

LibMAS 09.11

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BATTLE AREA CLEARANCE

Responsible National entity:

Libyan Mine Action Centre (LibMAC)
mandated by the Ministry of Defence (MOD)
Contact: LibMAC Deputy Director
quality.assurance@lmac.gov.ly



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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* Refer to LibMAS 09.10 Manual Mine Clearance (including 'Clearance of Vegetation')

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.

In this LibMAS, the term “Battle area” refers to an area in which ERW including UXO and AXO have been found. This may include former battle areas, defensive positions and sites where air delivered or artillery munitions have been left, fired or dropped.

1. Introduction

- 1.1 Battle Area Clearance is the systematic and controlled clearance of hazardous areas where the hazards are known not to include mines.
- 1.2 Battle area clearance may be conducted using surface and subsurface clearance procedures, concurrently or independently depending on requirements.
- 1.3 Depending on the risk assessment, there may not be a requirement to conduct sub-surface clearance following surface clearance.
- 1.4 Battle area clearance is not normally conducted in areas suspected or confirmed to contain mines, however the LibMAC may authorise Mine Action Organisations to use approved sub-surface battle area clearance procedures in areas where it is a confirmed threat of anti-tank mines however **no** anti-personnel mines, based on a pertinent risk assessment. This shall be considered as **mine clearance** and shall be detailed in the site implementation plan (IP).
- 1.5 For the purpose of this standard, the abbreviation **BAC** shall be used to describe surface clearance and **BACS** sub-surface clearance.
- 1.6 For the purpose of this standard, the term "Battle area" refers to an area in which ERW including UXO and AXO have been found. This may include former battle areas, defensive positions and sites where air delivered or artillery munitions have been left, fired or dropped.
- 1.7 For the purpose of this standard, the words 'UXO' and 'ERW' are interchangeable and used to describe the same thing, ERW includes AXO. A 'mine' is not considered to be a UXO or ERW.

2. General Principle

- 2.1 Clearance of former battle areas differs from mine clearance but should still be conducted in a planned and systematic way to ensure safety.
- 2.2 BAC is the systematic search and clearance of ERW from the ground surface (including partially buried ERW), in areas not suspected or confirmed to contain mines. When conducting BAC in buildings, the total BAC area recorded and reported shall include all floors searched/cleared.
- 2.3 BACS is the systematic clearance of ERW from beneath the ground, and based on a pertinent risk assessment and on authorisation from the LibMAC, BACS may be conducted in anti-tank mine areas, where it is confirmed that there are **no** anti-personnel mines. This shall be considered as mine clearance using approved BACS procedures.
- 2.4 BACS is not permitted in anti-personnel mine areas as it may involve personnel walking over uncleared ground and due to the nature of the device (small, often with minimum metal), manual mine clearance procedures are more appropriate with regards to the marking and search process.
- 2.5 When utilising BACS procedures in anti-tank mine areas the safety requirements shall be in accordance with a manual mine clearance site (reference LibMAS 10.20 Table 1).
- 2.6 BACS is especially useful in Libya because not only is there recent contamination resulting from the liberation struggle in 2011, there is also extensive ERW contamination from WW2 combat (legacy battlefields). The number of ERW in Libya cannot be estimated, but far exceeds the number of mines. It is recognised that in all combat more

than 10% of all the munitions fired will fail to detonate and become Unexploded Ordnance (UXO). In 2011 and in WW2, there was extensive fighting in parts of Libya for many months and mortars, artillery and large aerial bombs were used. Prior to survey and/or BAC it is reasonable to presume that at least 10% of these remain. Additionally, there is extensive contamination from ammunition that has been scattered after attacks on storage areas or munitions in transit, sometimes scattering munitions over a very wide area.

- 2.7 The danger presented by failed munitions varies according to the munition type and its release, firing or arming system. Munitions must not be moved for demolition unless the type can be identified and its condition gives full confidence that it can be moved safely.
- 2.8 Damaged or undamaged munitions that are still in Ammunition Storage Areas (ASAs), or within their outer perimeters, are not covered by this Standard. They are the responsibility of the Libyan Ministry of Defence and a Technical Guideline for ASAs will be issued to those tasked to make these areas safe.
- 2.9 As with all demining procedures, the beneficiaries of land released after BAC and BACS must be confident that the cleared land is safe for them to use. The local community should receive regular explanations during the BAC or BACS operation because this can be an effective confidence building measure.

3. BAC and BACS requirements in Libya

- 3.1 Depending on the manner of conflict and the weapons known to be used, it may be appropriate to conduct BAC as a stand-alone procedure in many areas contaminated during Libya's 2011 conflict. When the munitions used would not have penetrated the ground or when the contamination is believed to comprise AXO, subsurface search may not be needed and BAC alone should be conducted. During BAC, if there is any reason to suspect that there may be munitions beneath the ground surface or under rubble, the suspect area(s) should be reported and scheduled for BACS to be conducted before being released.
- 3.2 Generally, BAC should not be conducted over WW2 battle areas in Libya except as preparation for BACS. This is because it is very unlikely that all the ERW in any area will be on the ground surface, even if they were on the surface more than 60 years ago. The precise extent of many WW2 battle areas is uncertain and fighting positions were subjected to heavy bombardment that will have buried some items that were originally on the surface. Other munitions will have penetrated the ground surface before failing to detonate. As well as the ERW, mines were used very extensively and although extensive records of mine laying are available, those records are incomplete.
- 3.3 When a Mine Action Organisation wants to conduct BAC in a WW2 contaminated area without then conducting BACS in the same area, it must apply to LibMAC for permission to do, providing convincing reasons why BAC should be preferred to BACS.

4. Battle Area Clearance definition

- 4.1 Battle Area Clearance is the removal and/or destruction of all ERW hazards in a suspected hazardous area to a specified depth. This is achieved by:
 - Using Mine Action Organisations with LibMAC Operational Accreditation of their battle area clearance procedures and with staff that have appropriate levels of EOD competence;
 - Quality Assurance monitoring of the Mine Action Organisation (see LibMAS 07.40 Quality Assurance and Quality Control); and
 - Conducting a process of post-demining inspection of processed land when

necessary.

- 4.2 A battle area clearance task order should specify the area to be cleared, the detection target size, the clearance depth, and the requirements for Quality Assurance and Quality Control and post-demining inspection.
- 4.3 As work progresses, all battle debris that could lead a person to believe that the area was hazardous must be collected and removed or buried (in location approved by the LibMAC) before the Mine Action Organisation leaves the worksite. No land can be released to the end-user until this has been done.

5. ERW located during Battle Area Clearance

- 5.1 Battle Area Clearance involves searching the ground for metal objects of a significant size. These are then exposed and either collected or prepared for demolition in-situ. ERW found during battle area clearance operations can include:
 - a. Munitions in former military positions and temporary ammunition storage locations, or munitions dropped or abandoned that have not been prepared for use;
 - b. Munitions that have been primed, fuzed, armed or otherwise prepared for use but have not been fired, for example, munitions in former defensive positions;
 - c. Munitions that have been fired, dropped, launched or projected but which have failed to detonate. This includes hazardous parts of ERW that has only partially functioned; and
 - d. Booby traps and Improvised Explosive Devices (IEDs). **Note:** if suspected then a risk assessment must be conducted and clearance only by appropriated accredited personnel.
 - e. Metal-cased anti-tank mines used in former conflict may also be found.
- 5.2 If there is evidence of mines during battle area clearance then operations at the site must immediate cease, pending a pertinent risk assessment, which may culminate in a requirement for a change to mine clearance. This shall be detailed in the site implementation plan (IP). Refer to Annex D Mine Find During Battle Area Clearance.

6. Depth of Search

- 6.1 The depth requirements for BACS should be varied to suit the anticipated ERW contamination in an area. The method of detection used will depend on the depth required. For example, in areas where a 30cm deep search for devices the size of grenades or bigger is required, some conventional metal detectors may be appropriate to use.
- 6.2 In areas where the search is for large aircraft bombs that may be up to three metres below ground, electromagnetic and magnetometer detectors which may have the ability to search deeper, may be required.
- 6.3 Because most deep search detectors are not effective at shallow depths, deep search should follow a shallower search of the same area using a detector appropriate for shallow search.
- 6.4 The Mine Action Organisation must demonstrate at the site, or in similar conditions, that the detection equipment they will use is capable of locating the targets that are anticipated.
- 6.5 The Mine Action Organisation must keep accurate records of the search procedures and equipment used, the munitions found and their individual locations.

7. Detection Equipment

- 7.1 Battle Area Clearance search procedures in Libya shall usually involve the use of hand-held metal detectors, UXO detectors (electromagnetic and magnetometers) and or vehicle-mounted detectors.
- 7.2 For details about proven detection technology refer to the Metal Detector Handbook for Humanitarian Demining published by the European Commission in 2003:
<http://www.nolandmines.com/detector%20handbook.htm>
- 7.3 For additional information pertaining to the types and testing of Detectors refer to LibMAS 03.40/1 Detectors.

8. Assessment on Clearance Depth

- 8.1 The depth of search may need to be increased as work progresses. If devices are found at the required search depth or deeper, the Mine Action Organisation should increase the search depth to ensure that devices are not missed. The Mine Action Organisation must not reduce the required search depth without permission in writing from the LibMAC Operations office or the client.
- 8.2 When the Mine Action Organisation locates an area where ground movement may have buried mines/ERW at depths significantly greater than their equipment will search, these areas must be marked and mapped, and the details sent to the LibMAC Operations office.

9. BACS Procedures

- 9.1 Depending on the detection technology used, BACS may be conducted using conventional mine clearance procedures, demining lanes, and the same level of supervision. This may however be considered inefficient, so BACS procedures have been developed that speed up the process without compromising safety.
- 9.2 BACS shall be conducted using procedures for which the Mine Action Organisation has LibMAC Operational Accreditation.
- 9.2 BACS procedures may involve the area being systematically searched using detectors, signals are marked and investigated later. This allows the Deminers using the search equipment to cover a wide area quicker than if required to immediately investigate signals. Other Deminers can investigate the detector signals as soon as the Deminers searching have moved to a safe distance.
- 9.3 To expedite the BACS detector search procedure, it may be appropriate for BAC to be conducted first, removing all surface ERW and pertinent metal scrap which may otherwise be detected during BACS.

10. Safety during Battle Area Clearance

- 10.1 The safety requirements for battle area clearance shall be appropriate in accordance to the threat however are generally less stringent than for mine clearance, particularly in anti-personnel mine areas, where risk to personnel is greater due to the design and function of these mines.
- 10.2 A survey must be conducted prior to conducting battle area clearance to determine

whether there is a suspected or confirmed ERW or mine threat. Based on this information a decision shall be made whether to conduct technical survey or clearance using mechanical, MDD, manual mine clearance or battle area clearance assets.

11. Working Distances

- 11.1 Working distance between Deminers during battle area clearance are generally less than required for manual mine clearance. During BAC (visual detector aided) and BACS it may be possible for detectors to work closer together, without interference.
- 11.2 Working distances for battle area clearance shall be in accordance with LibMAS 10.20 Demining Worksite Safety, Table 2.

12. Marking

- 12.1 The Mine Action Organisation must use worksite marking that ensures that the entire ground area is searched, with sufficient overlaps to guarantee that no areas are missed. For additional details on marking, refer to LibMAS 10.20/1 Demining Site Marking Systems.

13. Personal Protective Equipment (PPE)

- 13.1 Frequently, the ERW discovered during battle area clearance would destroy PPE and severely injure or kill the person wearing it if were to detonate. Fortunately, accidents during battle area clearance are not common in Libya. The recorded accidents that have occurred during battle area clearance to date, have primarily involved fuzes with a small explosive content. These present a severe risk to the Deminer's eyes.
- 13.2 The minimum PPE requirement during BACS is frontal body protection and eye protection as specified in LibMAS 10.30 Personnel Protective Equipment. Supervisors and all staff inside the suspected hazardous area must wear the same PPE, as a minimum, while work is being conducted.

14. Detector Signal Investigation

- 14.1 When BACS detector indications are investigated manually, the Deminer must call a suitably qualified supervisor as soon as a munition is exposed. The decision over whether to move a munition for demolition or destroy it in-situ must be made by a suitably qualified EOD operator (or similar position). Refer to Annex B Investigating a Detector Signal and Full Excavation.

15. Quality Assurance (QA) and Quality Control (QA)

- 15.1 The level of Internal and External QA monitoring shall be dependent of the requirements of the LibMAC, and as detailed in the Mine Action Organisations SOP.
- 15.2 The minimum QC requirements for battle area clearance operations are detailed in this Standard, and reference shall be made to LibMAS 07.40 Quality Management.

16. Reporting and recording

- 16.1 To assist with National planning, the Mine Action Organisation must provide the LibMAC

Operations office with comprehensive records of the devices found, their precise location, and their condition. In densely contaminated areas, the positions may be recorded in a maximum of 10 metre square blocks, or other size, on authorisation from the LibMAC.

16.2 LibMAC will provide reporting templates that must be used.

17. Responsibilities and Obligations

17.1 International responsibilities of parties to past conflict

- a. [The clause below is taken directly from International Mine Action Standards (IMAS), 08.11 BAC, 1st edition, September 2007, p 6. Because they are signatories, it applies to countries whose armed forces were responsible for almost all of the mines and ERW in Libya.]
- b. Signatories to Protocol V of the CCW* have accepted the principles laid out in the Charter of the United Nations, Protocol V of CCW and the rules of international law of armed conflict which give parties to an armed conflict a responsibility to ensure that civilians are protected from ERW.
- c. In cases where explosive ordnance which becomes ERW is used, the “users” must, after the cessation of active hostilities, provide, where feasible, technical, financial, material or human resource assistance, to facilitate the marking and clearance, removal or destruction of such ERW.
- d. Parties to a conflict have a responsibility to:
 - i. Survey and assess the hazard posed by ERW;
 - ii. Assess and prioritise needs and practicability in terms of marking and clearance, removal or destruction;
 - iii. Mark and clear, remove or destroy ERW;
 - iv. Take steps to mobilise resources to carry out these activities; and
 - v. In geographical areas that are now outside of the control of one or more of the parties of a conflict, they should still make available records or ammunition use by types and locations, and any other knowledge they have of locations of ERW.
- e. [*Reference: The Convention on Prohibitions and Restrictions on the use of Certain Conventional Weapons which may be deemed to be excessively injurious or to have indiscriminate effects (CCW)].
- f. The relevant protocols and conventions are not retrospective, but signatories may choose to make them so.

17.2 Libyan Mine Action Centre (LibMAC)

- a. LibMAC will:
 - Specify the criteria for clearance allowing, where possible, Mine Action Organisations the flexibility to work on entire suspected or confirmed hazardous areas;
 - Maintain records of cleared, suspected and confirmed hazardous areas showing the status of each suspected hazardous area;
 - Control Quality Assurance monitoring and post-demining inspections as required; and
 - Collect and make available relevant technical and accident information.

17.3 Mine action organisation

- a. The Mine Action Organisation must:
 - Gain LibMAC Operational Accreditation for BAC and BACS procedures;
 - Apply the LibMAS ;
 - Maintain and make available documentation of activities as specified by LibMAC; and
 - Ensure that the affected community is fully aware of all demining activity in the area

and the implications for the community, (particularly related to the depth of search).

18. Detailed Battle Area Clearance Procedures

- 18.1 The following details for battle area clearance in Libya are relevant for the clearance of all ERW types, and have been primarily written based on proven practices in the clearance ERW with an emphasis on cluster munitions.
- 18.2 Throughout this Standard, the words cluster munitions, bomblets and sub-munitions are interchangeable and used to describe the same thing. Cluster munitions are delivered by a wide variety of vectors, such as missiles, rockets, projectiles, mortars or aircraft delivered dispensers.
- 18.3 Once the dispenser has been fired, launched or dropped, opening is normally determined by a time delay or proximity fuze. The sub munitions are normally dispensed in one of the three following ways: base ejection, nose ejection or case rupture. Since sub munitions disperse after ejection, the density of the impact footprint is dependent on the speed and altitude at which the dispenser, projectile or rocket opens.
- 18.4 Often cluster munitions are designed to detonate on impact, however failure to detonate for a number of factors, such as:
- Design,
 - Length and condition of storage,
 - Drop height and velocity,
 - Vegetation, and
 - Ground conditions at the impact area.
- 18.5 Cluster munitions and other ERW pose a direct threat to communities and internally displaced people, hamper humanitarian relief, hinder reconstruction efforts, and generally hinder safe movement.
- 18.6 During the clearance of ERW and in particular cluster strike areas, the focus should be on the systematic search, location and removal (i.e. by demolition) all sub-munitions in accordance with the clearance standard (i.e. depth) requirements. This is achieved through identification of the strike “footprint” and clearance to “fade out”.

19. Battle Area Clearance Search Categories

- 19.1 BAC and BACS shall be separated into the following categories for tasking, implementation and reporting purposes:

BAC

- Visual Search
- Detector Aided Visual Search

BACS (see Annex A)

- Detector Search

19.2 **BAC**

- a. BAC is generally the most effective method of rapidly locating, removing and/or

destroying the immediate threat of ERW from a contaminated area. The terrain, density of vegetation or habitation should be important factors when determining the maximum number of Deminers and safety distance between them when searching for ERW.

- b. BAC is conducted with or without the assistance from detectors and **may** involve 'intrusive actions'.
- c. A dependable method of systematic BAC is to be employed to ensure all areas are thoroughly investigated and no items on the surface are left undiscovered.
- d. Personnel conducting the clearance shall walk at a suitable speed to ensure that it is safe / effective and, unless it is necessary to speak (e.g., instructions from the supervisor or on location of an ERW), it should be conducted in complete silence. The supervisory person should be situated to the rear of the working personnel for command and control purposes.
- e. The supervisory person shall be positioned in order to observe the clearance, particularly if managing multiple Deminers collectively (i.e. in extended line).
- f. The supervisory person shall be informed of any ERW located during the clearance process and all ERW shall be appropriately marked prior to continuing.
- g. BAC shall be systematic and conducted in a safe and effective manner to ensure that the designated hazardous area is cleared of pertinent surface ERW.
- h. Surface clearance **may** involve intrusive actions and therefore, the supervisory staff shall ensure that appropriate safety measures are imposed (e.g. PPE) according to the situation.
- i. BAC is generally conducted by **multiple** Deminers searching for ERW in "**extended line**" or one or more Deminers in **individual clearance lanes**.
- j. All ERW located during clearance shall be marked and, if by-passed, personnel shall **not** walk within 20 cm of the ERW.
- k. The Demining Area / Box should be divided into Demining Lanes which should be marked in according to LibMAS 10.20 Demining Worksite Safety, and 10.20/1 Demining Site Marking Systems.
- l. Depending on the risk assessment the boundary of the demining areas / boxes / lanes may be marked beforehand.
- m. The size of the area to be cleared and distance between each Deminer shall be determined by the supervisory staff and may be dictated by certain factors such as the terrain, level of contamination, interference between detectors, command and control and safety.
- n. There shall be a minimum overlap of 10 cm to the sides of the Demining Lane during the search procedure.
- o. BAC is generally conducted in the following situations:
 - Removing the immediate threat of ERW to people, animals, etc. from the surface of the ground.
 - It is determined that due to the objective of clearance (i.e. land use) there is a preliminary or definitive requirement for surface clearance only.
 - It is not suspected that there are pertinent sub-surface ERW.
 - The residual risk from sub-surface ERW post clearance is tolerable.
 - The risk from sub-surface ERW during clearance is tolerable.

19.2.1 BAC Visual Search

- a. The visual search is conducted without the aid of detectors generally in areas where there is minimal / no vegetation or obstacles to impede the Deminers ability to visually search the ground for surface ERW. In circumstances where vegetation restricts and effective visual search then it should be removed or marked for subsequent clearance using detectors.
- b. Examples of where the visual search may be effective are barren land, cultivated ground or hard standing areas such as buildings, routes and airfields. The visual search **may** involve **intrusive actions**.
- c. During BAC visual search, the ground shall be searched once to be considered as effectively searched and cleared.

19.2.2 Quality Control (QC)

- a. A minimum of 10% "internal" QC of the cleared ground shall be conducted during surface visual search operations to confirm the standard of clearance. If however the ground has been searched twice then it shall be considered as having received 100% QC and requires no further "internal" QC.
- b. External QC shall be conducted as required by the LibMAC.

19.2.3 BAC Visual Detector Aided Search

- a. There may be a requirement to use a detector to aid the visual search for surface ERW. The use of the detector shall be dependent on the type of ERW, the denseness of vegetation and the nature of the ground which may impede the Deminer from conducting a safe and effective visual search. The Detector Aided Visual Search **may** involve intrusive actions.
- b. When conducting the detector search which involves a Deminer sweeping the search head (or equivalent) over the ground (across the clearance lane), the search head shall be moved over the same area of ground at least twice during the search procedure prior to it being considered as effectively searched and cleared.
- c. The detector shall be used to assist with the surface clearance procedure in areas where there is vegetation and/or other obstacles (i.e. rocks) which impede the ability to conduct an effective visual search of the surface of ground for pertinent ERW.
- d. The supervisor staff shall decide, based on a pertinent risk assessment, whether to search the entire area using detectors or specific areas; these areas may have been marked during an initial visual search and left for subsequent detector search.
- e. To optimise efficiency, the supervisor staff should aim to deploy as many Deminers with detectors / locators as possible in individual clearance lanes, however ensuring that there is no compromise to safety, in accordance with SOP and Implementation Plan requirements.
- f. **The detector is used to search for surface ERW.**
- g. Depending on the type of vegetation and height, there may be a requirement to cut all vegetation to ground level (e.g. otherwise the vegetation may become an obstacle to personnel when walking) and, a visual or detector search conducted, or it may be possible to cut the vegetation to a predetermined height (e.g. light vegetation / grass).
- h. The cut height should be based on prior detector test results and afterwards the detector used to check the surface at the predetermined height.
- i. The detector search technique should be similar to the sub-surface clearance procedure (e.g. systematic interlocking sweeps, with a minimum of 10 cm overlap to the sides and to the front when moving forward).

19.2.4 Quality Control (QC)

- a. A minimum of 10% "internal" QC of the cleared ground shall be conducted during BAC visual detector aided search operations.
- b. External QC shall be conducted as required by the LibMAC
- c. See 19.3.1 for additional QC requirements.

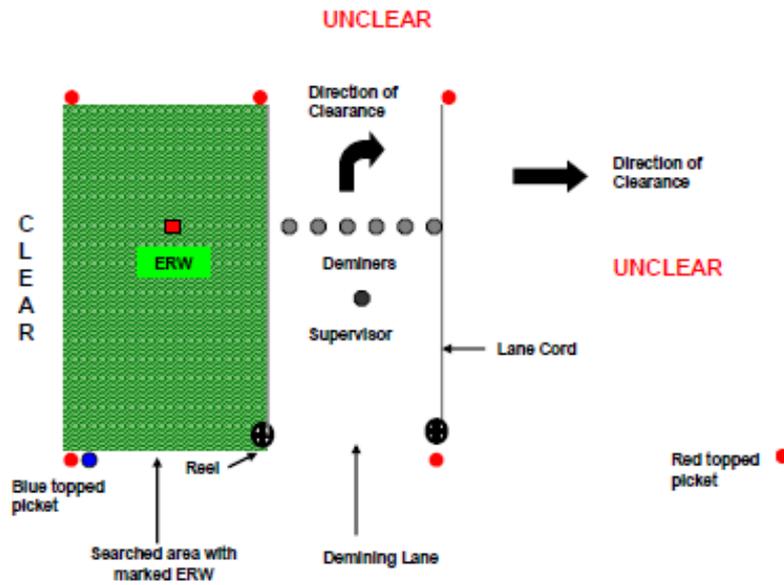


Figure 1: Example of BAC- Extended Line

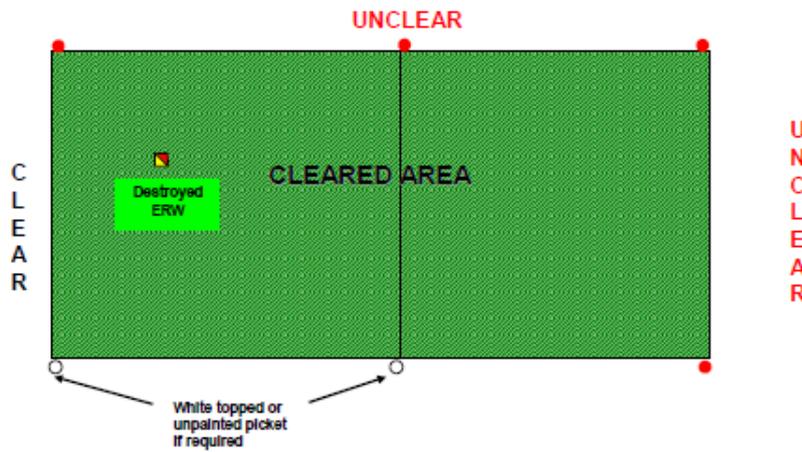


Figure 2: Example of BAC - Cessation of Daily Operations

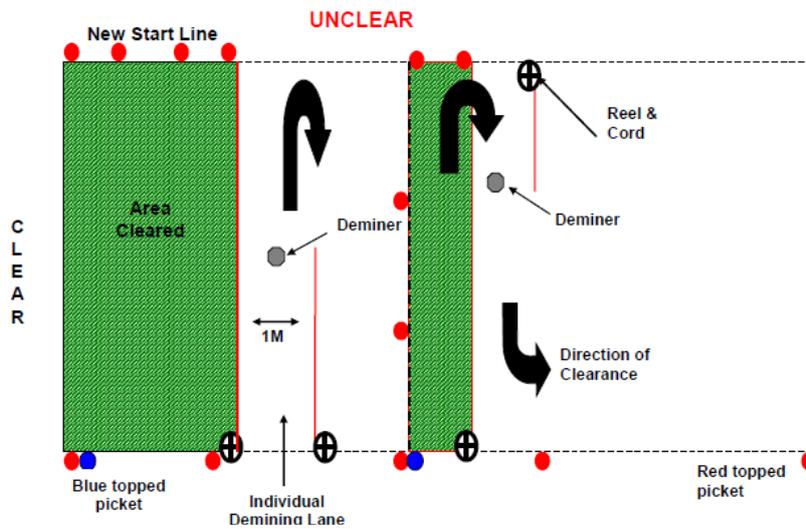


Figure 3: Example of BAC- Individual Demining Lanes

19.3 BACS

- a. The purpose of BACS is to systematically search, locate and clear the ERW hazardous areas (sub-surface) using detectors. The requirement to sub-surface clear all or part of the hazardous area may be dependent on certain factors such as the likelihood of sub-surface ERW (e.g. the condition of the ground when the attack occurred or landowner requirements). This shall be detailed in the Site Implementation Plan.
- b. BACS **should** involve intrusive actions. The method used to conduct sub-surface clearance will be dependent upon certain factors such as the location of the site, i.e., built up areas, plantations, open fields and the type of detectors used. A safe and effective method shall be employed ensuring that the designated hazardous area is systematically sub-surface cleared of all pertinent ordnance.
- c. Prior to using the detector, it has to be accurately adjusted and calibrated in accordance with the technical specifications, the minimum required depth and the searched ERW.
- d. The calibration has to be done at the detector testing area under supervision.
- e. All pertinent detector readings shall be marked and investigated through excavation if confirmed to be sub-surface. The Site Supervisor is responsible for devising a method that allows the maximum number of detectors to be employed whilst allowing for adequate separation in order to prevent interference between them.
- f. BACS is often subsequent to the surface clearance, however there may be situations whereby clearance shall be a combination of surface and sub-surface clearance. Nonetheless those detectors employed must be able to reliably locate UXO to the minimum required search depth.
- g. When conducting the detector search which involves one operator sweeping the search head (or equivalent) over the ground (across the clearance lane), the search head shall be moved over the same area of ground at least twice during the search procedure prior to it being considered as effectively searched and cleared.
- h. BACS using 'large loop' type detectors involves moving the search coil (attached to a rigid frame) over the ground once to be considered as effectively searched and cleared.
- i. A minimum 10 cm overlap to the sides of the clearance lane shall be conducted for detector search procedures.
- j. All ERW located during clearance shall be marked and, if by-passed, personnel shall **not** walk within 20 cm of the ERW.

19.3.1 Quality Control (QC)

- a. A minimum of 10% "internal" QC of the cleared ground shall be conducted during all BAC operations to confirm the standard of clearance. However, during BAC using 'large loop' type detectors, ground that has been searched twice shall be considered as having received 100% QC and requires no further "internal" QC.
- b. QC should be conducted using the same detector as used during clearance or at least the same type/category. If however a different type/category of detector is used then it shall be confirmed beforehand through a pertinent performance test that it is capable of performing to the same standard as that used for initial clearance.
- c. When conducting QC of excavated areas only, QC shall at least involve a visual inspection, and confirmation of the dimensions of the area (i.e. trench) to ensure that it is in accordance with clearance requirements.
- d. Metal located in a cleared area during QC may not constitute non-conformity if it is confirmed that there was no requirement to clear the metal, in accordance with clearance requirements (i.e. clearance depth and "target"). However an item located during QC within the clearance depth, of a similar or greater metal content as the "target", should constitute a non-conformity.
- e. Detectors may vary i.e. the ability for ground compensation (balance) and the sensitivity level therefore it should be realised that the QC results may vary between detectors.
- f. External QC shall be conducted as required by the LibMAC.

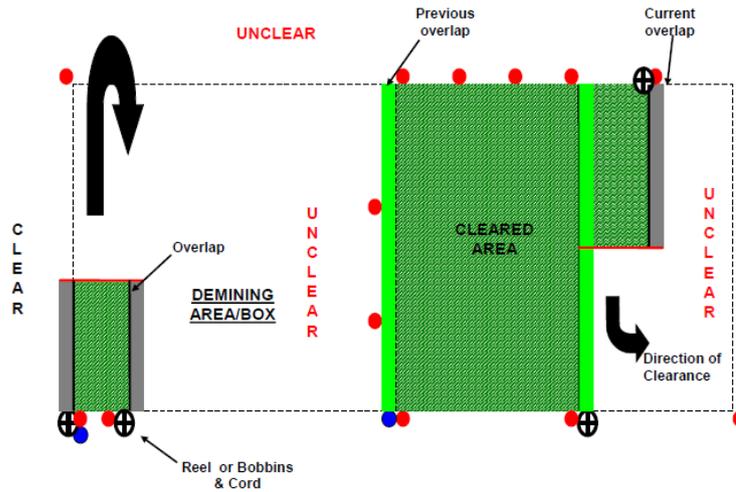


Figure 4: Example of BACS – Detector Search

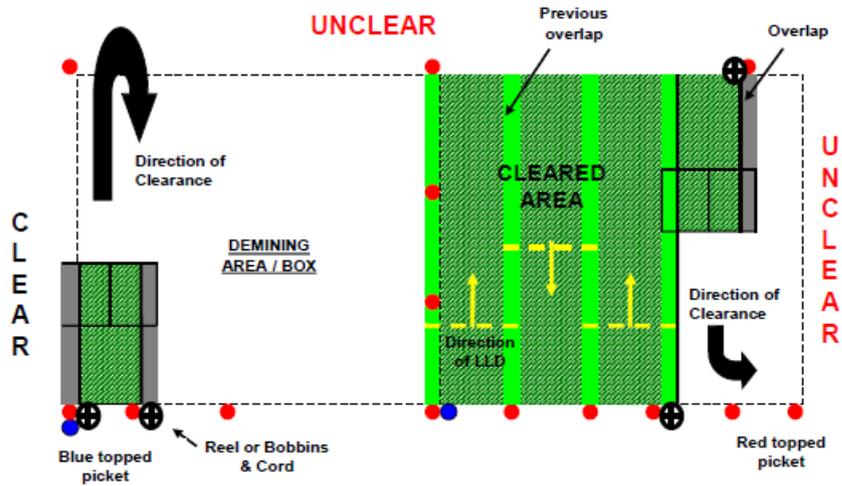


Figure 5: Example of BACS – Detector Search (Large Loop type)

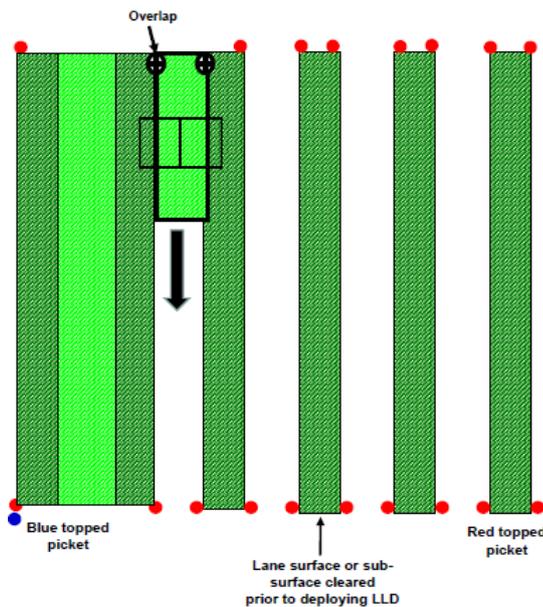


Figure 6: Example of BACS – Detector Search (Large Loop type)

20. Battle Area Clearance in Urban Areas

- 20.1 Prior to battle area clearance operations taking place in urban areas, every effort shall be made to evacuate all personnel from the areas to be searched and cleared.
- 20.2 Prior to the commencement of battle area clearance operations, the Mine Action Organisation shall liaise with the local population and relevant authorities in order to explain the implementation plan and gain any authorisation to search specific areas.
- 20.3 A map of the urban area to be searched and cleared should be produced as part of the Implementation Plan, to better understand the size of the hazardous area, requirements, any difficulties, and the estimated duration for operations.
- 20.4 During operations, the Mine Action Organisation shall search and clear all roads, paths, buildings (including roofs) and any other public places within the hazardous area.
- 20.5 All unoccupied buildings should also be searched. Occupied buildings should only be searched and cleared if the owner's permission is given. If permission is not given then the buildings location should be recorded and reported as such, including annotating on the task map.
- 20.6 During BAC operations in urban areas all local people should be asked if they are either keeping items of ERW or if they know the whereabouts of any ERW.
- 20.7 Obvious dividing lines such as roads and paths may assist in demarcating boundaries to be searched and cleared. As each area is searched and cleared, the buildings should be marked with white chalk or paint, normally red indicating it as a hazard and white as safe (however in accordance with LibMAS requirements). Unambiguous markings are especially important in urban areas in order to avoid confusion and safeguard the local population.
- 20.8 All cleared and uncleared buildings shall be recorded using a DGPS (Differential GPS) or GPS and annotated a different identification number (or similar)
- 20.9 Other cleared and uncleared areas within the battle area clearance site boundary (i.e. roads, gardens, fields) shall be recorded, i.e. turning and intermediate points.

21. Risk Assessment for Battle Area Clearance Operations

- 21.1 Assessments shall be conducted for battle area clearance operations to determine: (a) the threat, i.e. Explosive Ordnance type (mines, ERW), condition (UXO, AXO), location (i.e. surface, sub-surface); and (b) the risk to battle area clearance personnel.
- 21.2 It is the responsibility of all involved in battle area clearance to minimize the risk through the enforcement of SOP's, which includes safety requirements such as Personnel Protective Equipment (PPE) and safety distances.
- 21.3 In addition to the SOP's, an Implementation Plan (IP) is required for each battle area clearance task, detailing the objective, the requirements to achieve this (i.e. visual, detectors) and authorization for the task.
- 21.4 The decision on whether to conduct BAC (surface clearance) or BACS (sub-surface clearance) simultaneously or separate shall be dependent on the risk assessment and may also be influenced by other factors such as the scope of SOP's, the IP, availability

of resources and the terrain.

- 21.5 This Standard has been written with the aim of providing detailed and proven practices for conducting safe, efficient and effective battle area clearance operations. It includes several options for achieving this however the decision on whether demining personnel shall stand on unclear ground during battle area clearance shall be determined by the Mine Action Organisation on agreement from the LibMAC, based on a pertinent risk assessment.
- 21.6 Prior to the commencement of battle area clearance operations a pertinent risk assessment shall be made to agree the acceptable risk to demining personnel during operations. This shall be detailed in the Site the Implementation Plan.
- 21.7 The risk assessment shall consider the following:
- It is **UNACCEPTABLE** for demining personnel to walk on ground which contains surface ERW, of a similar or greater size and / or metal content than that required to be cleared however it may be acceptable if similar sub-surface ERW is present. I.E. **ACCEPTABLE** if there is no surface hazard.
 - It is **UNACCEPTABLE** for demining personnel to walk on ground with contains subsurface ERW, of a similar or greater size and / or metal content than that required to be cleared however it may be acceptable if similar surface ERW is present. I.E. **ACCEPTABLE** if there is no sub-surface hazard.
 - It is **ACCEPTABLE** for demining personnel to walk on ground with contains surface and subsurface ERW, of a similar or greater size and / or metal content than that required to be cleared.

22. Definitions

- 22.1 Pertinent definitions of terminology used within this Standard are detailed below to aid understanding however additional terminology may be found in the LibMAS 04.10 Definitions and Abbreviations, 10.20 Demining Worksite Safety, and IMAS.

22.2 Qualified

- For the purpose of this Chapter, the term **Qualified** is used to describe a person who has received operational Accreditation from the LibMAC, authorising them to perform specific battle area clearance activities in accordance to their accredited position.

22.3 Site Supervisor

- For the purpose of this Standard, the term **Site Supervisor** shall be used to describe the following person:
 - A suitably qualified person who is responsible for a battle area clearance site(s), including managing the operations and emergencies at the site(s).
 - The Site Supervisor is responsible for up to three (3) battle area clearance sites comprising a maximum of 3 battle area clearance teams, providing that adequate additional supervision is in place for the sites and teams.
 - During operations, the Site Supervisor shall be located within 5 minutes travel time and have reliable communications with the site(s).

- b. Refer to 'Organisation and Responsibilities', and 'Command and Control' below

22.4 Deminer

- a. A man or woman qualified and employed to undertake demining activities on a demining worksite.
- b. For the purpose of this standard, the term 'Deminer' is used to describe a person responsible for conducting battle area clearance operations as directed by the relevant Mine Action Organisation. The Deminer shall always be supervised when conducting battle area clearance operations and his/her primary responsibilities shall involve marking, searching, locating and reporting mines/ERW in accordance to the Mine Action Organisation SOP and LibMAS.

23. Organisation and Responsibilities

- 23.1 The structure of a battle area clearance team and job titles may vary between Mine Action Organisations and although, the quantity of qualified personnel may differ, there shall be a sufficient amount to conduct safe, efficient and effective battle area clearance operations.
- 23.2 Each person shall be qualified and accredited in battle area clearance procedures pertaining to their position and responsibilities.
- 23.3 The structure for a battle area clearance unit may vary between Mine Action Organisations, however for the purpose of this Standard, a battle area clearance 'unit' refers to a 'squad', 'section' or 'team' comprising a maximum of eight (8) Deminers.
- 23.4 A demining site may comprise one or more units and there shall be a minimum distance of 50 metres between each unit for command and control purposes, unless a reduction is authorised by the LibMAC.
- 23.5 Each unit shall be supervised by at least one qualified person when conducting battle area clearance
- 23.6 During battle area clearance there shall be sufficient operational personnel at site to manage, implement and support the operations, particularly in the event of an accident.
- 23.7 The minimum requirement to facilitate safe, efficient and effective battle area clearance operations including a casualty evacuation (CASEVAC) at the site is as follows:

Site Supervisor (minimum 2)

- a. Two (2) Site Supervisors (or person with equivalent battle area clearance qualifications) shall be located within five (5) minutes travel time, have reliable communications, and shall be capable of supervising operations at the site.
- b. Each Site Supervisor shall be able to manage an emergency at the site and at least one (1) shall be capable of briefing visitors.
- c. One (1) Site Supervisor may manage up to three (3) battle area clearance sites comprising a maximum of three (3) battle area clearance teams, providing that adequate additional supervision is in place for the all sites and teams, i.e. at least one (1) Site Supervisor located at each operational site.
- d. One (1) Site Supervisor shall be located at the Working Area during operations (i.e. Deminers conducting marking and clearance). He/she shall be located at a maximum distance of 150 metres from the working Deminers, with the ability to walk to each of the working Deminers within five (5) minutes.
- e. One (1) Site Supervisor is allowed to supervise a maximum of eight (8) working Deminers (equivalent to 1 unit), if safe to do so, and if located in accordance with the point d. above.

Deminer (minimum 3)

- a. Three (3) Deminers shall be located at the operational site.
- b. Two (2) of the Deminers shall be able to walk to the working Deminers within five (5) minutes. Note, the Deminers may also be conducting battle area clearance.
- c. One (1) of the Deminers shall be able to walk to the working Deminers within thirty (30) seconds. Note, the Deminer may be conducting battle area clearance.

- d. Three (3) Deminers may be located at up three (3) operational sites **only** if in accordance with the above points.

Medic (minimum 1)

- a. One (1) Medic may support up to three (3) operational sites.
- b. One (1) Medic able to travel to the medical treatment point within (five) 5 minutes for each operational site he/she is supporting.
- c. For additional details see LibMAS 09.10 Medical Support to Demining.

24. Command and Control

- 24.1 It is the responsibility of the Site Supervisor to ensure that there is sufficient command and control during demining operations.
- 24.2 Command and control may become more problematic particularly in urban areas, populated, adjacent to roads, and depending on the terrain. Consideration should therefore be given to the overall task and threat posed, with an appropriate response thought-out. The optimum search techniques should be employed to ensure all pertinent mines/ERW are reliably located.
- 24.3 The number of personnel conducting clearance operations at the Site simultaneously and the distance between personnel and teams shall be dictated by certain factors including the clearance methodology, threat, nature of the ground, climatic conditions and the ability of supervisory personnel, however shall be in accordance with 23. Organisation and Responsibilities, above.
- 24.4 Where possible, the person supervising should ensure that he/she is in a position to watch all people under his/her responsibility simultaneously however, as a minimum requirement he/she shall diligently observe each Deminer under his/her responsibility at least once during each working shift.
- 24.5 The person supervising shall ensure that they are aware of the activities of all personnel under his/her responsibility and that they are working safely, efficiently and effectively.
- 24.6 The working shift when conducting battle area clearance shall be a maximum of 60 minutes duration followed by a minimum of 10 minutes rest. Consideration shall at all times be given to the safety and therefore the Mine Action Organisation shall reduce the working shift duration and/or increase the rest period, in circumstances where it is considered unsafe, i.e. arduous conditions or extreme temperatures.
- 24.7 The rest period may be reduced from 10 minutes to a minimum of 5 minutes however **only** if the working shift duration is 30 minutes or less.
- 24.8 For additional safety requirements during battle area clearance operations refer to LibMAS 10.20 Demining Worksite Safety, Table 2.

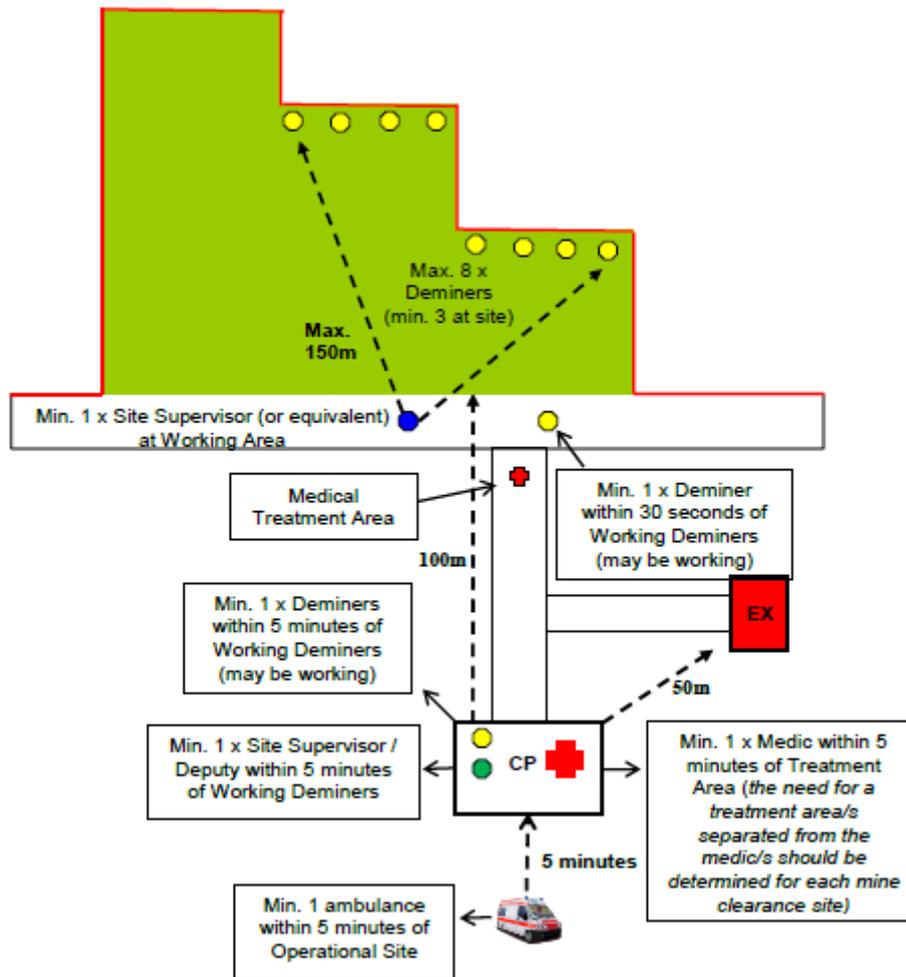


Figure 7: Example of Command and Control (minimum requirements)

25. General References

- a. International Mine Action Standards (IMAS), in particular, 10.20, Safety and Occupational Health – Demining Worksite Safety and 09.11 Battle Area Clearance.
- b. LibMAS 03.40/1 Detectors, 10.20 Demining Worksite Safety, 10.20 Demining Worksite Safety, and 10.20/1 Demining Site Marking Systems.

26. Record of Amendments

Ser.	Date: D/M/Y	Standard	Section / Paragraph	Amended by: Name / Position / Org.	Comments
1	07/10/15	09.11 Battle Area Clearance	All	Doug Ware, Chief of Ops/QA, UNMAS	Revised and add. details to existing Standard
2	07/10/15	09.11 Annex A	All	Doug Ware, Chief of Ops/QA, UNMAS	New Standard
3	07/10/15	09.11 Annex B	All	Doug Ware, Chief of Ops/QA, UNMAS	New Standard
4	07/10/15	09.11 Annex C	All	Doug Ware, Chief of Ops/QA, UNMAS	New Standard
5	07/10/15	09.11 Annex D	All	Doug Ware, Chief of Ops/QA, UNMAS	New Standard
6	12/11/15	09.11 Battle Area Clearance	All	Doug Ware, Chief of Ops/QA, UNMAS	Revised mainly regarding the use of BACS in ant-tank mine areas