



NATIONAL RIFLE ASSOCIATION



NATIONAL RIFLE ASSOCIATION CODE OF PRACTICE

DE-LEADING OUTDOOR TARGET SHOOTING RANGES

NRANC-001



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Document Information

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Amendment History

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1.0	17 June 2025	N. C.	Initial draft
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1. Background

The National Rifle Association (NRA) is the governing body for full bore rifle and pistol shooting sports in the United Kingdom. The Association was founded in 1860 to promote and encourage Marksmanship throughout the King's Dominions, in the interests of Defence and the Permanence of the Volunteer and Auxiliary Forces, Naval, Military and Air. The Association is a Charity incorporated by Royal Charter in 1890. The NRA is recognised by stakeholders including the Ministry of Defence, The Home Office, the College of Policing and others as a National Governing Body.

2. Objective

This guidance is provided by the NRA for NRA Members and NRA Affiliated Clubs only. The objective of this guidance is to support the Range Operating Authority (ROA) defined in NRA Rule 108b of the NRA Handbook; A Range Operating Authority is the person or organisation responsible for ensuring that a range is constructed and maintained to recognised safety and legal standards and for providing a physical and regulatory environment within which a Range Officer (RO) can run that range in safety and within the law.

The de-leading process is the periodic removal of bullet debris from the bullet catcher or stop butt of an outdoor range. It is a well-established process designed to prevent the build-up of ricochet inducing material.

De-leading is part of the broader programme of range maintenance and repair; the ROA determines the frequency based on a risk assessment and regular inspection that considers the ammunition used on the range, utilisation and other factors.

It is the responsibility of the ROA to ensure that lead, jacketed bullets and debris is managed appropriately through the lifecycle of target shooting, from the first shot to collection and the disposal of the waste materials. This may include recycling of lead debris captured in the bullet catcher or stop butt.

3. Outdoor Range Design, Construction, Bullet Catchers and Stop Butts

The key elements of a Gallery Range are:

- a. Stop butt and mantlet maintained at 34° or greater and at the required height
- b. Targets presented above and clear of the mantlet
- c. Firing points raised by 450mm or more
- d. No hard surfaces on the range floor or within the ballistic envelope
- e. Regular de-leading of the stop butt and mantlet
- f. Controlled Range Danger Area

4. Bullet Catcher, Material Boxes or “shoot in boxes”.

The bullet catcher is designed to stop and contain the majority of direct fire and ricochet, and must withstand continuous attrition.

A sand or granulated rubber bullet catcher may be formed on the face of the stop butt. Sand will help with identifying the fall of shot and either material will simplify de-leading. Steel bullet catchers allow the shot to fragment on impact and fall to the floor of the bullet catcher, enabling visual gauging of materials and easier retrieval.

5. Material Boxes

An area behind the target is excavated to 500 mm deep and filled with coarse sand or granulated rubber. To assist in maintaining the profile, these boxes may be constructed of timber and set into the stop butt. The height and width of the box in the stop butt is to be such that when a 1.22 m² (4ft target) is installed at least 0.3 m of material all around it is visible to the firer from the 100 yard firing point. In mantlets, a margin of material should be visible to the firer around the target from the 100m firing point. Granulated rubber should not be placed over the whole stop butt due to the fire risk. It is easier to control a fire in smaller shooting in boxes. Light rubber sheets or shredded rubber tiles may be used to stop granulate jumping out of the boxes following bullet strike. This also helps prevent grass from grass machinery and other debris getting into the granulate.

6. Use of Sand

Sand is widely used in bullet catchers and stop butts on outdoor ranges. This section specifies the quality of the sand, its profile and the maintenance necessary to capture shot without causing ricochet or backsplash. Wet sand will have the tendency to form tunnelling on ranges where tight grouping is expected, which may result in penetration of the bullet catcher.

7. Quality

It is recommended to use sand conforming to BS EN 12620: 2002 description "0/4 Concrete Sand". Grading should conform to BSI PD 6682-1 Table D1, "0/4 Concrete Sand CP" with angular shape for slope stability and sound physical properties to resist natural breakdown. This grade is fine enough not to cause ricochet yet coarse enough to retain the required profile effectively without likelihood of setting or forming a surface crust; it is also relatively stable in high winds. This specification also provides for a material that will not readily break down naturally, such material should not crush to fine dust when rubbed between the hands. Over time bullets pounding the sand reduce it to fine dust behind the Mean Point of Impact (MPI). At this point the sand will need to be replaced.

8. Construction

The core of the bullet catcher or stop butt may be constructed of any stable inert fill material. However, the surface must be covered by sand as specified for the range. Generally, the depth of sand is related to the type of firearm in use. For high velocity firearms (MV greater than 655 m/s 2145 ft./sec), the minimum depth measured on a line parallel to the Line of fire should be 1000 mm, 900 mm minimum on No Danger Area (NDA) ranges and 750 mm - 500 mm minimum on other ranges. For low velocity firearms (MV less than 655 m/s 2145 ft./sec), the minimum depth should also be 750 mm - 500 mm in the direction of the line of fire.

9. Profile

34° is the minimum recommended slope for the front face of the bullet catcher in order to reduce the risk of ricochet. Rounds impacting into, or the natural settlement of the sand, may reduce the slope, which must never be allowed to fall below 30° as this may cause ricochet to leave the range.

10. Weathering

In time, continuous impact by shot will break the sand down to a fine powder, which will blow away in the wind or bake hard in the sun. Fine sand will also cause the slope to lose its stability. When this occurs, which will be evident by regular inspection, the sand will no longer be of the prescribed grade and should be replaced. The following additives and reinforcements have been found useful in maintaining the shape of the sand:

- **Wood Shavings or Chips.** A mixture of wood shavings or chips in proportions by volume of about 2:1 sand/wood helps retain moisture and stability of the mass in sand under canopies. The wood will itself break down in time and more will need to be mixed in
- **Salt.** Adding 1-2% of salt by dry weight of sand also helps retain moisture in the sand and will reduce the danger of freezing in winter
- **Netting.** Mesh netting or geogrid may be used to reinforce the face angle. The mesh is placed just below the surface of the sand and is held in place with wooden pegs. Light galvanised wire mesh may also be used as it is effective against burrowing rabbits
- **Timber support.** Timber supports in the form of boxes or herringbone within the sand clear of the MPI, can assist the retention of the sand profile.

11. Granulated Rubber as an alternative to sand in Bullet Catchers

Granulated rubber may be an alternative to sand in terms of slope retention and cost. However, the fall of shot is not so obvious in the rubber. Local environmental/habitat restrictions may prohibit the use of granulated rubber.

12. Material Description

The granulated rubber should be used in the same form as sand traps, 340 slope with profile line marked on barrack range side-walls. The rubber elements are shredded from rubber that has no steel or fabric reinforcement. The rubber used must be fire resistant or treated with a fire retardant.

Shape. Shredded rubber with elongated elements removed to produce angular rubber fragments that are of regular shape approximately 10 – 25 mm in any direction producing tight interlock properties. There are sufficient suppliers who are able to meet this specification so the ROA should not accept granulate for bullet traps with any visible contamination or elongated rubber.

Durability. The rubber material will not break down in the short term unless there is an exceptional high rate of fire over extended periods. The granulated rubber traps are de-leaded regularly (see below) and any fine particles removed and replaced by topping up with new material. With effective maintenance, these traps should never need total replacement.

Fire Resistance. The material is fire resistant but there are some circumstances where the rubber may be ignited. The rate of burn is slow and allows plenty of time for range staff to extinguish the flame before it moves to adjacent rubber fragments. A light rubber sheet placed over the granulate will prevent contamination from timber and paper debris thrown out from targets. On ranges where engagement closer than 10m is permitted, a rubber sheet over the granulate is essential to prevent unburnt propellant falling into the granulate and increasing the risk of fire. A fire retardant coating may be applied to the granulate if required. Typical coatings may be sprayed on to coat the granulate, however it should not cause the granules to stick or clump together.

Stability. Due to the interlock properties the 340 slope should withstand many days of use without raking. Only with a high rate of fire will a depression become apparent behind the MPI.

Frost Resistance. The material may be used outside during frost conditions without any change in performance.

Washout Resistance. The material allows water to pass through it without disruption of the slope.

13.Environmental Impact

Rounds are captured either intact or in constituent parts. Lead dust is not generated in the trap to the same degree as in a sand trap. The rubber granulate should not break up into fine dust like sand so there is no particulate thrown into the air during firing or maintenance of the trap. Like sand, there is no impact noise. The granulate may be recycled many times on site to remove spent bullets. The granulate is then placed back into the trap.

14.Maintenance

As the material has good interlock properties, the compliant slope is maintained without slip at the MPI. This will reduce the maintenance effort considerably. As there is little or no lead dust, any maintenance of the trap will not expose range staff to excessive levels of lead in air. The material will not breakdown so readily as sand so replacement or rotation of the trap need not be so frequent. Rabbits do not like tunnelling in this material. Most suppliers are able to provide a de-leading or replacement service using a recycling process on site. To ensure the granulate is not contaminated by wood and paper debris from targets on barrack ranges it is advisable to provide a light rubber sheet covering the granulate. Regular and effective maintenance is essential as rubber dust generated at the MPI mixed with bullet and target debris will increase the risk of fire.

15.Potential Use

This material may be used in outdoor ranges. When used on gallery type ranges it should be used only in shooting in boxes fitted into the stop butt to minimise costs and reduce the area affected should there be a fire. For use near environmentally sensitive or populated areas, the addition of a suitable fire retardant should be considered. Complete bullet catchers on barrack ranges may be converted to this material. No additional works are required except to retain the material at the base of the bullet catcher.

16.Depth of Granulate

The granulate is expected to stop 5.56mm and 7.62mm rounds within 300-400mm. The depth of the granulate in line with the line of fire at the top of the trap for high velocity ammunition is between 900mm and 1000mm. For low velocity firearms, the minimum depth should be 500mm in the direction of the line of fire. For shooting in boxes in stop butts, the depth should be 500mm.

17. Disposal

The supplier may recycle this material. At no time should the granulate as a whole need to be removed for disposal as the regular maintenance will remove and replace broken down granulate.

18. Stop Butt & Bullet Catcher Testing & Routine Inspection

Regular maintenance of the sand is essential to range safety. There are several factors to be considered and these are described below. Renewal or replacement of sand may be achieved by rotating the existing sand or by replacing it with sand from another section of the bullet catcher. The following measures are particularly important.

19. Profile

Sand in the bullet catcher is to be raked to prevent tunnelling at the MPI behind targets to keep the surface of the sand in a loose state and to restore the profile to the slope of 34°.

20. Monitoring, Probe Checks

The ROA will be aware of the type of ammunition used on the range, which may include small calibre rim fire, centre fire ammunition, solid slug or projectiles used in muzzle loading firearms. The ROA will also be aware of the frequency of use of the range. Regular monitoring of the sand/granulate rubber behind the targets/MPI using a 1m long steel probe rod will identify balling or lead build up. These factors (type of ammunition, frequency of use and probe checks) should be used to develop a risk assessment to determine the frequency of the de-leading process. Ranges that are subject to heavy use will require more frequent maintenance and de-leading than ranges used on an occasional/infrequent basis. It is important that any build-up of lead/projectile debris is removed from the bullet catcher/stop butt before balling occurs which may cause splashback or ricochet.

21. The De-leading Process

Specialist de-leading contractors may use machinery to remove the sand, extract the lead debris for recycling and reinstate the stop butt/bullet catcher. The contractor will determine the process and equipment used depending on access to the range and design of the range.

ROAs may choose to perform the de-leading themselves by hand where site access is problematic or to minimise cost. ROAs should refer to the detailed approved code of practice and guidance available from the HSE, along with the Control of Lead at Work Regulations 2002 (CLAW). This must be considered and incorporated into the risk assessment for de-leading works.

The manual process is labour intensive involving excavation around the MPI to a depth of about 1.2m (4ft). The sand should be hand sieved to remove the debris. Areas away from the MPI should be hand sieved to a depth of approximately 300mm (1ft) to remove any debris including lead bullet debris that may present a ricochet hazard. Once complete the sand should be reinstated to the correct profile using the sieved sand. See Annex A.

22.Granulate Rubber De-leading The material should take up to 35,000 rounds per lane before inspection is required to ensure there is no build-up of lead behind the MPI. Frequent prodding of the area behind the MPI will extend the interval for de-leading. On ranges where black powder firearms or shotguns are fired, more frequent de-leading may be necessary. Contractors involved in de-leading are to ensure all bullets, bullet debris, fine rubber dust and target debris is removed from the granulate.

23.Cleaning & De-leading Process Considerations. Sand bullet catchers should be checked at least weekly to ensure surface bullet debris is removed and de-leaded on the basis of the risk assessment to ensure there is no build-up of lead which can generate a backsplash hazard. Rotation of the sand within the bullet catcher may prolong the life of the sand. The sand should be replaced when the maintenance of the 34° face becomes difficult.

The hazard of lead contamination when working on sand bullet traps must be considered in the risk assessment with appropriate measures e.g. gloves and face masks. The ROA is responsible for:

1. Observing the guidance in the Control of Lead at Work Regulations (CLAW 2002) available from HSE.GOV.UK
2. The safety of working practices

24.Disposal

Sand, soil and debris, which might contain or be contaminated by lead, should be disposed of as contaminated waste in accordance with the Local Authority/ Environment Agency (EA) Regulations or by a licenced waste carrier.

25.Documentation and Evidence

The ROA should retain evidence of de-leading activity. Where a contractor is used to perform the work, an invoice and if applicable waste transfer certificate should be retained as an auditable trail. ROAs may rely on volunteers to perform maintenance activity including periodic de-leading. It is the responsibility of the ROA to retain evidence of the works; this may include the risk assessment to show compliance with CLAW (2002) and receipts for lead sold for recycling/scrap. Sand or other materials removed from the range may contain lead and should be disposed of in accordance with local EA Regulations.

Annex A

Images to demonstrate the manual de-leading process for a sand stop butt



Example of tunnelling in sand stop butt prior to de-leading.



Example of tunnelling in a sand stop butt prior to de-leading.



The Butt stop sand is sieved, checked and all ricochet hazards removed



Range with Butt stop sand replaced and ready for use.



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