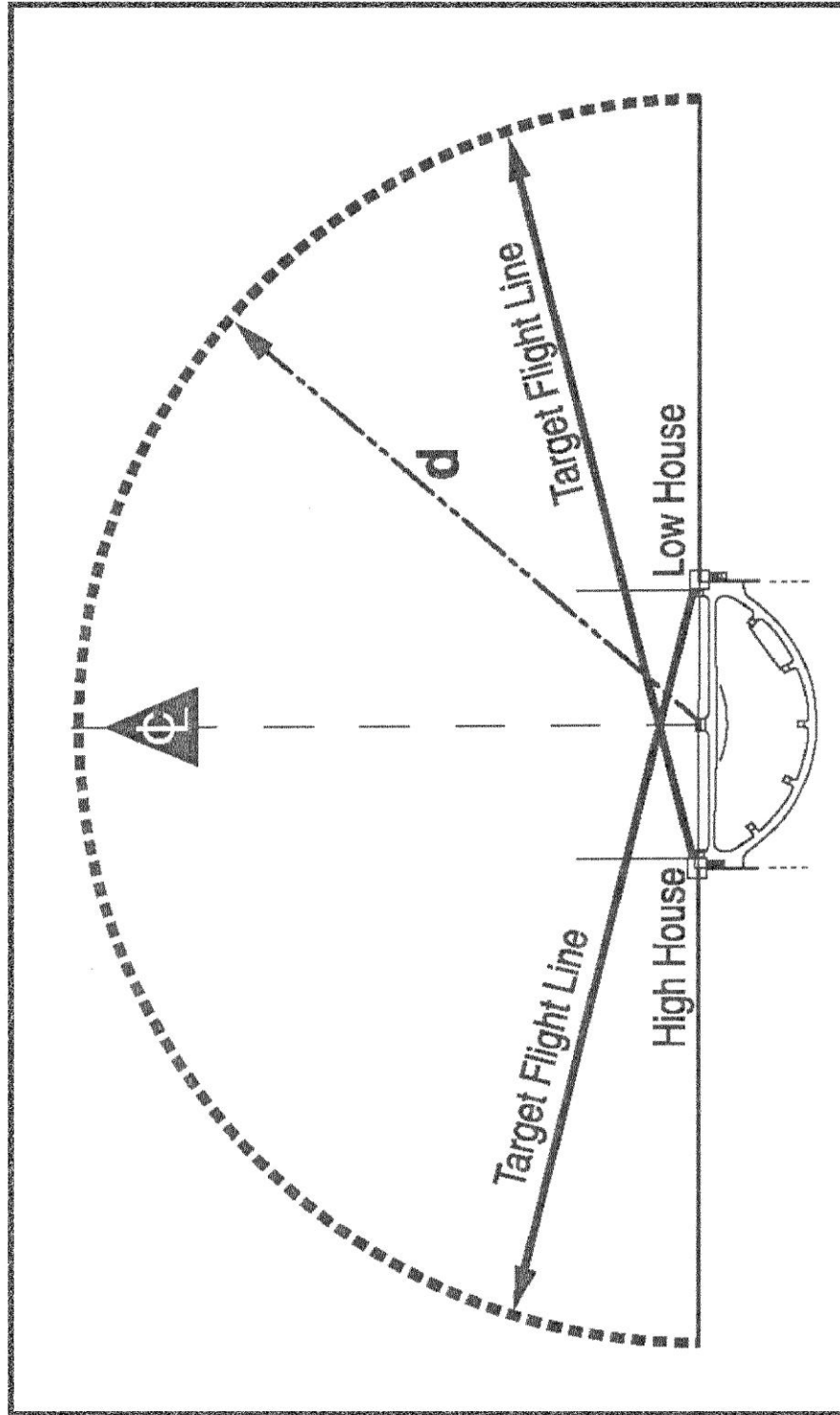


Figure: 1 **d = 200 metres**

Figure: 1

TRAP RANGE SAFETY AREA TEMPLATE

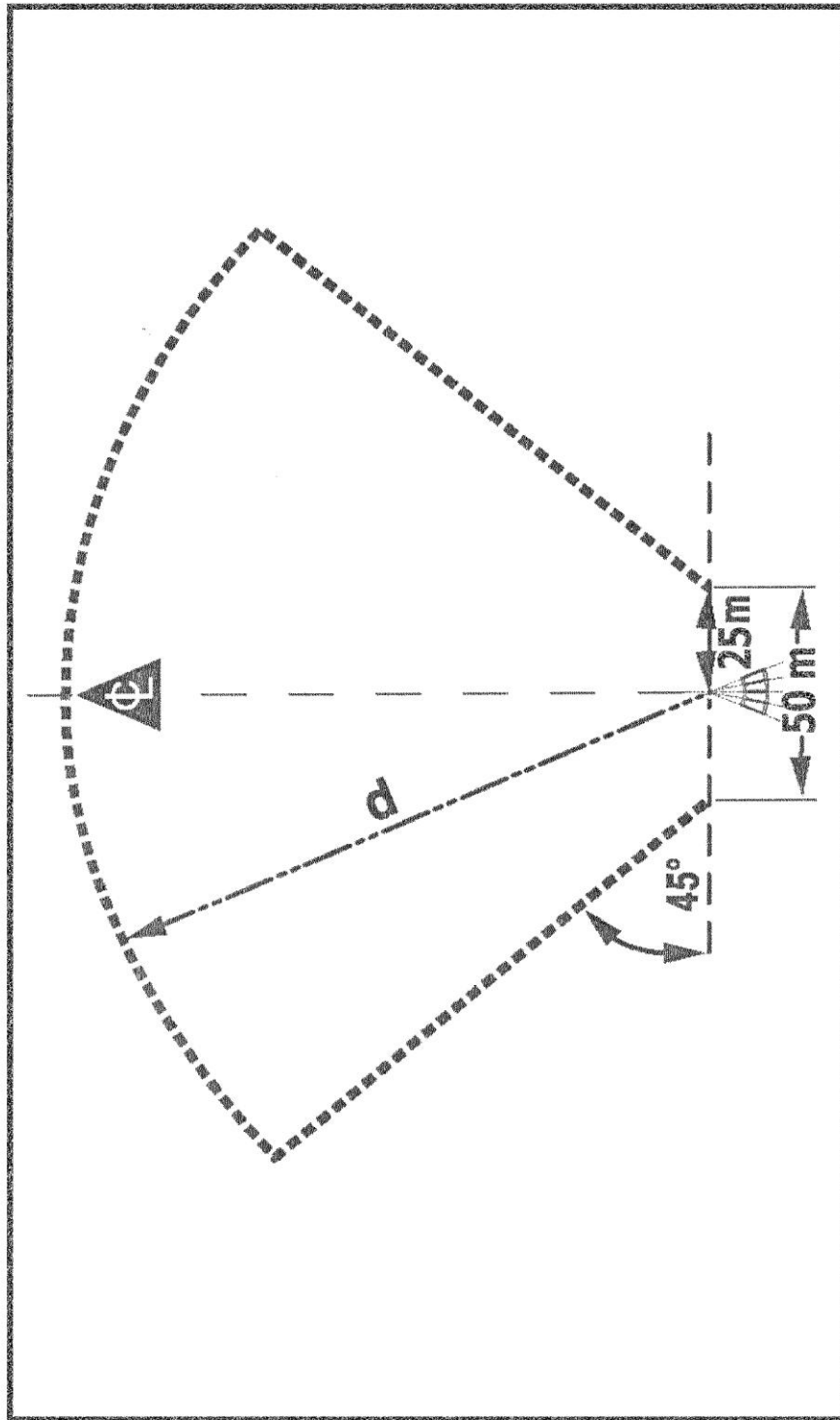


Figure: 2

d = 200 metres

SPORTING SAFETY AREA TEMPLATE

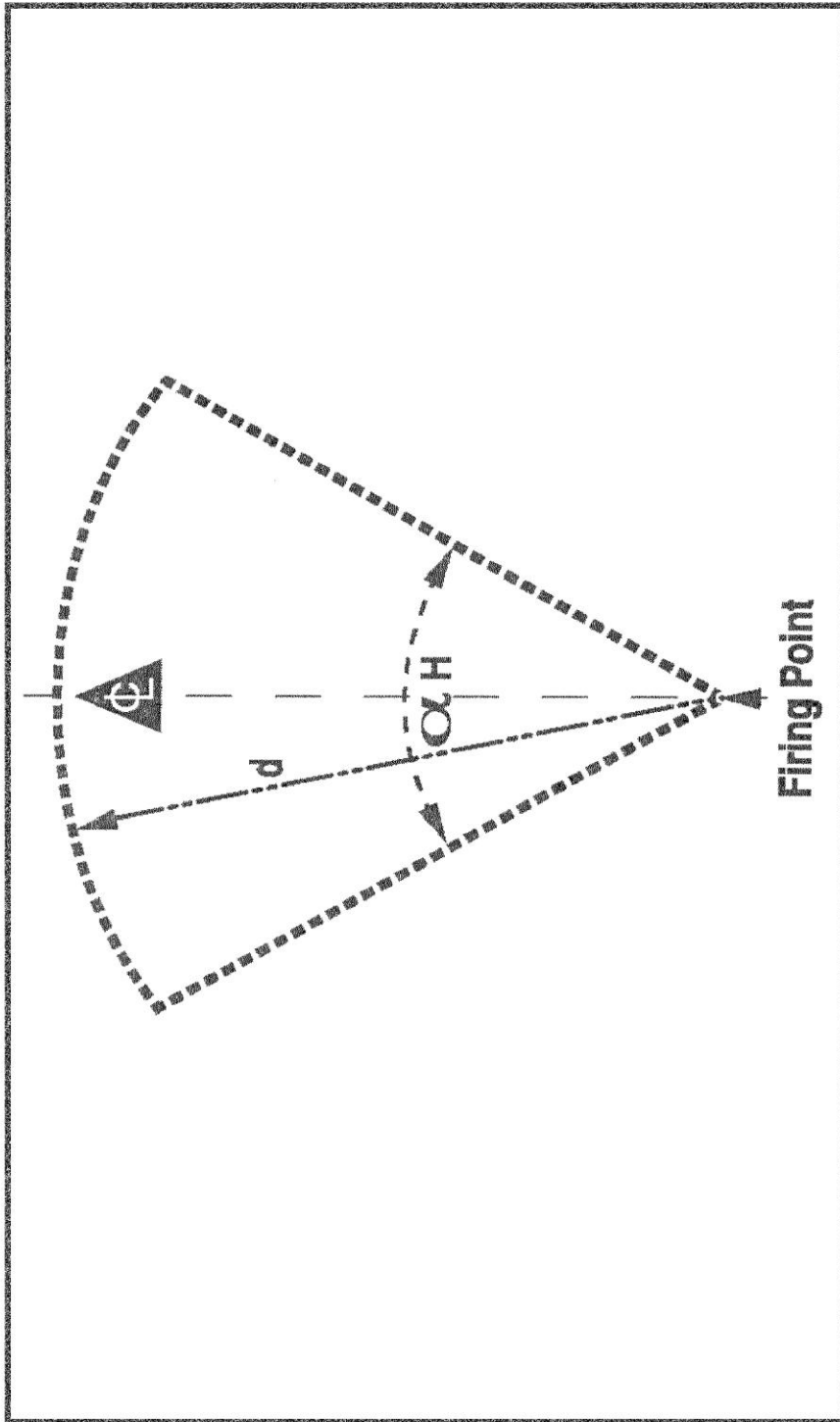


Figure: 3

FIELD FIRING SKEET SAFETY AREA TEMPLATE

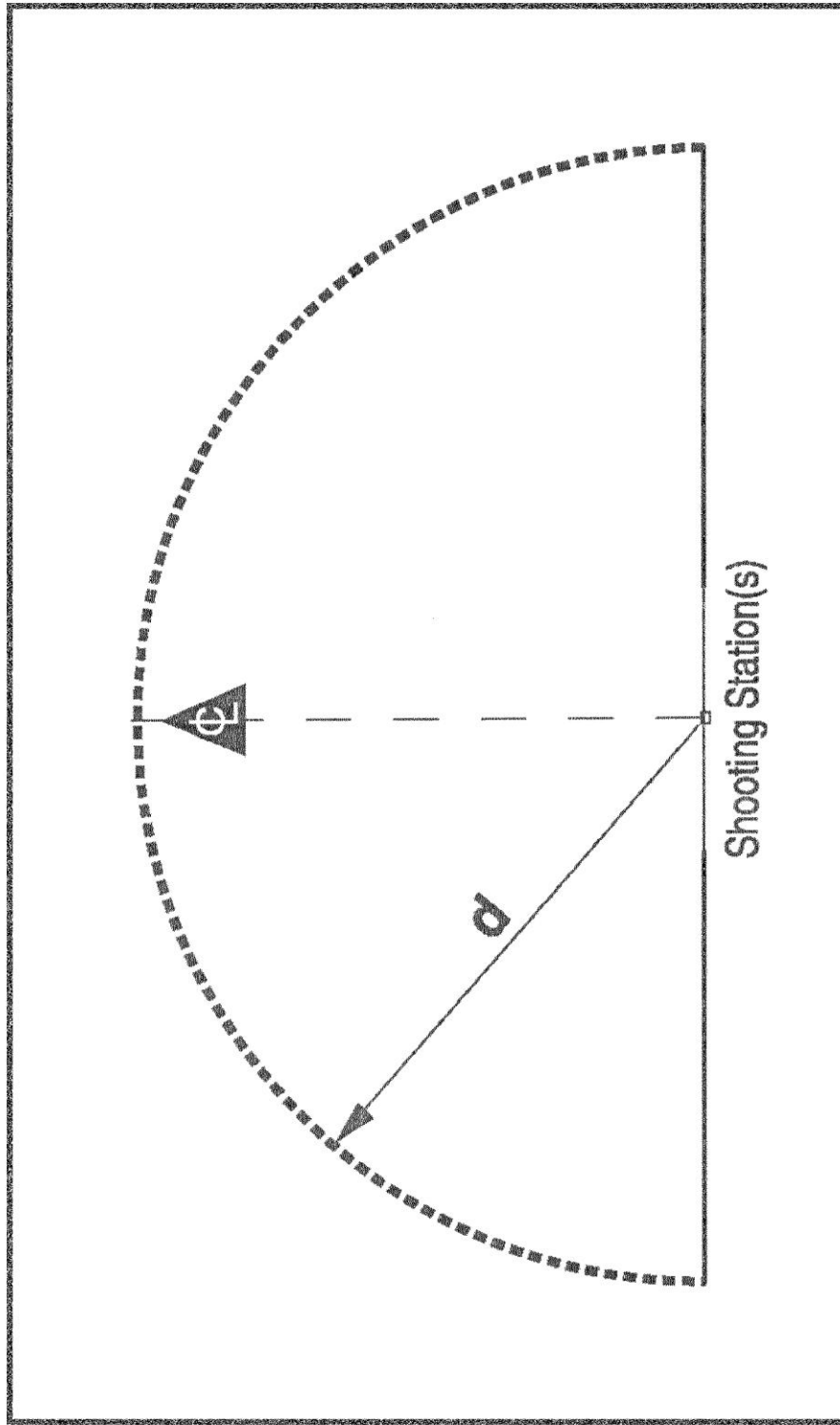


Figure: 4

d = 200 metres

TYPICAL SKEET RANGE LAYOUT

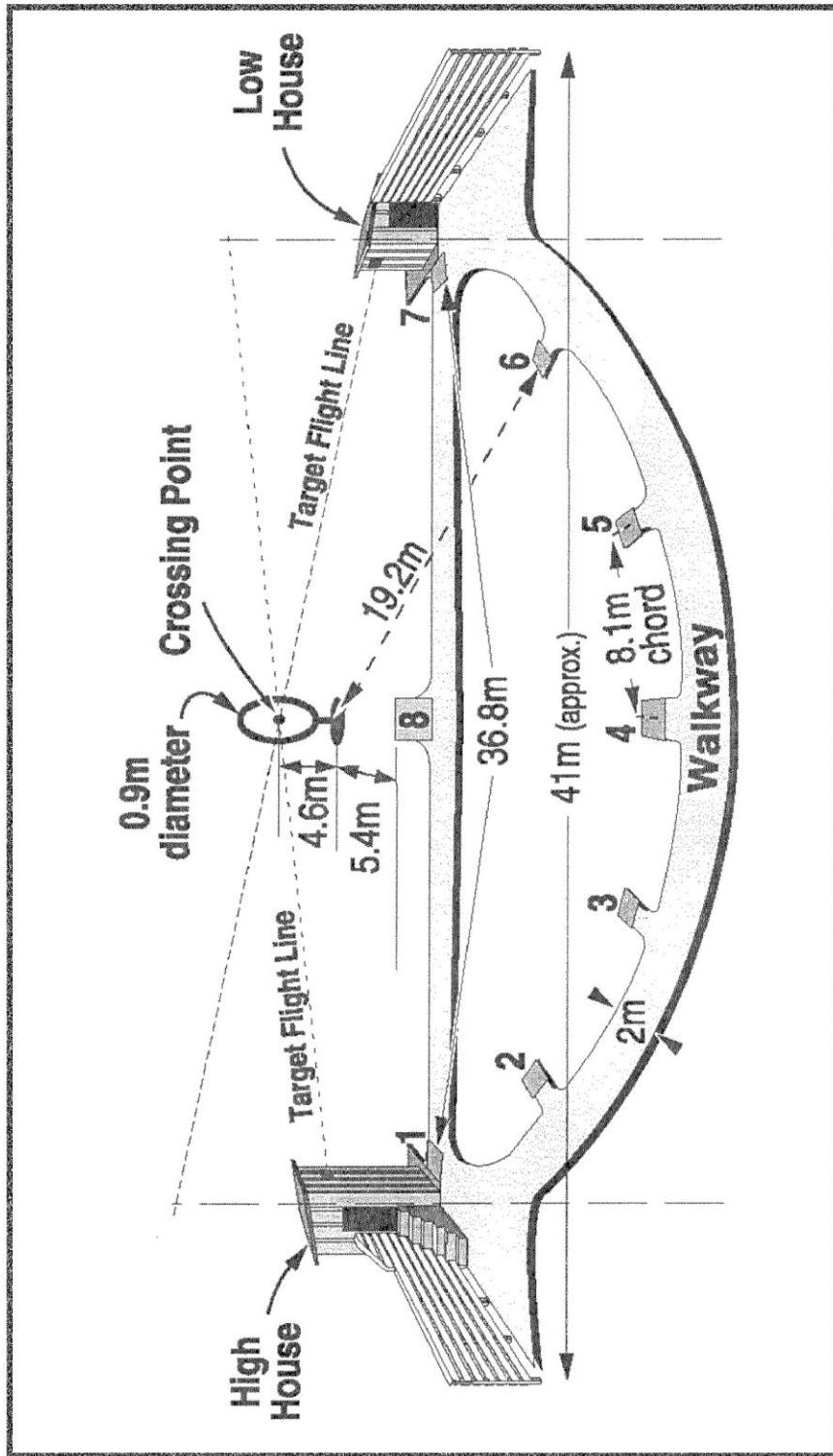


Figure: 5

SKEET RANGE

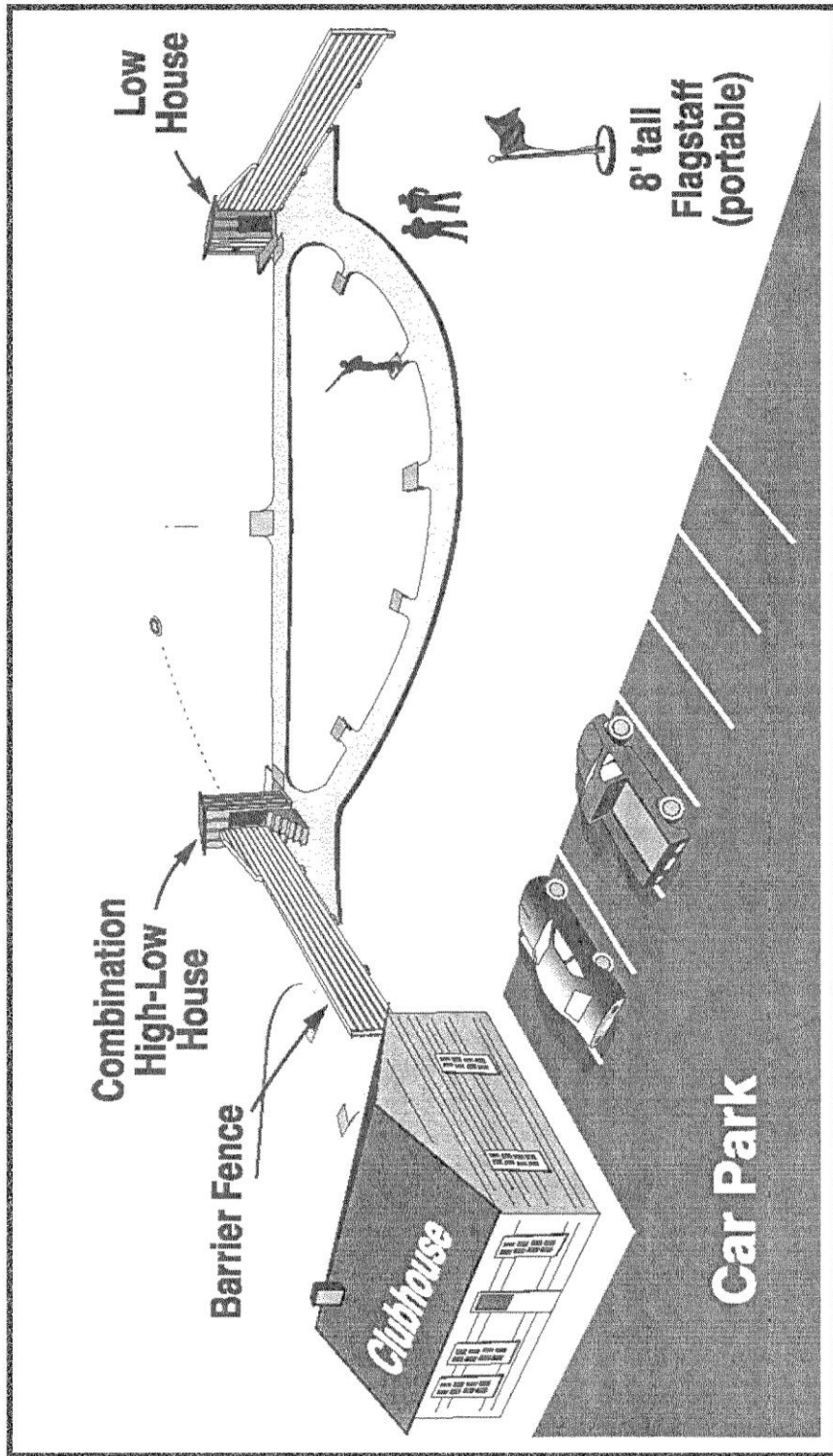


Figure: 6

SKEET RANGE BARRIER FENCE

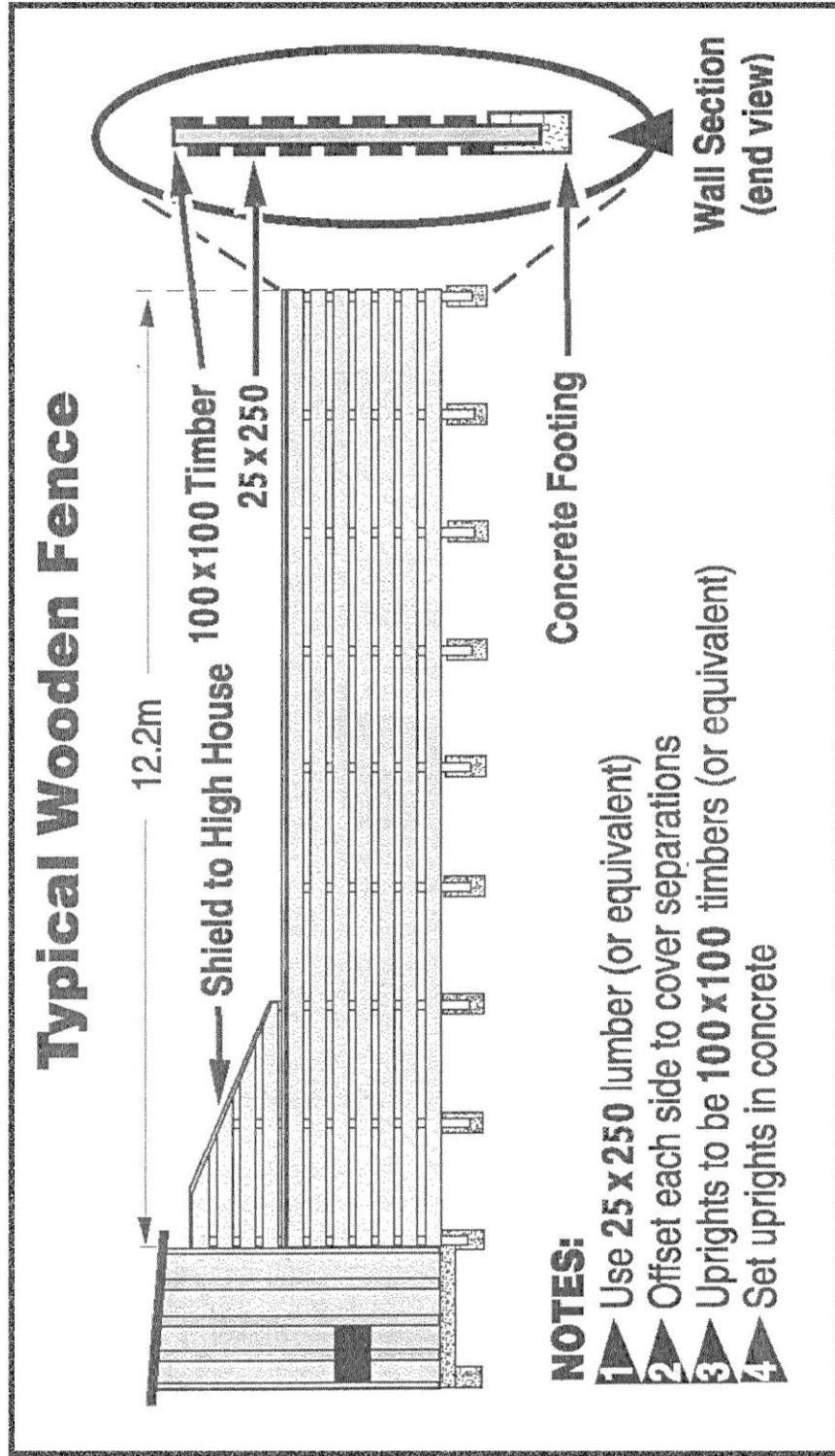


Figure: 7

TYPICAL TRAP LAYOUT

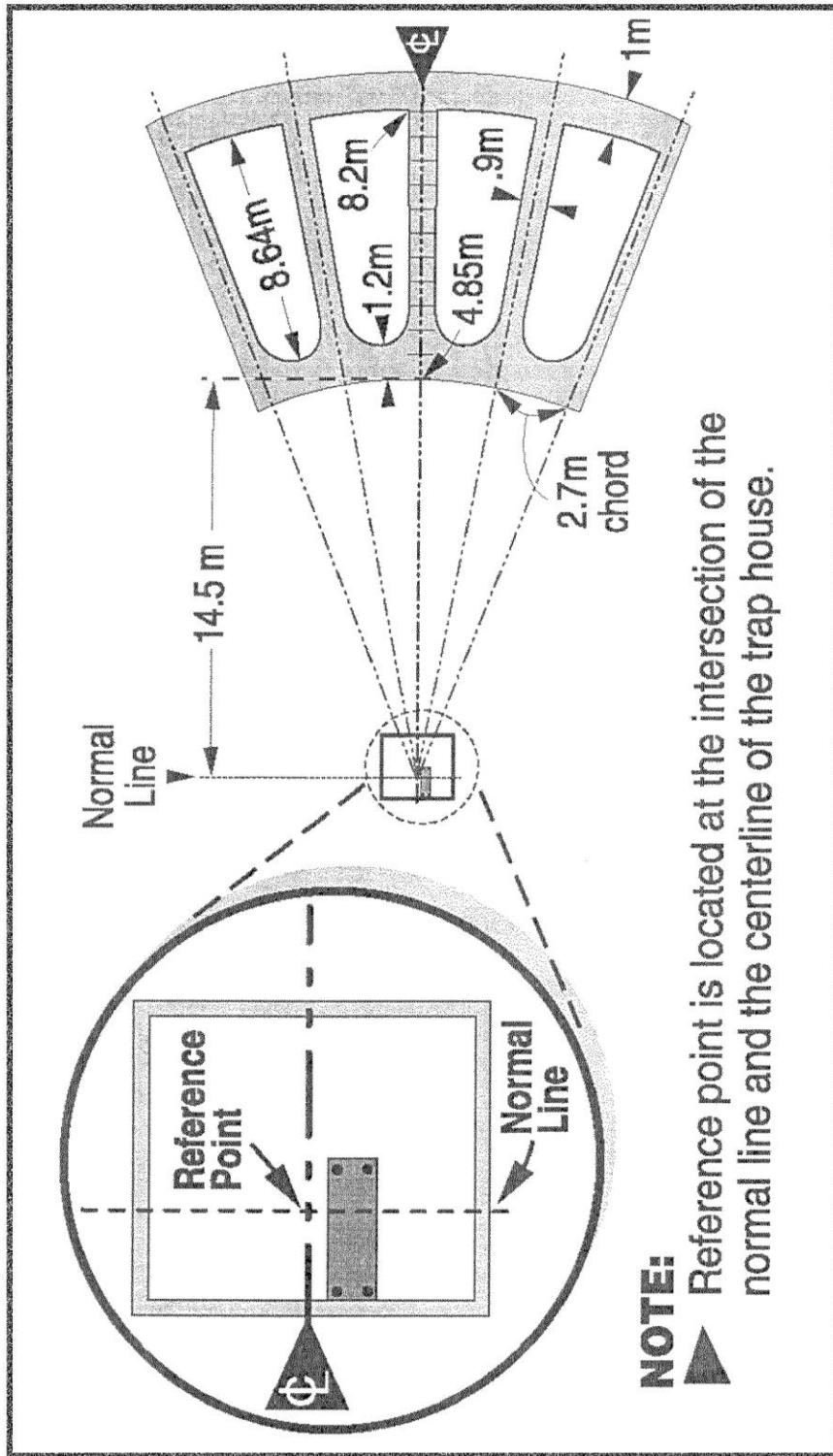


Figure: 8

SAMPLE TRAP HOUSE

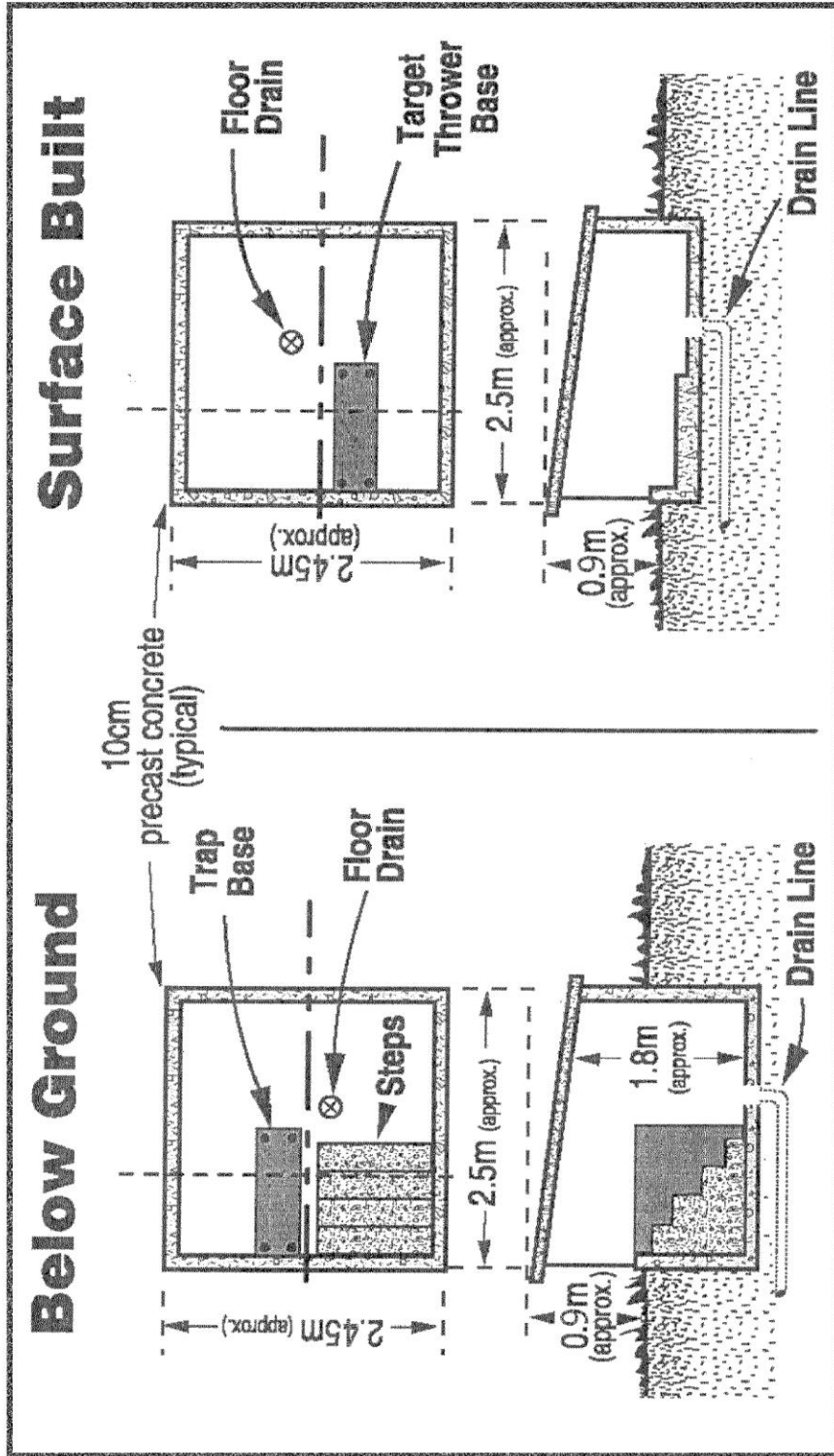


Figure: 9

FIELD FIRING SKEET RANGE

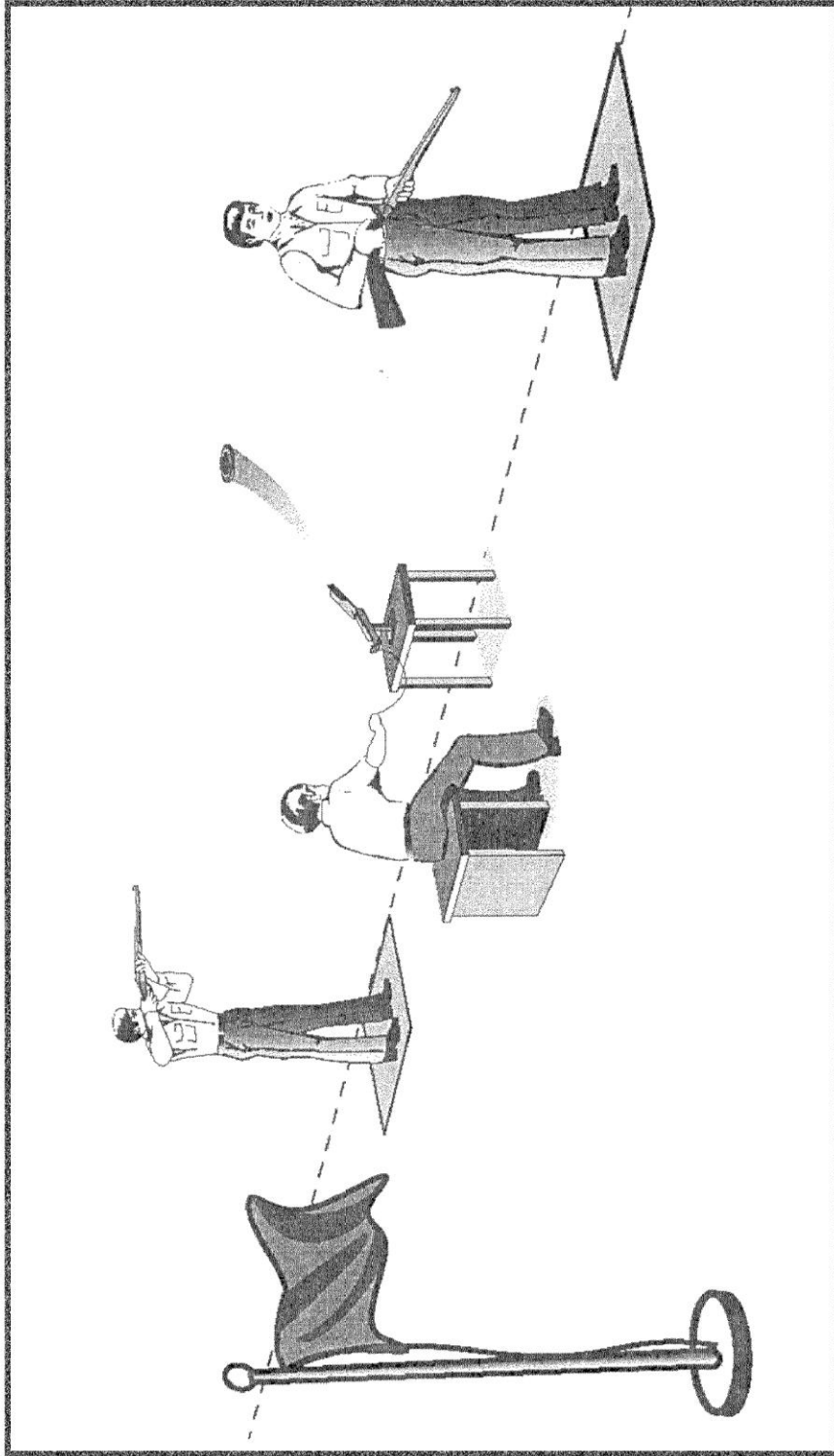


Figure: 10

VERTICAL ANGLE OF FIRE FOR SPORTING CLAY

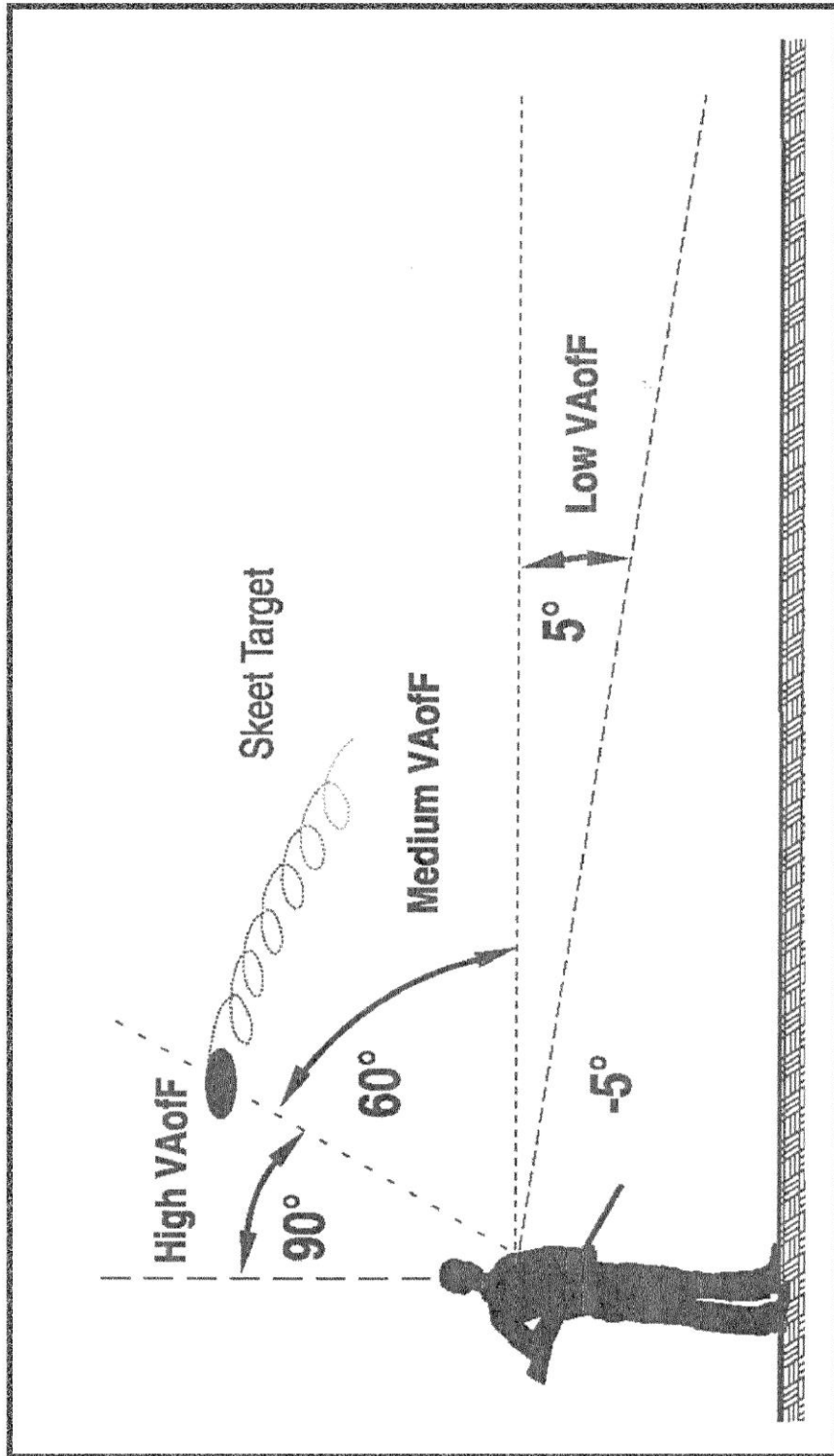


Figure: 11

SPORTING CLAY HORIZONTAL ANGLE OF FIRE

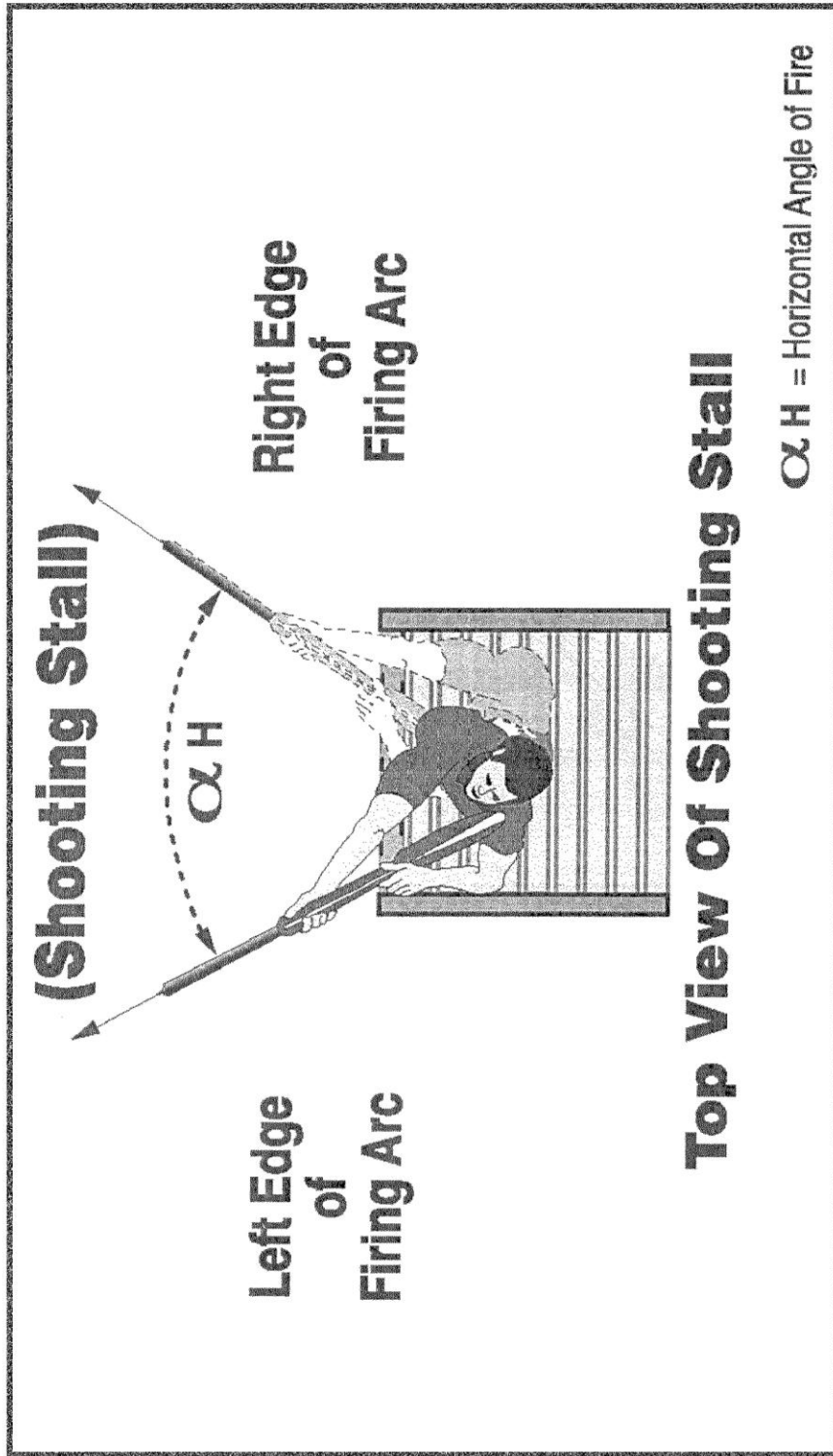


Figure: 12

SPORTING CLAY HORIZONTAL ANGLE OF FIRE

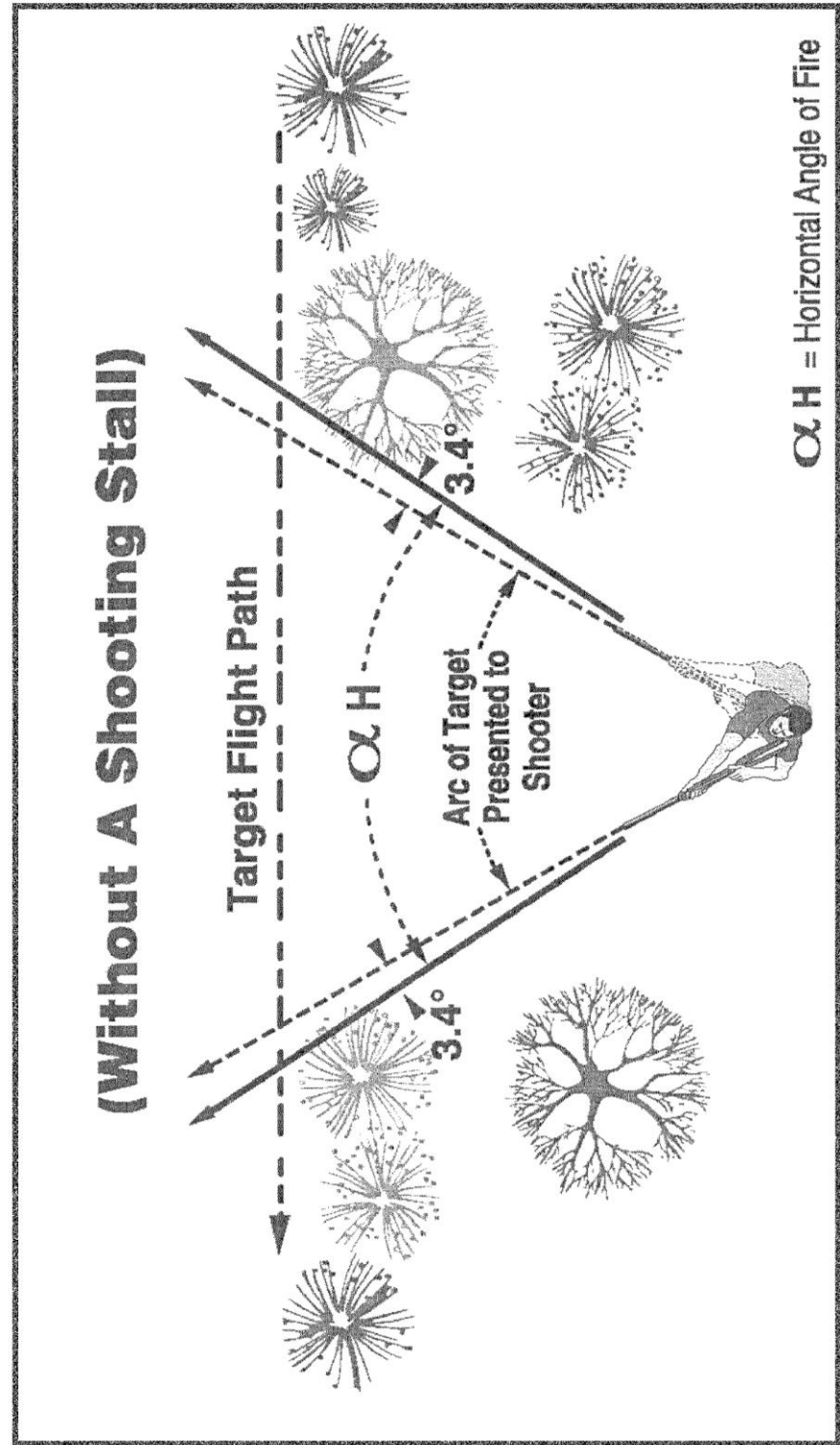


Figure: 13

SPORTING CLAY SHOOTING STALL

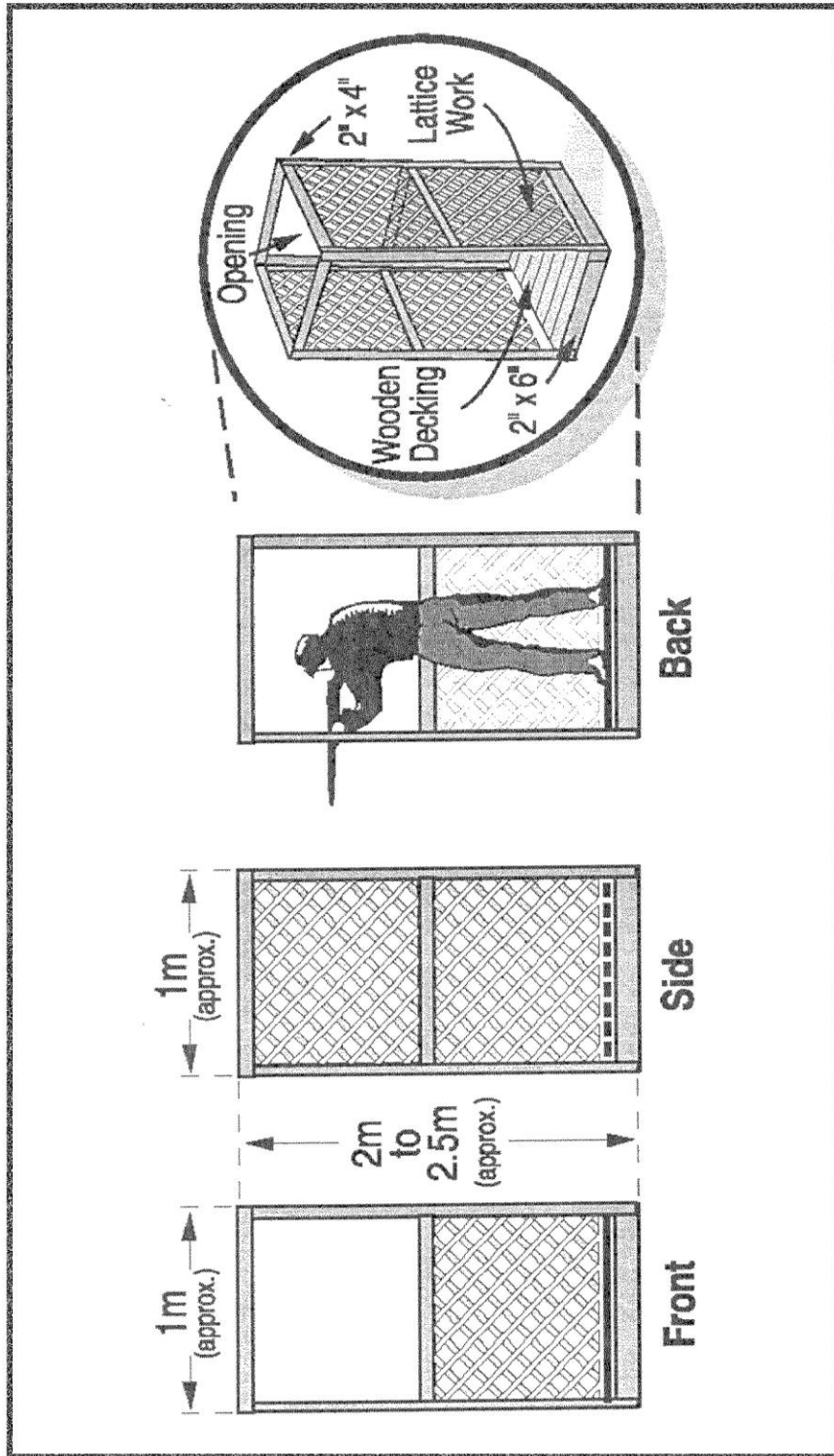


Figure: 14

SPORTING CLAY HORIZONTAL ANGLE OF FIRE

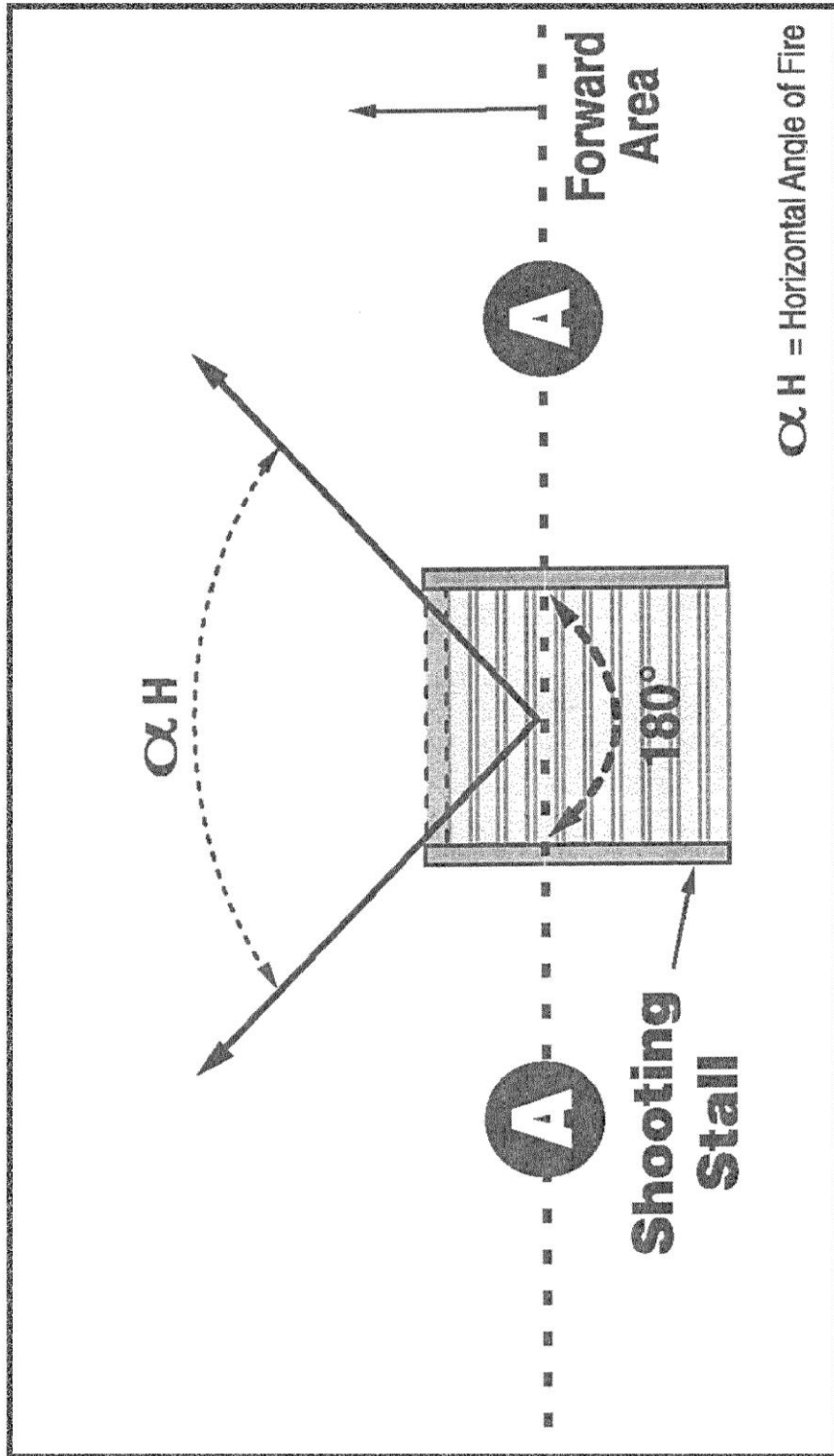


Figure: 15

SPORTING CLAY VERTICAL ANGLE OF FIRE

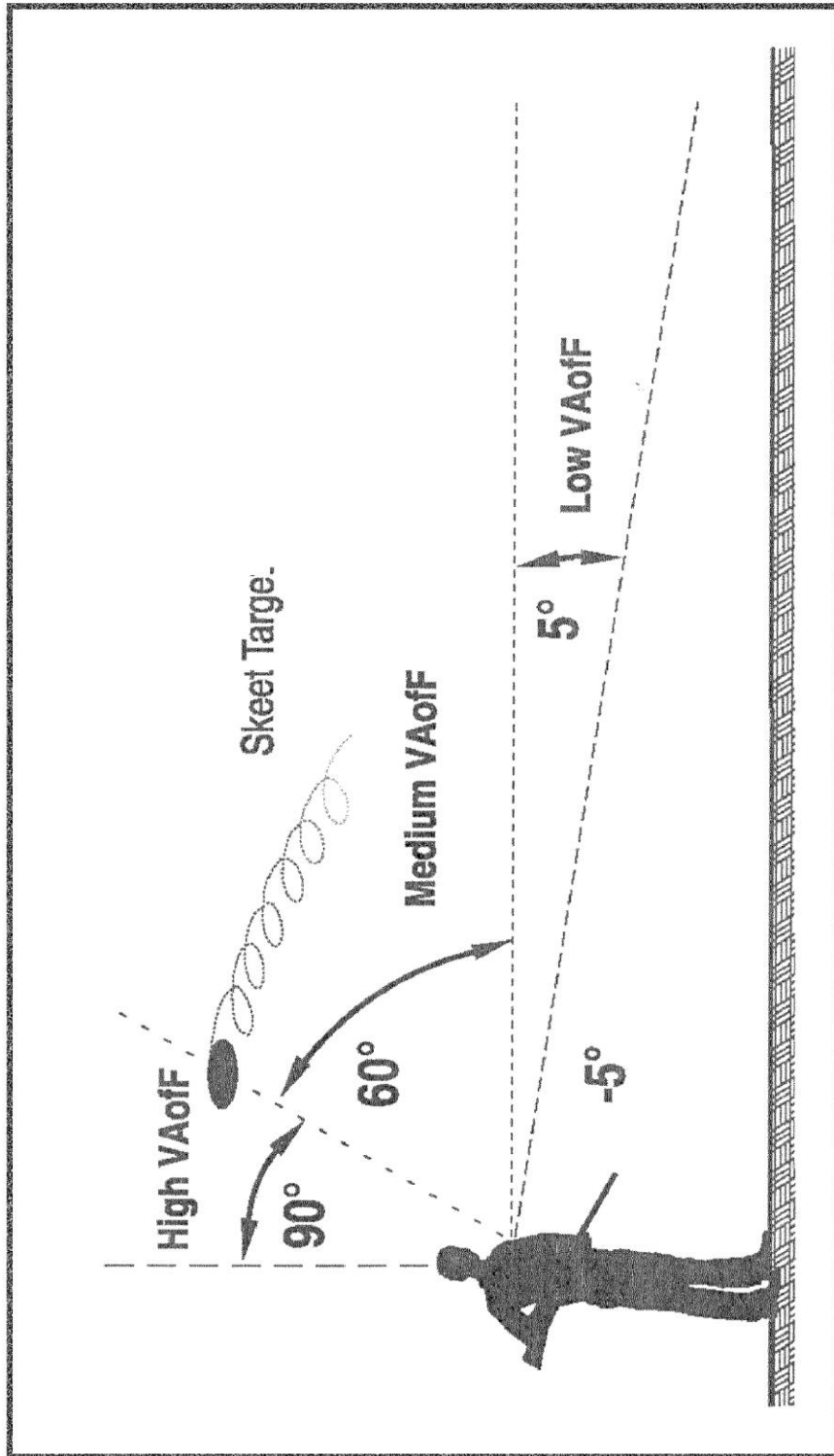


Figure: 16

EXAMPLE OF A FIELD FIRING TEMPLATE
Applied to a multi trap range

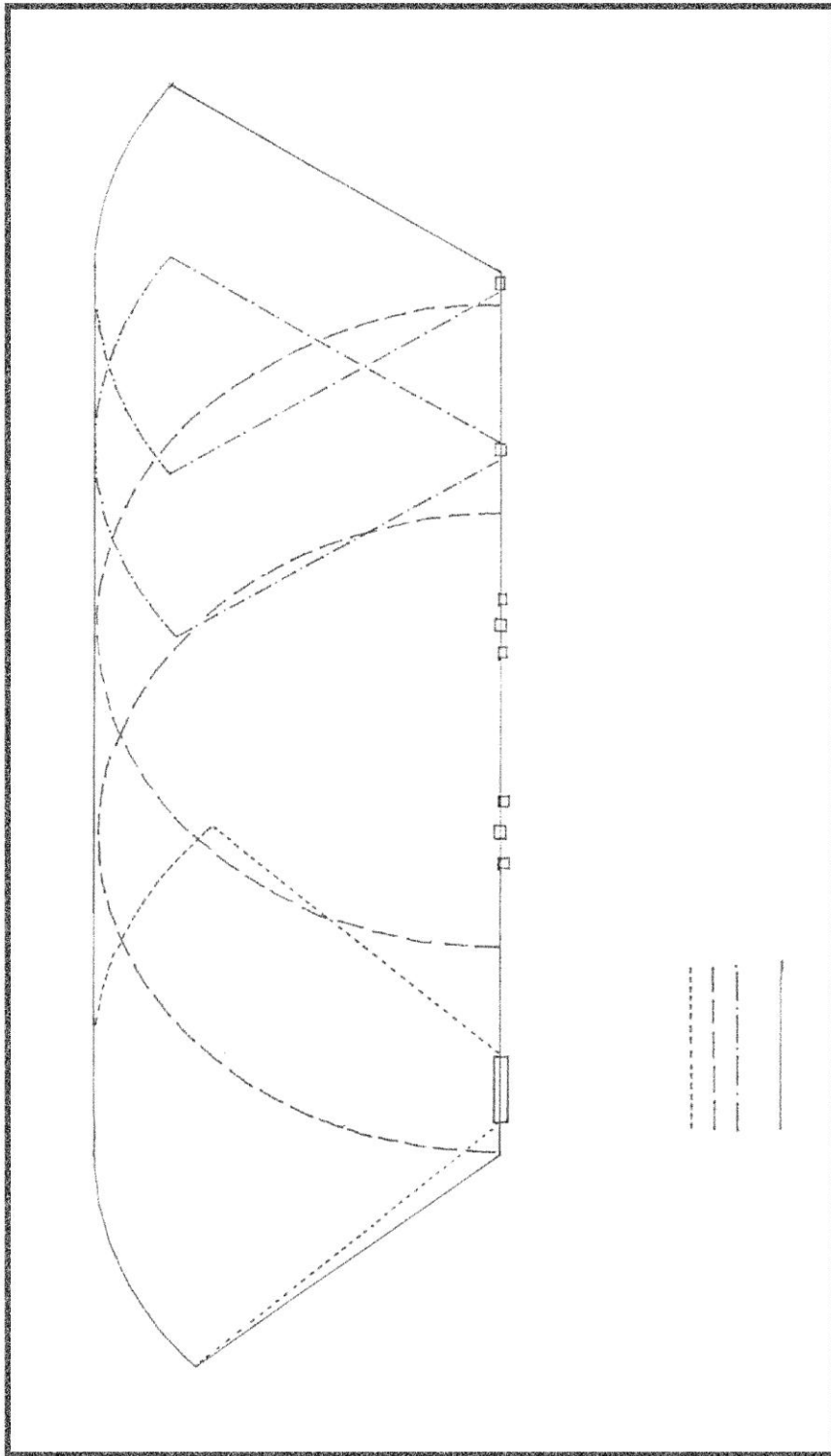


Figure: 17

**OTHER CONSIDERATIONS FOR SAFETY AREAS:
USE OF SHADE CLOTH ON THE BOUNDARY LINE**

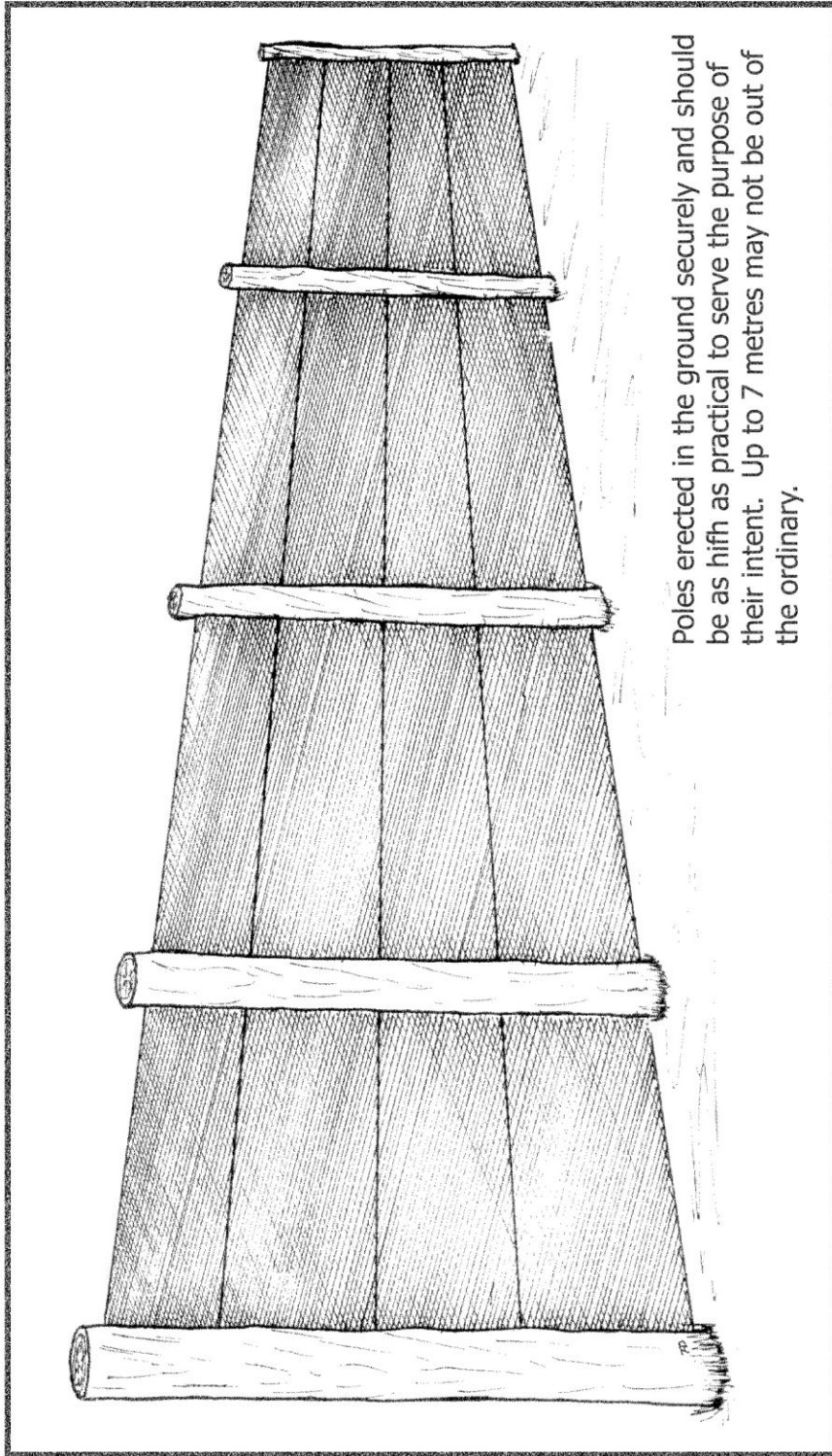


Figure: 18