

Target Shooting New Zealand

Target Shooting Range Manual

For Rimfire and Air Rifle Shooting

Published by TSNZ: 18 April 2023

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TSNZ Target Shooting Range Manual

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Introduction

Smallbore Target Shooting in New Zealand has a history extending back to the turn of the 20th century. The pursuit was generally followed by people who wanted to practise target shooting locally without the need to wait for fine weather. Local community halls and purpose-built indoor ranges were put into use and the practice quickly turned into a recreational sport.

Later, with 10m air rifle and 50m smallbore becoming Olympic and Commonwealth Games events, rifle ranges were constructed for those disciplines.

There is a need to develop a document outlining the safe utilisation of Smallbore Shooting Ranges. This comes about with Police, Government Departments and Local Bodies demanding that pursuits such as target shooting are carried out safely and without annoyance to the general public.

TSNZ's number one priority in this Manual is to ensure that Smallbore Shooting continues to be a safe Recreational Sport. It endeavours to provide Smallbore Target Shooting Clubs with information so they may upgrade existing ranges to acceptable safety standards and to provide a resource for planners of Smallbore Rifle Ranges in the future.

It does not propose to be a Gospel for Shooting Ranges - especially in the detail. There will always be the opportunity for the use of any other form of procedure, protection, device or material not specifically mentioned in the technical details of this manual to be used in the construction of ranges. The only criteria required is that any procedure, device, design or technical change must be documented and demonstrated that it fulfils its design function to the satisfaction of TSNZ and New Zealand Police .

Standards

When this manual was first published there was a general lack of information and standards on the construction of Shooting Ranges. Most of the information available has been written by the military.

JSP403 was the Joint Services Publication overall catalogue number for a host of Range Manuals for UK Military ranges. The relevant range document is available here:

<https://www.gov.uk/government/publications/jsp-403-volume-2>

JSP403 has been the information reference used by UK NSRA and other shooting organisation in New Zealand including NZ Pistol Association and National Rifle Association of NZ.

This has enabled NZ shooting organisations to rewrite their manuals with up-to-date information.

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The Arms Legislation Act 2020 resulted in New Zealand Police being tasked with certifying shooting ranges. Certifying of ranges used by TSNZ members was removed from TSNZ obligations.

NZ Police are accepting the TSNZ Manual as a recognised Range Manual for TSNZ Smallbore and Air Rifle shooting. This in effect means that current ranges can be assessed using this Range Manual. New ranges can also be designed using the information in this manual but the design and certifying of the range must be accepted by NZ Police.

The NZ Police resource for Clubs and Ranges can be found here:

<https://www.firearmssafetyauthority.govt.nz/manage-and-apply/clubs-ranges>

The NZ Police have also published a Police Shooting Range Manual. This manual is designed as background for anybody (person or organisation) intending to build any shooting range.

This TSNZ manual has extracted sections, drawings, construction and design criteria from any source that are relevant and useful to Rimfire and Air Rifle Shooting.

For 50m smallbore ranges, aspects of the application of JSP403 have been used to certify civilian target shooting ranges that appear to contradict accepted practice as outlined in JSP403 in applying military shooting standards to civilian usage of ranges. This was due to the military accepting the fact civilian target shooting is significantly more accurate than normal military shooting training activities. These factors have been incorporated into this manual.

The outcome is significant for 50m outdoor ranges where the calculated Cone of Fire (COF) for smallbore rifle has enabled a considerable reduction in the footprint for a 50m range.

In all other cases, e.g. Indoor 20 and 25yd ranges, more conservative recommendations will generally be the criteria adopted. These types of ranges are the learning venues for practically all smallbore shooters. The provision of enhanced safety is required because of the expected higher rate of “random shots”.

The reasoning behind these requirements is to ensure shooting is carried out safely. A proportion of the safe operation is related to the **physical range construction**, a proportion is related to **range use procedures** and the rest is related to **common sense**.

The TSNZ Range Manual, Safety and Shooting rules are required to be adhered to for the operation of any TSNZ Affiliate range.



This sign indicates a paragraph containing important criteria, instructions or recommendations that deems all Ranges shall comply with.

What this Manual is about

This Manual is designed to provide technical guidance along with typical examples of physical layout and equipment used on Rimfire and Air Rifle Ranges.

It is specifically related to smallbore (0.22in or 5.60mm calibre), subsonic, soft lead projectiles fired from a single shot target rifle and 0.177in (4.5mm) pellets fired from an air rifle. To ensure clarification throughout this manual, from here on in, smallbore ammunition as described above, shall be referred to as "RIMFIRE" unless otherwise stated.

The general specifications of Indoor 20/25 yd, Air Rifle and Outdoor Rimfire Rifle Ranges will be dealt with separately. Content will overlap and all endeavours will be made to ensure any differences are obvious.



Unlicensed Shooters and Immediate Supervision

TSNZ encourages the recruitment of people interested in target shooting. When introducing a new shooter to the sport it is necessary to ensure adequate control and oversight of the shooter to ensure range safety requirements are met.

The Firearms Legislation refers to the term "Immediate Supervision" when accompanying a shooter without a Firearms Licence. The person supervising any unlicensed shooter must hold a Firearms Licence.

TSNZ Policy

On all TSNZ ranges, initial instruction must be carried out with the instructor close to the shooter. TSNZ considers this to be close enough to adjust the sights. This includes the movement of the rifle to and from the range.

Once a shooter can comfortably shoot, follow and understand the range procedures and can safely handle the firearm, they can be on the firing point by themselves and considered to be under the Immediate Supervision of the Range Officer.

To be clear, once this stage is reached, it is considered no longer necessary for the supervision to be close to the shooter.

Duty Officer, Officer on Duty, Duty Range Officer, Range Officer

These terms, for the purpose of TSNZ Target Shooting, are interchangeable. The Arms Legislation Act 2020 Section 6, 38Q, states that at all times while the range is in use, an Officer is on Duty who:

1. holds a Firearms Licence and
2. is appropriately trained in shooting range safety management.

Contact TSNZ to undertake the Range Officer and Safety Course.

The Seven Rules for Firearm Safety



- 1. Treat every firearm as loaded**
- 2. Always point firearms in a safe direction**
- 3. Chamber a cartridge only when ready to fire**
- 4. Identify your target beyond all doubt**
- 5. Check your firing zone**
- 6. Store and transport firearms and ammunition safely**
- 7. Avoid alcohol or drugs when handling firearms**

New Zealand Arms Code 2022



Safety is Paramount

All shooters in TSNZ affiliated ranges shall:

- Be familiar with the Range Standing Orders
- Be familiar with the safe use of firearms
- Use all firearms under the controlling instructions of the Duty Range Officer.
- Obey the designated Duty Range Officer who shall have absolute control of the rifle range while shooting is in progress. Shooters shall obey ALL their instructions.
- Treat firearms AT ALL TIMES as loaded. This means when handling any firearm, check the action is open and the breech is clear of ammunition, and an empty chamber flag inserted.
- Ensure that visitors to TSNZ affiliated ranges are accompanied by a person competent in the safe handling of firearms and who is fully conversant with the Range Standing Orders for the range being used. This person shall be a firearms license holder. They shall be present whenever a visitor is handling a firearm and before the visitor handles a firearm, they are informed of all safety procedures pertaining to the Rifle Range and the safe operation of firearms.
- Ensure that AT ALL TIMES the Rifle Range shall be operated in a manner that ensures the safety of all shooters and the general public.

Firing Range Safety Implies:

- the proper use of a range as it relates to its physical design;
- a continuous and ongoing training programme for users, Instructors, Range Officers and Officers on Duty;
- regulations on the safe use of the range coupled with enforcement of these regulations are followed.

Range Considerations

- ▶ All Rimfire and Air Rifle Ranges shall be constructed to ensure projectiles fired from the firing point towards the range targets are confined within the immediate range area and their remains do not pose a hazard to safety and health.

Indoor: This means within the building

Outdoor: This means within the area defined by the appropriate range design.

The physical range construction is designed to prevent the remains of bullets, - whether they be whole or in part, from exiting the building or range environs, or returning to the shooter as dangerous projectiles.

No Danger Area Ranges

In general, a “**No Danger Area**” range is created by the introduction of a backstop or wall, either of natural or artificial composition, used in conjunction with a severely restricted arc of fire.

- ▶ **TSNZ Rule:** The final locking of the action shall not take place until the butt of the rifle is in contact with the competitor’s shoulder and the muzzle is pointed in a safe direction towards the target(s).

A range that does not conform to the “No Danger Area” criteria shall be tested as a “**Full Danger Area**” range using the “**Safety Template**” applicable to the firearm and ammunition that will be used on the particular range.

- ▶ All new 10m, 20 and 25yd Indoor, and 50m Outdoor Ranges on which TSNZ affiliated Clubs and/or Associations hold TSNZ sanctioned events shall conform to the “No Danger Area” range criteria.

Danger Zone Definitions

There are three main Danger Areas within a range that require protection from direct and indirect bullet strikes.

Defence Zone

Areas subject to occasional impact that will usually strike at shallow angles.
Side walls, roofs, floor.

Backstop (Back plate) area

Areas subject to more than occasional direct strikes.

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Bullet Catcher

Areas subject to intense and continual strikes. Immediately behind the targets - and including the warmer or fouling shot area!

Firing Points – Indoor and Outdoor

In the past, firing point space provided for each shooter has been a matter of squeezing in the greatest number of shooters as possible. This has meant that it has usually not provided a fair opportunity for all shooters to be offered the firing point of their choice or if drawn by lot, there has been a need to push left hand shooters to the end of the firing line.

TSNZ recommends that 1.2m be the minimum spacing between targets and firing points for any new ranges - Indoor or Outdoor. However, unless firing points are significantly wider than this (eg 1.6m) it will not be possible for right and left hand shooters to shoot side by side. Provision should be made on the left and right flank positions for right and left handed shooters respectively. The firing point shall be flat for at least 2.5m from the firing line towards the rear of the firing point. It shall be constructed of hard material that will not shift or move from the influence of adjacent shooters or range personnel moving around behind the firing line. The provision of shooting tables from which to shoot may be an alternative to the floor of the firing point.

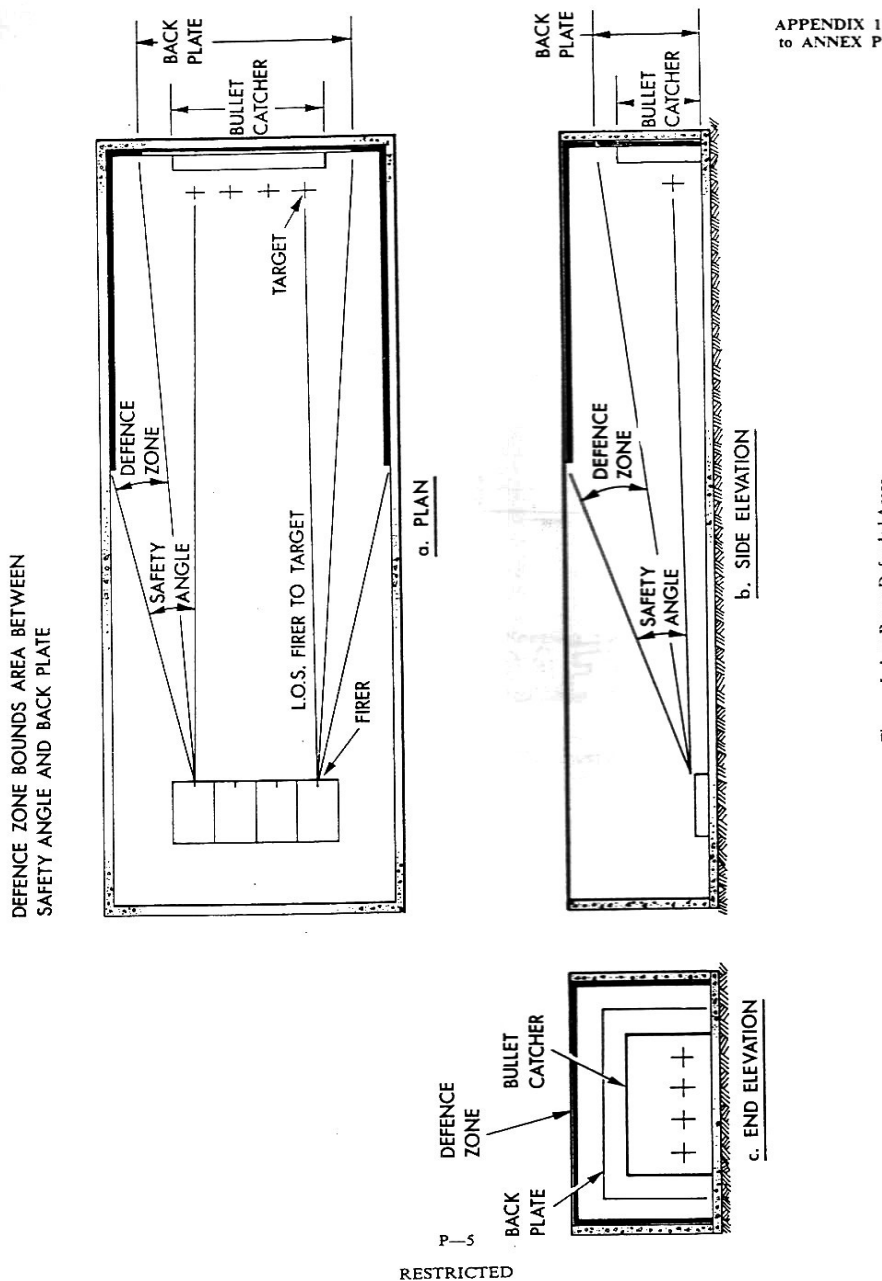
Indoor Ranges

The criteria are based on the angles and distances as outlined in Table 1 and the minimum construction details outlined in "Danger Area Protection".

Cone of Fire: The CofF for indoor 25 yd shooting is 4.5mils. This corresponds to +/-100mm from the centre of each target diagram at 25 yds or +/-80mm at 20yds. See Figure 4 for details.

- ▶ The range shall be constructed or modified to meet or exceed these criteria.

Figure 1



Figure—Indoor Range Defended Areas

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Table 1 - Indoor Range Defence Zones

Defence Zone	Description	20yd	25yd
Vertical	Limit of Defence Zone over LOS to highest target centre	2.0 m	2.5 m
Horizontal	Limit of Defence Zone from flank LOS	1.2 m	1.5 m

Backstop

Vertical	Backstop height over highest LOS	700 mm over LOS	875 mm over LOS
Horizontal	Backstop width beyond flank LOS	450 mm per flank	550 mm per flank

Bullet Catcher

Vertical	Bullet Catcher over/under highest/lowest LOS	80 mm over/under LOS (4.5mils)	100 mm over/under LOS (4.5mils)
Horizontal (Note Warmer Box)	Bullet Catcher width beyond flank LOS	80 mm per flank (4.5mils)	100 mm per flank (4.5mils)

See:

<https://www.gov.uk/government/publications/jsp-403-volume-2> Table 6, Page 30

Note: The LOS (Line of Sight) is defined as the line from the rifle barrel (measured from 300mm directly above the centre of the firing line) to the target. These design heights and widths are at the target line. Backstops and Bullet Catchers can be at differing distances behind the target. To cater for this, the height and width of the Bullet Catcher and backplate shall increase at a rate of 20 mm per metre behind the target. i.e. If a backplate is 1.5 m behind the target line, the dimensions of the backplate will increase by 30mm in both height and width. This increase applies to both 20yd and 25yd ranges.

Explanation: 25yd Range: The Bullet Catcher shall extend to the side from the furthestmost target by 100 mm. This means the extreme left or right hand counters on a 10 or 11 bull target. Likewise, the Bullet Catcher must extend 100 mm above the top counter and below the bottom counter of a 10 or 11 bull target. [And remember a 20 shot card is wider!]

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If a "Warmer" hole is mounted within a Bullet Catcher, it may require a horizontal extension to a Bullet Catcher.

Warmer or Blow Off Box:

A separate Warmer Box if used, shall have its opening dimensions 200 mm square. This applies to 20 or 25 yd ranges.

Finding the Defence Zone for Indoor Ranges

For a 25yd range, this is measured 2.5 m above the target line while the rifle is aiming at the TOP ROW of counters. Likewise, 1.6 m to the left and right of the extreme firing positions from the edge most counters. Where these lines intersect the roof and walls of the range defines the area that encloses the total Danger Area. TSNZ adopts a rifle height of 300mm above the firing point for measuring purposes.

The defence zone relies on the application of the TSNZ range rule that instructs all shooters to ensure when a rifle bolt is finally locked – or unlocked - the rifle butt must be on the shoulder, and pointing towards the target area.

Vertical Defence Zone Conversion Calculations:

For ease of calculation, for 25 yd. range, the Defence Zone increases 120 mm for every metre i.e. 1 metre from the firing point the safety angle line is 120 mm away from the LOS. For 20 yd. range it is 100 mm for every metre behind the target line.

Danger Area Protection - Indoor

The protection requirements for the three zones are as follows:

Defence Zone

Since this area will generally be subject to occasional impact, the requirement is to contain bullets that glance the walls, floor and ceiling at shallow angles. The provision of vertical baffles along the wall if there is sufficient space and their incorporation in the ceiling may be advantageous in allowing a minimum of material to be used. (See Baffles below)

Acceptable surfaces for the Defence Zone:

- Smooth concrete floor.
- Soft earth floor or pea gravel.
- Concrete block walls, smooth finish with smooth pointed joints. It is recommended to cover the concrete blocks with 10mm plywood to prevent splash back.
- 3mm sheet steel supported on the walls and ceiling overlapped with the edge overlapping towards the target.
- Adequate thickness of overlapping timbers.
30mm Hardwood Extremely variable depending on

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40mm Softwood type and quality of timber

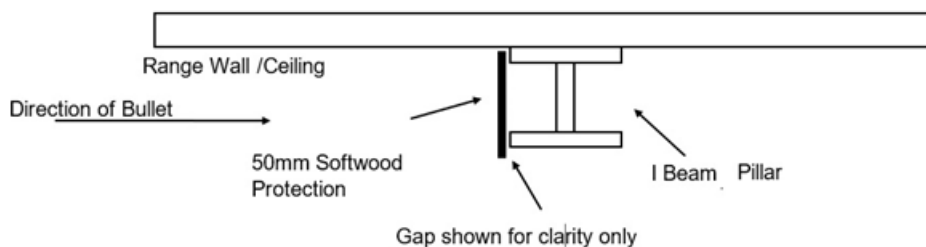
- Double thickness 16mm Particle Board (MDF)
- Any other method **demonstrated and documented** to be equally as effective

Pillars

Concrete or steel pillar supports that project into the range along the walls or down the middle of the range, shall have their facing sides (face nearest shooter) protected with soft timber. This prevents backsplash and the 'reflection' of shots back to the shooter. Suitable cover is 50mm soft wood attached firmly to the pillar.

Figure 2

I Beam / Pillar Protection -Ceiling or walls



Backstop

This area is subjected to more than random shots and will usually be hit with a direct shot at steep angles. Since there is no sustained damage in a concentrated area, the surface need only stop no more than 2 or 3 bullets in any one spot.

Acceptable surfaces for the Backstop:

- Smooth Concrete blocks covered with 25mm of softwood or 10mm plywood
- 4mm sheet steel backed and covered with 25mm of softwood. Backing the steel supports the steel when hit.
- Any other method **demonstrated and documented** to be equally as effective

Bullet Catcher

This area will be subjected to sustained impact in a concentrated area. It requires special construction to ensure the capture of the bullet.

A number of devices have been developed that are suitable for this requirement.

- Sand supported by timber boxing

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- Sheet steel deflectors
- Wooden blocks (Limited Use Ranges only)
- Bullet traps that contain the bullet and fragments within itself
- Proprietary supplied Bullet Catchers

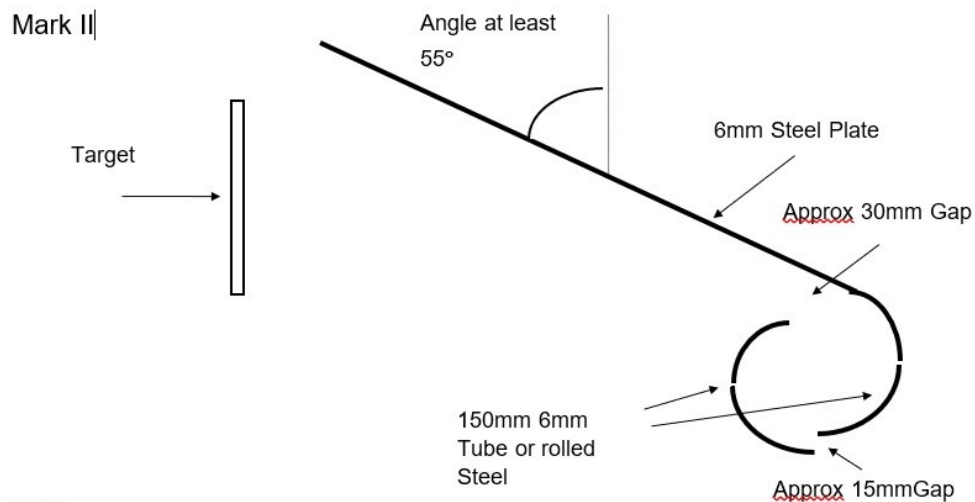
Points to note:

- The Bullet Catcher is usually the greatest generator of lead dust. The smashing of the bullet into and through bullet catching material scrapes off significant quantities of lead particles. The best types of Bullet Catchers are those that are easily maintained and require the minimum of protective equipment to clean. i.e., produce a minimum of lead dust.
- The cleaning and maintaining of Bullet Catchers and the rifle range in general is outlined in **Lead - Recommended Clean-up Procedures** on Page 35.

Bullet Catcher – Examples

Figure 3 Wainuiomata Catcher

[From Wainuiomata SRC design and use]



Note:

- The result of testing with an adjustable Test Rig, it was found that an angle less than 53° caused a bullet hitting the plate to break up. At angles greater than 53° the bullet did not. Thus the requirement to make sure the angle is > 55°.
- Mark I design did not incorporate the gap at the bottom of the tube. The bullet remains were left in the tube to be hit by later bullets. This meant extra lead dust being generated and regular cleaning was required. A semicircle of steel attached to a handle is used to scrape the remains out the end of the tube. The idea behind the gap is to allow the bullet to drop out of the tube and decrease the amount of lead dust generated. The bottom of the left hand tube needs to have a downward slope to assist the lead to fall out.
- One noticeable effect is the lack of pitting at high impact zones, ie sighter areas, as compared to more vertical plates.

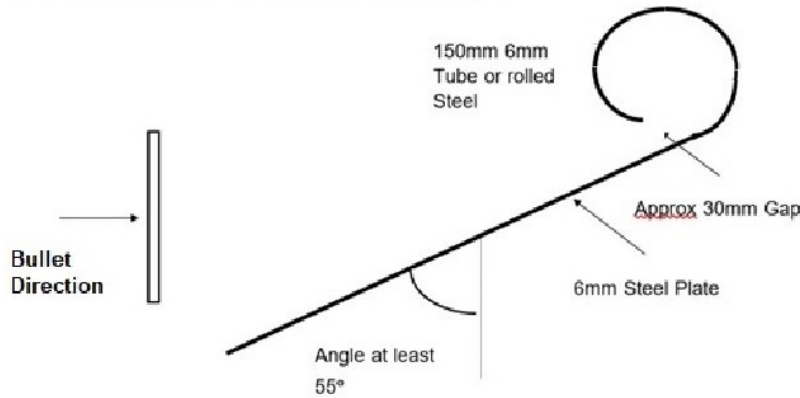
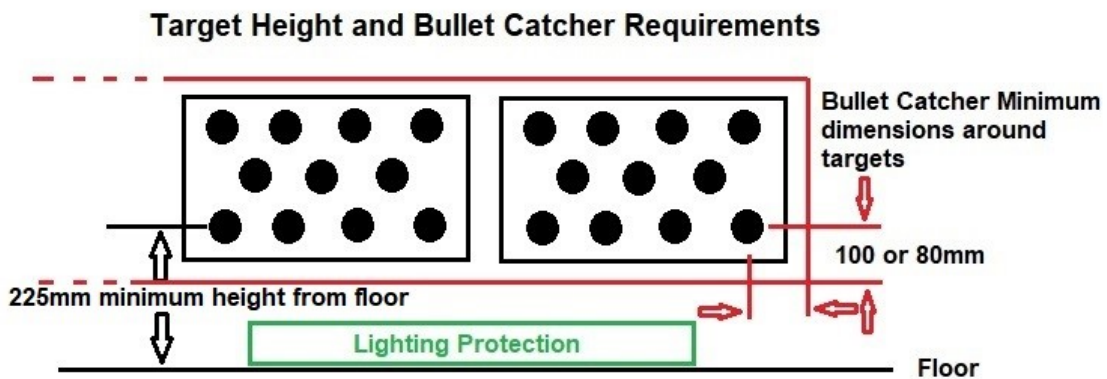


Figure 4



Ceiling Protection

The case of ceiling protection can be approached in a variety of ways. The priority is to prevent direct shots and ricochets from exiting the range. The ceiling invariably is the 'weakest wall' of a range. Ranges that are built beneath buildings have a requirement to prevent shots going through the floor into the spaces above. Corrugated iron sheet roofing by itself is not adequate as protection for direct shots.

The methods outlined in the Danger Zone requirements are effective but sometimes space requirements and cost may mean that other methods are more useful. So much depends on the layout of the range but the function of the installed protection shall remain.

Ranges with a reasonably high ceiling and width will almost certainly have rafters and/or trusses supporting the roof. These vertical sections can be utilised to support bullet catching material that will prevent the direct shot from exiting the range. Remember that in this case the vertical truss is no longer taking glancing hits, it will therefore require more protection than the Danger

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Zone criteria. These vertical trusses are effectively baffles. The layout, use and design of baffles is outlined later.

Ranges built beneath buildings can utilise the floor joists (if they are running at right angles to the LOS) as bullet stoppers, or joists can be used to support protected sheet steel as per the Danger Zone criteria above.

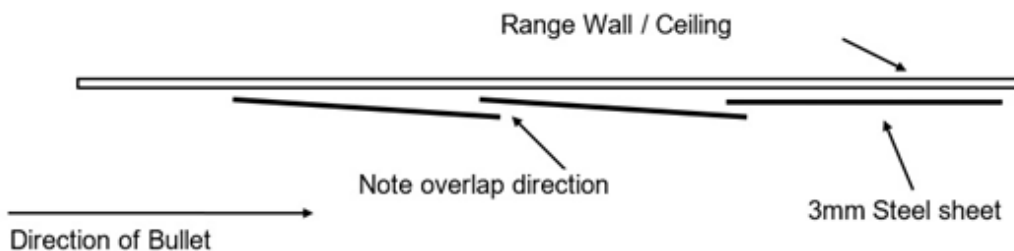
- Remember that the addition of steel and other heavy material to the underside of floors, ceilings etc. may require engineering calculations due to the extra load on these structures. Check local Building Regulations before construction!

Hidden Damage

It is imperative that inspections of backing material behind bullet catchers, defence zones and backstops and walls are carried out at regular intervals. This ensures the ongoing integrity of the external walls of the range.

Figure 5

Flush Wall / Ceiling Lining



Baffles

Baffles may be placed in the ceiling or along the walls enabling smaller and possibly cheaper alternatives to protecting the full Danger Zone of the range.

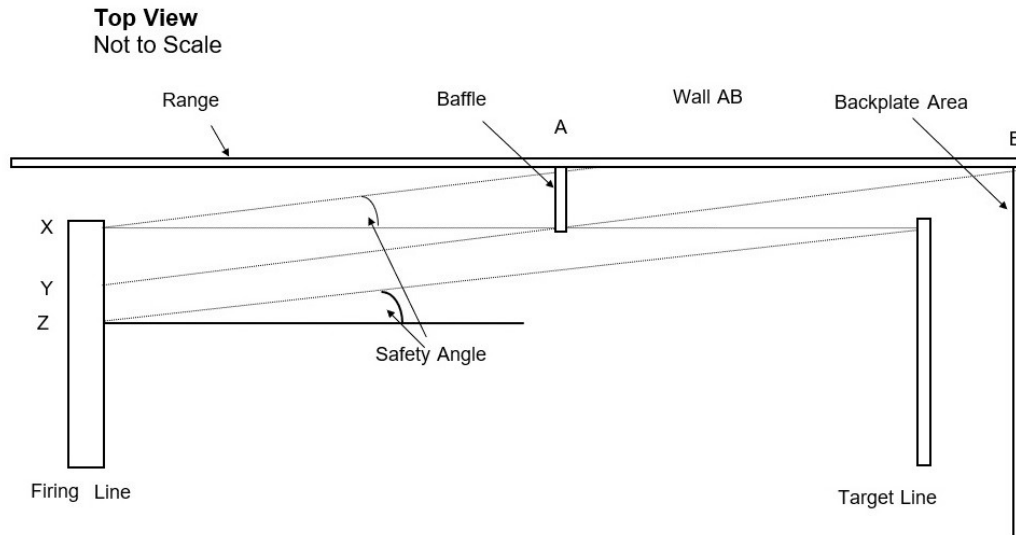
The placement of the baffles is a matter of geometry. The basic idea is to place vertical or horizontal panels such that no direct paths are created for a direct shot to exit the range. They must be constructed such that the direct shot is stopped or deflected into a Defence Area and ricochet and backsplash is eliminated.

If there is space to the side of the range of sufficient height, there may be a case for the installation of baffles instead of a full wall lining for the length of the safety zone. Remember that joists of a floor if they are running at right angles in effect, are baffles. Generally, if the walls are close to the LOS then a sheet type of protection on the wall is the most feasible. Baffles should also be used to protect light fittings along the range.

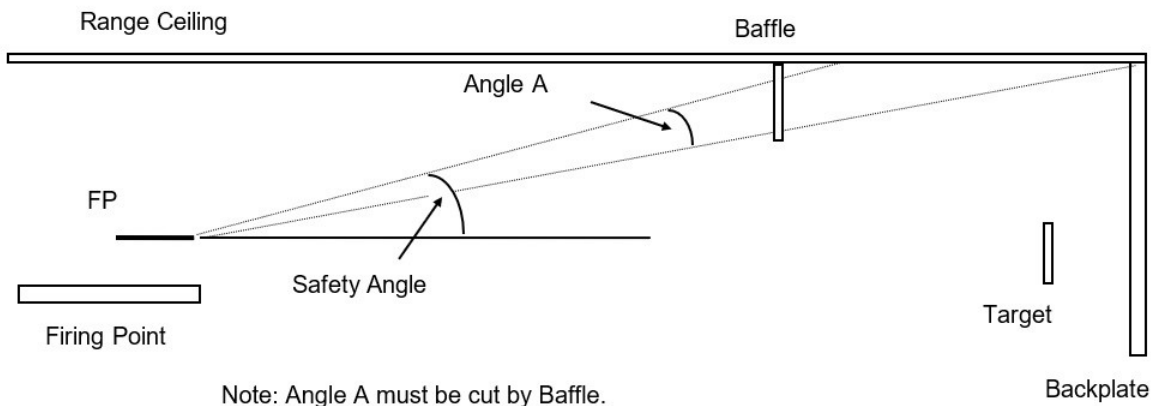
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The bullet loses significant energy after a ricochet and therefore the ceiling may only require a minimum of protection. A lining of 12mm particle board, 10mm ply, or equivalent would be appropriate.

Figure 6 Baffle Examples



Side View
Not to Scale



Points to note with Baffles (applicable to Outdoor Ranges also) are:

- There may be a need to place more than one baffle to cover the required angles that may be within the required safety angle
- See Table 1 page 13 and Table 2 page 22 for safety angles for different ranges.

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- Being vertical plates that are placed at right angles to the line of fire means that the Baffle need to be able to stop a bullet and catch it. See examples of construction.

Indoor Range Access During Shooting

It is necessary to ensure that access to the range in front of the firing points and within the range safety area is eliminated while shooting is in progress.

- Target changing doors need to have some form of lock and emergency exit doors need to be only accessible from inside the range. Electric interlocks on target changing doors that operate with any 'Red Light' system may be utilised but must be regularly checked for correct operation. This is especially so for side doors in front of the Firing Point.
- It is important that any locking mechanism must be able to be overridden to ensure easy exit from the range in an emergency. Do not forget to ensure that the overriding instructions are well known – paradoxically even to those you are trying to keep out!

Limited Use Ranges

There will be occasions when shooting is carried out on temporary premises, e.g. Town halls, gymnasiums. In these cases, it is imperative to ensure that all external doors and windows behind the target area, e.g. supper rooms, toilets, are locked and / or entry restricted while shooting is in progress.

- ▶ Entry points on the outside walls of the building accessible to the general public that may enable them to enter the area in front of the firing line and within the safety areas must not be accessible from the outside.

The stringent requirements for permanent Indoor Ranges can be acceptably modified for Limited Use Ranges. The strict criteria to be applied is that the rear wall to the outside of the building shall not allow a direct shot from exiting the building outside of a reduced Danger Zone. It is accepted that competitors using the Limited Use Range will be sufficiently skilled in correct procedures to enable the full Danger Zone criteria not being applied. Carefully positioned bullet stops need to be installed. Wool or Rag bales can fulfil the requirements of a reduced "Danger Zone".

It is recommended the height for the "Danger Zone" in a Limited Use Range may be reduced to 1.5 m above the top LOS. The horizontal Danger Zone is as applicable to Table 1.

Timber block Bullet Catchers that measure at least 100 mm outside the target area and at least 300 mm in depth can be used in Limited Use Ranges. The number of shots fired during one day events will be insufficient to compromise the timber.

Propellant Catch Areas for Limited Use Ranges

It is recommended that the area in front of the firing point be covered with wide brown paper. This should extend to at least 6m from the rifle muzzle. The overlaps should be taped. At the conclusion of the match the paper should be carefully rolled up and disposed of. This will ensure minimal vacuuming needs to be done and ensures the opportunity for lead dust and powder residue exiting the rifle to be adequately collected.

Outdoor Ranges

The application of the Cone of Fire (COF) criteria as outlined in JSP403 has significantly altered the acceptable range safety specifications for smallbore rifle on 50 m ranges.

Statistics applied to practical testing have been carried out to determine the raw COF for 50 m smallbore rifle shooting. This includes positional shooting and the following COF has been calculated and will apply until any future tests show otherwise.

Smallbore Rifle COF Diameter

5 standard deviations = 120 mm

Statistically this implies that approximately 1 in 1million shots is expected to hit outside a radius of 60mm centred on the middle of the target for a shot aimed at the target.

Of course, it is known that shots occur outside this circle on more frequent occasions. Therefore, there is a requirement to estimate where these shots are likely to appear. This can include the following:

- Shots that are deliberately aimed at the wrong target, these usually occur within 2 targets of the intended target;
- Accidentally discharged shots occurring when the bolt is closed and a shot goes off;
- A shot inadvertently let off in the process of aligning the rifle on the target.

Extended COF for Smallbore Rifle Target Shooting

Raw COF	=	0.06m
Azimuth COF (2 targets)	=	2.5m
Estimate of “loose shots”	=	0.5m

Therefore, the total COF is = 0.5m vertically (elevation)
2.5m sideways (azimuth)

The sideways COF is defined as a shot being fired from 2 firing points from the end and hitting the end targets. This will define the width of the Bullet Catcher required.

A similar procedure to the Indoor Range is used to ascertain whether a range meets the “No Danger Area” criteria for Outdoor Ranges.

A set of Safety Angles, Backstop and Bullet Catcher Wall widths and heights are set out in Table 2. The only difference is that the measurements are scaled up to the required ranges, which in Smallbore Rifle shooting is usually 50m.

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The criteria for a “No Danger Area” range include a “**severely restricted arc of fire**” and by insisting that the firearm is locked, or unlocked, only when the butt is on the shoulder, the design of this type of range fulfils the criteria adequately.

- ▶ A Range to qualify as a No Danger Area Range shall be constructed or modified such that it is able to meet or exceed the criteria.

Table 2 – No Danger Area Outdoor Range Defence Zones

Backstop	Description	50m	100m
Vertical (C in Appendix 2)	Backstop crest over LOS	3.5 m over LOS	4.5 m over LOS
Horizontal (XY in Appendix 2)	Backstop flank width	1 m per flank	1.5 m per flank
Bullet Catcher			
Vertical	Bullet Catcher height over highest LOS	0.5 m over LOS	1.0 m over LOS
Horizontal	Bullet Catcher width beyond flank LOS	0.5 m per flank	0.75 m per Flank
Crest of Backstop	Thickness at top of Backstop	0.4 m	0.4 m

<https://www.gov.uk/government/publications/jsp-403-volume-2> Page 50,51

Note:

1. The LOS (Line of Sight) is defined as the line from the rifle barrel (measured 300mm immediately above the firing line) to the target.
2. These design heights and widths are at the **target line**. Backstops and Bullet Catchers can be at differing distances behind the target. To cater for this the height and width of the Backstop and Bullet Catcher shall increase at a rate of 20mm per metre behind the target. i.e. If a Bullet Catcher is 3m behind the target line, the dimensions of the Bullet Catcher will increase by 60mm in height and 120mm in width.
3. The top of the Bullet Catcher and Backstop may be further back than the bottom of the Bullet Catcher and Backstop. This must be taken into account. i.e. The top of the Backstop crest will be wider by the proportioned amount.
4. Given that the target is in the same position for all 3 positions in 3P shooting, The prone position is the ‘worst case’ for calculating the Backstop height. When kneeling and standing the LOS is depressed relative to the prone position.

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5. The same rules for multiple targets as indoor apply for outdoor ranges. i.e. the top row counters and the furthestmost counters are taken into account for calculating LOS.
 6. The Range Danger Area for this “No Danger Area” range is a 50m circle at each end of the Backstop where the LOS of both vertical and horizontal converge on the Backstop. This covers the possibility of “pop overs” occurring from the Backstop or Bullet Catcher.
 7. A recommendation for No Danger Area Ranges is a range operational procedure that smallbore shooters be instructed and shoot on an Indoor range before shooting on the range. This ensures the shooter can demonstrate the ability to shoot within the COF applicable to the range.
- ▶ A Range to qualify as a No Danger Area Range shall be constructed or modified such that it is able to meet or exceed the criteria.

Figure 7 Outdoor Range “No Danger Area” Range - Side View

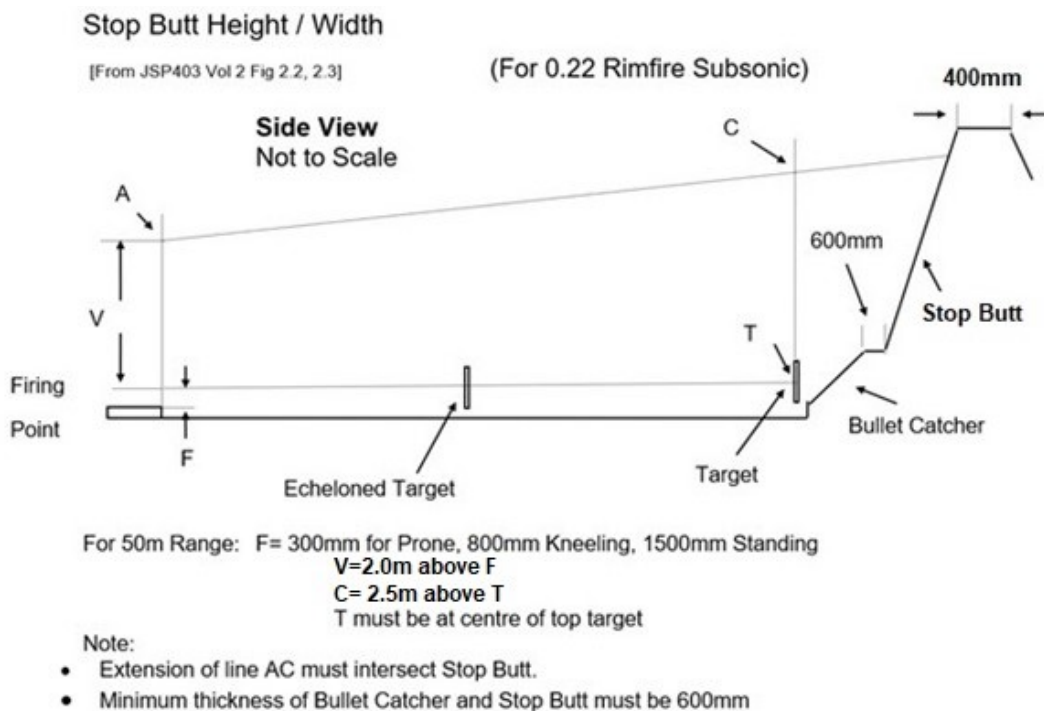
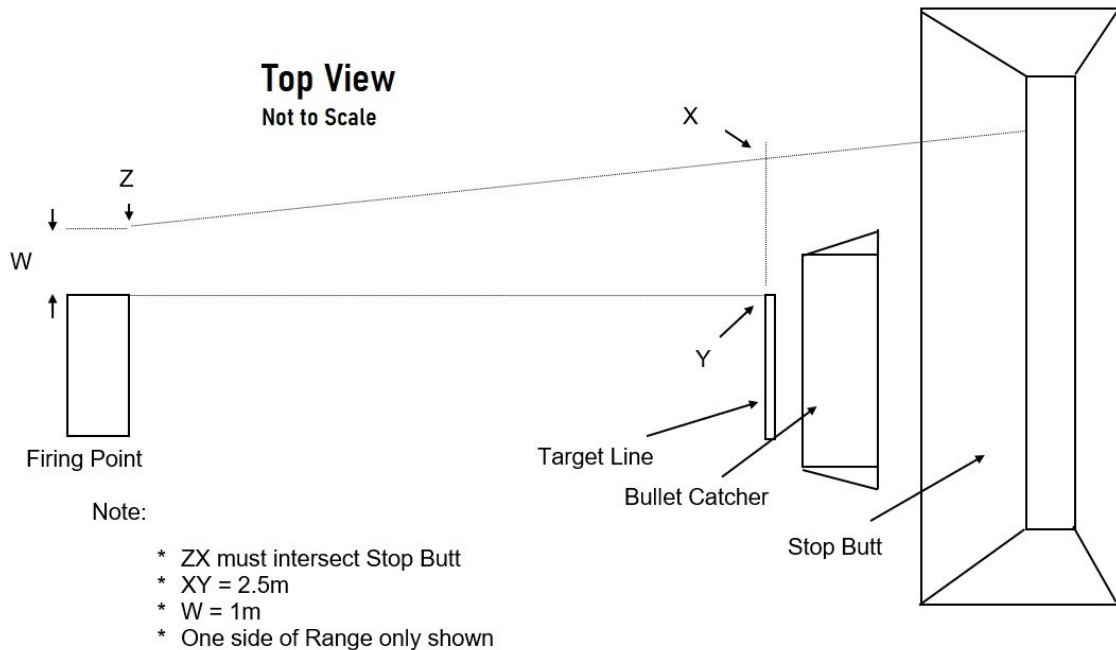


Figure 7 Outdoor Range “No Danger Area” Range - Top View



Ricochet

It is useful to discuss ricochet and when it is likely to occur. The Backstop criteria imply that the surface of the Bullet Catcher and Backstop is a “penetrable” target. A bullet will rarely ricochet when the impact angle is greater than 30° from the surface of a penetrable surface. It is obvious then that since the Backstop angle must be greater than 56° from the horizontal, a direct hit will strike at an angle greater than 30° from the horizontal over the whole of the Backstop. That is, it will rarely induce a ricochet. A direct shot in practically all cases is absorbed by a compliant Backstop. A further case for a compliant Backstop is to ensure that ricochet occurring from the ground between the shooter and target will have a good chance of being caught by the Backstop.

Backstop

The adequacy of a Backstop has been fraught with one big problem. The problem has always been the interpretation of the requirements. The two types, natural and artificial are subject to stringent criteria. To understand the reasons for adequate Backstops it is necessary to understand the ricochet danger.

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Natural Backstop

Usually consist of natural hills, quarries, sandpits, old mines etc. But rarely is a natural hill adequate for the purpose.

The natural Backstop must conform to the following:

1. Must be the highest available bank face
2. A downrange area, beyond the bank face, comparatively free from habitation, roads, and pathways.
3. A forward area (this means between shooter and target) and bank as free as possible from hard, ricochet inducing surfaces consistent with 1 and 2 above
4. A bank slope not less than (56°) or a slope of 3 in 2 (3 units up for 2 units along) from the horizontal (over the total mean height).

No. 4 is the hardest to acquire and harder to accept as necessary. It is steep! It comes down to the function of the Backstop, which is to stop a direct shot and a ricochet from any part of the ground between shooter and target.

Note the exception if the Bullet Catcher extends to the full Backstop height below.

Artificial Backstop

Usually consists of earthworks specifically designed to conform to the Backstop criteria. Points to note here are the height and width of the Backstop and the crest thickness of the top of the butt.

- ▶ For rimfire ammunition this minimum thickness of the crest is 400mm.
- ▶ The minimum slope of a Backstop is 3 in 2. That is, for every 2 units horizontally the height increases by 3 units. This is equal to 56° . This angle is measured from the base of the slope to the top of the crest. See Appendix 2
- ▶ The Backstop shall consist of material that is penetrable. (i.e. Clay or material such that a bullet impacting the bank will be retained).

Bullet Catchers

A form of Bullet Catcher must be provided over the full width and height as defined in Table 2. It may consist of timber, dense rubber screens, sand or fine soil, free from hard lumps and stones. Alternatively proprietary steel bullet traps with baffles may be used provided all risk of splash back to shooters, arising from such devices, is eliminated.

In naturally occurring Backstop / walls, the bank itself may consist of sand or other light grained material, which is itself suitable as a Bullet Catcher. The angle from the horizontal of this sand bank type of Bullet Catcher shall be kept greater than 34° (A slope of 2 units up and 3 units along). However, due to de-leading, constant firing and weathering, the lower portions will eventually collapse and seek a natural angle of repose of less than 30° to the horizontal, thereby rendering the bank unsuitable.

- ▶ Regular maintenance is to be carried out to ensure the correct slope is maintained.

Ricochet will rarely occur with bullets hitting **soft sand** at angles greater than 30° from the horizontal. Note here the mention of **soft sand**. The criteria for the rest of the Backstop being a penetrable target implies that it may be clay or similar penetrable material.

The slope of the Bullet Catcher must be kept at an angle of greater than 34° or a slope of 2 in 3 at all times. (i.e. 2 units up for 3 units along the ground). This ensures that the bullet will have less tendency to ricochet from the catcher.

It is advisable to build up a Bullet Catcher separate from the Backstop. This will keep the Backstop wall in one piece and will allow easier maintenance of the Bullet Catcher, for instance de-leading the catcher. Building up the front edge of the catcher will enable the thickness of the sand trap to be retained easier. The thickness of the Bullet Catcher must not be less than 600mm, measured horizontally, at any place within the Bullet Catcher measurement criteria.

- Other Bullet Catchers consisting of timber walling of sufficient thickness to absorb all shot and eliminating backsplash, or thinner timber that allows the shot to pass through into a protected clear space behind can be utilised. Both of these require regular turning and moving of the timbers to ensure that they are not “shot out” and lose their effectiveness.
- It is recommended to install stakes indicating the required angles along the Backstop and Bullet Catcher to indicate slope disintegration. This enables easier maintaining of the slopes as well.

Note: If a Bullet Catcher extends to the full height of the required Backstop, the steep Backstop is not required.

The Firing Point to Target Area

The area of ground between the firing point and the target should be clear of all ricochet inducing material. This includes rocks and stones to less than 35mm in any direction. Sticks and hard clods of clay should also be removed. It should be of a “soft” target nature that will cause a minimum of ricochet of any shot accidentally fired into it. Top soil covered in mown grass is the ideal. But any soft shot absorbing material will suffice. Literature suggests that any ricochet from a shot hitting the ground (of soft soil) between shooter and target will tend to be deflected into the area of the Backstop.

For smallbore rifle shooting the range floor will be outside of the COF. It is advised that the ground should still be cleared of material likely to induce ricochet.

Application of Ammunition Danger Area (ADA) Templates

An ADA template is used when the criteria for a 'No Danger Area' range is unable to be fulfilled on an outdoor range. It outlines the area that a bullet may be expected to pose a danger if shooting is carried out within the confines of a range and directed towards defined targets. In TSNZ's case this usually means a 50m range firing towards targets where Bullet Catchers may or may not be used.

The COF for smallbore will almost certainly mean that the bullet impact area **behind** the target is the important area to concentrate on.

- ▶ All new ranges must fulfil the requirements of a 'No Danger Area' Range.
- ▶ All existing ranges that do not comply with the 'No Danger Area' criteria shall have the ADA template applied.

Figure 8 indicates the shape and dimensions of an ADA.

Point FP is the firing point. The distance that the ADA extends will be 1200 m from the Firing Point. The width of the ADA is related to the type of area that is between the shooter and the targets. 150 m is applicable with soft or ground targets. 300 m is applicable for hard or rocky targets. That is, if there is soil and grass up to the targets then it is soft, If there is a considerable number of rocks or hard areas up to the targets then it is hard.

The ADA is transferred to a clear plastic overlay and manufactured to the same scale as the map that it is to be laid over. Small holes drilled accurately at the corner points make transferring the ADA to the map easier. A sharp compass needle works well.

It is necessary to take into account the width of the firing point. This means that the extreme firing points are used to find the total area that the ADA will apply to.

How to apply the ADA template

1. Obtain a georeferenced map or Aerial Photograph of suitable scale. At least 1:50,000. Larger scales of 1:20,000 or 1:10,000 would be better for 50m ranges. LINZ sourced maps comply with this requirement as do most Local Council aerial photo coverage.
2. Identify the position of the range, firing line, target direction and target line. This should be done with a compass to get the proper directional alignment. Taking into account the Magnetic Declination, convert the directions from Magnetic to True.

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3. Measure the length of the firing line with an accurate tape measure.
4. Identify one end of the firing line and transfer the length and direction of the firing line to the map.
5. Construct lines from the ends of the firing line towards the targets. This is assumed to be at right angle to the firing line.
6. Place point FP over one end of the firing line, align the centre line of the ADA over the target direction line and carefully mark all corners of the ADA onto the map.
7. Repeat this with the other end of the firing line.
8. There will now be two ADA's overlaid onto the map. The complete area that both ADA's cover is the area that needs to be taken into account when defining the safety zone.
9. Identify any features where people, animals and building may be within the safety zone.
10. If there are any features that relate to this within the Safety Zone then measures must be taken to eliminate and / or minimise the problem.

- ▶ TSNZ requires that any range where an ADA template is applied must have a Range Danger Area that can be ensured to be free of persons occupying houses, roads, walkways, that are legitimately accessible to the general public if shooting is active. Permission must be obtained from the land owner/manager to enable application of the ADA. There is a responsibility of the range operator to inform the land owner/manager of the seasons shooting programme. It is imperative that communication between the Range Users and the Land Users be initiated detailing when shooting is to take place.

Using Google Earth

Google Earth, and Local Council map resources have the ability to display contours and distances. Much of the map coverage available from Local Councils include contour information at 1m intervals, far superior to Topo Maps and Google Maps.

Coordinates of the range can be read off the page.

Figure 8 Full Field Firing Template

Rimfire subsonic 0.22 calibre

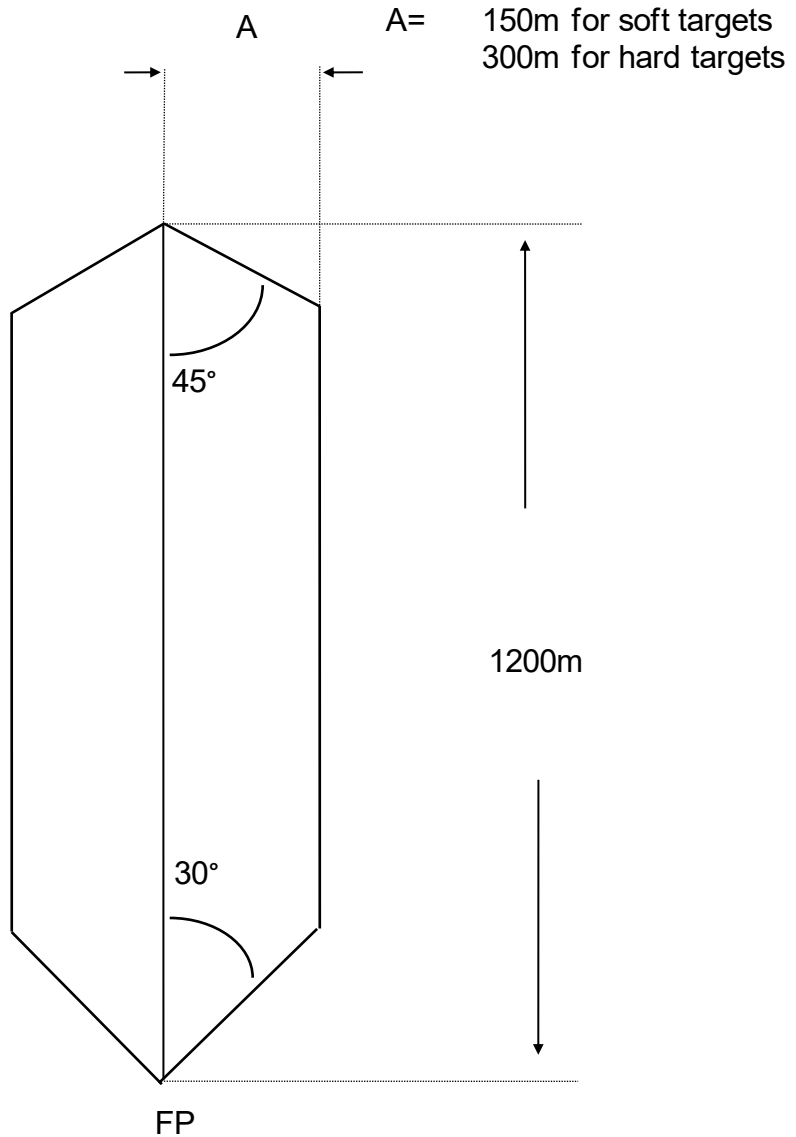
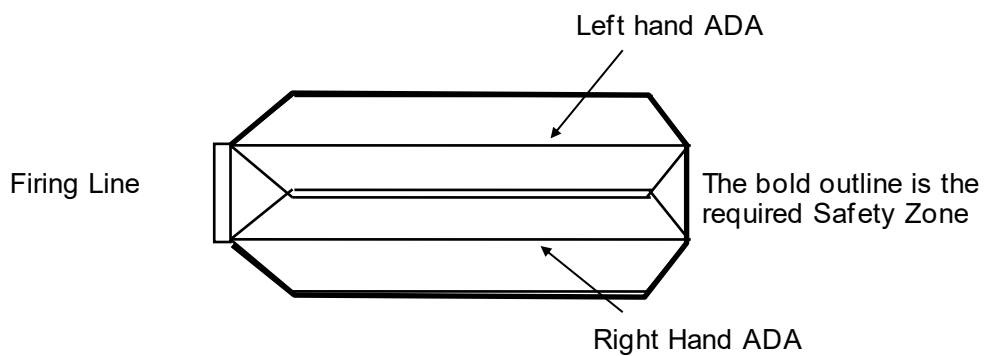


Figure 9 Applying ADA to Range



Range Accessories and Equipment

Any accessory and equipment that is used on the range must be of a material or protected material so that ricochet is prevented.

These must be constructed of material that will allow bullets to pass through relatively unimpeded and remain within the immediate range area. Or to catch a bullet and prevent ricochet.

Targets / Frames

Targets, their frames and target numbers should be made from wood or wood product or some other material that is easily penetrable by rimfire bullets. The centre of the target should ideally be 750mm above the mean ground level provided the datum point, 750mm below the target, is on the same horizontal plane as the firing point. ISSF specifications suggest that an allowance of $\pm 500\text{mm}$ is allowed for the centre of the target from this 750mm height. That is, the target may be from 250mm to 1250mm above the horizontal plane from the firing point. (Maidstone Target Changers, used extensively throughout New Zealand, have been shown to catch direct shot or reduce their energy to a safe level).

Flags

Flag sticks should be made from light wooden doweling or other material that will not promote ricochet. The flags should be at about the line of sight height, without impeding sighting. The method of holding the flag to the stick needs to be of a light chain or thin gauge wire to ensure a small target is presented to a bullet. ISSF specifications are the flag should be made of cotton or polyester material of a weight of 150 g/m^2 and be at least 400mm long and 50mm wide. There are no specifications as to how to hang it from the flag stick.

Targets at Intermediate Distances

It may be necessary to position targets carefully when the minimum Backstop is being employed. The Backstop must be designed for the greatest range used. This is especially true if a 100m range is used. When targets are positioned at intermediate distances e.g. 50m, they must be aligned so that they are echeloned, or on the same LOS as the 100m targets. In other words a shooter in the firing position will see targets in the same relative position when the targets are positioned at the intermediate and far positions. This ensures that the maximum use is being made of the Backstop and that the range still conforms to a "No Danger Area" Range.

Check the bullet flight line for standing shooting when the targets are positioned at intermediate distances. The bullet needs to impact a Bullet Catcher. The range floor by itself is NOT a Bullet Catcher!.

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It has been found by experiment that a filled sandbag positioned at the impact point for standing and kneeling is perfectly adequate as a Bullet Catcher. This can be ascertained by visually aligning through the target changer where the bag fills the middle of the target area.

Regular Checking of Ranges

- ▶ A range must be regularly checked against the “No Danger Area” range criteria. Any aspect that does not conform to the criteria shall be rectified immediately before shooting can recommence.

A list of critical aspects of the Range should be made and inserted in the Range Standing Orders. A check against this list should be undertaken at the end of the season and about midway through the season. This will ensure maintenance is done prior to the next season and the midway check ensures the range is maintaining its integrity.

Air Rifle Ranges

Air Rifle Ranges are a case where the usual protection required for rimfire ammunition is not as stringent. Pellets have a relatively low energy and the range surrounds require significantly less protection.

Pellets propelled from an Air Rifle nevertheless can still be dangerous if a person is hit. The loss of an eye is extremely serious.

The same rules apply to Air Rifle shooting as rimfire shooting as regards the general operation of a range. Where Air Rifle Shooting differs is that sufficient protection is provided by general building materials and thus little special safety factors need to be built into any normal hall or room.

The major piece of protection required is a good pellet catcher. These usually come fitted to commercial target changing apparatus. Target changing equipment that is otherwise manufactured must have a pellet catcher. This needs to be 4mm steel set at an angle of at least 45° to the horizontal and 250mm square centred on the target position. A tray that catches and contains the pellet is advantageous.

The wall immediately behind the wall should be capable of stopping random pellet hits. It should be faced with soft material such as pinex, as hard vertical surfaces such as dressed timber and customwood are prone to “bounce” flat nosed target pellets straight back towards the firing line.

Lead dust is generated by Air Rifles, although to a lesser degree than Smallbore Rifles, and care still needs to be exercised when cleaning the range.

Range Hazards

See also TSNZ Health and Safety Manual on TSNZ Website

The projectile emerging from a rifle is the prime hazard. Unburnt propellant from rifles is another, Lead requires safety in its monitoring and working with. Lead in damaged bullets collected in Bullet Catchers and lead dust on surfaces in the range and in the air are hazards that need special care.

Hearing Protection

Hearing must be protected as the noise level from 0.22 Rimfire is sufficient to damage hearing. All persons on or immediately behind the Firing Point must wear hearing protection. Ear Plugs or Ear Defenders are recommended.

Projectiles

It is clear that operational procedures outlining the use of a range ensures the safety of those using firearms, spectators and range workers. No one should be unprotected in front of the firing point under any circumstances while shooting is in progress.

Unburnt Propellant

Unburnt propellant is released into the range when a firearm is discharged. Long rifles will emit about 2% unburnt propellant. Pistols can emit around 7% due to their breech seals not being as efficient as rifles. Most unburnt propellant falls in the area in front of the firing point and distributed downrange. Limited Use Ranges and ranges with wooden floors show this distribution quite obviously. If it is allowed to accumulate it can pose a significant hazard. This is enhanced when it is gathered, swept or vacuumed into small volumes. Spent cartridges will also contain unburnt propellant.

Accumulated Dust containing Lead

Dust can contain lead. The blast from rifles may disturb the dust from the range floor or dislodge dust from other surfaces. Dust collected during cleaning may pose an explosive hazard.

Noise

All persons within the firing point are required to wear hearing protection. Earplugs and commercial ear protectors are the methods for reducing noise and damage to the ears.

Access to the downrange area

Most ranges access targets from the firing point end. This entails walking through lead contaminated areas. This can be reduced by specifying an access path which avoids the worst contamination, typically down the two sides of a range is less affected. The minimum of movement down the range should be the norm within these ranges. Moving slowly and methodically ensures minimal disturbance of the lead and dust from the floors. It is clear that footwear will transfer lead dust to the

rest of the range. Measures should be put in place to minimise this transfer. The idea of a footwear transfer station is addressed later.

Lead

Lead and the human body

Lead is dangerous and can cause severe health problems. It can affect your blood, kidneys and nervous system including your brain.

Children are very susceptible to lead. A child is able to absorb upwards of 90% of ingested lead compared to about 10% for an adult. The effect of lead on children can be profound.

- ▶ No child under the age of 13 shall be permitted forward of the firing line or in the target area at any time.

Lead gets into the body by:

- Breathing in dust and fumes especially from rifle action chamber openings
- Eating or smoking with unwashed hands
- Biting dirty fingernails

Avoidance of Lead

Avoidance is the best policy in preventing personal lead contamination. This can be achieved by following some simple and basic procedures.

- Avoid eating and drinking within the confines of the shooting range.
- Avoid raising dust.
- Do not allow dust to collect around areas where people congregate.
- Do not sweep any part of the shooting range without wearing a mask. Avoid dry sweeping the range area.
- Wear overalls when cleaning and keep them separate from normal day to day clothing. It is necessary to wash these regularly. **WASH SEPARATELY. DO NOT INCLUDE THEM IN THE REGULAR WASHING OF DAY TO DAY CLOTHES.**
- Keep hands and fingernails clean. Hands should be washed in warm soapy water. Use a nailbrush. Wash the face before food is eaten or before smoking. Don't forget to wash before supper.
- Vacuum with efficiently HEPA filtered cleaners.

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- Breathing through the nose decreases lead uptake.
- Avoid wiping hands across your face and mouth area.

Note: Clubs should seriously consider installing a hand washing basin in the social area of their ranges. This should have an instant hot/warm water supply. Club members should be actively encouraged to wash their hands before eating or drinking and before leaving for home.

Recommended Range Clean-up Procedure

- ▶ The recommended minimum clothing to be worn includes: overalls, gloves, footwear, breathing mask. The clothes should be carefully removed and washed separately from normal household washing.

Avoid moving rapidly. The clean-up should proceed slowly to avoid excessive dust movement.

Containers for the collection should be set aside. They should be easily handled. Lead is heavy. Many small containers are better than a few large ones.

Bullet Catchers must be emptied slowly, a small shovelful at a time. Again to keep the airborne dust to a minimum.

Once the bigger pieces of lead, i.e. bullet pieces, are contained, it is then necessary to dampen down the area that contains the dust. A mist spray is best as it allows the smaller water droplets to be absorbed with the lead without dislodging it. Let the moisture soak and then wet sweep and / or wipe the accessible areas.

Care should be exercised in checking all places that lead can settle. Horizontal surfaces are the biggest collectors. Trusses, beams, wall top plates, floors are examples. To assist future cleaning it may be useful to line trusses with thin painted plywood so that the horizontal surfaces are no longer accessible to dust, thus leaving only vertical surfaces. Unpainted walls attract dust into the cracks. It is recommended that walls, especially timber, be painted.

Ventilation of Indoor Ranges

The firing of lead bullets as used in Rimfire Rifles and Air Rifles contributes to airborne lead dust. To assist in preventing shooters from inhaling the gases produced by the firing process it is recommended there is adequate ventilation on the range.

It is necessary to ensure that an airflow towards the targets is present at all times. Ventilation exits at the target end of a range are necessary.

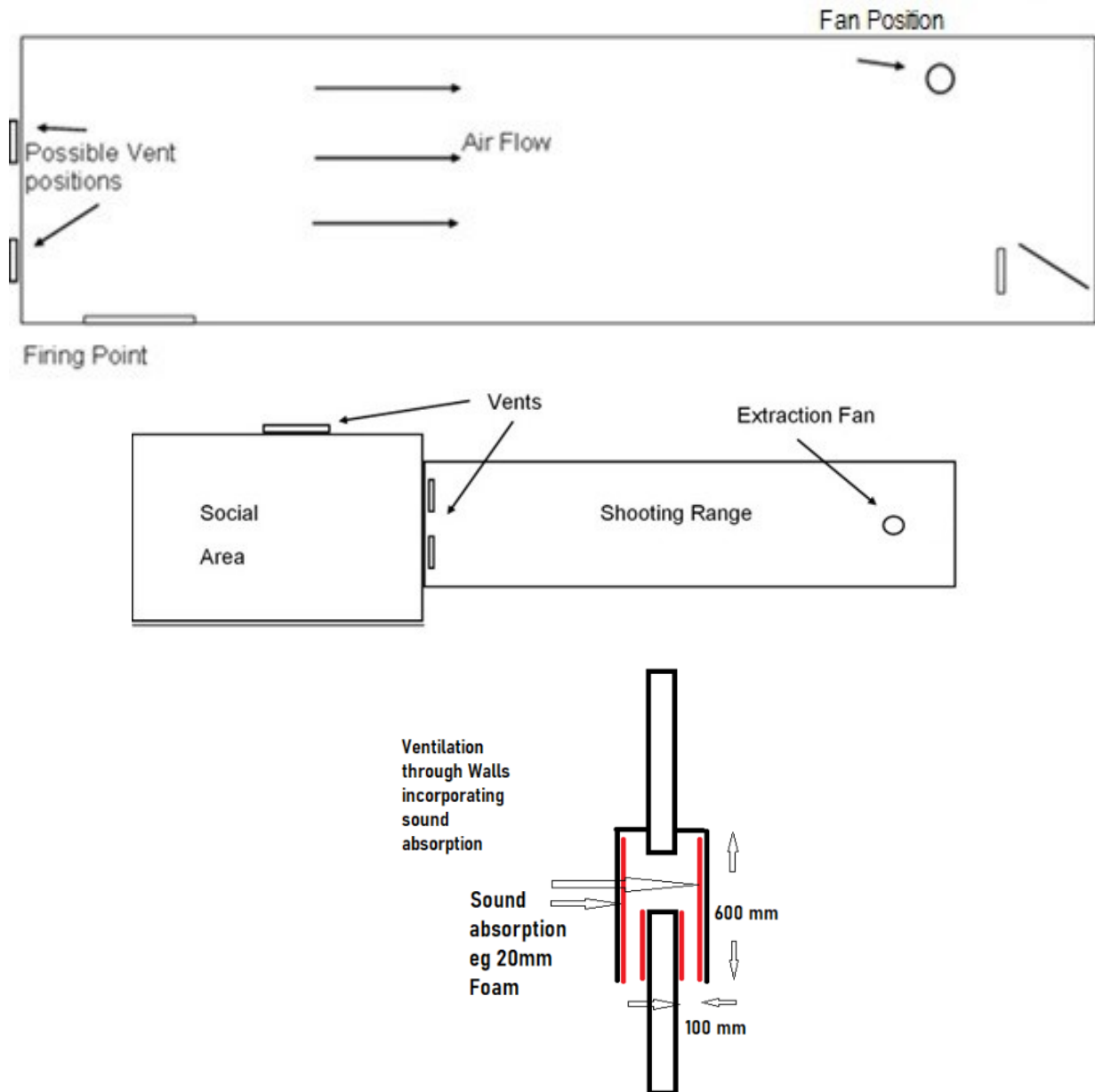
The provision of adequate ventilation is dependent on a number of factors:

- The body of the range should be designed and maintained to be as airtight as possible.
- Any air leakage into the range between the shooter and the extraction point, for instance along the top plate, ceiling, and walls, reduces the effectiveness of ventilation by reducing the air flow past the shooter.
- There should be sufficient air inlets behind the firing point to ensure a good flow of clean air past the shooter, and downrange to the air extraction point.

If procedures are in place that prevent people from travelling over lead dusted areas when shooting or target changing, then large air flow velocities may not be necessary. What this means is that care must be taken when moving around the range while shooting is in progress. It is suspected that the high velocity air movements in some International Range Ventilation Standards is in some part an attempt to eliminate the dust from settling within the range. Given New Zealand's shooting preference for Indoor Shooting to be a winter activity, this would probably entail large air conditioning systems to ensure that shooters shot in some degree of 'pleasant' and warm surroundings.

- Because of the cost involved of any such system, TSNZ recommends that the careful approach with regular cleaning of the range and a ventilation system that ensures air movement towards the targets and careful personal hygiene be the primary procedures in minimising lead contamination of range users.
- It is recommended the provision of a 'Lead Isolating Station' at the point where people enter the area forward of the firing points when changing targets would eliminate to a large degree the transfer of lead into the marking rooms and social areas of the range. Galoshes, gumboots, or any type of easily fitted shoe or overshoe would be appropriate to place at the Station.

Figure 10 Examples of Vents / Extraction Fan siting



- Ensure Gaps throughout shooting range are eliminated. This will ensure that most of the air extracted by the fan is inside the range.
- A number of vents at the shooting end (more than 2) should be installed. This will ensure a more even flow and less turbulence around the shooter.
- Ensure that air is freely available from the area where the air is coming through the vents into the shooting range. If this is the social area, install a vent to the outside in the social area. It is better to take the air from outside into the range area as this will reduce air flow restriction for better efficiency.

The fan(s) should be operating at all times any part of the range is in use.

First Aid

For Health and Safety, it is recommended organisations that partake in **potentially** dangerous activities should ensure that there are persons present **while the activity is in progress** who have possession of current First Aid qualifications.

Minimum Requirements for Range Shooting

The minimum First Aid requirements for acceptable Range Operation are:

- A complete and current First Aid Kit within the range building or the immediate environs.
- A readily accessible list within the range or the immediate environs, of emergency medical services.
- An Action List that explains what to do in the event of a firearm accident that has caused injury.

TSNZ recommends its members attend an accredited First Aid course.

First Aid Kit

Any commercially available First Aid Kit from any Health and Safety Shop is adequate.

The First Aid Kit is to be kept in a handy place in full view of range users, either in the range or in the social area.

The SRO and Clubs who administer or use the range shall designate a First Aid Officer who shall ensure the First Aid Kit is kept complete and current. This person's name shall be written legibly on the First Aid Kit.

Each Club that uses the facility for shooting purposes will be made familiar, by the administering organisation's First Aid Officer, of the First Aid Kit's whereabouts and the correct procedure for notification of use.

Range Certification

From 24 June 2023, all Shooting Ranges must be certified by The Commissioner of Police.

The link on page 6 contains the background information for Clubs and Shooting Range Operators for Range Certification.

The link includes the necessary forms the Shooting Range Operator (SRO) to fill prior to Range Inspections and Certification.

Range Standing Orders

- ▶ Every range in which TSNZ affiliated Clubs shoot shall have the Range Standing Orders available at all times the range is operational.

The Range Standing Orders are the handbook of the day-to-day operation of the range. It outlines the appropriate uses the range is certified for, the safety procedures, the allowed ammunition and firearms.

It is a Risk Assessment based on the operations within the range environs.

From 24 June 2023 all shooting ranges certified by NZ Police must include a set of Range Standing Orders. The Police Clubs and Ranges website includes a template for Range Standing Orders (RSOs). A Guide to the Police RSOs is available on the TSNZ website.

Extra Comment regarding RSOs

In an effort to expand a little on the template the following may be useful:

It is good practise to include details such as titles, leases, rent agreements, plumbing and electrical certificates, plans of the range including plumbing and drainage and electrical wiring diagrams and fire escape plans. By including this type of information in the RSO, continuity will be maintained and important information will be easily accessible to future Club Members.

These details can be included as an appendix to show they are peculiar to your range rather than for shooters to understand.

Where is the range?

Identify the range. Show, with the aid of maps and survey descriptions, the actual position of the range, its orientation, town and street.

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Whose range?

Describe who owns, rents, leases the range.

Which organisation is responsible for the operation of the range.

Contacts, which must be kept up to date - this may include the current range committee.

It should outline procedures for other organisations using it - especially if the facility is used for purposes other than shooting. Another section of the manual could be kept aside for this in which it could be described what parts of the range are accessible to people - especially children as it is necessary to consider the effect of children having access to possibly lead contaminated atmosphere and soils inside the range area.

What sort of firearms / ammunition are allowed?

Rifle, pistol, air rifle, combination? What ammunition and firearms are permitted to be used on the range.

First Aid / Fire Plan / Approved Evacuation Plan

Describe where the exits are.

There will be a need to outline the requirement to keep fire exit doors clear. Exit signs next to all exits.

Where are the Alarm switches, Smoke Detectors, what type are they, who services them and when do they need to be checked?

First Aid kit, where is it, who looks after it, checks and replaces out of date or used items?

Firearm Storage

Firearms and ammunition security is regulated by NZ Police. The range inspection report will note security provisions, but these must be approved by Police.

Shooting Procedures

Outline the conduct of shooting at this range.

Who is allowed to shoot?

Where are firearms allowed to be handled, cleaned, disassembled?

Who may issue ammunition to visitors? This procedure may differ from Club to Club but in all cases the issuing of ammunition to people without Firearms Licences must be strictly controlled. It is imperative that good auditing of ammunition usage is carried out and policed.

The Duty Range Officer's function needs to be outlined.

Describe who has control of the shooters on the firing point.

What procedures must be adhered to when preparing to shoot, e.g.: changing targets, loading firearms, red light operation, verbal instructions expected during shooting.

Maintenance Procedures

What needs cleaning; Floors, rubbish bins, ammo case rubbish, used targets.

Range cleaning procedures. The pertinent measures as outlined in the section on **Lead** of this Manual may be included here with specific reference to the techniques to be used on the particular range. This may include emptying Bullet Catchers, clean-up and disposal of brass and lead, clothing and protective equipment to be worn, recycling of old targets.

Where is the vacuum cleaner, brooms and cleaning chemicals kept?

Who is responsible?

Overriding Range Construction

Range builders and or renovators are actively encouraged to design innovations into any range they are involved with.

The only criteria TSNZ and Police will insist upon are that:

- The design works and
- It fulfils the opening paragraph of Range Construction on page 10.

References

JSP403

Copies available from internet

Merck Manual

A comprehensive Manual on Chemical Injuries, Poisonings, Treatments
Available on the Internet www.merck.com

TSNZ Shooting Rules

NZ Police Range Manual

NZ Police Arms Code