

LibMAS 10.20/1

Second Edition: January 2017

DEMINING SITE MARKING SYSTEMS

Responsible National entity:

Libyan Mine Action Centre (LibMAC)
mandated by the Ministry of Defence (MOD)

Contact: LibMAC Deputy Director

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NOTE:

This document is current at the date shown on this page. The Libyan Mine Action Standards (LibMAS) are subject to regular revision, so users should ensure that they are using the latest version of each document in the standards. The most recent versions of LibMAS are the versions that are posted on the LibMAS pages of the LibMAC website www.lmac.gov.ly

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Foreword

Critical safety, control and quality elements of the International Mine Action Standards (IMAS) have been retained in the Libyan Mine Action Standards (LibMAS), so ensuring that they maintain the principles agreed in IMAS guidelines.

The work of preparing, reviewing and revising LibMAS is conducted by a technical committee with the support of invited international, governmental and non-governmental organisations in Libya. The latest version of each standard can be found LibMAC website.

In all LibMAS the words “must”, “shall”, “should” and “may” are used in the following way. “Must” or “shall” is used to indicate a requirement, something that must be done in order to conform to the LibMAS. “Should” is used to indicate the preferred requirements, methods or specifications, but these may be varied when reasons for doing so are given. “May” is used to indicate a possible method or course of action that should be considered but need not be applied.

1. Introduction

- 1.1 Demining sites where technical survey, mine clearance and battle area clearance operations planned and conducted, shall be clearly marked to differentiate between the safe and hazardous area and to identify specific points or objects.
- 1.2 The primary temporary marking system used during mine clearance and battle area clearance operations shall be **wooden posts** painted a distinctive colour. In circumstances where ground conditions are too hard / rocky to position wooden posts, then **painted rocks** shall be used, so long as the colouring system remains the same. Short wooden posts shall have at least 30 cm above the ground and long wooden posts shall have at least 1 metre above the ground. When using rocks, they shall be a minimum of 10 cm in diameter and a minimum of 5 cm in height.
- 1.3 During mine clearance operations marking shall not be placed in the hazardous area. During battle area clearance operations it may be necessary to position markers in the hazardous area however marking posts shall not be inserted into the hazardous ground unless it has been confirmed as cleared to the specified depth, or based on authorisation from the LibMAC, based on a pertinent threat / risk assessment.

2. Marking Systems Used For Demining

- 1.1 The following coloured system shall be used:

- a. **Long Red Topped Posts** – Indicate the boundary of the hazardous area. During mine clearance operations the suspected / confirmed boundary of the hazardous area shall be marked with long red topped posts positioned at a maximum of 15 metre intervals and at each Turning Point (TP). A mine warning sign should be positioned on this post at a maximum of 30 metre intervals. **The LibMAC may stipulate that these distances are reduced where there is a concern regarding safety.**

During battle area clearance operations the suspected / confirmed boundary of the hazardous area shall be marked with long red topped wooden posts positioned at a maximum of 50 metre intervals and at each Turning Point (TP). **The LibMAC may stipulate that these distances are reduced where there is a concern regarding safety.**

Long red topped posts may be used to demarcate the Working Area and should be used in areas where the terrain has a detrimental effect on visibility and safety. It is recommended that they are placed at turning points.

The LibMAC may authorise the use of red / white painted rocks as an alternative to red painted rocks. The white side of the rock faces towards the clear area and the red towards the hazardous area.

- b. **Short Red Topped Posts** – Demarcate clear and unclear areas in the Working Area.

During mine clearance operations they shall be positioned at a maximum of 2 metre intervals.

During battle area clearance operations they shall be positioned a maximum of 50 metres apart when used in conjunction with another authorised marking system, such as cord, 10 metres apart if used solely when conducting surface clearance and 5 metres apart if used solely when conducting sub-surface clearance. Prior to removing cord marking demarcating the clear / uncleared area, red topped post shall be positioned, as detailed above. **The LibMAC may stipulate that these distances are reduced where there is a concern regarding safety.**

The LibMAC may authorise the use of red / white painted rocks as an alternative to red painted rocks. The white side of the rock faces towards the clear area and the red towards the hazardous area.

Long or short red topped posts may be used to mark the position of ERW located. During battle area clearance, red topped posts shall be used to mark ERW which has not been removed or destroyed at the cessation of daily operations. A minimum of 3 red topped posts shall be positioned on the outside and a minimum of 10 cm from ERW, demarcating it as hazardous.

- c. **Yellow Topped Post** – Used to mark the location of an Anti-personnel and Anti-tank / Anti-vehicle mine, destroyed or removed during clearance. The location, date located, type and depth of mine shall be recorded in the site documentation and the type of the mine shall be written on the Post.
- d. **Yellow/Red Topped Post** - Used to mark the location of an ERW destroyed or removed during clearance. The location, date located, type and depth of the ERW shall be recorded in the site documentation and the type of the ERW should be written on the Post, and shall be written in the case of submunitions.
- e. **Blue Topped Post** - Used to mark the start of daily work. One post is required for each Demining Lane and / or working deminer.
- f. **White Topped or unpainted Posts** - Used to mark all other boundaries, i.e. administration areas, control lane.
- g. **Green Topped Post** – Used to mark the boundary or the centre of sampled boxes during sampling operations, and may be used to indicate the area where external quality control has been conducted.
- h. **Orange Topped Posts** – Used to mark a MDD indication.

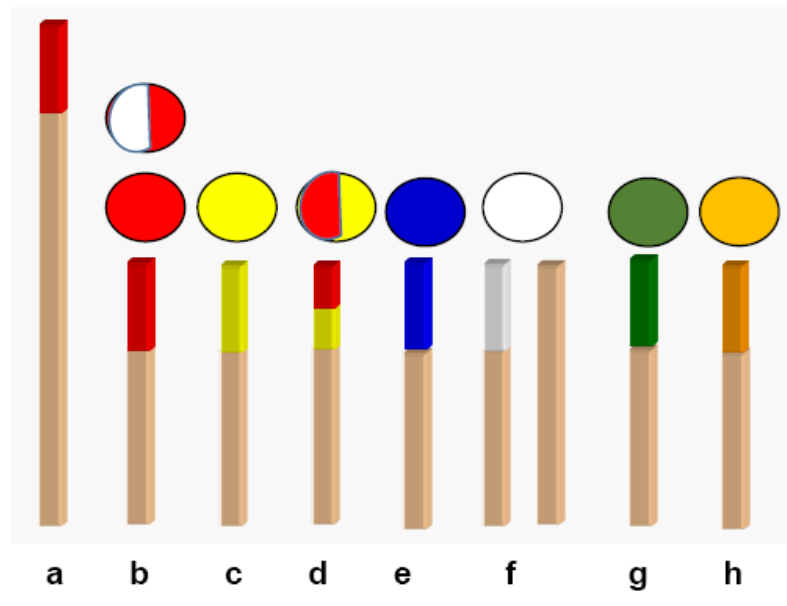


Figure 1: Marking Posts (wooden posts and rocks)

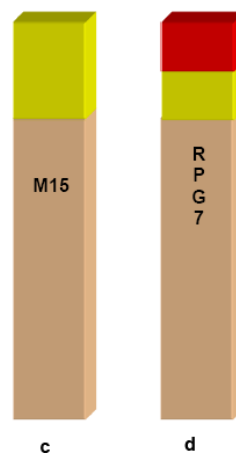


Figure 2: Mine and ERW Marking Posts

1.2 Internal Quality Control (QC) Marking

1.2.1 Mine Action Organisations should use standard markers to indicate the location where internal QC has been conducted, particularly during manual mine clearance and battle area clearance operations. Short wooden posts or rocks may be use and the following is an example:

- a. **Blue/White Topped Post** – Used to mark the location of an internal QC has been conducted by the person directly responsible for monitoring deminers operating at the demining site, i.e. Team or Section Leader. Two markers may be required to mark the point where QC is started and finished.
- b. **Green/White Topped Post** – Used to mark the location of an internal QC has been conducted by the person directly responsible for managing the demining site,

i.e. Site Supervisor. Two markers may be required to mark the point where QC is started and finished.

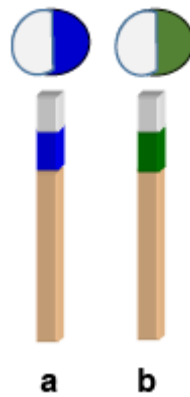


Figure 3: Example – Internal QC Marking Posts

- 1.2.2 Hazardous area marking tape (red or red/white) and red coloured cord may be used in conjunction with red topped wooden posts, to demarcate the Demining Area / Lane. Red cord is preferable for this purpose. Hazardous area marking tape and white or uncoloured cord may be used between white topped or unpainted posts.



Figure 4: Example - Hazardous Area Marking Tape (Photo provided by Doug Ware, UNMAS)

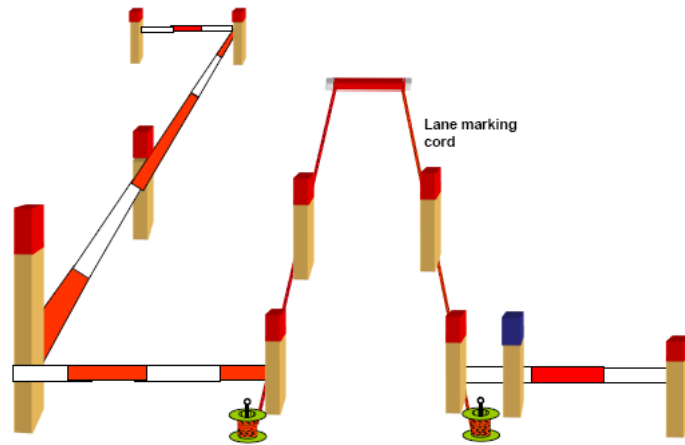


Figure 5: Example – Wooden Post, hazardous area marking tape and lane marking cord

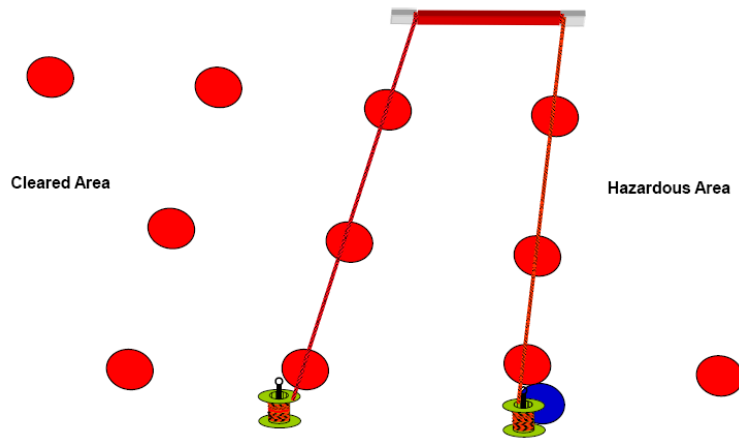


Figure 6: Example – Marking using red rocks

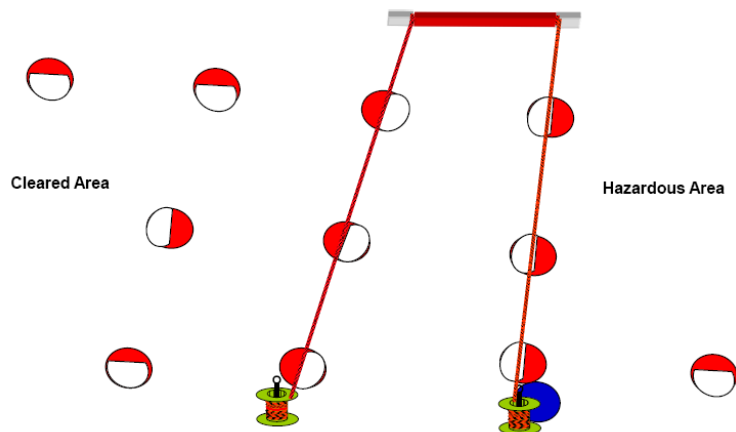


Figure 7: Example – Marking using red / white rocks

3. Marking for Closure of a Demining Lane

- 3.1 It may be necessary to close a demining lane to deter people from entering, i.e. after the location of a mine / ERW, trip wire, or post demining incident / accident. The lane shall be closed using one or a combination of the following:
- Two red topped wooden posts in the form of a cross positioned in the centre at the place where the lane is to be closed.
 - Three red topped wooden posts or red rocks positioned at the right side, centre and left side at the place where the lane is to be closed.
 - Improvised markers positioned as per points a. and b. above, which shall be replaced with temporary markers by the cessation of daily operations at the site.
 - Hazardous area marking tape or cord across the lane at the place where the lane is to be closed.

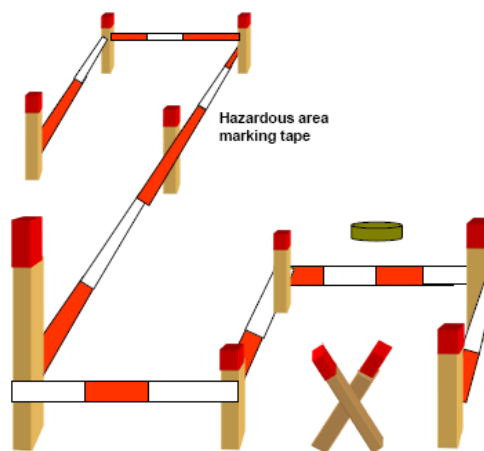


Figure 8: Example - Demining Lane Closure (e.g. located mine)

4. Improvised Marking

- Improvised markers for use during demining operations must be detailed in the Mine Action Organisation SOPs.
- When used to mark hazardous items and areas, improvised markers shall be replaced with temporary markers by the cessation of daily demining operations.
- The following are examples of improvised markers used in demining operations which **may** be used if authorised by the LibMAC:
 - Red coloured plastic cone (a minimum of 10cm x 10cm) during battle area clearance, on to mark the demining area / lane and located ERW.
 - Red painted wooden baton (a minimum of 20cm x 2cm x 2cm) during battle area clearance to mark the demining area / lane and located ERW. **Note:** This may also an effective 'emergency' marking system used if there is a requirement to clear a lane to a casualty in the event of a demining accident (mine clearance and battle area clearance).

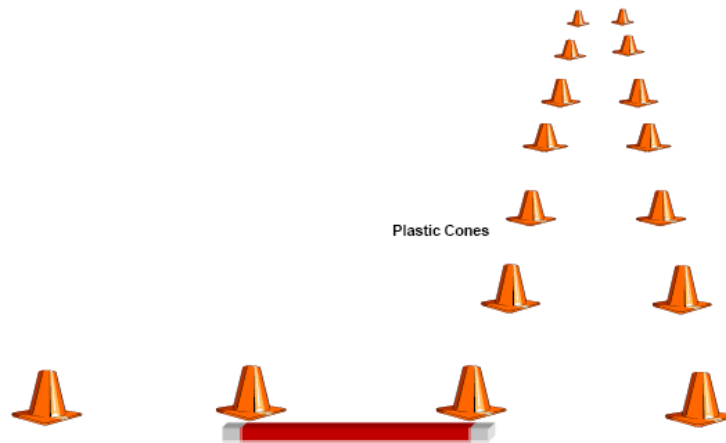


Figure 9: Example – Marking during battle area clearance using Plastic Cones

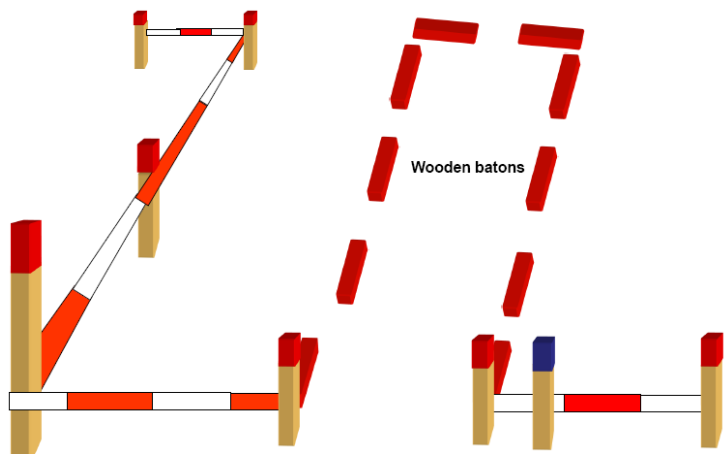


Figure 10: Example – Marking during battle area clearance using Wooden Batons



Figure 11: Example – Cones used to mark located ERW during surface battle area clearance

Figure 12: Example – Wooden (square) frame used to mark located ERW during surface battle area clearance

(Photos provided by Doug Ware, UNMAS)

4.4 The following are improvised markers **shall** be used in demining operations:

- a. Red painted wooden triangle (a minimum of 10cm in length on each side x 0.5cm depth) shall be used to mark that location of a mine / ERW, trip wires or suspicious objects during manual mine clearance and sub-surface battle area clearance.



Figure 13: Used to mark located mines, ERW, tripwires or suspicious objects
(Photo provided by Doug Ware, UNMAS)

4.5 The following are improvised markers **should** be used in demining operations:

- a. Red painted wooden sticks 'signal isolation markers' (a minimum of 10cm x 1cm x 1cm) shall be used to mark the extremities of a detector signal (3 sides – front, right, left). The right and left sticks indicate the minimum width required for an excavation trench when investigating the signal.
- b. Note: the Mine Action Organisation shall seek approval from the LibMAS to use alternative markers.



Figures 14 and 15: Example – Marking for detector signal isolation
(Photos provided by Doug Ware, UNMAS)

5. Base Stick

- 5.1 The Base Stick shall be used during manual mine clearance, and should be used during sub-surface battle area clearance when there is a requirement to use a detector to search a 1 metre wide Demining Lane. It may also be used for surface / instrument aided battle area clearance.
- 5.2 The primary purposes of the Base Stick is to demarcate the clear and unclear area, ensure that the 1 metre Demining Lane width is maintained and provide a clear indication of the minimum width and overlap (10 cm safety margin) when performing the detector search procedure. The general rule is that the area behind the Base Stick is clear (safe) and the area to the front is unclear (unsafe).
- 5.3 The standard Base Stick used for manual mine clearance operations shall be manufactured from wood and the dimensions should comply to the following:
- 5.4 Length = 1.2 metres, width = 2.5-10 cm, and depth = 1.5-3 cm.
- 5.5 The Base Stick shall be painted white at both ends (10cm) and red along the centre (1 metre). The red painted (1 metre) centre portion of the stick marks the correct lane width and the white (10cm) ends serve as a reminder to the deminers to overlap their clearance area into the adjoining lanes.

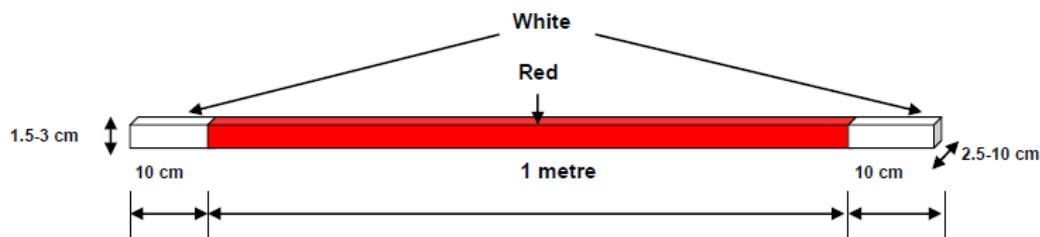


Figure 16: Base Stick - dimensions

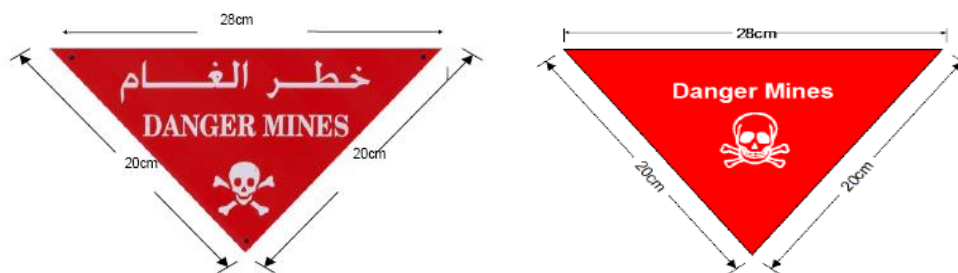
- 5.6 **NOTE:** During manual mine clearance operations, lane marking tape or cord shall be connected to the Base Stick to assist with maintaining the lane width, the direction and demarcation of the clear / uncleared area. The tape or cord shall be attached at the red 1 metre mark and not on the outside edge of the 1.2 metre base stick.



Figures 17 and 18: Example – Bobbins and cord attached to Base Stick
(Photos provided by Doug Ware, UNMAS)

6. Mine Warning Signs

- 6.1 The International triangular mine sign has been adopted as the recognised sign for a hazardous area in Lebanon. The minimum size of a mine warning sign is to be 20 cm x 20 cm x 28 cm. This minimum stipulated size of the mine sign ensures that it is clearly visible at a distance of at least 50 metres.
- 6.2 The background colour of the sign is red, which is an internationally recognised warning to "stop". The symbolism is white, so that it is clearly recognisable on its red background and discernible by both day and night.
- 6.3 The skull and cross-bones symbol is an internationally recognised symbol, warning of danger. It visually depicts death or serious injury and is easily identified. Mine warning signs should be printed in the Arabic and English languages with the word "MINES" printed in bold lettering, so as to be easily identified at a distance of at least 25 metres. The lettering should be in white, to contrast with the red background.
- 6.4 The unmarked side of the sign must face the inside of the minefield and the marked side must be visible from the outside of the minefield. The sign must be securely fastened to the minefield fence at intervals of no greater than 30m.



Figures 19 and 20: Mine Warning Signs - Triangle (28cm x 20cm x 20cm)

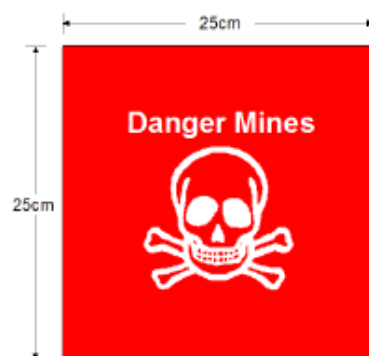


Figure 21: Mine Warning Signs - Square (25cm x 25cm)

7. Minefield Fencing

- 7.1 **Fencing** is the most effective barrier for mine / ERW areas that are in places of frequent or dense human and animal traffic. Fencing materials such as barbed wire are effective barriers to humans and animals. Coated or galvanized barbed wire will

usually endure the elements for a long period of time. Other types of materials, such as plastic rope, plastic tapes etc. are used only for expedient and temporary marking.

- 7.2 **Strands** for fencing are to be placed at heights which are easily visible, and which will not allow a child or an adult, or livestock to cross without specific effort. For example, one strand placed at 25 cm from the ground and one strand placed at 1.25 metres high would be adequate to cause a man to lift his feet or bend over to penetrate the fence. This action, coupled with the visual warning of painted posts and mine signs, gives ample warning to individuals.
- 7.3 **Pickets** are used to suspend fencing material and to hang or affix mine signs. Picket material can range from reinforced concrete to angle iron, and wood poles. The use of these types of materials may depend on their cost. Pickets must be designed for the soil type in which they will be placed. For example, clay type soils are capable of holding a picket in place with only a short portion of the picket below the surface of the ground, whereas sandy soil requires a much larger portion of the picket to be driven into the ground. The height of the picket must be calculated to permit suspension of mine signs at the appropriate height so as to be clearly visible, despite surrounding vegetation, the minimum height is 1.5 metres above ground level. The maximum distance between pickets is to be 15 metres.
- 7.4 **Fasteners** for fencing materials and mine signs must be a material that has equal or greater durability than the product it is fastening.
- 7.5 **Material** used for all aspects of mine marking must be durable enough to resist the deteriorating forces in their environment, and to conform with the length of time of their intended use. Minefield marking material must be such that it has no economical local use.

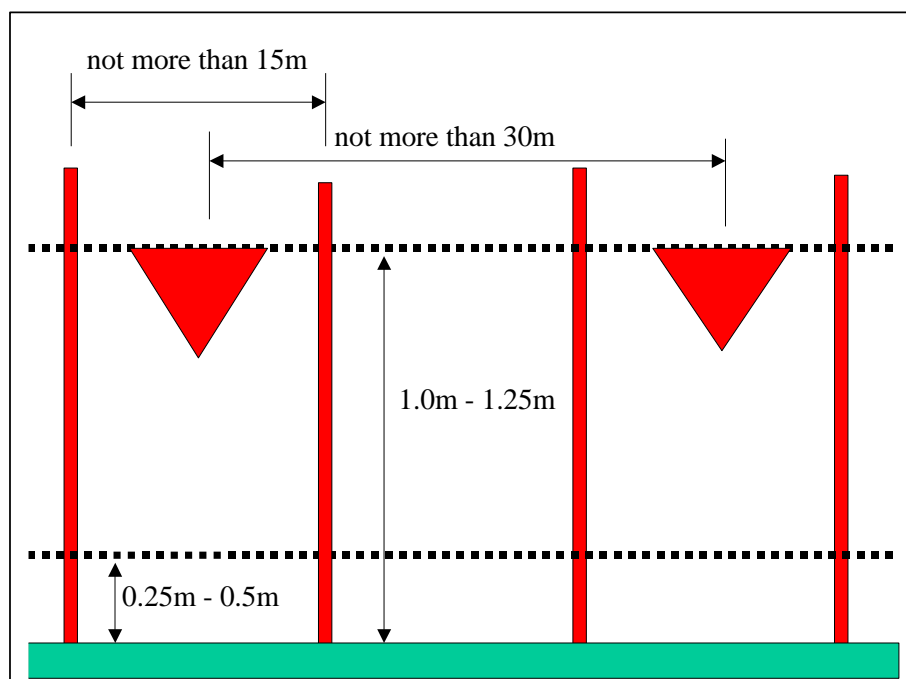


Figure 22: Minefield Fencing

8. Cluster Bomb Warning Sign

- 8.1 The cluster bomb warning sign should be used to demarcate areas which contain a cluster bomb hazard and should be positioned similarly to **Mine Warning Signs**.



Figure 23: Cluster Bomb Warning Sign

9. Marking on Completion of Demining Operations

- 9.1 The marking of a demining site on completion of operations shall be unambiguous and the boundary of all cleared areas shall be marked using permanent markers, unless the LibMAC authorises temporary markers.

10. Bench Mark

- 10.1 During survey and clearance a temporary BM may be used, i.e. marked large tree, or large rock, however on completion of a demining site a permanent BM shall be constructed as follows:
- White painted concrete pillar protruding a minimum of one metre above the ground, or a white painted concrete slab measuring 50 cm x 50cm x 20cm, set in the ground so that the top face is flush with the ground surface.
 - Three metal pickets (steel or iron) a minimum of 30cm long shall be inserted flush into the ground which should act as an anchorage, and as a means of detection should the Bench Mark be removed.
 - The following information shall be engraved on the Bench Mark, coloured red or blue:
 - Task ID (number).
 - Mine Action Organisation name and/or logo.
 - Grid Reference of Bench Mark.
 - The date completed may be included at the request of the LibMAC.
 - In circumstances where it is not practical to use a concrete slab, e.g. the likelihood that it shall be removed or if it is unsuitable for the terrain, then, the LibMAC may authorise an alternative fixed natural or manmade object for marking of the Bench Mark. The same information as detailed above shall however, be permanently recorded on the Bench Mark.

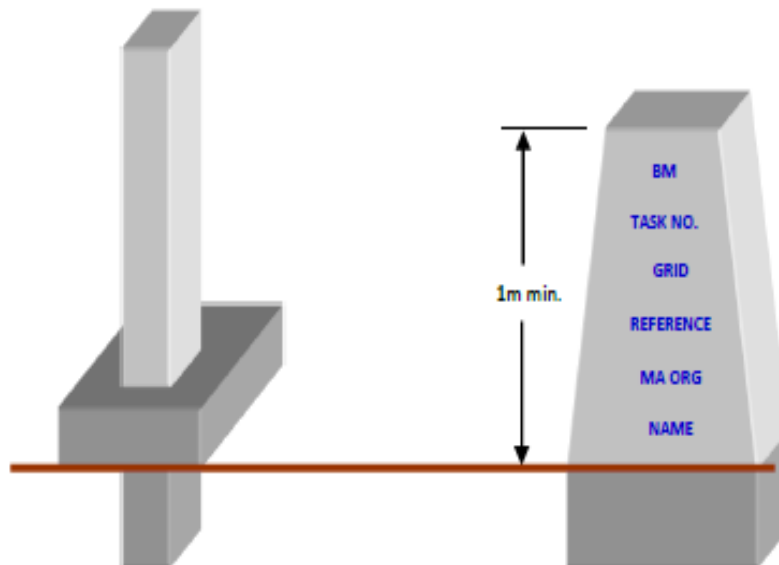


Figure 24: Bench Mark (concrete pillar)

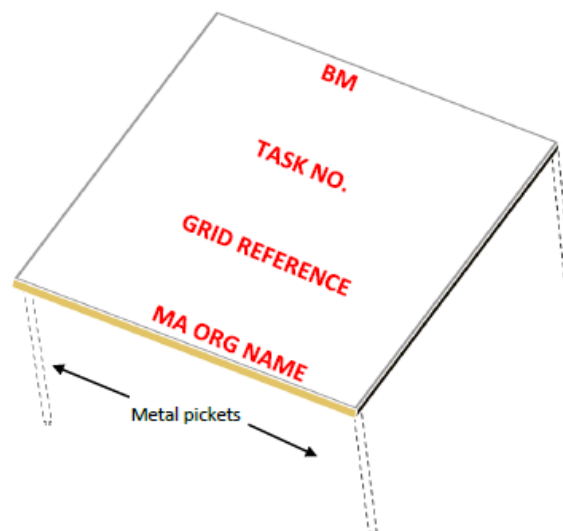


Figure 25: Bench Mark (concrete slab)

11. Completed Site Boundary Points

11.1 The Start Point (SP), each boundary Turning Point (TP) and Intermediate Point (IP) shall be marked as follows:

- a. With 1 x metal picket (steel or iron) a minimum of 20cm long driven into the ground

- (10 cm protruding painted **white**).
- b. Intermediate Points (IP) shall be marked when the distance between TP's is greater than 100 metres and if the view between TP's is obscured.
 - c. TP's and IP's shall be driven flush with the ground only after the external QA Completion has taken place.
 - d. In circumstances where it is not practical to use metal pickets, i.e. hard ground or the likelihood that the pickets will be removed, then the LibMAC may authorise for the an alternative marking system to be used, i.e. rocks.
 - e. The LibMAS may request that fencing is used, i.e. in circumstances where the completed task is bordered by a hazardous area and where there is a possibility of mines / ERW migrating into the cleared area due to ground movement.

12. Marking on Suspension of Demining Operations

- 12.1 Demining sites may be Suspended for variety of reasons, e.g. on completion of specific technical survey or clearance operations, pending the commencement of further operations, or in unforeseen circumstances such as adverse weather conditions, hostilities, accidents, and the termination of a Mine Action Organisation's Accreditation.
- 12.2 The marking of a demining site on suspension of operations shall be unambiguous and the boundary of all cleared areas shall be marked using temporary markers (i.e. wooden posts or rocks) or permanent markers (i.e. metal pickets), depending on the requirements of the LibMAC.

13. Suspended Site Boundary Points

- 13.1 The Start Point (SP), each boundary Turning Point (TP) and Intermediate Point (IP) shall be marked with temporary markers, for sites suspended for **less than 1 month**.
- 13.2 For sites suspended for **1 month or more** then the following shall be used, unless the LibMAS authorises an alternative marking system:
 - a. With 1 x metal picket (steel or iron) a minimum of 20cm long driven into the ground (10 cm protruding painted **red**).
 - b. Intermediate Points (IP) shall be marked when the distance between TP's is greater than 100 metres and if the view between TP's is obscured.
 - c. TP's and IP's shall not be driven flush unless otherwise authorised by the LibMAS, i.e. in circumstances where it is likely that they will be removed during the suspension period.
 - d. In circumstances where it is not practical to use metal pickets, i.e. hard ground or the likelihood that the pickets will be removed, then the LibMAC may authorise for the an alternative marking system to be used, i.e. rocks.
 - e. The LibMAS may request that fencing is used, i.e. in circumstances where the suspended task is bordered by a hazardous area and where there is a possibility of mines / ERW migrating into the cleared area due to ground movement.

14. Recording Marking of Demining Operations

13.3 All area marked during technical survey, suspension and completion shall be accurately mapped and recorded as a testimony to the operations conducted by the Mine Action Organisation.

13.4 Records of demining operations including site maps, shall be made available to the LibMAC for external monitoring and evaluation, and shall be included in the Task Dossier.

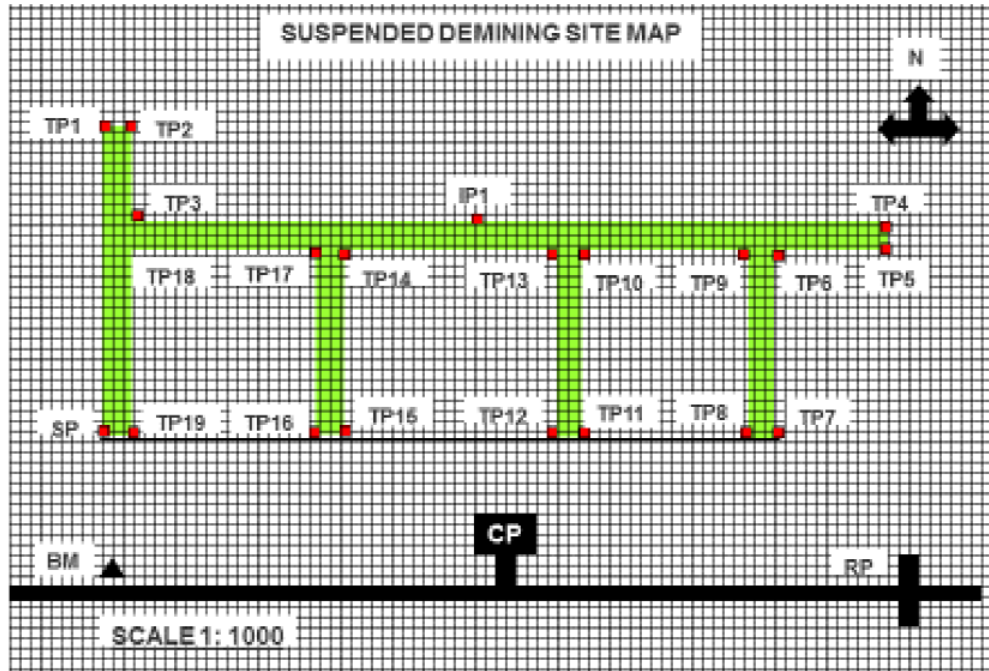


Figure 26: Example – Suspended Site Map

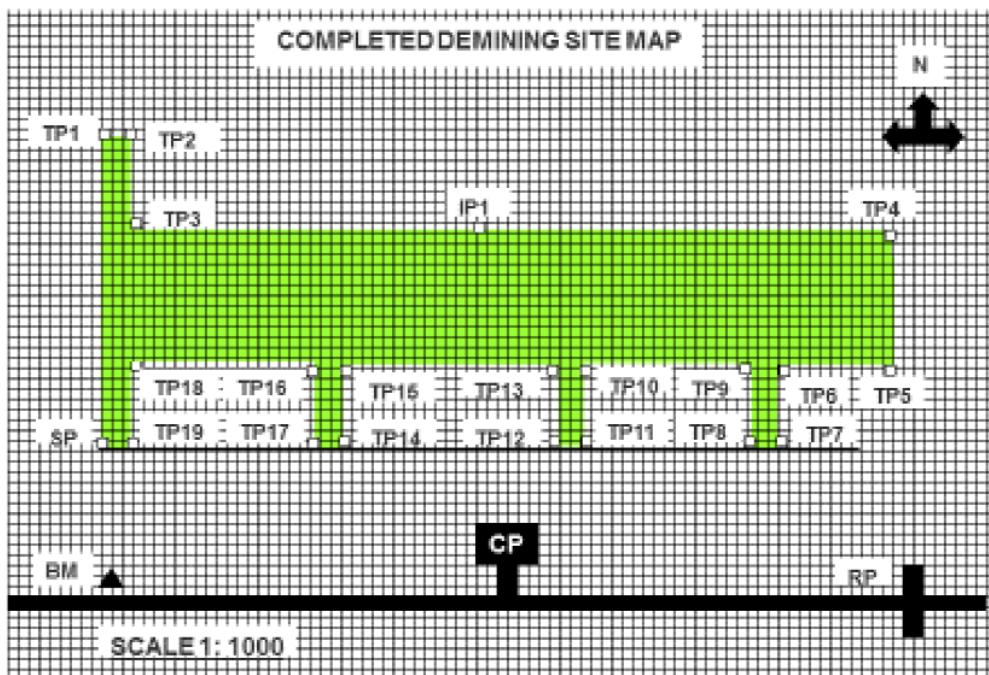


Figure 26: Example – Completed Site Map

15. General References

- a. International Mine Action Standards (IMAS), in particular, 10.20 Safety and Occupational Health – Demining Worksite Safety.
- b. LibMAS 10.20 Demining Worksite Safety.

16. Record of Amendments

Ser.	Date: D/M/Y	Standard	Section / Paragraph	Amended by: Name / Position / Org.	Comments
1	29/09/15	10.20/1 Demining Site Marking Systems	All	Doug Ware, Chief of Ops/QA, UNMAS	New Standard