SITE LAYOUT AND MARKING SYSTEMS

References

1. This document has been developed with reference to the following documents:

i. IMAS 10.20 Demining Worksite Safety
ii. IMAS 08.40 Marking of Hazards
iii. IMAS 10.20 Demining Worksite Safety

Scope

2. This chapter covers all mine / UXO clearance operations.

Objective

3. To ensure that all clearance and destructions are conducted on a safe and organised site.

Introduction

4. The design of mine and UXO hazard marking systems should take account local materials freely available in the contaminated area and the period for which the marking system will be in place.

5. It is generally accepted that materials used in marking systems should have little, if any, value or practical use for purposes other than mine and UXO hazard area marking. If material of any value is used, then it is likely to be removed.

6. This standard will concentrate on three broad areas:

i. Marking of Suspect Hazardous Areas

ii. Site preparation and Layout

iii. Marking System employed in clearance operations

Marking of Suspect Hazardous Areas

7. Mine/UXO area marking has been categorised into three levels, from which a variety of situations can be effectively addressed.

i. Emergency marking

ii. Semi-permanent fencing

iii. Permanent fencing.

8. Emergency marking: A suspect mine/UXO area is usually marked immediately to provide a visual warning of the presence of mine/UXO. This type of marking will, whenever possible, use the existing “mine” signs that clearly indicates the danger. Several different mine signs may be used (See Annex A for details). Emergency marking should be clearly recognisable from a distance of fifty metres, and be able to endure all the elements for six months. Local type mine/UXO marking, such as crossed sticks and stone piles, will always be recognised as a form of marking, people who do not have the resources to install a formal mine-marking boundary often install it.

9. Semi-permanent fencing is a more permanent and visual barrier surrounding a mine/UXO area. These signs should be visible from a distance of fifty metres and be visible sign-to-sign in heavily vegetated or undulating ground. The barrier must be in accordance with the specifications detailed in the section marking systems employed in clearance operations outline latter in this chapter. Semi-permanent marking should endure the elements for six months to one year.

10. Permanent fencing is normally preceded by Technical Survey and is for areas where it is not possible to conduct mine/UXO clearance operations in the immediate future. Permanent marking should be a physical and visual barrier to the movement of humans and livestock. It will consist of metal pickets, barbed wire and mine warning signs. This type of marking should endure the elements for one to five years.

SITE PREPARATION AND LAYOUT

11. The nature of the ground will determine the layout of any work site, however a consistent arrangement with correct marking will increase the safety of those involved in the mine clearance operation. The standardisation of all clearance marking systems is paramount; the following features are essential requirements for all mine/UXO clearance sites.

DESIGNATED AREAS

12. **Control Point:** A command post from which a commander can control the operation. The control point may also act as an administration and briefing area and is the point at which all visitors shall arrive. Ideally it should be on level, well-drained land and have vehicle access and preferably some shade. The location of the control point shall be be 100 metres without adequate protection.

13. **Clearance Lane:** This has also been known as a **Working Lane and is** the lane where clearance personnel are working. The clearance lane width is maintained using a base stick during clearance and shall be clearly marked along the edges with red topped posts or rocks at a minimum of 2 metres intervals and at all turning points.

14. The clearance lane shall be a minimum of 1 wide and a maximum of 5 metres in length before the width is increased to a minimum of 2 metres. Therefore, the maximum distance for a 1 metre wide clearance lane shall be 5 metres. To increase safety, it is recommended that clearance lanes are widened to 2 metres as soon as possible and it is **mandatory** that they are widened to a minimum of 2 metres in circumstances where personnel are required to traverse rocks, undulating ground and other obstacles which may cause additional difficulties when walking, lose of balance or contribute to them stepping into an uncleared area. **This must be made a priority**.

15. **Control lane:** There maybe a requirement to identify a route through a clear area to the worksite or control point/admin area. White or unpainted posts or stones may be used to mark this.

16. **Vehicle Park:** This should be close to the Control Point and large enough to accommodate the mine/UXO clearance organisation’s vehicles and visitor’s vehicles. It is situated a minimum of 100 metres from any mined area. All vehicles should be positioned in the park so they do not have to manoeuvre to depart in the event of an emergency.

17. **Stores and Equipment Area:** Where all equipment is securely stored. Usually part of, or adjacent to, the Control Point.

18. **Medical Area:** A static medical point, normally close to the control point. The medical area is to be occupied at all times during mine/UXO clearance operations, by a qualified medic. The medic is to ensure that the area is properly equipped at all times. The area should be flat, dry and shaded. The area may be combined with the control point or stores area but must be easily accessible from the minefield. The location of medical area is to be within 5 minutes of the furthest point of work in the mined area.

19. **Explosives Area:** When not in use all explosives shall be stored in a secure and marked explosives storage area. The explosive area must be sited between the non-operational area (control point/stores area etc.) and the minefield. This area will be a minimum of 50 metres away from other areas.

20. Exemptions from this minimum distance may be approved in cases where security is an issue; approval is to be requested from the NCDR. Explosives and accessories will be kept dry, shaded and separate from all other administration areas.

21. **Rest Areas:** Rest areas are to be used by deminers during their breaks.

22. Sufficient space should be allowed for resting, preparing / storing certain equipment, and other necessary reasons. The area should be dry and shaded if possible. The minimum distance from the rest area to the nearest operative in the minefield is used as the basis for the following calculations:

i. Personnel in rest area not wearing PPE when demining operations underway:

ii. Personnel in the rest area wearing PPE when demining operations underway:

iii. Personnel in rest area when no demining operations underway:

Note: The distance may also be reduced when there is adequate protection from blast and fragmentation between the rest area and minefield (E.g., hill). **In all circumstances, the rest area shall be located a minimum of 100 metres from uncleared areas.**

23. **Metal Collection Pit:** This should be marked and shall be located in a safe area and at a convenient distance from working deminers. All metal removed from the mined area including inert mines/UXO should be placed within the metal collection pit. Prior to completion or suspension of the task, the contents of the metal contamination pit shall be buried and marked or removed to another area for disposal.

24. **Latrine:** To prevent people inadvertently straying into mined areas, and for hygiene purposes, a latrine should be designated for each clearance area. Latrines should be located in the vicinity of the rest area and should be adequate for the number of personnel on the site.

25. **Demolition Area:** A location cleared for the disposal, by explosive demolition, of mines and unexploded ordnance.

26. **Sentry Points:** Sited at mine/UXO clearance sites when required, particularly on route, road and verge clearance tasks. It will have radio communications with the senior person on site.

SITE REFERENCE POINTS

27. **Reference Point:** A fixed point of reference outside the hazardous area. It should be an easily recognised feature (such as a building, cross-roads or a bridge) which is used to assist in navigating to one or more benchmarks. The Reference Point description, location and the safe route to the Bench Mark should be included in the survey report.

28. There maybe a requirement to identify Intermediate Points when the Reference Point is located at a vast distance from the Bench Mark, the terrain is featureless, there are a number of obstacles or multiple changes in direction along the route.

29. **Benchmark:** A fixed point of reference used to locate a marked and recorded hazard or hazardous area. It should normally be located a short distance outside the hazardous area.

30. **Benchmark Construction:** A benchmark may be a natural object or manmade and the following regulations shall apply:

i. It shall be enduring and when constructed, shall extend deep enough into the ground with a solid foundation to support the weight.

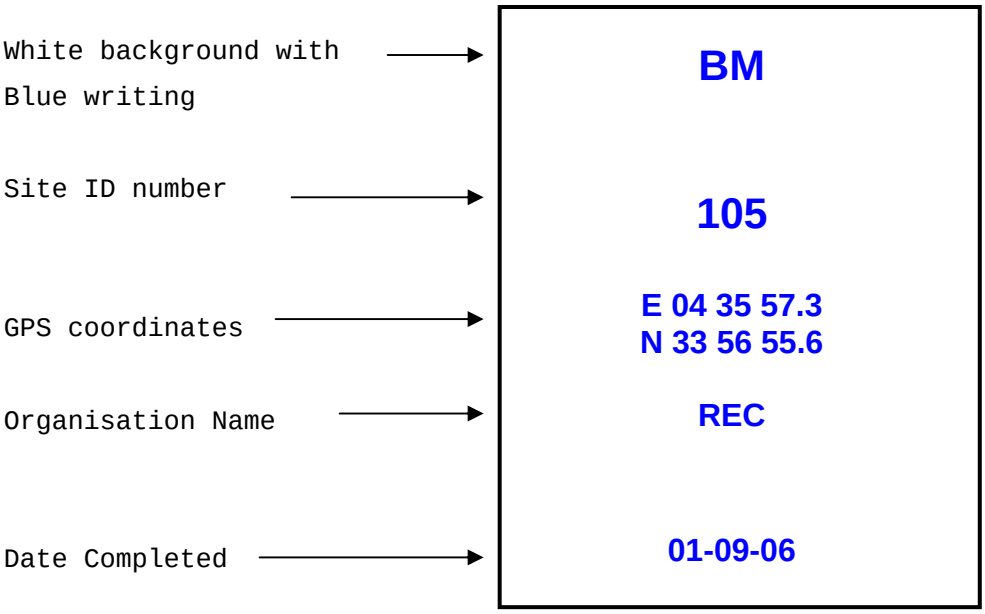
ii. It shall be clearly visible in normal daylight at a distance of 30 metres from a safe direction of approach.

iii. The Bench Mark description and its direction from the Reference Point shall be recorded.

iv. A metal picket or similar shall be driven flush with the ground at the base of the benchmark.

v. It shall be marked with a distinctive White background with the necessary information written in Blue.

Figure 1 Benchmark Information



31. **Start Point:** This is also known as a Datum Point, it is a clearly identifiable fixed marker and the point where clearance begins. All minefield measurements are taken from the Start Point and depending on the location of cleared mines / UXO, it may be decided to position additional Start Points for ease of mapping during or on completion of clearance. The initial Start Point should be clearly visible from the Bench Mark otherwise Intermediate Points shall be located for ease of navigation.

32. **Mine/UXO**: When a mine/UXO is not dealt with immediately upon being located, it shall be marked by placing a mine marker a minimum of 100 mm before it. The clearance lane will then be closed off and a new lane commenced. Before the end of the working day these mines/UXO are to be destroyed unless prior approval has been granted from the NCDR. Alternately, the mine may be dealt with in situ and clearance in this lane may then continue.

33. The table below shows minimum distances to be employed between personnel in a minefield clearance area. *Any reduction to these distances must be authorised by the NCDR.*

MINIMUM DISTANCES FOR A MINE CLEARANCE WORK SITE			
Serial	**Situation**	**Minimum Safety Distance**	**Remarks**
(a)	**(b)**	**(c)**	**(d)**
1.	Working Personnel in adjacent lanes on blast Anti personnel mines.	25 metres*	
2.	Working Personnel in adjacent lanes on Anti tank	50 metres	
3.	Explosive storage point and mined area.	50 metres	
4.	Vehicle park and mined area.	100 metres	
5.	Briefing area and dangerous area.	100 metres	
**** In any instances where the risk of fragmentation is low clearance organisations may in consultation reduce this distance to 15m***			

Table 1: Minimum Distance for a Mine Clearance Site

Demolition Safety Distance

34. Safety distances for typical items are:

Type of Ordnance	***Item on the surface without protection***
Detonators	25
AP Mines	100
AP mine Fragmentation/Bounding/Directional	300
AT Mines (blast)	300
AT Mines (shaped charge)	1800
Off Route mine	1000
Mortar up to 82mm	300
Shell up to 80mm	300

Shell up to 160 mm	800
Shell above 160mm	1000
Mortar 82-120mm	800
AT Rocket up to 88mm	500
Hand/Rifle Grenade	300

Table 2: Demolition Safety Distances

35. Any item over 155mm diameter shall be destroyed by an EOD team

MARKING TO BE USED DURING CLEARANCE OPERATIONS

36. Demining organisations shall develop and utilize a temporary marking system for use in clearance operations. Apart from the need to delineate the boundary of the hazard area as set out above, this temporary marking should allow all persons moving around the site to identify, as a minimum:

i. The location of mines or UXO discovered during the clearance process, in order to help managers identify any pattern in the minefield

ii. Areas that have been cleared that day by deminers, in order to allow managers to monitor progress and productivity

iii. Areas that have been quality control (QC) checked. This may include a system to differentiate between different levels of quality control such as section commander, site manager, etc.

Note: The area between the last QC marker and any accident site shall be considered uncleared for the purposes of casualty evacuation and accident investigation.

37. Where stones are used they shall be of a size and colour combination to make them stand out from the background – this is especially important for black, white and yellow painted stones.

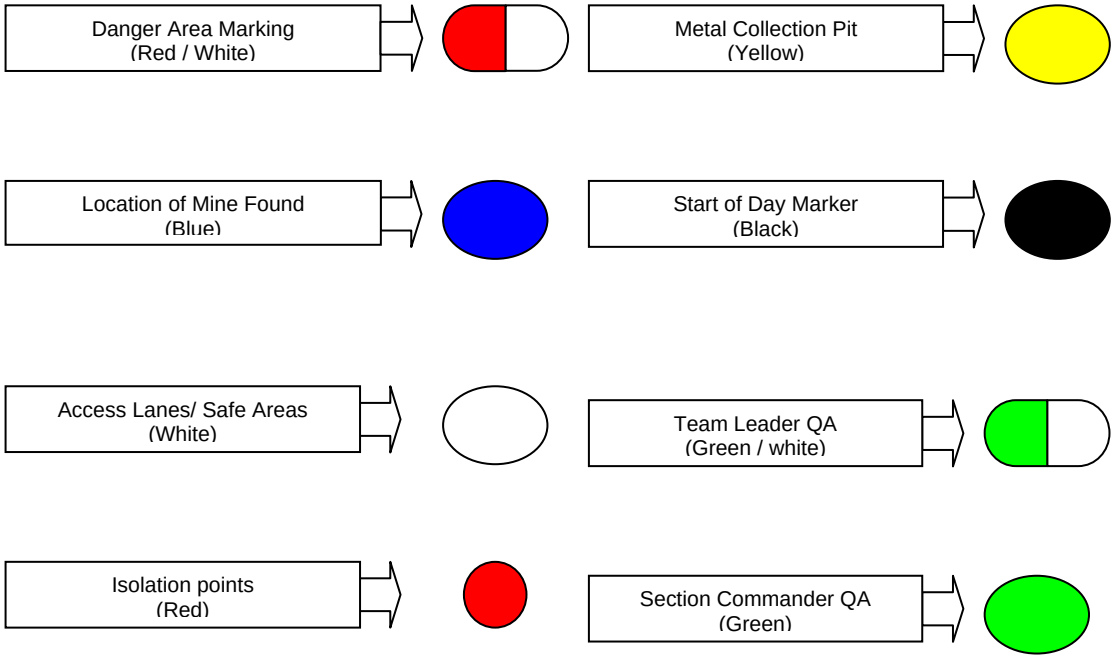


Figure 2: Marking system using coloured stones or pickets

Annexes:

Annex A: Hazard signs - minefield and mined areas

Annex A to Chapter 6

Hazard signs - minefield and mined areas

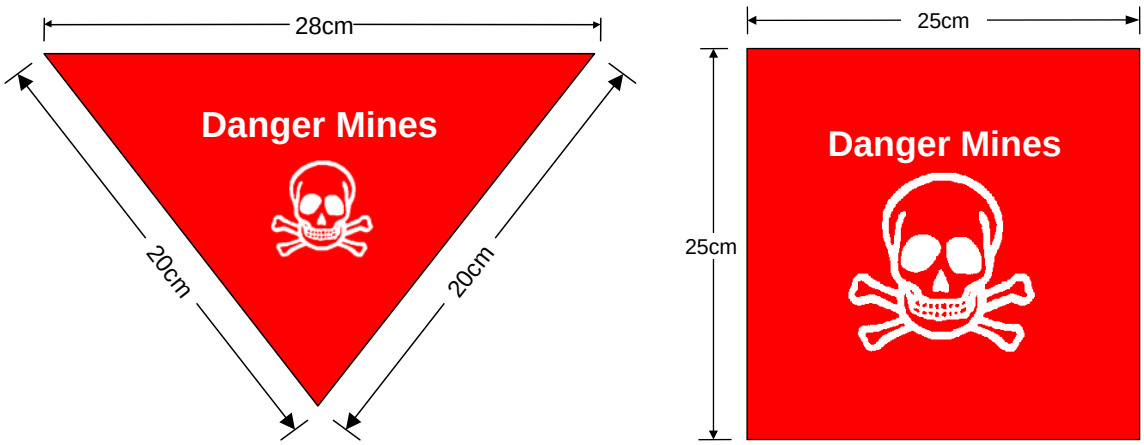


Figure 1: Hazard sign

Notes:

Flexibility in the design and layout of hazard signs is permissible in accordance with the direction given in the remainder of these notes.

The sign should have a red or orange background with a white symbol for danger. The universal symbol for danger is the skull and crossbones

The words ‘Danger Mines’ (or ‘Danger UXO’ depending on the predominant hazard) should appear on the sign in Arabica (and where possible English).

The rear surface of the sign should be white.

Dimensions should not be less than indicated on the diagram.