

No. R. 643

28 May 2004

STANDARDS ACT, 1993**COMPULSORY SPECIFICATION FOR SMALL ARMS SHOOTING
RANGES**

I, Mandisi Mpahlwa, Minister of Trade and Industry, hereby under section 22 (1) (a) (i) of the Standards Act, 1993 (Act No. 29 of 1993), and on the recommendation of the Council of the South African Bureau of Standards, with effect from the date two months after the date of publication of this notice, declare the specification contained in the Schedule, to be compulsory.



M Mpahlwa
Minister of Trade and Industry

Schedule

VC 9088

COMPULSORY SPECIFICATION FOR SMALL ARMS SHOOTING RANGES

1 Scope

1.1 This specification covers general requirements for the planning, construction and operation of indoor and outdoor shooting ranges.

1.2 It does not apply to any area where it could otherwise be lawful to discharge a firearm.

2 Definitions

For the purpose of this specification the following definitions apply:

2.1

backplate

the steel plate covering the area of the protected zone (qv) of an indoor range, behind and around the bullet trap (qv), where bullet strikes are likely. It has no direct equivalent on an outdoor range.

2.2

baffle

a structure or device, that is mounted with its face towards the firing point (qv). It is intended to stop or redirect misdirected shots.

2.3

bullet trap/catcher

the device or construction behind the targets intended to stop and trap shots that pass through or near the targets.

2.4

danger area

the fan shaped area beyond the targets where those misdirected shots that do not impact the stop butt (qv), either in azimuth or elevation, will impact. A danger area is not required if the stop butt is of sufficient size.

NOTE – Only outdoor ranges can have a danger area.

2.5

firing point

the point, or points, from which shots may be fired on the range.

2.6

full bore

centre fire cartridges and firearms so chambered.

2.7

protected zone

the area of an indoor range, behind and around the Bullet Trap (qv) and Backplate (qv), intended to stop all misdirected shots that may reasonably be expected to be fired. Depending on the dimensions of the range it may include parts of the sidewalls and ceiling. Analogous to the stop butt (qv) on an outdoor range.

2.8**ricochet**

a bullet that continues to travel through the air after rebounding or skipping off some object or part of the range.

2.9**safety angle**

the required minimum angle between the sighting line (qv) and an imaginary line drawn from the eye of the shooter to the top or side of the stop butt (qv) or protected zone (qv).

2.10**small arms**

handguns, rifles and shotguns.

2.11**small bore**

the 0,22 inches rim fire cartridge and firearms so chambered.

2.12**sighting line**

an imaginary line drawn from the eye of the shooter to the target.

2.13**stop butt /back stop**

the bank, wall or other device, behind and around the bullet trap (qv), intended to stop all misdirected shots that may reasonably be expected to be fired. It applies only to outdoor ranges.

3 Categories of ranges**3.1 General**

There are three basic categories of shooting ranges:

- a) Indoor ranges (see Annex B),
- b) Outdoor no danger area ranges (see Annex C), and
- c) Outdoor danger area ranges (see Annex D).

NOTE – There is no essential difference between handgun and rifle ranges. However, the much higher velocities and muzzle energies of most rifle ammunition impose greater demands on the bullet trap, protected zone or stop butt, and danger area of the range. The use of a range for centre fire rifle, in addition to handgun, will often be dependant on the economics of the necessary construction and/or the danger area available.

3.2 Indoor ranges

Indoor range is a range that is constructed inside a building.

3.3 Outdoor no danger area ranges

A no danger area outdoor range shall be constructed or designed in such a way that no misdirected shot, that can reasonably be expected to be fired towards the targets, will leave the range.

3.4 Outdoor danger area ranges

3.4.1 Outdoor danger area ranges are ranges where the stop butt (only outdoor ranges can have danger areas) is not sufficiently high and/or wide to meet the requirement to contain all reasonably expected misdirected shots.

3.4.2 Outdoor danger area ranges shall have a danger area (see figure 1) beyond the stop butt. In the case of shotgun ranges there is no stop butt, and the danger area then naturally is the area where all the shot impacts.

4 Potential hazards associated with shooting ranges

4.1 Indoor range potential hazards

The following potential hazards should be taken into consideration when designing and constructing a shooting range:

- a) Bullets striking some part of the range other than the bullet trap and ricocheting so as to pose a hazard to shooters or a third party.
- b) Splashback of particles from target frames, bullet trap or any other item within the protected zone.
- c) Noise from the discharge of the firearm damaging shooters' hearing.
- d) Noxious fumes from the propellant gases.
- e) Lead dust and particles from unjacketed bullets.
- f) Risk of fire from dust build-up and from tracer ammunition.
- g) Ejected cartridge cases or gas and propellant particles striking an adjacent shooter.
- h) Inadequate lighting affecting the shooter's ability to see clearly the sights and targets.
- i) Incorrect usage of the range.

4.2 Outdoor range potential hazards

The following potential hazards should be taken into consideration when designing and constructing a shooting range:

- a) Bullets missing the stop butt and leaving the range.
- b) Bullets striking some part of the range other than the stop butt and ricocheting so as to miss the stop butt, and thus leaving the range.
- c) Splashback of particles from target frames, bullet trap or stop butt.
- d) Noise from the discharge of the firearm damaging shooters' hearing.
- e) Ejected cartridge cases or gas and propellant particles striking an adjacent shooter.
- f) Glare from the sun affecting the shooter's ability to see clearly the sights and targets.
- g) People entering the danger area, or into the range itself.
- h) Incorrect usage of the range.
- i) Any extraordinary hazards e.g. low flying aircraft from a nearby airfield.

5 Distances over which ammunition is dangerous

When designing a range the maximum range distances should be taken into consideration, see Annex A.

NOTE - Small arms projectiles will travel a considerable distance when fired at a slight elevation angle.

6 Range construction

6.1 Stop butt or protected zone

6.1.1 The range shall have a stop butt, or protected zone in the case of an indoor range. This shall be of such a height and width that it will intercept any shot that can reasonably be expected to be fired in the general direction of the targets and bullet trap. For this purpose the top of the stop butt/protected zone shall subtend a safety angle of 8° (vertical) from the sighting line, as seen from the firing points and the ends of the stop butt (horizontal), 12° (see figure 2). The stop butt/protected zone shall, in addition, be of thickness and material that bullets will not penetrate. It shall not cause ricochets or splashback of bullets or pieces of bullet.

6.1.2 The size of the stop butt/protected zone will depend on the length of the range from rearmost firing point to targets, the distance between targets and stop butt/protected zone, the width of the firing point and the height or heights above the ground (or range floor) that shooting takes place (prone or standing shooting, etc) and will incorporate a vertical safety angle of at least 8° to the firing point.

6.1.3 Specific requirements for different types of ranges are given in annexes B, C, D and E.

6.2 Danger area

6.2.1 The construction of a stop butt becomes impractical and/or uneconomic on ranges of more than 25 m to 100 m, unless a high hill behind the bullet trap, that incorporate a safety angle of at least 8° to the firing point, is available. In such cases it is therefore necessary to have a fenced off danger area beyond the stop butt. Such danger area shall not be entered by people or animals whilst the range is in use.

6.2.2 It is not uncommon to use such a danger area for farming. However, measures shall be taken to clear the area before the range is used, and warning notices and flags shall be employed.

6.2.3 The extent of the danger area will depend on the types of firearm used on the range (handgun, shotgun or rifle, or some combination), the length of the range and the width of the firing point or points.

6.3 Bullet trap

6.3.1 The bullet trap shall not only stop/trap bullets without splashback or ricochets, but it shall continue to do so in the face of repeated impacts over a concentrated area. The mostly common used basic forms of bullet trap are:

- a) A sand or earth bank that is usually employed on outdoor ranges, and
- b) Steel sheets that either deflects the bullets down into sand or a water filled tray, or that redirect the bullets into a swirl chamber where repeated impacts remove the bullet's energy.

6.3.2 The bank type shall be regularly dug out and sieved, to remove spent bullets and stones that could cause ricochets ("de-leaded"), and the slope of the bank restored. The steel sheet type shall have any damage repaired by welding and smooth grinding. Thick plate, preferably armoured steel, should be used as a bullet trap.

6.4 Ricochet prevention

A ricochet may occur when a bullet strikes a hard surface at an oblique angle. The ricochet will not leave the surface at the same angle that it impacts.

If the floor and walls of an indoor range are hard and smooth, a bullet that strikes them will ricochet and will continue down range and strike within the protected zone or on ricochet preventing baffles.

Similar conditions apply on outdoor ranges, with the added danger that ricochets could miss the stop butt and leave the range. For this reason targets should not be placed on the floor of the range, but rather shall be elevated above the ground so that the bullets impact on the bullet trap.

Where obstructions cannot be removed then baffles shall be used to trap or deflect potential ricochets.

It is recommended to wear eye protection whilst shooting.

6.5 Baffles

6.5.1 Baffles are used for one of two purposes:

a) To protect against ricochets from light fittings, wall pillars and other obstructions that could cause ricochets. In protecting against ricochets, the baffles serve also to protect the fittings from damage (see figure 2). However, the primary purpose is to protect against ricochets.

b) To stop misdirected shots that could be expected to leave the range because the protected zone (indoor ranges) or stop butt (outdoor ranges) is not as high or wide as it should be and thus cannot incorporate a vertical safety angle of 8° and a horizontal angle of 12° to the furthest firing point.

6.5.2 The baffles shall be positioned so that they intercept the sighting line, and hence line of fire, of shots that are fired too high or wide to impact on the protected zone or stop butt. They can be used in the case of a stop butt of insufficient height on an outdoor range, or in lieu of a bulletproof ceiling (within the protected zone area) in an indoor range. However, the disadvantage is that they severely limit the positions within the range where firing points may be situated.

6.5.3 All baffles should be faced with a material that prevents bullets splashback e.g. a 50 mm thick softwood (on the face towards the firing point) spaced from the steel on 50 mm battens. The wood facing stops backsplash, and the space between the steel and wood prevents damage to the wood from ricochets across the face of the baffle. The battens should be mounted vertically to permit bullets and particles to fall out.

6.5.4 Consideration should be given to the secondary projectiles when baffles are within 10 m of any firing point.

6.6 Firing point

6.6.1 For safety reasons, shooters shall be a minimum of 1,5 m apart. This will either dictate the number of shooters who may shoot at the same time, or conversely dictate the width of firing point required on a new range. Screens are sometimes used between firing points on a range where firing always takes place at one fixed distance. In these circumstances, the distance between shooters can be reduced to 1m. However, screens cause ejected cartridge cases ("brass") from self-loading pistols to bounce around and sometimes strike the shooter.

6.6.2 For standing shooting the firing point should be a flat hard surface. However, for prone shooting a surface that slopes slightly upwards towards the targets is preferred. For outdoor ranges, the firing point surface should also be of a nature that drains well and does not become a mud bath in wet weather and a dust bowl in dry weather.

6.6.3 If tables or benches are used in front of the shooters at the firing point, then they should be made of wood to prevent ricochets or splatter if accidentally hit by a shot.

6.7 Ventilation and dust control

6.7.1 Indoor ranges shall have extractor fans installed. Such fans should be installed at the target end of the range so that fumes are pulled away from the shooters and any range staff or spectators. Filters on the outlets of the ventilation ducting will reduce the discharge of lead dust into the atmosphere. Inlet ventilators shall be installed behind the shooters.

6.7.2 If the air supply and extraction is horizontal, the average air speed measured at a level of 1,5 m above the floor shall not be less than 0,3 m/s. If the air supply is vertical and extraction thereof is done through slits or grills along the side walls at floor level, the average air speed measured at a level of 1,5 m above the floor level, shall not be less than 0,3 m/s.

6.7.3 It is recommended that a build up of dust in an indoor range should be avoided by regular weekly cleaning. Dry dusting should be avoided to prevent the dust becoming airborne.

NOTE - Although modern propellants are "smokeless" they nevertheless do liberate large quantities of gas and particles, which are neither pleasant nor healthy to inhale. In addition, unjacketed lead bullets can release particles of lead into the air when they break up on impact. Excessive exposure to lead particles and fumes may be dangerous and hence the need for adequate ventilation.

6.8 Noise reduction in indoor ranges

6.8.1 Hearing protection shall always be worn on both indoor and outdoor ranges.

6.8.2 It is recommended to install noise absorption materials on the walls, and possibly, also in the ceiling. The advice of an acoustics expert should be considered.

6.8.3 The materials used should be non-flammable.

6.9 Location of a range

It is recommended that an environmental impact study should be carried out to evaluate the ecological impact of the range on the surrounding environment.

6.10 Noise abatement

Indoor and outdoor ranges can largely be treated together when considering noise abatement.

When planning/positioning a range the environs of the range should be taken into consideration. An industrial or business area is preferable to a residential area. In the case of an indoor range, a stand-alone building will avoid the transfer of noise to adjacent properties through the structure of the building. Danger area ranges shall be situated in sparsely populated locations. Even so, the positioning of the firing point end of the range should take into consideration adjacent dwellings.

In the case of outdoor ranges (with or without danger area) screening of the firing point end by means of earth banks, rows of shrubs or trees, etc can make a considerable difference to the propagation of noise away from the range.

6.11 Range orientation and lighting

6.11.1 It is recommended that the in Southern hemisphere outdoor ranges should be orientated facing South to keep the sun out of the shooters' eyes.

6.11.2 Indoor ranges should be lit throughout their length. If required, dimmers can be used to enable low light shooting practice.

7 Range (shooting) safety

7.1 Irresponsible conduct of the shooters can negate the safety built into the range design.

7.2 The shooters shall obey the range (shooting) safety rules at all times.

7.3 The shooting needs to be supervised by a person competent to do so and who is able to give his or her full attention to the safety aspects without the distraction of trying to shoot at the same time. Such a supervisor is known as the range officer.

7.4 The duties of a range officer are given in Annex F and suggested range safety rules are given in Annex G.

7.5 The range should have first aid resources.

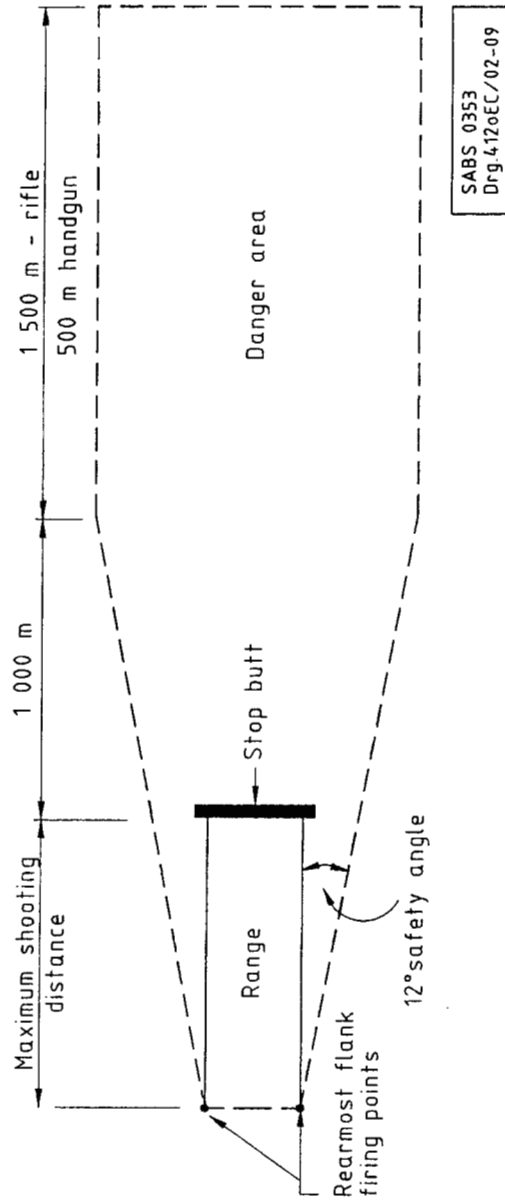


Figure 1 – Outdoor danger area range (danger area template)

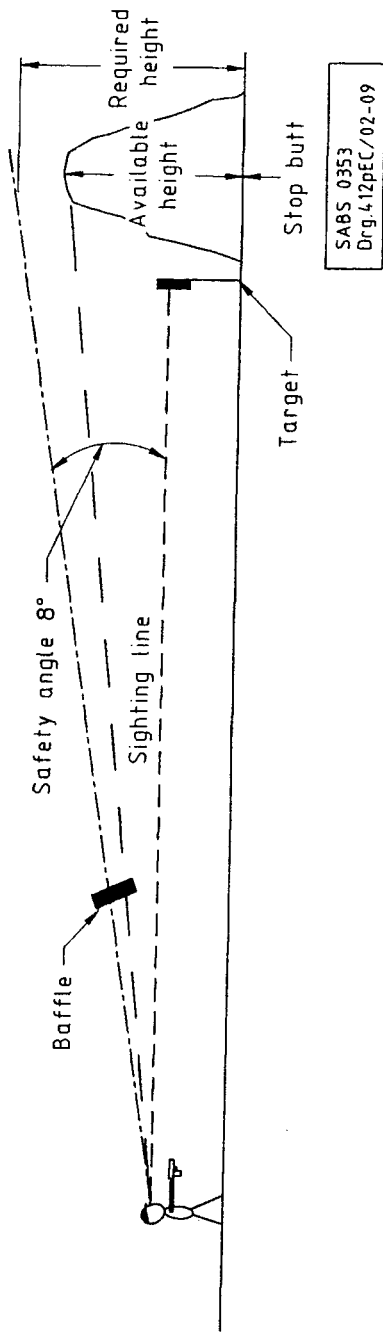


Figure 2 – Application of safety angle (showing use of baffle)

NOTE – The safety angle of 8° equates to 142 mm height required for every meter between the shooter and stop butt. The height of the sighting line above the ground should be added to the calculated safety angle height to determine the required height of the stop butt to be constructed or whether a natural hill is high enough to act as a stop butt.

Annex A
(Normative)

Examples of maximum ranges

Table A.1 – Shot cartridges

1	2
Shot size / diameter (mm)	Maximum range (m)
7 to 9 / 2 to 2,5 mm	200
BB / 4 mm	350
Buckshot, greater than 5 mm	1200

Table A.2 – Ammunition of muzzle velocity less than 330 m/s (1000 ft/s)

1	2	3
Ammunition/firearm	Calibre examples	Maximum range (m)
Rim-fire cartridges	22 short 22 long rifle	1000 1500
Centre-fire handgun cartridges	9 mm short, 38 Spl, 45 ACP	1500

Table A.3 – Ammunition of muzzle velocity greater than 330 m/s (1000 ft/s)

1	2	3
Ammunition/Firearm	Calibre examples	Maximum range (m)
Shotgun slugs	12 Bore	1400
Rim-fire cartridges	22 long rifle	1500
Centre fire handgun cartridges	9 mm Para, 357 Mag	2500
Centre fire rifle-cartridges	223 Rem, 308 Win, 30-06	2500 - 4000

Annex B (Normative)

Indoor ranges

B.1 Bullet Trap

Bullet trap shall take one of several forms of angled (45°) steel plate or plates that direct the spent bullets down into a sand or water pit. Alternatively, an escalator type of steel plate trap may be used which, while more complex to construct, will require less maintenance. A sand bank, as used on outdoor ranges may also be used, but this will take up considerable space and may lead to a dust and dirt problem. Heavy plastic/rubber sheeting may be hung in front of the bullet trap to stop small particles of backsplash and dust from returning up range.

Old car or truck tyres should not be used as a bullet trap. Many tyres contain metal bands that can cause ricochets. Spent bullets can lodge in the tyres and cause ricochets. There is also a distinct risk of fire from the particles of rubber broken out by the impact of the bullets.

B.2 Backplate

The backplate should cover the rear wall behind the bullet trap, and should extend outwards to cover the entire part of the rear wall that falls within the protected zone (see B.3). The area of the backplate that is visible from the firing point/s shall be faced with wood or compatible material spaced on battens in the same manner as any baffles (see 6.5).

B.3 Protected zone

This is the part of the range that is enclosed by the safety angle of 8° to the sighting line in both the vertical and horizontal planes. All parts of the range falling within this zone shall be bulletproof and proof against ricochets and backsplash. Smooth faced flush jointed double brick or 250 mm dense concrete or similar can be considered suitable. Where parts of the structure within the protected zone are not considered bulletproof then they shall be overlapped with steel plate.

Where the rear wall of the range does not contain the safety angles, those parts of the side walls or ceiling or both that come within the safety angles shall also be bullet-proof, and proof against ricochets and splashback. Suitably designed and situated baffles may be erected in lieu of bulletproofing of sidewalls or ceilings where this is more practicable or economic.

The floor of the range should be hard (e.g. concrete) and smooth, and should be kept clear of any objects that could cause ricochets if struck by a bullet.

Cladding (as for baffles) should be used when the protected zone surfaces are not proof against ricochets and backsplash.

NOTE 1 The required size of the protected zone can be calculated by taking the safety angle of 8° as equalling 142 mm for every metre of distance between firing point and backplate.

NOTE 2 Centre fire rifle ammunition can inflict major damage to steel plates and great care is needed in selecting suitable plate material and thickness. Armoured steel is highly preferable.

NOTE 3 Steel overplating of the protected zone is only required when the structure is not bullet proof. However, in the long term overplating may prove more economic.

B.4 Range entrances

No door or entrance should exist forward of the rearmost firing point, unless secured from the inside. A red light should be fitted above all doors giving direct access to the range itself (not the building). Such lights should lit whenever the range is in use.

B.5 Fire

Cognisance should be taken of local bylaws, and a fire extinguisher should be available on the premises.

Annex C (Normative)

Outdoor no danger area ranges

C.1 Stop butt

The stop butt shall be enclosed by the safety angle of 8° to the sighting line in the vertical and 12° in the horizontal planes. The stop butt should be the steep side of a hill, the wall of an abandoned or disused quarry, sandpit, etc, or a purpose erected bulletproof brick or concrete wall, or a bank of hard earth. In the latter case, the core of the bank can be made of hard fill such as rock, building rubble, etc. The minimum slope of the face of the stop butt is 56° from the horizontal, and the face will have to be of hard material to retain such a slope over time. It will thus be unsuitable to also act as a bullet trap. The stop butt should not be less than 5 m high for all shooting at 15 m or less.

A thick covering of light earth or sand would make a suitable bullet catcher, but this would collapse to a natural angle of repose of 30° to 35° as a result of weathering, de-leading and constant bullet impacts. It is therefore normally more practicable and economic to provide a bullet trap as a separate exercise.

NOTE – The required size of the stop butt should be calculated by taking the safety angle of 8° as equalling 142 mm for every metre of distance between firing point and stop butt. The height of the sighting line above the ground should be added to the calculated safety angle to determine the required height of the stop butt.

C.2 Bullet trap

The bullet trap should be made of steel plate in the same way as for indoor ranges, but a thick bank of earth and/or sand is normally more practicable. Care shall be taken to ensure that all rocks and stones are removed from the material used, and that the top part of the bank is deep enough from front to back. It should be remembered that bullet strikes occur at target level, not ground level. The bottom front of the bank can be made of a sand bag wall to avoid what would otherwise be a sloping bottom taking up considerable space. A top-covering layer of mixed sand and sawdust will provide a light non-caking surface that is easily de-leaded when required.

C.3 Baffles

Where the butt stop is not, or cannot economically be made, wide or high enough, baffles should be used to block the sighting line beyond the stop butt sides and/or top. Regardless of the use of baffles, the stop butt shall not be less than 5 m.

C.4 Range floor (ground)

The range floor shall be free from hard surfaces, rocks or other ricochet inducing surfaces. A sand or grassed surface is preferable, and drainage should be taken into consideration when constructing the range.

C.5 Range boundary

The periphery of the range should be fenced and warning notices permanently displayed. The fence should pass some 5 m behind the stop butt.

Annex D (Normative)

Outdoor danger area ranges with stop butt

D.1 Introduction

The most common application of such ranges is for rifle shooting up to 600 m, and sometimes more (1000 yards or 900 m). However, similar design considerations apply to any outdoor range where the butt stop is not, or cannot be made, big enough to accommodate the specified safety angles.

D.2 Danger area

Shooting ranges shall be constructed so that the full danger area is on ground that is unfrequented by the public. No occupied buildings, public roads, power lines or telephone lines should lie within the danger area. Public roads, private roads and footpaths are permissible provided that they are closed when firing is in progress.

The length of the standard danger area behind the targets is 1500 m for handguns and 2500 m for centre fire rifles. The width will vary according to the width of the firing point, which in turn will dictate the number of targets that can be accommodated.

The above are minimum distances, and all new ranges should be constructed to comply with these limits. The danger areas of certain old established ranges may not conform to the distances given. However, these ranges may well be acceptable, subject to the following conditions:

- a) that it is impractical or impossible to extend the danger area to the prescribed dimensions, and
- b) that the past history and accident record of the range indicates that it is safe to use.

Warning notices and flags shall be employed around the periphery of the range and its danger area, and both of these shall be fenced in with at least the equivalent of a five-strand farm fence. Warning notices and flags shall be placed in such a way that they are visible to a person approaching a range from any direction.

D.3 Determination of the required danger area

This is done by applying the safety angle of 12° from the rearmost flank firing points to a line 1000 m behind the stop butt, and then continuing parallel to the line of fire for a further 500 m or 1500 m as appropriate.

All the corners of the shooting ranges danger area shall be marked permanently. If this is not possible for practical reasons, e.g. the safety area falls within the fields of a farmer where the day to day actions of the owner will be impaired, other points on the side directly opposite the corners shall be marked so that during inspections the corners can easily be plotted.

D.4 Reduction of the danger area under certain circumstances

If a sufficiently high hill that incorporate the vertical safety angle of 8° exists within the standard danger area then it may be possible to reduce the size of the danger area. The height of the hill shall be taken in relation to the extension of the sighting line to the perpendicular from the hilltop, and not from the height of the targets.

D.5 Location of the range

The ground should be level and the sub-soil firm. An uphill site should be avoided as the chances of ricochets are greatly increased. A hollow site is also unsuitable because, unless the hollow is shallow (in which case the firing points can be built up to give a level line of sight), the line of sight from the shorter ranges would invariably be uphill. This increases the chances of ricochets. In addition, a target frame suitably positioned for firing from the shorter distances is liable to be struck by shots from the more distant firing positions.

D.6 BULLET TRAP

All rifle, shotgun slug and handgun ranges require a bullet trap that should not be less than 5 m high for all shooting.

On certain sites, a hillside may enable an artificial bullet trap to be dispensed with. In such cases, the ground at the rear of the targets shall rise at an angle of not less than 30° to the general level of the firing points. If the angle is less than 30° , the hillside should be scarped from a height of 1 m above the targets to 0,3 m below the lowest possible line of fire from the most distant firing point. If an ample danger area is provided, the scarping is not essential and some form of bullet trap on the face of the hillside may be substituted, if more economical.

The bullet trap shall be of such length as to project at least 3 m beyond the outside edges of the outermost targets. Allowance should be made during construction for wear and tear due to the weather and the strike of bullets. The face of the bullet trap need not be steeper than the natural slope of the material from which it is made, a slope of 1 in 3 is usually suitable. The material of the bullet trap is a matter for local consideration, but an area behind each target should be faced with earth or sand to show the strike of the bullet.

The distance of the bullet trap from the targets depends on the material used to construct the trap. When sand or soft earth free from stones, etc. is used, the trap may be placed within 5 m of the targets. The presence of stones, etc. is a common cause of "backsplash" and when these are present, the distance shall not be less than 30 m. When possible, the trap should be 30 m from the targets, the intervening space can then be adapted for use as a 25 m range. The stop butt can also be used as a bullet trap.

D.7 Markers' gallery (if required)

For penetrable targets, the requirements for the gallery (markers shelter) are practically the same, whatever apparatus or pattern of frame for holding the targets is used. The main conditions to be fulfilled are the following:

- a) the gallery shall be exactly at right angles to the axis of the range and parallel to the bullet trap.
- b) the height shall be not less than 2 m.
- c) ample protection shall be provided to ensure the safety of the markers.
- d) to facilitate marking, the markers should be able to see the strike of the bullets on the bullet trap.
- e) the roof of the gallery shall slope slightly downwards towards the targets to avoid ricochets from the roof on to the targets. A layer of sand or earth should be used to reduce the chances of these ricochets.
- f) the crest of the gallery should be defined with a plank on the edge. Care should be taken to keep the gallery crest up to the limit to avoid the formation of scoops in front of the targets, which cause widely divergent ricochets through shots striking the sides of the scoops.
- g) the bottom of the target shall be raised so that it can be seen clearly from all firing points.
- h) the choice of concrete or brick for construction will depend on the supply of these materials and the situation of the range.
- i) the actual level of the floor of the gallery in relation to the ground level is a matter for local consideration. It may be necessary to keep the gallery as low as possible in order to reduce the height of the bullet trap or to raise the floor level to provide for efficient drainage of both the gallery and the target trench.
- j) it should be remembered that ricochets occurring from a range on which the targets are some distance above the ground level are likely to be fewer than when the targets are positioned at lower levels.

k) the retaining wall and the gallery shall be bulletproof. The material from which they are constructed depends on the permanency of the range. It is recommended that the whole construction should be of brick and/or concrete.

l) the entrance to the sunken gallery should be by a ramp, as steps increase the difficulty of transporting targets and other stores. It is essential that if steps are provided they be made as wide as possible.

D.8 Firing points

The firing points are normally at ground level. Raised platforms may, however, be needed when the site is hollow or swampy, or when the targets are not visible without them. Where raised platforms are required, the width at the top should be not less than 3 m.

Where a stop butt has to be constructed, building up the firing point may permit the stop butt to be lower than would otherwise be the case.

D.9 Other construction considerations

D.9.1 Target numbers

If required, all targets can be numbered from the left, looking from the firing point. Numbers should be placed on the crest of the bullet trap in such a position that, from the firing points each number appears directly above the target.

D.9.2 Flagpoles and flags

Flagpoles and red danger flags should be provided as indicated below:

a) Bullet traps

A tall flagpole erected at one end of the bullet trap. This flagpole to be fitted to allow for the hoisting of a 1 m² red danger flag.

b) Markers' shelter

A flagpole to be erected at one end of the markers' shelter and to show at least 2 m clear of the shelter roof. It shall be possible to hoist a 1 m² red danger flag from under cover of this shelter.

c) Firing points

A portable flagpole, to which a 1 m² red danger flag has been attached, to be available for use on the firing points.

D.9.3 Target store

A target store is normally required on ranges. It is best to construct it as a continuation of the markers shelter when it may be a lean-to shed with back and end walls of brick or concrete and with a corrugated iron roof. The size will depend on the number of targets to be stored.

D.9.4 Communications

Telephone or radio communication between the markers' shelter (where there is one) and the firing points is recommended.

Annex E
(Normative)

Outdoor shotgun ranges (no stop butt) for cartridges only

E.1 General

Although the muzzle energy of most shot cartridges is high, this energy is shared between the total quantity of shot, and the energy of each individual shot is low. Furthermore, round shot has a ballistically inefficient shape and as a result, the velocity and energy rapidly falls off and the maximum range is very limited in comparison to a normal bullet. However, even falling spent shot can cause injury, particularly to unprotected eyes, and a danger area is required.

Shotguns are usually fired at moving targets and so the precise direction of fire can vary over a wide arc. The spent shot can also be carried by the wind. The danger (shot fall) area shall take both these factors into account in addition to the theoretical maximum range.

A stop butt is not required for outdoor shotgun shooting with shot cartridges. Instead, a shot fall (danger) area complying with Figure A.1 and the dimensions given below shall be applied.

NOTE Shotgun slugs should be treated as the large heavy bullets that they are, and a stop butt range in compliance with Annex B or C is required.

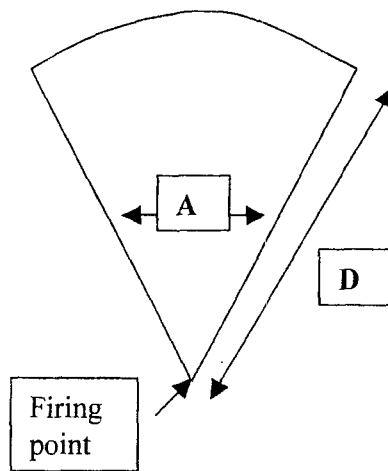


Figure A.1 – Shotfall Area

Table A.4 – Distance D

1	2
Shot Size / Diameter	Distance D (m)
7 to 9 / 2 to 2.5 mm	300
AAA to BB / 4 to 5 mm	550
LG to SSG / greater than 5 mm	1000 ¹⁾

1) If used for aerial targets. For ground targets a stop butt range would be a better choice.

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E.2 Angle A

The required distance D shall be applied over at least the entire arc over which shots may be fired. For aerial targets thrown across the front of the shooter, this will normally mean an angle of 180°. For targets thrown going away from the shooter, a narrower angle will be appropriate.

Where a clear shot fall area can only be obtained over a limited angle, barriers or a shooting cage are recommended to prevent the shooter swinging the shotgun beyond the limits of the area.

E.3 Trap Protection

Many forms of clay target shooting require that the target traps be positioned forward of the shooter. In such cases protection shall be installed to entirely shield the trap and operator from any shot fired towards them from the firing point. Such shields shall be shot proof, and can be either permanent (brick, concrete, etc) or temporary (multiple straw bales and zinc sheeting, etc).

Annex F
(Normative)

Duties of the range officer

One or more range officers shall be responsible for supervising the conduct of most shooting at ranges. Only shooting by experienced shooters is excluded. In such instances, the shooters should appoint one of their numbers to undertake the duties of the range officer.

NOTE – The range officer's responsibility is safety, not the conduct of shooting in accordance with the rules of a particular shooting discipline or competition.

The range officer shall be a responsible for the following:

- a) to ensure that all the shooters are acquainted with the provisions of the range rules.
- b) to ensure that the range safety rules are observed at all times.
- c) constantly supervise the shooters whilst they are at the firing points.
- d) for controlling or operating any barrier, warning or signalling systems at the commencement of, during, and at the conclusion of shooting activities.
- e) for managing and supervising ancillary staff such as target-operators, etc.
- f) decide when shooting is to commence, be interrupted and cease.
- g) to ensure that all firearms in use on the range are holstered or put down unloaded before allowing anyone to proceed in front of the firing point (to change targets, for example).
- h) be empowered to exclude from the shooting range persons who disrupt operations or pose a threat to safety, and persons perceptibly under the influence of alcohol or drugs.
- i) to ensure that all spent cartridge cases and litter are removed from the range.
- j) ensure that all shooting exercises are carried out in accordance with the shooting instructions for that particular range.

Annex G (Informative)

Suggested range safety rules

General as well as specific safety requirements for a shooting range should be laid down in a set of range safety rules. These rules should be displayed at the firing point and at the entrance to the range. Taking into account local conditions and the type/s of shooting practised, the rules should contain the following stipulations:

G.1 The types of firearms, ammunition and bullets that are permitted or not permitted on the shooting range and any specific types of firearm, ammunition and bullet not to be used.

G.2 Commands and signals to be used, such as "Fire", "Cease fire", and the like, should be explained.

G.3 The safety measures (closing of barriers, hoisting of warning flags, switching on of warning lights, ventilation, emergency lighting, etc.) to be taken prior to any shooting event, and the opposite measures to be taken after such event (opening of barriers, etc.) should be stated.

G.4 Rules of conduct for shooters:

G.4.1 The firing point shall not be left with a loaded firearm (not applicable for firearm carried for self protection).

G.4.2 Firearms shall only be loaded at the firing point on instructions from the range officer, and with the barrel pointing at the bullet trap.

G.4.3 Only the targets provided shall be fired at. Under no circumstances shall glass bottles, etc be used as targets.

G.4.4 No shooting shall be done at targets, tin cans, or any other item placed on the floor of the indoor range, since this poses a ricochet hazard.

G.4.5 Turning around with a loaded firearm is forbidden.

G.4.6 Firearms shall be holstered, or put down unloaded, whenever shooting is interrupted for target changing, etc. Under no circumstances may firearms be handled whenever anyone is in front of the firing point or points in use at the time.

G.4.7 Other people's firearms shall not be touched without the express permission of the owner.

G.4.8 Hearing and eye protection shall be worn during shooting.

G.4.9 Smoking and handling of naked lights on indoor shooting ranges is prohibited.

G.4.10 Instructions given by the range officer shall be complied with unconditionally.

G.4.11 Persons engaged in shooting (shooters, target changers, ancillaries, etc.) shall not be under the influence of alcohol or drugs.