AMAS 06.01

Third Edition
March 2011

Mine Clearance Techniques

Mine Action Coordination Centre of Afghanistan (MACCA)
Post Box : 520 Kabul – Afghanistan
Website: www.macca.org.af

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Mine Clearance Techniques

1. Introduction

Mine/ERW clearance techniques used during each project may differ according to vegetation, soil content and type of mine/ERW.

2. Scope

This AMAS provides standard guidance on conducting the basic mine clearance drills and techniques e.g. using metal detector, trip wire feeler and action on locating a mine/ERW.

3. Stages of Mine Clearance Operations

Generally the followings stages should occur during mine clearance operations:

a) Visually and manually inspect the area in front of the Base Stick for tripwires, ERW, surface-laid mines, protruding fuses or suspicious objects

b) Using a tripwire feeler to search for tripwires if the minefield is covered by vegetation.

c) Clear vegetation as required, using a small pruning tool or garden shears.

d) Carry out controlled sweeps with a metal detector over the entire width of the clearance lane

4. Detection of Tripwires

If the vegetation permits, a tripwire feeler shall be used to locate tripwires. This should be made from light-gauge wire and fabricated in such a way to allow the detection of both loose and tight wires. If the vegetation does not allow the use of a tripwire feeler, the search shall be completed by using the eyes and hands. After a thorough visual check, the area shall be searched by slowly moving the hands forward, gently parting any thick vegetation that may obscure tripwires.

5. Clearance of Vegetation

The clearance of vegetation shall be done in a safe, controlled method, avoiding any disturbance of vegetation outside the width of the lane.

Site-specific vegetation cutting procedures can be authorized by the MACCA/AMAC depending on the threat assessment for that site and the type of vegetation. The cutting procedure shall be mentioned in the clearance plan.

6. Use of the Metal Detector

Before commencing the sweep of the area, the metal detector shall be assembled to ensure that it is fully functional, checked, balanced and its sensitivity adjusted to the target specified.

The sensitivity of the metal detector shall be checked at least once every **ten minutes**. Details of detector calibration from the manufactures shall be included in the organizations SOPs.

7. Base Sticks

Base Sticks shall be 1.2-metre long wooden rods, painted white at each end (100 millimetres) and red over the centre. These sticks are used by deminers to mark the boundary between the

cleared/unclear areas as the deminer is working. The rule is that the area behind the stick is safe (cleared of mines), and in front of the stick, it is unsafe (not cleared of mines). The middle 1 metre part of the stick marks the correct lane width. The white ends (100 millimetres each) serve as a reminder to the deminers to overlap their clearance area into the adjoining lanes.

8. Use of Dual Sensor Detectors

Dual sensor detectors such as the HSTAMIDS, which combines metal detection with ground penetrating radar (GPR), offer the operator an ability to distinguish between “possible mines” and “metal clutter.” “Possible mine” calls receive positive indications from both sensors, the metal detector and GPR, while “metal clutter” calls receive a positive indication from the metal detector only. This can provide significant productivity gains when deployed with SOPs which allow for lane preparation and the quick excavation of “metal clutter” calls.

The dual sensor detector provides a productivity gain by reducing the amount of time spent on signal excavation or full excavation. Accordingly the detector gets its biggest return when used in areas of high metal contamination. Methods of deployment shall depend largely on the types of targets. Dual sensor detectors may be used as stand-alone systems or in conjunction with other detectors.

A comprehensive and unambiguous marking system shall be used in clearance operations utilising dual sensor detectors. This system shall be detailed in an organisation SOPs.

Stand alone detection of AT mines only or AT/ERW only: Where the threat is assessed to be AT only or AT/ERW only, after having physically surveyed the area, it may be acceptable to walk on the un-cleared ground to prepare lanes ahead of detector deployment. Lanes may be laid out and vegetation cut. This means that the detector operator is not losing time through repeatedly picking up and putting down tools as he advances down the lane. All signals found should be isolated and called as either “possible mine” or “metal clutter”. Once the lane is completed the “possible mine” calls should be investigated using normal signal investigation drills. The deminer should then go back and deal with the “metal clutter” calls using a quicker excavation process. Lanes may be left metal free or “metal clutter” signals may be left beyond the national standard depth or assessed threat depth, whichever is the greater. The person doing the signal investigation is not necessarily the one who operated the detector and made the initial calls.

Stand alone detection of AP mines only: Where the threat is AP mines it shall not be possible to walk on the un-cleared ground to prepare the lanes. Operators may consider working the lane side-on, as per short-leash MDD drills, or straight ahead as per normal manual demining drills. The side-on approach does allow some lane preparation from safe ground and is generally more productive approach. Whichever method is selected, the operational concept remains the same. In the first detector sweep signals are marked for “possible mine” or “metal clutter.” “Possible mines” shall be investigated first using normal signal investigation drills. “Metal clutter” calls shall be investigated next using a quicker drill. Lanes may be left metal free or “metal clutter” signals may be left beyond the national standard depth or assessed threat depth, whichever is the greater. The person doing the signal investigation is not necessarily the one who operated the detector and made the initial calls.

Composite drills: There may be occasions when it is decided that better results are achieved through the use of another detection system. An example is the detection of minimum metal AT mines at depths below the metal detector capability of the dual-sensor detector. A more sensitive detector shall be used on the first pass to identify and isolate all signals. The dual-sensor shall then simply check each signal found and calls “possible mine,” “metal clutter” or “undetected.” The “possible mine” and “metal clutter” calls shall be investigated as described in the paragraphs above. In the case of an area with AT mines only or AT/ERW only, then shallow excavations may be made above the “undetected” calls until the detector is able to make its discriminatory call. In very hard soil conditions this will still save time and improve productivity.

Quality Assurance considerations during task planning: If the clearance process is selected that leaves lanes metal-free then the QA process shall simply check that the lane is metal-free immediately after the lane has been completed. If the process is for metal to be left behind from "metal clutter" calls (e.g. after excavation to the national standard or maximum perceived threat depth, whichever is the greater), the organisation shall confirm the QA procedures with the MACCA. If full excavation to an agreed depth would be acceptable then there is no reason why signals left below that depth should prevent the lane from being declared clear during QA.

9. Depth of Clearance

The depth of clearance shall be determined by the clearance organization in consultation with MACCA area office (AMAC) and should be developed through the use of non-technical and technical surveys, or from other reliable information. Otherwise, the minimum clearance depth shall not be less than 13 cm for anti-personnel and 20 cm for anti-tank mines from the original ground surface.

10. Prodding and Excavation

Once an accurate signal point has been established with the metal detector, the prodder or hand-trowel is used to identify the cause of the signal through prodding or excavation. Prodding shall start a safe distance before the reading using an angle of less than 30 degrees ensuring that the entire width of the signal is covered. The distance between prodding shall be no more than the width of the smallest mine found in country. Depth of each prod should be to the same level and where necessary the ground should be removed and a second deeper prod should be used to ensure the full search depth has been achieved. Where hard ground is encountered water may be used to soften the ground before prodding.

11. Use of the Trowel (Excavation or Sapping)

After the location and size of the mine or metal object has been established, the hand-trowel is used to excavate the soil to reveal its identity. Any excavation should ensure the required depth is achieved and no downwards pressure is applied.

If an object is not located after using the prodder, the cause of the metal detector signal may be either a deeply buried mine or small metal object (bullet. fragment etc.) The hand-trowel should still be used to remove the soil and locate the metal object. The maximum depth of excavation shall be decided by the team leader in consideration of hazard encountered and the land use. The minimum depth of excavation is 13cm in AP mines and 20cm in AT mines. The amount of excavation shall be kept to a minimum and should only be sufficient to identify the item being excavated.

12. Missing Mine Procedures

In a number of instances there will be occasions where mines will be found to be missing from the established pattern during the clearance of the mine rows. This may be due to a number of reasons: removal by local people, migration due to weather, burial due to subsidence of soil, detonation and burning. In all these cases the area where the mines were shall be searched to confirm and ensure that no mines have been left.

It is the responsibility of the Site Supervisor or the Team Leader to establish the cause of these missing mines during either the initial survey of the minefield or during the clearance phase.

13. High Metallic Areas

In areas where the metallic content of the soil is high, the metal detector may be ineffective. The detector procedure shall then be removed from the mine clearance sequence and replaced with a complete prodding and excavating procedure to a minimum depth stated in section 10 from the natural ground level.

14. Mountainous Rocky Terrain with Loose Rock Areas

In areas where the ground is mountainous and rocky and the metal detector drill cannot be used, prodding and excavating drills shall be used. The Team Leader/Supervisor shall make an appraisal regarding the approach and clearance methods used for each particular site and hazard encountered.

15. Clearance of Obstacles

In areas with obstacles that contain a threat of mines or UXO, a procedure for clearing obstacles shall be used. The following are considered as potential obstacles:

b) Former trenches in defensive positions

c) Any ditches in mined areas

d) Fortified wire entanglements

e) Abandoned vehicles

During the clearance of minefields, obstacles shall be identified and special clearance drills shall be adopted. Obstacles should ideally be cleared 360 degrees around or along its axis on both sides.

16. Burning

Unclear areas may be burnt prior to mine/ERW clearance, at the discretion of the supervisor and in co-ordination with local authorities, to increase visibility for the deminers and increase mine/ERW clearance rates and safety. However, team leaders/supervisors shall exercise good judgment, as burning unclear areas may cause damage to neighboring agricultural land, or alter the stability of unexploded ordnance. A minimum wait time of one day (24 hours) should elapse between burning an area and manual mine/ERW clearance taking place on it. In all cases, a suitable firebreak should be constructed and AMAC and local services (if available) shall be informed, during the burning operation. A minimum wait time of four (4) days shall elapse between burning an area and MDD clearance taking place. The authorization shall be taken from the AMAC.

17. Working Hours

No deminer should work for longer than 60 minutes before taking a break. The working time may change depending on the climate (heat, cold and rain) and the vegetation. The working time is subject to the Team leader/Supervisors judgment in each situation.

A normal working day for a deminer should not exceed 9 hours including traveling time to and from sites with a minimum of 5 hours actual working excluding the rest period within the minefield. During hot and cold weather and if it is felt uncomfortable to undertake demining, the operation should cease or only be undertaken in short sequences with frequent breaks.

18. Deminer's Equipment

The minimum equipments that should be provided to each deminer for the conduct of manual clearance include:

a) Metal Detector

b) Excavation tool

c) Prodding tool

d) Tripwire feeler

e) Saw type vegetation cutting tool.

f) Shears type vegetation-cutting tool

g) Wire cutters

h) A stiff brush

i) Tools and materials for the cleaning and maintenance of hand tools.

j) A base stick.

k) A bag suitable for carrying the tools, less the metal detector.

l) PPE and protective clothing. Individual deminers shall have their own PPE.

m) A bag for the collection of scrap metal

n) A small Pick

o) Working Gloves

p) Tarpaulin

q) Mine Markers

The equipments issued to deminers shall be checked and approved by the MACCA. During the accreditation process, the demining organizations shall not change the type or quality of deminers' equipments without the approval of the MACCA.

19. Briefing Boards and Maps

Briefing boards and site maps should be maintained for all static demining worksite. Briefing boards and maps should include the following information as a minimum:

a) Sketch map of the site showing:

   i. Perimeter of the hazardous area

   ii. Key topographical features.

   iii. Locations of marking systems

iv. Cleared and unclear areas; these may be further defined by areas cleared during technical survey or by MDD or mechanical assets.

v. Clearance lanes in progress.

vi. Locations of mines or ERW located to date.

vii. North Indicator and legend.

b) Dates work started, days worked and expected completion date.

c) Date of last demining accident plan practice (Causality Evacuation Drill).

d) Progress to date in terms of area cleared in relation to the area to be cleared, and mines and ERW located and disposed off.

Annex – A Example of Site and Safety Brief

Site Brief

Below is an example of what may be included in a site brief, which are normally given to visitors in demining worksites:

a) History of the site including who laid the mines, effect on local communities and any accidents to people or livestock.

b) Clearance plan for the site including what areas to be cleared, what kind of asset to be used, work timeframe and any problem and constraints.

c) History of clearance on the site to date including days worked, area cleared, mines/ERW removed, problem encountered and expected completion date.

d) End user of the cleared land.

e) Site layout including site marking system, cleared and unclear areas, admin area, parking, location of site medic, latrine, rest area and other control areas.

Safety Brief

The following is an example of the details that may be included in a safety brief:

During the visit of a live mined area, the visitor (s) shall comply with the following rules:

a) Obey all instructions given to them by team leader or any appointed person;

b) Remain with escort at all times and not permitted to move around the site;

c) Only walk in the areas indicated by team leader or appointed person;

d) Not touch or pick up any items on the ground;

e) No Smoking during the visit inside the minefield; it is only permitted in the rest area as previously indicated;

f) In the event of an accident or incident follow the instructions of team leader or appointed person and remain calm.

g) Before leaving the control point towards the mined area, shall wear PPE.

h) Turn off portable telephones or radios;

i) The deminers may be required by safety rules to stop work while the visitors are within safety distance;

j) Attempt to keep the time on the site to minimum and ask questions or carry out any discussion after moving off the site;

k) Not to move back and forth, while taking photo;

l) Keep a distance of 5 meters between two persons; and

m) Not to go beyond the cleared area.