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MINES AND BOOBY TRAPS
MILITARY TRAINING PAMPHLET
No. 40

**PART II (ALL ARMS)—LAYING AND RECORDING OF
BRITISH MINES**

1944

(This pamphlet in conjunction with Part I supersedes Military Training Pamphlet No. 40, 1942, and cancels the *Policy with regard to British Minefields* issued under WO letter 43/Training/3307 (MT3) dated 9th March 1943, and also that published in ATM 45, para 24.)

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*Prepared under the direction of
The Chief of the Imperial General Staff*

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PREFATORY NOTE

Military Training Pamphlet No. 40, Mines and Booby Traps, will consist of the following parts:—

Part I (All Arms).—How to deal with individual mechanisms, Part I Supplement (All Arms).—Enemy methods of minelaying (illustrated).

Part II (All arms).—Laying and recording of British mines.

Part III (All arms).—The breaching of minefields.

Part IV (All arms).—In course of preparation.

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MILITARY TRAINING PAMPHLET No. 40

MINES AND BOOBY TRAPS

PART II (ALL ARMS).—LAYING AND RECORDING OF BRITISH MINES—1944

SECTION 1.—INTRODUCTORY

1. In view of the fact that all arms are now involved, the policy for laying and recording of mines has been modified so that the laying and recording can be done as easily and simply as possible without extra technical knowledge being necessary.

2. Part I of this pamphlet tells you how to arm individual mines; Part II aims at telling you how to lay the mines on the ground in the best pattern and how to record their position so that our troops can be warned of their presence and later someone, who perhaps was not present when you laid the mines, can come out and pick them up with a minimum of danger to himself and his men. It is your responsibility therefore to see that you provide the essential minimum information, as set out in this pamphlet, to enable him to do so. If circumstances permit, or if you have superior technical knowledge, it is also your responsibility to provide this, or fuller information, in such a manner as to make the task of those lifting the field easier. Engineers laying and recording minefields will always be expected to produce fuller information than this pamphlet demands, with large scale diagrams.

3. It is necessary that there should be uniformity between and within all theatres of war in the policy for naming, laying, marking, and recording our own minefields. This policy is set out in Chapter 1. Commanders-in-Chief will issue instructions appropriate to the theatre of war concerned, based on this policy and amplifying it where necessary. **Passages set in black type indicate radical changes from the previous policy issued in ATM 45.**

4. Chapter 2 gives practical details of laying mines and suggested instructions on the best methods of using the minelaying drills given in Appendices A, B, and C. It also gives practical examples of how to fill in the minefield record *pro forma* mentioned in Chapter 1.

CHAPTER 1

POLICY WITH REGARD TO BRITISH MINEFIELDS

SECTION 2.—NOMENCLATURE

5. The following terms will be used and other terms or variations will not be introduced.

- (a) *Minepanel*—consists of a number of mines laid in a definite pattern in straight rows from one datum line at right angles to the rows.
Our own anti-personnel mines and anti-lifting devices fitted to anti-tank mines will be laid as part of the pattern inside the panel.
- (b) *Minebelt*—consists of a linear series of panels.
- (c) *Minefield*—consists of an area that contains one or more minebelts sited one behind the other, and may also contain several areas of scattered mines. A minefield may thus be of considerable depth.
- (d) *Landmark*—consists of an existing permanent point of known map reference. Should no such point exist within reasonable distance, an artificial landmark will be erected.
- (e) *Datum lines*—these will be marked during laying by tape at right angles to the start of the rows of mines in each panel, but will be permanently defined on the ground by major datum points or datum points at one end of the line and a picket driven flush with the ground at the other end.
- (f) *Major datum point*—consisting of a permanent point at the inner end of the datum line of the reference panel, tied in to the landmark and the datum point of the panel by compass bearing and distance. Major datum points should be inside the boundary fence and within 10 yds of the corner mine.
- (g) *Datum point*—consisting of the point on the datum line from which the inner row of mines starts. It is marked on the ground by a picket driven flush with the ground, and tied in with the previous datum point by compass bearing and distance.
- (h) *Density*—is defined as the number of mines per yard of front. In the standard panel of six rows at 6 yds spacing, the density is one mine per yard of front.
- (i) *Suspect area*.—A suspect area is an area that contains both minebelts and minefields, the boundaries of which have not been accurately determined.

- (j) *Breaching*.—Breaching a minefield is the operation of clearing one or more lanes to allow the passage of vehicles through the minefield.
- (k) *Clearing*.—Clearing a minefield implies the recovery and collection of all the mines over the whole area concerned.
- (l) *Protective minefield*.—Protective minefields are those laid to prevent penetration by the enemy of a defended locality, post, or roadblock.
- (m) *Defensive minefields*.—Defensive minefields are those laid with the object of preventing penetration between forward defended localities or into an outpost position.
- (n) *Tactical minefields*.—Tactical minefields are those laid with the object of canalizing penetration within a defended area or enemy movement round the flank of such an area.
- (o) *Nuisance or scattered mines*.—Nuisance or scattered mines are small pockets of mines laid with a view to delaying the enemy approach to a position, for example, in defiles or along approach roads. While their presence will impose great caution on the enemy, it must be remembered that they may interfere with the withdrawal of our own covering troops or counter-attacks. Since they are not necessarily covered by fire, they must be well concealed, unmarked, laid in considerable depth, and, if possible, accompanied by anti-lifting devices.
- They will only be laid on the orders of the commander of a formation not lower than a division.
- (p) *Dummy minefields*.—Dummy minefields are areas in which the ground has been disturbed and all other steps have been taken to produce the appearance of a real minefield, including normal marking.

SECTION 3.—LAYING OF MINES

6. *General*.—All minefields will as far as possible be laid so as to supplement, or join up, natural obstacles. Concealment, and the inclusion of anti-personnel mines or other devices, when available, are essential deterrents to lifting of minefields. Minefields that are not covered by fire have merely a delaying effect, often not commensurate with the labour and resources expended in their laying. For this reason, protective minefields will invariably be covered by small arms and anti-tank fire. The extent to which the same rule applies to defensive minefields depends upon the distances between localities, but during darkness and fog, cover by such fire will be provided by patrols and posts specially detailed for this purpose. Where tactical minefields are at a distance from any defended locality positions will be reconnoitred and prepared so that the minefields can be covered by fire when the enemy approaches.

Protective minefields

7. Units will so site and lay their own protective minefields as to fit in with the framework of their defence and in conjunction with any anti-tank gas under command. Rapid preparation of defences demands that the use of protective minefields should not be subject to any standing restriction, but occasions will arise when it is necessary for the formation commander concerned to impose restrictions, for example:—

- (a) To keep clear the ground over which our own counter-attack is to be launched.
- (b) To leave gaps through which our own vehicles can move.
- (c) To economize mines by ensuring that all belts laid are in accordance with a pre-determined minefield plan.

8. **Defensive and tactical minefields.**—The divisional or corps commander will order the laying of defensive and tactical minefields, and will lay down their general alignment. Regarding tactical minefields, a decision will usually be given only after the plan and place of destroying the enemy by counter-attack has been decided. **He will also lay down the policy regarding anti-personnel mines, anti-lifting devices, and booby traps.**

Detailed siting will be decided by the CRA or the anti-tank regiment commander on his behalf, with the CRE or his representative. The laying of defensive and tactical minefields is the responsibility of the CRE, but help from the other arms may be required if the task is to be completed in time and without undue prejudice to other engineer work. All arms should, therefore, be able to lay minefields in accordance with standard methods. **Anti-personnel mines, anti-lifting devices, and booby traps must be sited by subordinate commanders and laid and recorded by engineers, or by other arms under engineer supervision.**

9. **Methods of laying.**—Mines will always be laid in a set pattern in rows starting at right angles from a known datum line. The rows will always be laid to the right when facing outwards.

The method of laying to be used is the pacing method described in Appendix B. A standard number of six rows and a spacing of 6 yds has been adopted to simplify laying and recording. All panels will be laid to this standard. Appendices B and C also describe two methods of distributing the mines to the layers by the use of carrying parties and by vehicles.

Where greater accuracy is required and is obtainable by use of the knotted wire method, this may be used by engineers. In this case special records will have to be made by them.

10. **Dummy minefields.**—Dummy minefields will be used as much as possible to supplement live minefields and thus to confuse

and delay the enemy. To be effective it is essential that dummy minefields shall be enclosed and marked like live fields. Great care must be taken to ensure that the fact that they are dummy is not disclosed by vehicles or troops passing through them.

The inclusion of buried tins or other metal objects that give a detector reaction will aid deception in dummy minefields. But, if buried in dummy minefields, tins, etc, should also be placed in live ones.

11. **Nuisance mines.**—Where nuisance mines cannot be left unmarked they will be best concealed and most effective if a dummy minefield is made to include their real position, or to extend it.

12. **Temporary protective mine belts.**—Units will frequently have to put down their first line No. 75 grenades to block roads or other approaches, particularly when in harbour. It is essential that these mines, unless formally handed over to an incoming unit, be removed by the unit before it leaves the area. To ensure lifting, No. 75 grenades may be linked together in groups of six with string, which will be removed only when the group becomes part of the layout of a deliberately prepared position.

13. **Co-ordination.**—Mines once laid will eventually have to be lifted, and freedom of movement to our own patrols must meanwhile be ensured. For these two reasons haphazard and unco-ordinated laying of mines must never be permitted. It will be the most urgent duty of formation commanders to issue, at the earliest possible moment, the necessary instructions to ensure control.

14. **Burying.**—In general, the object is to achieve concealment from ground and air observation. If it is possible for this to be achieved without burying, then mines can be left unburied. When the urgency of the tactical situation is such that mines have to be laid unburied in the first instance, if burying is necessary for concealment it should be done as soon as possible. In this connection the danger of handling mines which have been subjected to blast, e.g. from shell fire, must be remembered.

SECTION 4.—MARKING OF MINEFIELDS

Marking of perimeter fence

15. All minefields (including dummy and enemy minefields which have been over run by our forward troops or incorporated in our defence positions) will be marked. Minefields laid by our own troops will be marked as they are laid. Unmarked nuisance mines must be restricted to ground that we ourselves will not require to use, and the location of these mines must be known to all drivers and to all patrols who may possibly cross that area.

16. Protective minefields, which will probably be laid very early in the occupation of a position, will be guarded until marking has been completed.

17. When operational conditions permit the minefield will be enclosed by a wire fence. Red tin triangles of 8-in sides (markers, minefield perimeter) will be hung on the wire at about 50-yds interval. Fences marking minefields will not conform to the shape of the minefield.

18. All markings will be removed before a final withdrawal.

Marking of lanes through minefields

19. If lanes in our own or enemy minefields have to be marked to enable men and vehicles to advance through for an attack, the following methods will be used:—

- (a) By day—with tin or wooden signs (signs, gap marking) at 25-yds spacing. RED on the side next to the minefield, WHITE on the side next to the gap, on 5-ft pickets.
- (b) By night—with pairs of coloured lights, GREEN and AMBER, GREEN on the safe side and AMBER on the danger side. These lights should be placed on gap marking signs at 50 yds spacing. An additional green light will be hung on the end gap marking sign at each side of the enemy end of the gap to show drivers when they are clear of the gap.
- (c) These markings are fully illustrated and described in MTP 40, Part III.

Provision of minefield marking stores

20. Minefield marking stores will be provided in the field as follows:—

- (a) Marker, minefield perimeter (red triangles).

These will be provided on a basis of 1 per 20 mines and will be provided with the mines. A reserve of 400 markers per division will be carried in the four mine lorries of the Div Tps Coy RASC. These will be available for marking dummy fields.

- (b) Mine warfare stores.—Two sets of mine warfare stores will be provided.

(i) Set A.—This will be carried on the G1098s of all units which have mine detectors. The sets will be issued on a "per detector" basis. The contents of the set are listed in MTP 40, Part III.

- (ii) Set B.—This will be carried by engineer units in 3-ton lorries provided for the purpose. Two sets will be carried in the field company or squadron and three sets in the div or corps field park company. The contents of the set are listed in MTP 40, Part III.

Inspection and maintenance of minefield marking fences.

21. Minefield marking fences must be regularly inspected and maintained. Areas of responsibility must be laid down.

SECTION 5.—RECORDING OF MINEFIELDS

22. General.—Recording of minefields must be carried out under two heads:—

- (a) *For operational purposes.*—The unit which lays a minefield will at once report its location and extent to the brigade or higher formation headquarters concerned. It will be the responsibility of "G" staff at divisional HQ to co-ordinate these tactical reports, to maintain their tactical minefield record, and to pass the reports back to the next higher formation to ensure that all involved are informed.
- (b) *For lifting purposes.*—As accurate a record as can be made in the circumstances is required, so that unnecessary loss of life can be avoided when the mines are lifted by men of another unit. This record will be compiled by the officer in charge of laying and will not necessarily be an RE responsibility.

23. Form of record

- (a) Tactical reports submitted by units as in (a) above will consist of definition on the largest map in use by co-ordinates or by a tracing of the mined area. This area will also be marked and once its approximate position is established, units approaching it can watch out for the marking fence and commanders planning counter-attacks can avoid it. This tactical report should be submitted as laying starts, giving if possible an estimated time of completion.
- (b) The record required for lifting purposes (*see* (b) above) will be made on the *pro forma* shown in Section 13. All spaces will be filled in or initialled. One *pro forma* will be used for each new major datum point. These *pro formas* will be issued in pad form. If the record is for more than one panel, the sketch on the back of the *pro forma* must show the relative positions of the panels.

(c) The following points will also be noted:—

- (i) All bearings will be magnetic. Where possible the same compass should be used throughout.
- (ii) Distances between landmarks and major datum points, etc., must be obtained in the most accurate manner possible.
- (iii) The use of the term "home" and "enemy" in describing the sides of a minefield, has led to confusion, and will be discontinued. The terms "inner" and "outer" will invariably be used for protective and defensive minefields. With tactical minefields, reference may be made to the points of the compass if this makes it clearer.
- (iv) Before forwarding records, the officer in charge will make himself personally responsible that they are free from fundamental errors or omissions and that they can readily be interpreted by another unit and that all landmarks and major datum points are of a permanent nature.
- (v) All measurements will be made in YARDS.

(d) Where engineer units are responsible for mine laying they will submit, along with the records above, large scale sketches showing the minefield in greater detail. Also where A per mines or anti-lifting devices are incorporated in any minefield by engineers or under engineers supervision, large scale sketches showing the position in the field of each device, and any trip wire attached to it, will be pinned to the record. The number laid and details will be filled in in para 8 of the *pro forma*.

(e) All troops, finding our own or enemy mines, must report to their own HQ at once and, when possible, to the nearest traffic control post. It does not matter if this fact is known already. Information held by traffic control posts will be only of a positive nature and should be valued in that light.

24. Submission and holding of detailed recovery records

(a) Record forms and sketches will be made out by units in triplicate and forwarded through the usual channels to division. One copy will be retained at divisional engineer HQ, the other two will be sent back through engineer channels. One of these copies will be retained at the highest HQ as a permanent record.

- (b) Should the division concerned subsequently hand over the area, the record will also be handed over to the incoming divisional engineers. If no division takes over, the records will be forwarded to higher formation through engineer channels.
- (c) Any alterations to the original layout, such as opening or closing gaps, picking up or thickening up mines, will be dealt with in the same way, and necessary amendments to the original records will be issued.
- (d) In forward areas, recovery records of minefields will not be held or taken forward of divisional HQ, only such notes being held by units as would be of no value to the enemy.
- (e) A complete set of all detailed records will be built up from formation reports, co-ordinated by means of key plans and held available for reference at highest HQ.

25. Temporary minefields.—Records will not be necessary for protective minefields when they are laid and guarded by a unit and are not to remain in place after the unit leaves or for longer than 48 hours, whichever period is less. In such circumstances the unit MUST recover ALL the mines laid.

SECTION 6.—REPLENISHMENT

26. Expenditure of mines will be reported and replenished as mines are laid, exactly in the same way as ammunition. Purely temporary laying of mines, e.g., during a halt, will not be reported as expenditure.

CHAPTER 2

DETAILS OF LAYING AND RECORDING

SECTION 7.—GENERAL

27. The requirements of a good minefield layout are as follows :—

- (a) Mines must be laid in such a way that
 - (i) The enemy cannot readily locate the field or individual mines.
 - (ii) We can readily locate them when required.
- (b) The pattern must be such that clear lanes are reduced to a minimum.
- (c) The layout should be standard within each belt, yet sufficiently flexible to enable both linear and closed minefields (and the variations between these two) to be laid.
- (d) The layout must be such that mines can be laid quickly, particularly at night, and easily recorded.

Chapter 1 lays down the general policy by which the above standards are obtained and any deviation from it in any theatre of war must be made by the Commander-in-Chief only and must be common to the whole theatre.

28. This chapter and Appendices A, B and C give practical hints and drills for laying and information of a more detailed nature than Chapter 1. All drills refer to a standard layout of six rows of mines laid at 6 yds spacing. The drills given are training drills, and must be adapted by each unit to suit varying establishments or circumstances. Remember, however, that in a laying operation organized by sappers with infantry labour, these standard drills will be used, and also that reinforcements, coming up to replace casualties, will have been trained in the same drills.

29. There are three main tactical situations to consider in the laying of mines :—

- (a) The re-organization on a captured objective when a hasty protective minefield is laid to improve the A tk defence against the counter-attack. In this situation the main object will be to get mines on to the ground and recording will be given secondary consideration. However, if the mines are laid by a standard method, the field is surrounded by a marking fence, and the total number of mines laid is known. Later on, when time is available, recording can be done properly. If circumstances prevent recording, then the marked area must be treated as an enemy minefield and cleared by deliberate methods.

- (b) The situation in which there are 48 hours available to prepare a defensive position. A battalion may have sufficient mines available to block the likely tank runs. In these circumstances, the infantry will lay these mines by themselves and record them on the *pro forma* fully at the time of laying.
- (c) The case of the deliberate prepared defensive position with extensive minefields. The minefields will be laid under engineer supervision, and all recording will be carried out with extreme accuracy by engineers.

30. There will be variations in the above situations, but it must be taken as a general rule that it is the personal responsibility of the OIC laying to produce the best record possible under the prevailing circumstances. Sections 8, 9, and 10 following deal with each of these situations in turn, and give suggestions for the methods of organizing the operation.

SECTION 8.—LAYING A HASTY PROTECTIVE
MINEFIELD

31. The action to be taken here will depend on the time and the number of men available. It may be possible to adopt the procedure given in the next section ; on the other hand, there may be no time to lay tapes and in this case the officer or NCO in charge must set his laying parties off parallel, roughly by eye, by choosing direction posts such as trees or hedge corners. He must mark roughly his major datum and datum points, datum line, make a note of the area of the field and the total number of mines laid in it. He must report back the area of the field as shown in para 46.

32. Then, as soon as possible, he will erect a marking fence to contain the field.

33. The above essentials will both give him a form of A tk defence and prevent damage to our own troops or vehicles.

34. The next stage to be carried out, when circumstances permit, is the completion of the record *pro forma*, shown in Sec 13, as accurately as possible. If, as may often be the case, the field contains No. 75 grenades laid singly, unburied (they may be visible), it may be possible to lay an extra No. 75 grenade by each already laid and to bury and conceal them, at the same time completing an accurate record.

35. If, however, the officer or NCO becomes a casualty or, for any reason, the completion of the record *pro forma* cannot be carried out, the area enclosed by the marking fence will be treated as an enemy minefield and cleared, using deliberate methods.

SECTION 9.—LAYING SINGLE MINE PANELS

36. The procedure will normally be as follows :—

- (a) A setting-out party (as shown in Appendix A) lays a tape to mark the inner edge of the panel. The siting of this tape is chosen so that the panel will block the most likely approach and so that it can best be covered by the weapons of the defenders.
- (b) The same party lays out the datum line at right angles to, and at the start of the tape above, and drives a picket to mark the datum point. The major datum point is erected at a suitable distance at the inner end of this datum line, and a picket is driven at the outer end of it for recording and subsequent picking-up purposes.
- (c) This party now lays out the laying tapes at right angles to the datum line to the right when facing outwards (see Fig 1). The tape, laid to mark the inner edge of the field, can be used as one of the laying tapes.

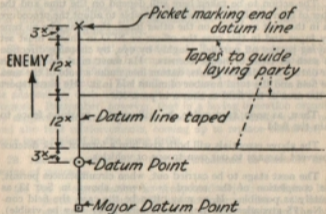


Fig 1. Layout of tapes for laying a panel of six rows of mines at 6 yds spacing by pacing method.

- (d) The commander of the laying party who will normally also be in charge of setting out, is responsible for carrying out the necessary reporting back and recording as shown in Sec 13.

- (e) While the setting-out party has been carrying out these operations, the laying party can be getting ready, removing the top slat from the mine crates, making dumps of mines at intervals along the field (see Appendix B), or doing whatever else is necessary.
- (f) If a marking fence is to be erected (and this must be done unless tactical considerations forbid) then a separate party should be detailed who will erect the complete fence independently of the progress of the laying.
- (g) The remainder of the laying is carried out as laid down in Appendix B or C. Once laying is completed, all that remain in the field are the marking fence, the cairn or picket marking the major datum point, the datum point picket, and the picket at the far end of the datum line, both driven flush with the ground, and the mines themselves (see Fig 2).

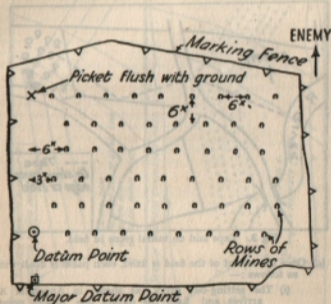


Fig 2. Diagram to show completed panel laid by pacing method.

SECTION 10.—LAYING A MINEBELT OR SERIES OF PANELS

Sequence of reconnaissance and laying

37. The following sequence should be taken as a guide to the method in which a minebelt should be laid.

- (a) An initial reconnaissance should be carried out by representatives of the laying party and by a tactical representative to decide on the layout of the field. This layout will depend on the general tactical object of the field, the siting of the weapons of the defence and the suitability of the ground for laying.
- (b) On this reconnaissance, a tape will be laid to represent the inner edge of the field. In all probability the layout can be altered slightly without disturbing the tactical siting, to allow the tape to run, for ease of laying, between distinguishable features such as a certain tree to a hedge corner, etc. After this reconnaissance, the field is represented by a single tape running in a series of legs as shown in Fig 3.

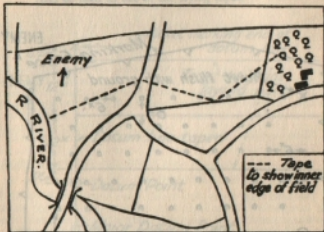
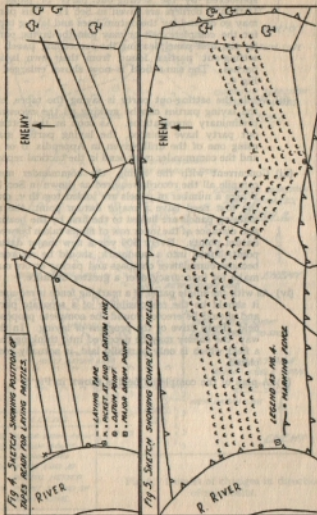


Fig 3. Tape laid on initial recon of field.

- (c) Once the layout of the field is fixed, each panel is dealt with as follows:—

- (i) The setting-out party (as shown in Appendix A) arrives and fixes the datum line, datum point, major datum point, and lays the laying tapes;



these will run up to the datum line of the next panel and if this is not already laid, it must be taped or spitlocked by the setting-out party of panel 1. Details of corners are given in Sec II. This party may go on and lay the datum lines and laying tapes for the complete belt or may join the laying party for the first panel, leaving the succeeding panels to setting-out parties found from their own laying parties. The same field is now shown enlarged in Fig 4.

- (ii) While the setting-out party is laying the tapes, etc, the laying parties can be making all the necessary preliminary preparations. As soon as the setting-out party have finished, the laying parties start using one of the drills given in Appendix B or C, and the commander must send in the tactical report.
- (iii) Concurrent with the laying, the commander must compile all the records required as shown in Sec 13. Where a number of panels are joined together, only the first need have a major datum point, the remaining panels are linked to the first by the bearing and distance of the inner row of mines taken between datum points. Every 500 yds a new major datum point, linked into a landmark, should be recorded, because cumulative compass and pacing errors may make for inaccuracy over a greater distance.
- (iv) As with the single panel, if a marking fence is required, it should be the responsibility of a separate party and should be erected round the complete proposed field, irrespective of the progress of laying. In this way, the enemy may be deceived into thinking that a field which is only partially laid, is actually completed.
- (v) A plan of the completed field is shown in Fig 5.

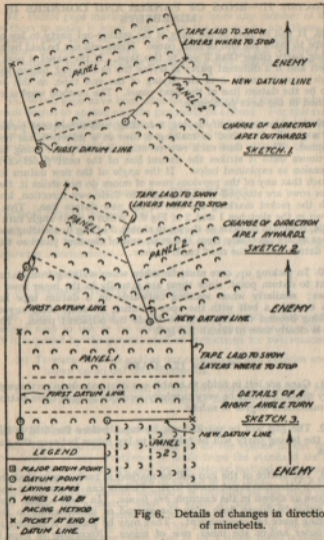


Fig 6. Details of changes in direction of minebelts.

SECTION 11.—ENDS OF PANELS AND CORNERS IN MINEBELTS

38. It will be part of the duty of the setting-out party to lay out a tape to mark the end of their panel. Mines will not be laid by the laying party closer than 3 yds to this tape. If the panel is part of a belt and if a different party is laying the next panel, liaison with them must be made over the laying of the end tape, as this will also be the datum line of the next panel. The method used is explained in the next paragraph.

39. In order to simplify laying, recording, and subsequent picking up, a standard method of making a turn in a minebelt has been adopted. This is that each row of mines in the panel being laid continues until it strikes the datum line of the next panel or its extension as explained below. If the angle of the new datum line is such that any of the previous rows of mines do not strike it, then these rows are stopped at right angles to their own direction, level with the picket marking the end of the new datum line. This is shown in the sketches 1 and 2 of Fig 6. When a right angle turn is made, it should be done as shown in sketch 3 of Fig 6, omitting such mines as are necessary from the inner row of the first panel so that the datum line of the next panel is clear.

40. In picking up, care must be taken when walking from datum point to datum point, since these are actually in the inner rows of mines; similarly when walking outwards on a datum tape laid at a bend in a belt with the apex pointing inwards, since anyone walking beyond the tape will be inside the adjacent panel. This fact is clearly seen in sketch 2, Fig 6.

SECTION 12.—GAPS

41. Gaps are left in fields to enable our own patrols to go through. They must therefore be very carefully recorded to give these patrols the maximum degree of safety.

42. The gap will be marked out by tapes before the field is laid and the laying party will be told not to lay mines between the gap tapes.

43. The centre of the gap will be marked in such a way that the enemy's attention is not drawn to it. Pickets can be used for this purpose as shown in the example *pro forma*. In such a case they will either be driven flush with the ground or incorporated in the masking fence for concealment. They may be placed if desired in the outer and/or the inner row of mines. Recording of gaps is explained in para 50.

44. Patrol gaps marked as above may have any number of kinks in them to make it more difficult for the enemy to find them, and because they may be made to wind between the mines without altering the regular pattern. When vehicle gaps are required they will normally be laid straight through the field, marked on the same principle as above.

45. When gaps have been used for any length of time, an obvious track begins to appear and the gap must be altered. For this reason and in case of attack, sufficient mines will be left concealed and protected from blast, near each gap, in order to close it. The position, number, and type of these mines must be kept with the records of any gap made.

SECTION 13.—RECORDING

Tactical report (para 22 (a))

46. As soon as the officer in charge has organized and started the work of laying a minefield, he should report back, giving the following information:—

- (a) Location and area of the field.
- (b) Estimated time of completion.

47. This information can be sent by DR with a trace of the largest map in use or by wireless giving four-corner co-ordinates. It is required by the general staff at formations for two reasons:—

- (a) To warn all units so that our own troops and vehicles are not blown up on our own minefields.
- (b) To plan the movement of our own counter attacking forces, so that they are not held up by our own minefields.

Recording of a single panel (para 22 (b))

48. This is carried out by filling in all the spaces in the record *pro forma*. If any divergence is made from the standard six rows of mines at 6 yds spacing laid by the pacing method, this must be clearly shown on the *pro forma* or sketch at the back. With a single panel, all the information necessary is included on the front of the *pro forma*, but a sketch must be made at the back, connecting the panel with the ground for checking purposes and to help any subsequent picking up party. This need only be in the simplest form. An example *pro forma* filled in for a single panel is shown on pages 20 and 21.

MINEBELT RECORD.

Army Form W 4011-A

Serial No. of Belt
Belt No.

1. LID BY 7640MOMHURES (Unit 550 Inf Bar 218th),
Other ID laying..... *L. A. MOOKER*
Authority for laying..... *550 INF BDE*

2. DATE OF LAYING *10 MAR 44* (From *10-30* - 31st.
Map Sheet No. *40* Scale *1"=1 MILE*.
Description *ANTICORNER RED BRICK HOME*
HOUSE CALLED "REFUGE"

3. LAMENURE TO MAJOR BATHON PORT.
Distance *96* - yds. Magnetic bearing *87* degrees
Description of Major Datum Point *ICE PICKET.*

4. BATHON LINE. Length *39* yds. Magnetic
bearing from Major Datum Point..... *97* degrees.

5. BEARS. From Major Datum Point to Datum Point at
each of linear row..... *9* yds. Number of rows..... *5*
Distances between rows, commencing from the linear
row..... *8* yds. *6* yds. *4* yds. *2* yds. *1* yds.
Length of linear row of last panel..... *230* - yds.

7. A 14 BIRDS LAD. Total No. *4-66*
Type *275'S GREENHEADS, LAMP IN PAIRS*

NOTE—Changes in direction of the linear row must be
shown on sketch, giving bearings and distances between
Datum Points.

8. BAYS. Width of bay..... yds.
Length of bay..... yds.
Bearing from *N. 0. N. 8. H. 10. 1. 1* degrees
from..... yds on a bearing of..... degrees
from..... yds on a bearing of..... degrees
Course of bay marked by.....
Location of..... square miles to color (if any)

9. NUMBER AND DETAILS OF A PER WIRES OR CORDS
TRAPS. (To be shown in red).

10. Remarks *MOVE*
car

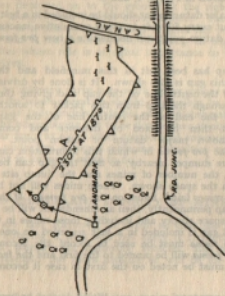
11. Signature *A. H. HARRIS*
Date *10 MAR 44*

12. Landmarks, Major Datum Points, Datum Points, Inner
Bears of Mine and their Bearings and Distances from
Datum Points. (To be shown in red.)
ground features to help recognition, such as traps or
sketch on back.

Remember. On the accuracy of these particulars will
depend the safety and lives of our men, who will have to
lift the minefield, make a job, or clear a lane through it.

MINEBELT SKETCH.

NOTE—Changes in direction of the linear row must be shown, on sketch, giving bearings and
distances between Datum Points.



Total No. of Mines
in each Panel.
A 466

LEGEND.

Major Datum Point
Datum Point
Bearing
Inner Row of Mine

INSERT ARROWS.
Direction of Linear Row
Bench Mark

Recording of minebelt or series of panels (para 22 (b))

49. The form is filled in for the reference (left hand) panel. The remaining panels, containing the same number of rows, laid by the pacing method at the same spacing, are connected up to the first panel by a sketch on the back of the *pro forma*. The sketch must show the length and bearing of the inner row of mines of each panel. This is taken from datum point to datum point; the datum point of each panel being marked by a picket driven flush with the ground. The record *pro forma*, shown on pages 24 and 25, is filled in for the minefield shown in Figs 3, 4, and 5.

A new major datum point should be included in a belt of connecting panels about every 500 yds to avoid cumulative inaccuracies. Each new major datum point will necessitate a new *pro forma* being used.

50. A gap has been left in this minefield and the method of recording this gap is also shown. It is done by driving a picket at the start of the centre line of the gap and giving the bearing and distance through the gap from this picket to another picket or marker at the end of the centre line of the gap. The first picket can then be fixed by distance and compass bearing from a known major datum or datum point. There is a space on the *pro forma* in which this information can be inserted. If mines are dumped nearby, so that the gap can be closed in an emergency, the number of mines and the dump site must also be included in the space shown. These mines will not be included in the "total mines laid" figure on the *pro forma*. If they are used to close the gap permanently, then an amendment will be issued leaving the dump space empty and including those mines in the total laid. If a second gap is included in a belt recorded on one *pro forma*, a second *pro forma* must be used to record the second gap. This second *pro forma* will be pinned to the first and the fact that it has been used must be noted on the first in case it becomes detached.

51. Anti-personnel mines, anti-lifting devices or booby traps laid by engineers or under engineer supervision will be recorded by filling in para 9 of the *pro forma*. These will always be laid as part of the pattern in each panel and a large scale sketch will be attached to the *pro forma* to show the exact position of each and of any trip wires used. The details included in para 9 of the *pro forma* should be as follows:—

"Shrapnel mines laid every 4th mine (4, 8, 12, etc) from datum line in outer two rows of panel B. Total laid 10. Large scale sketch attached."

If sufficient space is not available for the above information on

the *pro forma*, then only the total laid and the type used will be shown in para 9 with a reference to the attached large scale sketch on which the remaining information will be inserted.

Any attachment must of course have a reference back to the *pro forma* to which it refers in case it becomes detached.

SECTION 14.—ORGANIZATION OF WORKING PARTIES

52. In a large operation the actual laying of the mines will normally be the simplest part. The organization of getting the mines and the trained parties deployed on to the ground at the right time and together will always need careful consideration. The field may have to be laid in a place where wheeled vehicles can neither reach nor be used and it may therefore be necessary to organize large carrying parties whose role is of equal importance to that of the layers themselves.

53. Where an infantry party is to work under sapper supervision, a rehearsal of the whole operation should, if possible, be carried out so that each man fully understands his part. Rehearsal is particularly important where laying has to be done either at night or under shell or mortar fire; at night strict control and supervision are not possible and, under fire, reserves replacing casualties must be able to st-p straight in knowing what to do.

SECTION 15.—DEPTH AND DENSITY OF MINEFIELDS

54. Mines are laid scattered in depth so that the momentum of one tank entering a field will not carry it right through and leave a clear passage for following vehicles, and because the deeper the minefield the more difficult it will be for the enemy to lift it.

55. The standard belt laid by the pacing method gives a depth of 30 yds (six rows at 6 yds spacing). If a deeper minefield is required without using more mines, then the centre lines of alternate pairs of rows, *i.e.*, laying tapes, may be spaced farther apart than 12 yds. The pacing method can still be used to lay these mines as the rows in each pair are still only 6 yds apart, 3 yds on each side of the laying tape. If this method is adopted it is easily recorded. The two blanks left in para. 6 under "Distances between rows" are filled in with the figure 6 in both cases when the panel of standard depth is used. In the case of a deeper panel, where the

laying tapes have been spaced farther apart, only the distances left blank will vary and these must be filled in correctly.

56. The density of a minefield means the number of mines per yard of front. The standard belt of six rows at 6 yds has a density of one mine per yard of front. If a density of two mines per yard of front is required, this is obtained by laying two belts, one behind the other.

57. However, if there are only a limited number of mines available, the best use must be made of them, either by spreading them thinly over the whole area or by spreading them thickly across the most likely approaches. This must be a tactical decision. If due to interference from the enemy or for other reasons fewer than 6 rows of mines are laid, this is recorded by filling in on the *pro forma* the number of rows laid and amending the detail following "Distances between rows" as necessary.

58. A smaller density makes a field less effective. Trials indicate the effectiveness of various densities as below. In actual battle the mere presence of mines or of a marking fence may act as a sufficient deterrent to enemy vehicles, until they have reconnoitred the area.

Density	Effectiveness %
1 mine per yard of front ...	75-86
2 mines per yard of front ...	80-100

SECTION 16.—USE OF DIFFERENT TYPES OF MINES

59. The minimum spacing of mines to prevent accidental setting off of one mine by another is as follows:—

- (a) Mark V mine 2 yds
- (b) Mark IV mine 5 yds
- (c) No. 75 grenades laid side by side 2 yds
- (d) No. 75 grenades laid end to end 1 yd

However, in minefields the practicable minimum spacing is 6 yds.

60. The Mark IV and Mark V GS mines are always laid singly in fields since they contain sufficient explosive to do extensive damage and have a fairly wide area to trap the tank track. No. 75 grenades are effective laid singly against all but the Mark VI tank; they are, however, normally laid in pairs, because this arrangement increases the amount of explosive and damage caused, and also increases the area which the tank must avoid. Whether the mines are laid singly or in pairs must be a decision made by the commander on the spot and dependent on the numbers of mines available. In the consolidation of a position where few mines are likely to be available, they will normally be laid singly. Later, if more mines become available, the mines in the belt laid can be doubled up or a second belt with mines laid in pairs can be sited in support.

61. The No. 75 grenade is laid with the filler cap pointing towards the enemy so that the spuds on the tank track cannot bridge it. If laid in pairs, a second grenade is laid behind the first, as shown in Fig 7.

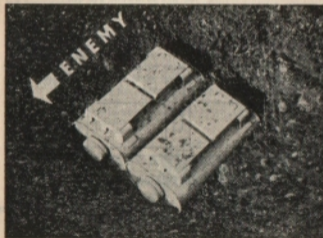


Fig 7. No. 75 grenades laid unburied in pairs.

SECTION 17.—CONCEALMENT OF MINES AND MINEFIELDS

62. The concealment of the actual mine is carried out by burying it or concealing it under natural debris or growth. If buried, the ground round the mine must on no account be able to take the weight of the wheel or the track off the mine so that it does not explode.

63. Mines laid in water will only remain effective for 24-48 hours unless the fuze assembly is above water level.

64. Examples of methods of laying different types of mines are given below.

(a) *GS mines.*

- (i) *Unburied.*—A cavity is cut in the ground to take the base of the mine. The top is left $1\frac{1}{2}$ ins above the surface. This is shown in Fig 8.

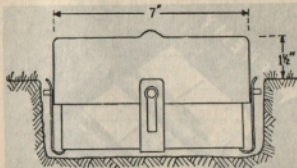


Fig 8. GS Mk IV mine unburied.

If time permits, the turf can be replaced over the top of the mine to help conceal it.

(ii) *Buried.*

1. *The carpet roll method.*—A rectangular strip of turf 20 ins \times 4 ins is cut on its two long sides and one short side and rolled back. An excavation is made, shaped as in Fig 9, to ensure that the weight of a passing vehicle will explode the mine. The mine is inserted with its top 1 in below ground level and the turf is rolled back into position.

In certain soils it may be only necessary to loosen the earth around the mine instead of excavating it.

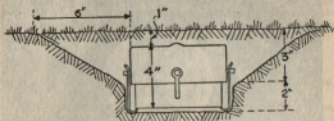


Fig 9. GS Mk IV mine buried using "carpet roll" method.

Photographs of a buried Mk IV mine in cross section and in plan with the earth scraped off the top are shown in Fig 10.

2. *The "hot cross bun" method.*—This method is particularly used with the Mk V mine. The turf is cut in the form of a cross 24 ins long, and the four triangles are rolled back. The earth is excavated to the same shape as in Fig 9 and the mine inserted. The turf is then rolled back to coincide with the angles of the spider cover as shown in Fig 11.

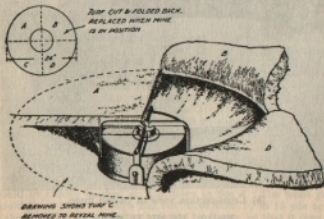
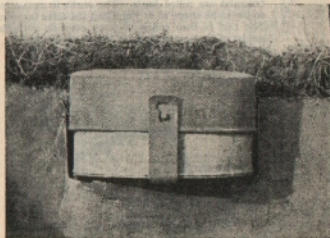


Fig 11. GS Mk V buried using "hot cross bun" method.



(a) Plan view of buried mine with camouflage removed.



(b) Cross-section view of buried mine.

Fig 10. GS MK IV MINE

Fig 12 contains two photographs showing the cross-section of a Mk V mine buried and a plan view with the earth scraped off the top. Great care must be taken with this mine to see that earth or pebbles do not get between the spiders and the top of the mine and thus prevent it from operating.

(b) No. 75 grenade.

- (i) *Unburied.*—The grenade is laid on top of the ground; it can be concealed with leaves or rubbish.
- (ii) *Buried.*—The grenade is buried as shown in the cross-section photograph in Fig 13. The striker plate is left $\frac{1}{4}$ inch above the original ground level. The other photograph in Fig 13 shows the buried grenade with the earth scraped off its top.

65. As well as the individual mines, the complete field must be concealed so that if a withdrawal is ordered and the marking fences are removed, no trace of the field will be left. Debris from crates, the adhesive tape used in packing the fuze, etc, must not be left about and should never at any stage be placed on the ground. All excavated earth must be removed or concealed.

66. If vehicles are used to distribute the mines, all packing must be kept in them. If hand distribution is used, the layers must keep all debris in their pockets until they can place it in an empty crate. At the end all empty crates must be counted up and removed.

67. Tracks must be kept to a minimum. For this reason as well as for their own safety all members of the working party must go only where the drills lay down.

68. If possible, one man should always be detailed to follow up each party with an improvised broom or rake to rough up the tracks made. It must be remembered that the vehicle method of distribution will leave tracks which will be more difficult to conceal or disguise.

SECTION 18.—FENCING OF THE FIELD

69. In order to avoid casualties to our own troops, minefields should be clearly marked as laid down in Sec 4. The fence posts should be at least 4 ft high and not more than 10 to 15 yds apart, as shown in Fig 14. The fence should be strong, so that it does not collapse and leave the field unmarked.

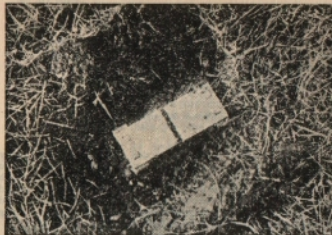


(a) Plan view of mine showing camouflage removed.

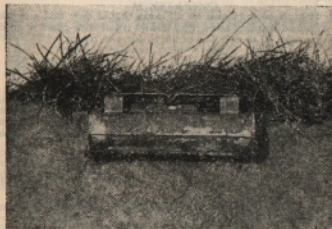


(b) Cross-section view showing mine buried.

Fig 12. GS MK V MINE



(a) Plan view of buried grenade showing camouflage removed.



(b) Cross-section view showing grenade buried.

Fig 13. No. 75 GRENADE

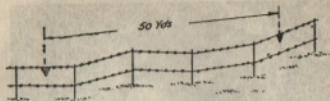


Fig. 14. Sketch of marking fence.

70. Fencing of a field should be carried out by a separate party and should be laid complete, independently of whether the field is finished or not. If this is not done, and the fence keeps pace with the field, the enemy will be able to mark the progress of laying and take counter measures to suit. For a similar reason, the fence should never give an indication of the shape of the field. Extra fencing may be laid across the field to deceive the enemy.

71. If the field is laid within earshot of the enemy, some method should be used to deaden the noise of the mauls. One method is by placing a sandbag filled with waste on top of the picket being driven.

72. It must be impressed on all ranks that if they find a break in a minefield marking fence, they should repair it or guard it until it can be repaired to save loss of life to our own troops.

SECTION 19.—TIMING

73. It is very difficult to lay down times to cover all conditions, but the following times for laying buried mines are an average taken over a series of training exercises using the parties and drills given in the Appendices. Reports from abroad have confirmed that these are if anything on the conservative side.

(a) By day.

- (i) By pacing method, using hand distribution—4 mines per man-hour.
- (ii) By pacing method, using vehicle distribution, 5 mines per man-hour.
- (iii) By pacing method, using vehicle distribution, laying No. 75 grenades. Times only for laying unburied, and do not include reece or marking, 20 mines per man-hour.

(b) By night.

Times above should be increased by 50 per cent for a dark night and by 20 to 30 per cent for moonlight.

(c) Carrying.

(i) It should be noted that all times given allow for the mines being brought straight into the area of the minefield by vehicle. If this is impossible, extra men or extra time will have to be provided.

(ii) One crate of mines and one cylinder of fuzes are a one-man load; it is estimated that one man can carry 18 loads per hour for 100 yds return journey.

74. Detailed timings for specific operations, which might be useful, are given below.

- | | | | |
|--|-----|-----|------------------|
| (a) To bury and conceal one GS mine | ... | ... | 3 minutes |
| (b) To bury and conceal two No. 75 grenades | ... | ... | 1/2 to 2 minutes |
| (c) To arm 12 No. 75 Mk I grenades, two men | ... | ... | 5 minutes |
| (The Mk II can be armed quicker than this) | | | |
| (d) RE with pneumatic equipment from time of arrival on site can make 10 holes for GS mines in hard macadam road | ... | ... | 30 minutes |

SECTION 20.—GENERAL SAFETY PRECAUTIONS IN MINELAYING

75. A mine (GS or No. 75 grenade) may be set off by any of the following:—

- (a) All vehicles (including motor cycles).
- (b) A horse or cow.
- (c) A man walking, running, or riding a bicycle over it.

76. For this reason all mines will be considered dangerous to passage by our own troops, but they must not be relied upon to stop enemy on foot.

77. It is a general rule in all work in minefields, that in the laid part of any field everyone must walk on tapes. This must be obeyed at all times. Special precautions are taken in the drills to see that the layers and distributors who have to leave the tapes are not in danger.

78. Parties laying mines will be dispersed as far as is possible without interfering with the efficiency of the operation. The illustrations of the minelaying drills, given in Appendices B and C, show for diagrammatic purposes the parties bunched together. In training and in operations the parties on the tapes must be spread out to avoid large casualties.

79. Each mine and fuze will be inspected before laying to see that the shear wire is not damaged and to see that the safety pin is present. In training, special precautions will be taken to see that dummy and live equipment are not mixed.

SECTION 21.—CARRIAGE IN THE FIELD

80. Units carry No. 75 grenades on their G1098 for their own protection, on scales as shown in this table below :—

Unit	Number held
Infantry battalion	348
Fd or AA Reg. RA	144
A tk Regt RA	468
Fd Coy/Sqn RE	72
Fd Pk Coy RE	48

81. The total carried in the division is approximately 12,000 No. 75 grenades. Reserves are carried in RASC second line transport.

82. Expenditure of mines is reported in exactly the same way as ammunition and replenishment is received through normal ammunition supply channels. The policy, as laid down in Sec 6, Chap 1, is that mines laid in temporary protective fields will not be reported as expenditure.

83. Packing of mines is as follows :—

- GS mines Mk IV or V are carried five mines in a wooden crate, total 71 lb. Fuzes are packed in cylinders containing five in each, four cylinders being carried in a wooden box weighing 34½ lb.
- No. 75 grenades are packed twelve in a steel box which also contains 24 detonator assemblies. Total weight 40 lb.

SECTION 22.—DELIBERATE CLEARANCE OF MINEFIELDS

84. As the field army advances, both our own and enemy minefields will have to be cleared completely to open up communications. Clearance of our own minefields will be done wherever possible from the records. In enemy minefields and our own minefields that have been in enemy hands, the area should be swept with mine detectors.

85. Normally, in this operation, greater attention can be paid to the safety of the troops engaged than is usual. This point is dealt with more fully in Appendix D.

SECTION 23.—INSPECTION OF ANTI-TANK MINEFIELDS

86. When anti-tank mines are laid in minefields that will be left in position for some time, they are liable to deteriorate owing to one or more of the following causes :—

- Water percolating into the fuze primers of body of the mine where it may act physically, by waterlogging the mechanism or deadening the explosive in fuze or primer, or chemically, by corrosion of metal parts. Local factors (e.g., acidity of the soil or atmosphere or fluctuating temperature) may assist the action.
- Frost following flooding may subject the mines to mechanical strains and distortions.
- Mechanical obstructions between the area and the body may arise from the activities of insects or vegetation.

87. Inspection should be carried out regularly to see that the minefield is still effective. The details of this are shown in Appendix E.