

**BRIEF FOR RCOs (HME)**  
**THE NEW HIGH MUZZLE ENERGY (HME) PROCEDURE**

**EFFECTIVE ON RECEIPT**

**Summary**

The HME procedure has been substantially revised. The new procedure was approved by MoD with the publication of JSP Vol 1 Part 2 Chapter 2 Annex A Version 1.0 (copy at Annex A to this document). The procedure at Annex N to the NRA Range Conducting Officers' Course Instruction Manual Edition Five is no longer valid, and is replaced by the procedure and explanation below.

It is suggested that readers first read the procedure itself, then return to the explanatory text below for a fuller understanding of the new procedure and the principles underlying HME zeroing.

**Introduction**

**The Problem**

MoD ranges are designed against a set of assumptions regarding the characteristics of the firearm / ammunition combination to be used on them. For most MoD Gallery Ranges (GR) that set includes an assumption that the maximum Muzzle Velocity (MV) will be below 1000 m/s and the maximum Muzzle Energy (ME) below 4500J. The risk is that a firearm / ammunition combination developing greater values, if used in a way that causes the bullet to miss the stop butt, could send a projectile beyond the limits of the Range Danger Area (RDA). The problem arises on MoD GR with Limited Danger Areas (LDA), where the dimensions are such that a bullet in free flight that is not captured by the stop butt may escape the LDA even if fired within allowable parameters, because its MV / ME exceed the range design assumptions.

**Exceptions**

By definition there is no HME issue on a No Danger Area (NDA) range, because the range is constructed so that bullets fired within allowable parameters cannot escape the range itself. However, that presupposes that the range structure is robust enough to withstand the impact of HME fire and to do so without creating a hazard to range users. Therefore, before firing HME on a NDA range, the MV and ME limits of the range must be checked to establish that the HME fire will not exceed the capabilities of the structure based on those limits.

A Field Firing Area (FFA), otherwise known as a Live Fire Tactical Training Area (LFTTA), is essentially a firing range on an area of open ground large enough to contain bullets fired within the allowable parameters of the range. It follows that HME procedures do not apply on a FFA, because there is no means within allowed parameters other than distance to contain the bullet. Therefore, HME fire may take place on a FFA without additional procedures provided that the dimensions of the FFA are such as to accommodate the type of HME fire. Note that, frequently, that will not be the case. For instance, Stickledown Range at Bisley has a Danger Area based on FFA dimensions, but

those dimensions are in turn based on use of firearms with ME and MV less than 4500J and 1000 m/s respectively. Therefore, for HME purposes Stickledown must be treated as a Gallery Range with a Limited Danger Area, ie the requirement that bullets impact the stop butt cannot be disregarded in considering the procedure for allowing HME fire.

### The Solution

Given that the risk is that an HME bullet that misses the stop butt of a GR with a LDA may escape that LDA, the mitigation is a procedure that ensures, to the greatest extent practicable with the minimum resultant effort, that HME bullets do not miss the stop butt. That is achieved by check zeroing the firearm / ammunition combination on a range with a sufficiently large stop butt that the likelihood of the first round missing that stop butt is negligible. Since stop butts are large structures of fixed dimensions, the means to obtain a larger stop butt, in terms of containing angular errors, is to shoot from a shorter distance so that the angular size of the stop butt is sufficient to ensure capture of the bullet.

### What Constitutes a Short Distance?

Since HME procedures do not apply on an NDA range, in principle any NDA range with sufficient ME/MV limits may be used at any distance authorised on that range to carry out a check zero. However, it is generally inconvenient to check zero on one range before moving to another for the intended practice, so the documentation to check zero for HME fire on a NDA range has only been prepared in respect of the Zero Range at Bisley.

Otherwise, a maximum distance such that the allowable cone of fire for the firearm does not exceed the angular dimension of the stop butt is required. HME fire at long range is inevitably deliberate with the firearm supported, and for check zeroing a condition requiring deliberate fire with support can be imposed. The angular limit of the allowable cone for supported deliberate fire (from JSP403 Vol2 Ch2 Table 3) is 21.5 mils. By calculation, such a cone should be contained by the stop butt on a standard GR from a firing point at 200 metres or closer, but not necessarily from a firing point at 300 yards or greater. Therefore, procedures have been developed on the concept that on a GR a procedure based on fire from 200 yards / metres is acceptable.

### Constraints

The main technical constraint arises from the design of many HME firearms. In general, HME firearms are long-range rifles, typically intended for use at 800-1200 yards. In order to make available the range of elevation adjustment on a telescopic sight that is needed to shoot at such distances, sights are frequently mounted on the rifle in such a way that the minimum range for which a correct zero setting is obtainable is of the order of 500 yards. Thus, a procedure suitable for such firearms must enable zeroing with a sight setting appropriate to about 600 yards or greater while actually firing from 200 metres or less.

## Administration

The intent of the HME procedure is to allow HME fire on ranges where such fire exceeds the normal range design parameters ie firing at distances of 300 yards or greater on GR with LDA. Since that constitutes a derogation from the normal authorised limits, a record of the event happening and of the process used to authorise it is required. That in turn leads to a requirement to certify and retain a record of the check zero for any HME event where such fire takes place. It follows that, conversely, if HME fire will take place only at distances where the design parameters are not exceeded, such a record is not required. However, the complexities of the process are such that it is necessary to require that it be conducted under the supervision of persons qualified to do so by virtue of specific training. Hence the requirement for the RCO (HME) course and qualification.

## **The Procedure**

There are two main variants of the procedure, both of which have sub-categories. The first where HME fire will take place only at distances of 200 metres or less, and the second where HME fire will take place at greater distances. Typically the first will be for some form of training or technical development or will involve the use of large-calibre hunting rifles, while the second will be associated with long-range competition or training for that.

### Preliminary.

MoD as an organisation works in metric units. However, Bisley ranges are mainly set out in yards, and some MoD ranges still have Imperial dimensions. In dealing with HME zeroing, the elevation difference between 200 yards and 200 metres is of the order of 30mm at the target, or just over 0.6 minutes of angle. Since, even in the worst case where the intended practice will be conducted at 1200 yards, the target subtends slightly over 6 minutes of angle vertically, the difference in zero occasioned by shooting from 200 yards distance rather 200 metres is not significant. Therefore, in the text below, where no unit of distance is quoted against a figure, it may be interpreted as either yards or metres as needed to suit circumstances.

### HME at 200 metres or less.

Since the allowable cone of fire for deliberate supported fire is contained within the stop butt of a GR at 200 metres or less, all that is required to ensure capture of bullets in the stop butt is that the firer confirms that the firearm is correctly set and then fires a deliberate correctly aimed shot on such a range. Para 1(c) of the HME procedure defines the ranges that may be used. Provided that the impact of that shot is registered, whether by eye, by a strike on the target or by an electronic scoring system, the firer may then continue. The process to achieve that is set out at para 3 of the MoD HME procedure. The relevant sub-paras, with NRA commentary in *italics*, are reproduced below. Note that this procedure does not require use of a special target. The firer may engage the target intended for the subsequent practice from the start, provided that it enables hits to be registered and meets the requirement regarding placing on the target screen. Note also that initial zeroing at any

distance less than 200 metres is, by implication, valid for any subsequent distance up to 200 metres, other than the special case of BSRC below.

Extract from JSP403 Vol 1 part 2 Chapter 2 Annex A para 3, showing those elements relevant to HME zeroing for subsequent fire at 200 metres or less:

- a. The RCO (HME) is to record in the MoD Form 906, Land Range Log, when a firearm / ammunition combination is being used which generates muzzle energy greater than 4500J. *This meets the requirement to document the activity. At Bisley, the equivalent note is made in the range log sign-on sheet in the Range Office.*
- c. The target is to be attached such that the target centre line is set on the target screen centre line both vertically and horizontally. *This ensures the maximum area of the target and stop butt is available in every direction to assist in detecting the impact and in capturing the bullet.*
- d. The shooter is to clarify to the RCO (HME) the rifle type and technique to be used to ensure a hit with the first shot. *It is not possible to be prescriptive about the process used to set up the firearm correctly for the activity; there are too many variables. The qualified RCO(HME) must exercise his judgment that measures described and/or demonstrated by the firer constitute a valid case that the rifle is suitable to the practice and correctly set for it.*
- e. Because of the increased risk of flashback with high energy bullets the butt marker is to wear safety glasses in addition to hearing protection. *Although not explicitly included in the procedure as an option, it is frequently straightforward to observe fall of shot directly from 200 metres or less. It follows that this paragraph refers to the safety of a butt marker should one be needed, and does not mandate that a butt marker is in place if other means of determining fall of shot are available and suitable in the opinion of the RCO(HME).*
- f. The RCO will appoint a person to observe the initial fall of shot until the initial strike on the target screen is identified: *If the RCO(HME) is supervising only the one firer, then it is acceptable for the RCO(HME) to act as the observer. If a butt marker is being used, he may act as the observer. Implied within this paragraph is that once a strike on the target screen is observed, the firer may carry on with the practice as required.*
  - (1) If a strike off the target screen is clearly identified the shooter may adjust and fire again.
  - (2) If no strike is identified the shooter is to cease fire until the weapon has been re-collimated or bore-sighted to the RCO (HME)'s satisfaction.

The one special case of HME at 200 metres or less is the use of the zeroing butt on the British Sporting Rifle Club (BSRC) layout at Bisley. This is mentioned explicitly at para 1(c) of the procedure because the stop butt on that layout does not meet GR dimensions. However, since engagement is only from 100 yards, a 21.5 mil cone of fire represents only 1.96 metres, and the stop butt does meet that dimension. Additionally, the ballistics of big-bore hunting rifles are such that there is no practical possibility of the bullets used departing the available Danger Area beyond the BSRC stop butt. BSRC have published internal rules for use of their zeroing butt, which are highly prescriptive and include boresighting the rifle from a rest. **This briefing document constitutes**

**authority for ROs authorised by BSRC, whether HME qualified or not, to supervise HME zeroing on the BSRC zeroing butt following BSRC rules and using the procedure for 200 metres or less, provided that any subsequent practice is on the BSRC layout at a maximum distance of 100 metres.**

HME Zeroing when fire beyond 200 metres is intended.

The requirement to document the check zero is the main source of complexity in HME zeroing for subsequent use beyond 200 metres. The required elevation difference between 200 and 1000 yards (typical long-range competition distance) is such that it is generally not possible to place an aiming mark at 200 such that, with 1000 yards set on the sights, impact will be on the same target screen as the aiming mark. Therefore, not only is a specially designed target required, but also the exact design of that target varies dependent on the features and capabilities of the firearm and of the range being used. Selection of the correct target, in accordance with para 3(b) of the procedure, is thus a critical duty of the RCO (HME).

There are three types of target available, with variants of each for different calibres:

Targets printed on a single A4 sheet, for use on the Zero Range at Bisley. These are designed so that the firer sets the elevation for 1000 yards on the firearm, and the shots impact in a defined box about 200mm above the aiming mark, thus providing a direct indication of the correct elevation setting. The new procedure does not change the design of existing targets of this type.

Targets assembled from three A4 sheets placed vertically, for use on a 200 yard / 200 metre range. These are designed so that the firer sets the elevation for 600 yards on the firearm, so the shots impact on the top sheet, which carries the grouping box and is marked with areas for certifying the activity. The new procedure does not change the design of existing targets of this type.

A new target, on a single A4 sheet, designed to be used at 200 yards / metres directly, for firearms that have sufficient sight adjustment available to zero at 200 and subsequently adjust to the actual distance required. The firer shoots at the aiming mark and the impact of the check group is recorded within the aiming mark. A template of the new target is attached.

The NRA is working on revised versions of the existing targets to make them easier to use. Any revised targets issued will carry the instructions for their use.

The zeroing process needs to meet three conditions:

- It must be conducted in such a way that bullets impact the stop butt from the first shot.
- It must demonstrate that the rifle zero is correct and that the firer can group within the dimensions required for the subsequent practice.
- It must produce a record of the demonstrated capability so as to create an audit trail.

These conditions are met by following the full process at para 3 of the procedure, which is reproduced below with commentary in *italics*:

- a. The RCO (HME) is to record in the MoD Form 906, Land Range Log, when a firearm / ammunition combination is being used which generates muzzle energy greater than 4500J.

*This meets the requirement to document the activity. At Bisley, the equivalent note is made in the range log sign-on sheet in the Range Office.*

- b. Before shooting at any distance greater than 200 metres, the shooter is to demonstrate that the firearm is correctly zeroed by firing a 3-shot group which must fall within the box of the issued NRA/MoD approved target at 200 metres or, at Bisley only, within the box of the appropriate HME zero card used on the Zero Range. The RCO is to confirm that the zeroing target being used is correct for the firearm / ammunition combination and for the planned subsequent activity. *As discussed above, it is acceptable to use a target calibrated for 200 metres from 200 yards.*
- c. The target is to be attached such that the target centre line is set on the target screen centre line both vertically and horizontally. *This ensures the maximum area of the target and stop butt is available in every direction to assist in detecting the impact and in capturing the bullet.*
- d. The shooter is to clarify to the RCO (HME) the rifle type and technique to be used to ensure a hit with the first shot. *It is not possible to be prescriptive about the process used to set up the firearm correctly for the activity; there are too many variables. The qualified RCO(HME) must exercise his judgment that measures described by the firer constitute a valid case that the rifle is suitable to the practice and correctly set for it.*
- e. Because of the increased risk of flashback with high energy bullets the butt marker is to wear safety glasses in addition to hearing protection. *Although not explicitly included in the procedure as an option, it is frequently straightforward to observe fall of shot directly from 200 metres or less. It follows that this paragraph refers to the safety of a butt marker should one be needed, and does not mandate that a butt marker is in place if other means of determining fall of shot are available and suitable in the opinion of the RCO(HME).*
- f. The RCO will appoint a person to observe the initial fall of shot until the initial strike on the target screen is identified: *If the RCO(HME) is supervising only the one firer, then it is acceptable for the RCO(HME) to act as the observer. If a butt marker is being used, he may act as the observer.*
  - (1) If a strike off the target screen is clearly identified the shooter may adjust and fire again.
  - (2) If no strike is identified the shooter is to cease fire until the weapon has been re-collimated or bore-sighted to the RCO (HME)'s satisfaction. *This circumstance indicates that the firer was incorrect in some aspect of his explanation to the RCO at sub-para d. The RCO should permit the firer to continue only if he is all respects satisfied that it will be safe to do so. If the RCO is not satisfied, he may consider alternatives such as permitting the firer to re-zero closer to the target and to return to 200 once the firer has satisfied the conditions for HME fire at 200 or closer.*
- g. All 3 rounds of the final group must be within the box before the shooter may move to a different distance. *This is the condition to demonstrate both the correct setting of the firearm and the grouping ability of the firer.*

h. The butt marker is to identify clearly and mark those shots which were used as sighting shots and which are not to be included in the qualifying group. *If the new 200 target is in use, it is suggested that such shots are patched out in a contrasting colour.*

i. After qualification the target is to be completed and signed by the shooter and the RCO (HME) and retained by the Club for 12 months.

#### HME Practices at Long Range.

Once the correct zero and grouping capability has been demonstrated, the firer may transfer to the distance for the intended practice, and must adjust the elevation setting to the correct value for the new distance. There remains the possibility of error at this stage. The available range of adjustment is inevitably such that even with the worst possible error, the resulting shot would not escape a LDA if properly aimed and fired. However, assurance that HME fire is being correctly applied is increased by applying the final paragraph of the new procedure, that the first shot of an HME practice should be detected, and if it is not, then at least one of the stated conditions must be met before the firer may continue.

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Annexes:

- A. Annex A to JSP403 Vol 1 Part 2 Chapter 2 version 1.0 dated Feb 15
- B. NRA 200 Yard / Metre HME Zero Target for use with firearms capable of direct setting of elevation for 200.

Annex A to JSP403 Vol 1 Part 2 Chapter 2 version 1.0 dated Feb 15

## **Chapter 2 Annex A**

### **HIGH MUZZLE ENERGY PROCEDURES**

1. The National Rifle Association (NRA) and MoD approved procedures below must be used on MoD ranges when civilians are shooting on constructed ranges with firearm / ammunition combinations where muzzle energy (ME) exceeds 4500 Joules. Note that:
  - a. No firearm with a muzzle energy exceeding 7000J may be used on a constructed MoD range.
  - b. HME procedures do not apply on No Danger Area (NDA) ranges, but the range limitations must be checked to ensure that the developed MV and ME lie within permitted values.
  - c. The zeroing procedures below must be carried out: on an NDA range or a range with a stop butt that is immediately behind the target and that meets Gallery Range criteria; exceptionally, for large calibre historic or hunting rifles being used at distances of 200 metres or less only, into the zeroing butt at 100yd on the British Sporting Rifle Club layout at Bisley.
2. The Chairman of the appropriate Club must give authorisation in writing before a shooter may use a firearm / ammunition combination generating over 4500J muzzle energy. Such authorisation will normally be given through the certification process.
3. The shooter is to check zero using the procedure described below under the supervision of an RCO who holds the NRA RCO (HME) qualification (except when checking zero on the Zero Range at Bisley, which is a NDA Range and on which supervision by an RCO (HME) is not required), as the first activity of any range session. If HME fire will be carried out from distances in excess of 200 metres, then the full procedure below is to be carried out. If HME fire will take place only from 200 metres or less, then only paras a, c, d, e and f apply:
  - a. The RCO (HME) is to record in the MOD Form 906, Land Range Log, when a firearm / ammunition combination is being used which generates muzzle energy greater than 4500J.
  - b. Before shooting at any distance greater than 200 metres, the shooter is to demonstrate that the firearm is correctly zeroed by firing a 3-shot group which must fall within the box of the issued NRA/MoD approved target at 200 metres or, at Bisley only, within the box of the appropriate HME zero card used on the Zero Range. The RCO is to confirm that the zeroing target being used is correct for the firearm / ammunition combination and for the planned subsequent activity.
  - c. The target is to be attached such that the target centre line is set on the target screen centre line both vertically and horizontally.
  - d. The shooter is to clarify to the RCO (HME) the rifle type and technique to be used to ensure a hit with the first shot.
  - e. Because of the increased risk of splashback with high energy bullets the butt marker is to wear safety glasses in addition to hearing protection.
  - f. The RCO will appoint a person to observe the initial fall of shot until the initial strike on the target screen is identified:

- (3) If a strike off the target screen is clearly identified the shooter may adjust and fire again.
- (4) If no strike is identified the shooter is to cease fire until the weapon has been re-collimated or bore-sighted to the RCO (HME)'s satisfaction.

- g. Rounds on target may be adjusted but only the 3 final rounds are to be counted for the group, one of which may include the final adjusting round.
- h. All 3 rounds of the final group must be within the box before the shooter may move to a different distance.
- i. The butt marker is to identify clearly and mark those shots which were used as sighting shots and which are not to be included in the qualifying group.
- j. After qualification the target is to be completed and signed by the shooter and the RCO (HME) and retained by the Club for 12 months.

4. Direction is provided on the NRA / MoD approved target for sight adjustment for different distances subject to achieving a successful group.

5. The zeroing procedure is to be carried out on each day the shooter wishes to shoot unless the zeroing is for an official competition or training course where firing is carried out on consecutive days, when the procedure may be considered valid for the duration of the competition or course.

6. Once zeroed using the procedure in paragraph 3 above, the shooter may shoot under the direction of a qualified NRA RCO who need not have the HME qualification. If, in any practice, the first shot from an HME firearm misses the intended target, the firer may only continue if one of the following applies (derived from a reduced version of the exemptions in NRA rules for such an occurrence in competition – as at 31 Mar 14, NRA rule 277):

- a. The shot was seen to strike the stop butt, or was registered by an electronic scoring system.
- b. The firer identifies and rectifies a fault or error (eg left instead of right wind allowance) that would reasonably account for the miss.
- c. There is reasonable evidence (eg an unexplained shot on the next target) that the firer has crossfired.
- d. There is reasonable evidence (eg based on the advice of other firers) that the wind allowance applied was such as to account for the miss.

**NRA 200 YARD / METRE HME ZEROING TARGET FOR USE WITH FIREARMS CAPABLE OF DIRECT  
SETTING OF ELEVATION FOR 200. FINAL GROUP MUST FALL WITHIN BLACK AIMING MARK.**

Name \_\_\_\_\_ Club \_\_\_\_\_

Rifle Serial No \_\_\_\_\_ Numeric elevation reading \_\_\_\_\_

Ammunition: Cal \_\_\_\_\_ Bullet Wt \_\_\_\_\_ Load \_\_\_\_\_

Date \_\_\_\_\_ Firer Sig \_\_\_\_\_ RCO Sig \_\_\_\_\_

