



NMAS 08.40
Marking of Hazards

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Edition 2.1

Lebanon Mine Action Center-LMAC

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Warning

This document has been released on the date shown on the cover page. The National Mine Action Standards (NMAS) of Lebanon are subject to regular review and update, so users are advised to consult the most recent version. To ensure that you have access to the current version, contact the Lebanon Mine Action Center (LMAC) through the www.lebmac.org website or by sending an email to info@lebmac.org.

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Foreword

The National Mine Action Standards (NMAS) of Lebanon were first developed in the form of Technical Standards and Guidelines (TSG). These TSG were edited into the first edition of the NMAS in 2010 and were written to comply with the first edition of the International Mine Action Standards (IMAS). Since then, the scope of the IMAS has been expanded to include more components of mine action and amended to mirror the most recent changes to standards as required in today's operations. These changes, as well as changes in the local context of Lebanon, have necessitated a review and update of the NMAS.

As detailed in the National Mine Action Policy of 2007, the Lebanon Mine Action Center (LMAC) has the responsibility to execute and coordinate the Lebanon Mine Action Program (LMAP) on behalf of the Lebanon Mine Action Authority (LMAA), including the development and amendment of standards. Such standards shall be developed in a participatory approach that shall involve international, governmental, and nongovernmental organizations.

The NMAS shall be reviewed as needed to reflect amendments in the IMAS as well as incorporate changes to international obligations and local requirements. Such revisions shall be made available on the LMAC's website www.lebmac.org or can be obtained through contacting the LMAC via the email info@lebmac.org.

Acronyms

BAC	Battle Area Clearance
BM	Benchmark
CCM	Convention on Cluster Munitions
CHA	Confirmed Hazard Areas
ERW	Explosive Remnants of War
HMA	Humanitarian Mine Action
IA	Implementing Agency
IMAS	International Mine Action Standards
IMSMA	Information Management System for Mine Action
IP	Intermediate Point
LMAA	Lebanon Mine Action Authority
LMAC	Lebanon Mine Action Center
LMAP	Lebanon Mine Action Program
MRE	Mine Risk Education
NMAS	National Mine Action Standards
NTS	Non-Technical Survey
QA	Quality Assurance
QC	Quality Control
RP	Reference Point
SHA	Suspected Hazard Areas
SOPs	Standard Operating Procedures
SP	Start Point
TP	Turning Point
TS	Technical Survey
TSG	Technical Standards and Guidelines
UXO	Unexploded Ordnance

Introduction

Marking of hazards is a vital component of Humanitarian Mine Action (HMA) and ensures that on-site personnel, visitors, and community members are alerted to potentially hazardous areas. To reduce risk to the population and to persons working in HMA, the Lebanon Mine Action Center (LMAC) and Implementing Agencies (IAs) shall take all appropriate measures to ensure that Suspected Hazard Areas (SHAs) and Confirmed Hazard Areas (CHAs) are clearly marked in a way that should unambiguously differentiate between safe and hazardous areas.

In general, hazardous area marking is placed by the team that is conducting survey or clearance operations. Whenever practicable, physical barriers should be used to reduce the risk of unintentional entry to hazardous areas.

This NMAS provides standards on the requirements of the marking used to demarcate EO hazardous areas. In addition to being a national requirement, marking hazardous areas helps Lebanon comply with its obligations under: the “Convention on Cluster Munitions” (CCM) Article 4.2; the “Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to have Indiscriminate Effects” (CCW) Article 5; and the 1997 *Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction*, which is often abbreviated to the ‘Anti-Personnel Mine Ban Treaty’ or the ‘Ottawa Convention’. This NMAs is designed to ensure that all that is practicable is done to meet these obligations.

Marking of Hazards

1. Scope

This NMAS provides standards and guidelines to ensure that on-site staff, visitors, and community members are appropriately warned of hazardous areas (dangerous areas). It provides minimum standards that should be applied in marking all EO hazards in Lebanon. It divides marking systems requirements into those that should be followed to protect the safety of civilians and those that should be used by IAs during demining operations to protect the safety of on-site staff.

2. References

A list of normative and informative references is provided in Annex A.

Normative references provide cross-referencing to other standards referred to in this NMAS, and which form an integral part of the provisions of this standard.

Informative references provide a list of documents that may be consulted for a clearer understanding of this standard.

3. Key Terms and Definitions

The following key terms and definitions are used in this NMAS:

- *Benchmark*: a fixed point of reference used to locate a marked and recorded hazard or hazardous area. Benchmarks are normally located a short distance outside the hazardous area. A benchmark may not be necessary if the reference point is sufficiently close to the perimeter of the hazardous area. A benchmark will also be used as a reference to a cleared area; this benchmark may be a natural or manmade feature which is unlikely to be moved.
- *Hazard marker*: warning markers used to indicate the presence of EO hazards when signs are not available or when local conditions prevent their effective use.
- *Hazard marking system*: a combination of measures (signs and barriers) designed to provide the public with warning about the proximity of EO hazards. The system may include the use of signs or markers, or the erection of physical barriers.
- *Hazardous Area*: the area in which EO hazards are anticipated. Also referred to as *Contaminated Area*.
- *Intermediate point*: survey markers used between start and finish markers, or between turning points that are more than 50 m apart.

- *Marking*: emplacement of a measure or combination of measures to identify the position of a hazard or the boundary of a hazardous area. This may include the use of signs or markers, or the erection of physical barriers.
- *Mine sign*: a permanent or semi-permanent notice which, when placed as part of a marking system, is designed to provide warning to the public of the presence of EO hazards. Mine signs include a combination of written words and symbolic forms to enable easy recognition locally.
- *Reference point*: a fixed point of reference assigned/placed some distance outside the hazardous area at an easily recognizable place (such as a crossroad or a bridge), which can be used to assist in navigating to one or more benchmarks. Internationally, reference points are often also referred to as Geodetic Points when they refer to a pre-surveyed location.
- *Start Point (SP)*: is the first point in the perimeter on which the last turning point closes.
- *Survey marker*: a durable and long lasting marker used to assist in the management of marked and cleared land in demining operations.
- *Turning point*: a fixed point on the ground, which indicates a change in direction of the perimeter of the hazardous area or perimeters of a cleared area that has been documented in the Information Management System for Mine Action (IMSMA) completion report.

In addition to the above terms, NMAS 04.10 provides a glossary of terms and definitions used across all standards.

As in the IMAS, the terms 'shall', 'should' and 'may' are used across all standards to indicate the required degree of compliance. For any organization working in Lebanon, the use of 'shall' indicates a compulsory requirement. The term 'should' indicates the national preference which may be varied with LMAC approval. The term 'may' indicates a suggestion that is not obligatory.

4. Marking Requirements

Hazardous area marking may be placed by the team conducting Non-Technical Survey (NTS). Hazardous area marking should be placed by any team conducting Technical Survey (TS). Marking may also be placed or moved as new information is gathered during TS or area clearance.

Hazard signs and markers shall unambiguously show which side of the marked boundary is considered safe and which side is dangerous. They shall be placed facing outwards from the Suspected Hazard Area (SHA) or Confirmed Hazard Area (CHA). At all times, hazard signs and markers should be easily visible in daylight at a distance of 50 meters. When line-of-sight between markers is obstructed, the number of markers used may be increased or fences

may be used. At all times, an effective marking system should ensure that alert members of the public will be aware of the hazard.

Temporary or emergency marking may be improvised but no hazard signs and markers shall ever be constructed using materials that may once have contained explosives. Area marking should comply with the requirements provided in Annex B.

4.1 Marking Systems Set-up

The systems used to mark hazardous areas shall be categorized into three types, depending on the local materials available in the contaminated area and the period for which the marking system will remain in place. These types are: permanent marking systems; temporary marking systems; and improvised marking systems. Improvised marking systems should only be used in exceptional circumstances.

4.1.1 Permanent Marking Systems

Permanent marking systems are marking systems that have an indefinite period of use and so may require maintenance. Such systems should be used to mark hazardous areas that are not scheduled for TS or clearance in the near future. Permanent marking systems comprise a combination of markers, signs, and physical barriers (including fencing when appropriate) that clearly identify the boundary of the hazardous area.

Permanent marking should comprise metal pickets, wire or barbed wire, and mine warning signs that are designed to survive the environmental conditions for up to five years. Permanent fencing of a more fixed type may be used, depending on the duration the hazardous area is expected to remain un-cleared.

It is acknowledged that permanent marking may be subject to theft or removal for other uses, so the materials used may change and the use of paint on rocks or trees is not prohibited as long as it is eventually painted out when the area is released.

4.1.2 Temporary Marking Systems

Temporary marking systems have a limited life and are usually placed during TS or clearance operations, or just before the start of such operations. Wooden pickets/posts that are used as temporary marking signs should be painted in a distinctive color. In circumstances where the ground is too hard/ rocky to use wooden posts, painted rocks may be used as long as the LMAC approved coloring system is used. Short wooden posts should stand at least 30cm above the ground, while long wooden posts should stand at least 1m above the ground. When painted rocks are used, they should be a minimum of 10cm in diameter and a minimum of 15cm in height.

Temporary marking systems may also be used during emergencies such as when a suspected hazardous area (SHA) is first discovered/reported and the area needs to be marked immediately to provide visual warning. Whenever possible, standard mine signs

described in Annex B should be used to clearly mark the SHA from a distance of 30m. Local improvised hazard marking, such as crossed sticks, may only be used as emergency marking and should be replaced with the standard marking system as soon as possible.

Temporary marking systems may include semi-permanent fencing erected around a hazardous area. As with standard hazard signs and markers, semi-permanent fences should be visible from a distance of 50m and designed to endure environmental conditions for as long as is practicable.

4.2 Marking Systems during Operations

4.2.1 Temporary Marking Systems

TS and area clearance task sites shall be clearly marked to differentiate between the safe and hazardous areas and to identify specific points or objects. The primary temporary marking system used during such operations shall be as described in the IA's LMAC approved SOPs.

During area clearance operations, marking shall not be placed in the hazardous area. However, during Battle Area Clearance (BAC) operations, it may be necessary to position markers inside the hazardous area. Nevertheless, marking pickets/posts shall not be inserted into the ground unless it has been confirmed as searched to the specified depth in accordance with the Clearance Plan. Marking used during BAC by the IA shall be as described in the IA's LMAC approved SOPs.

When possible, hazardous area marking tape (red/white) and red- or white-colored cord should be used in conjunction with red-topped wooden posts to demarcate the working area. The red cord may be preferred for this purpose because it is more durable. Hazardous area marking tape and white or un-colored cord may be used between white topped or unpainted posts.

During manual TS and clearance operations, demining teams shall use base sticks for marking the extent of progress in lanes. The Base Stick is used to ensure that the 1 meter clearance lane width is maintained, and to provide a clear indication of the minimum width and overlap (10 cm safety margin). Details of the IA's lane marking system shall be included in the SOPs they submit to the LMAC for approval. Only LMAC authorized marking systems shall be used.

4.2.2 Improvised Marking Systems

Improvised marking systems may use locally available material, such as plastic cones or wooden triangles. Their use by an IA may be authorized by the LMAC on a case-by-case basis. When used, such systems should be replaced at the end of the working day with standard temporary markers or signs unless otherwise agreed with the LMAC.

4.3 Marking Systems Following Operations

On the completion of operations in an area, benchmarks, start markers, finish markers, and turning point markers shall be left behind to indicate the boundary of the area that has been searched and cleared. Such markers should comprise metal pickets and be present during Land Release and the handover of land to the end-users. Subsequently, end-users may remove these pickets.

5. Roles and Responsibilities

5.1 Role of the LMAC


The LMAC shall:

- assess and when appropriate approve the marking SOPs submitted by IAs;
- monitor and oversee the continuous maintenance of marking systems;
- mark hazardous areas as required in this NMAS;
- brief men, women, and children in at-risk and impacted communities as well as LAs about the marking system;
- approve the marking and signs to be used at each task; and
- ensure that the signs and their meanings are explained during the Mine Risk Education (MRE) sessions held.

5.2 Role of IAs

IAs shall:

- submit marking SOPs compliant with this standard to the LMAC for assessment;
- mark hazardous areas as required in this NMAS; and
- continuously monitor and maintain markers and signs.

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	ANNEX A: Normative and Informative References			
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The documents listed below constitute normative references and form an integral part of the provisions of this standard:

- Current LMAC and IMSMA reporting formats (request copies from the LMAC);
- NMAS 05.10 Information Management;
- NMAS 08.10 Non-Technical Survey;
- NMAS 08.20 Technical Survey;
- NMAS 12.10 Mine/ ERW Risk Education; and
- NMAS 04.10 Glossary of Mine Action Terms, Definitions, and Abbreviations used in the Second Edition of the NMAS.

In addition to the normative references listed above, the following informative references may be consulted:

- IMAS 08.40 Marking of Mines and ERW Hazard.

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B.1 Hazard Warning signs

B1.1 Triangular Mine Sign

A triangular mine sign is used as the recognized sign for an EO hazardous area in Lebanon. The minimum size of a mine warning sign is 20 cm x 20 cm x 28 cm. This size is intended to ensure that it is clearly visible at a distance of 50 meters.

The background color shall be red and the symbolism shall be white so that it is clearly discernible during low light times.

Mine warning signs shall be printed in Arabic and English with the word 'MINES' printed in bold lettering. The word 'mines' in this context is used to indicate all explosive hazards other than sub-munitions.



The unmarked side of the sign shall face the inside of the hazardous area and the marked side shall be visible from the outside of the area. The sign should be securely fastened to a fence or a post at intervals not greater than 30m.

B1.2 Cluster Bomb Warning Signs

The cluster bomb warning sign is used to demarcate areas which contain a sub-munition hazard (from cluster bombs) and should be positioned in the same way as Mine Warning Signs. The size and dimensions are the same as the International triangular mine sign.



B2 Permanent and semi-permanent hazardous area fencing

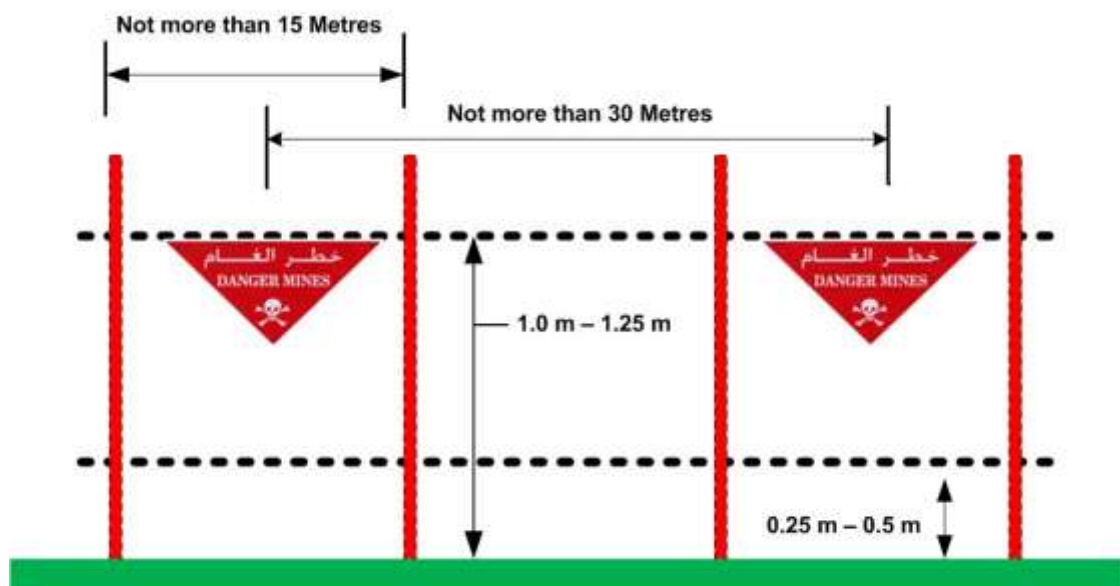
Fencing is the most effective barrier for hazardous areas that are in places of frequent or dense human and animal traffic. Fencing materials such as barbed wire can be effective barriers to humans and animals. Coated or galvanized barbed wire will usually endure environmental exposure for a long time. Other materials, such as plastic rope or tape and woven tapes should only be used for temporary marking.



ANNEX B: Approved Signs and Markers

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Strands for permanent fencing should be placed at heights which are easily visible, and which make it difficult for a child, adult, or livestock to cross without deliberate effort. For example, one strand placed at 25 cm from the ground and one strand placed at 1.25 m height 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.



Pickets should be used to suspend fencing material and to hang or affix mine signs. Picket material can range from reinforced concrete to angle iron and wooden poles. Picket material should be selected and sized to suit 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. On rocky ground, the use of heavy angle-iron pickets may be necessary, and pickets cannot be used at all on solid rock. Where they can be used, the height of the picket should permit suspension of mine signs at the appropriate height to be clearly visible, despite surrounding vegetation. The recommended minimum height is 1.5 m above ground level. The maximum distance between pickets should be 15 m.

Fasteners for fencing materials and mine signs should be made from a material that has equal or greater durability than the product it is fastening.

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Material used for all aspects of permanent area marking should be durable enough to resist the deteriorating forces in their environment, and to conform to the length of time of their intended use.

Whenever practicable, minefield marking should be made from material that have no obvious other local use.

B.3 Marking on Completion of an area Clearance or BAC Task

The marking of any cleared area following clearance shall be unambiguous. When no adjacent CHA areas are left un-cleared, then all perimeter points shall be permanently marked.

The Benchmark should be marked with a white painted concrete slab measuring approximately 50 cm x 50cm x 20cm. It should be set into the ground so that the top face is flush with the ground surface. Three 60 cm metal pickets should be inserted flush into the concrete to act as an anchorage and means of detection. The task number, Implementing Agency (IA) name or logo, and UTM should be embossed into the slab surface and highlighted in red. 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 LMAC may authorize an alternative fixed natural or manmade object for use as a benchmark. The same information as detailed above should be permanently recorded on the benchmark.



The Start Point (SP), each boundary, cleared area Turning Point (TP), and Intermediate Point (IP) should be marked with 1 x 30 cm steel picket driven into the ground (10 cm protruding painted red). On completion of a mine clearance or BAC Site, Intermediate Points (IP) should be marked when the distance between the TP's is greater than 100 meters and when the view between TP's is obscured. These pickets should not be driven flush with the ground until after the LMAC Quality Assurance (QA) Completion evaluation has taken place, and the site is ready for release. Only on acceptance of the site should the pickets be driven flush with the ground.

If only a portion of an area is cleared, and SHAs remain, then the un-cleared areas should be unambiguously marked and fenced. When it is not practicable to construct a fence, the LMAC may authorize alternative marking such as red painted steel pickets positioned around the boundary at regular intervals including TP's and IP's. Un-cleared areas that are

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canceled or released as not posing a hazard need not be fenced but shall be recorded as not having been searched and cleared.

All perimeter points shall be indicated on both the IMSMA Completion Report and associated schematic diagram or map submitted, along with all perimeter coordinates (distances and bearings). In places where the ground is unsuitable for metal picket insertion, then a red painted rock (a minimum of 20 cm in diameter) or a pile of red painted rocks should be positioned at each perimeter point. Intermediate Points (IP's) may be recorded on the Completion Report and schematic diagram as Turning Points (TP's).

IMSMA Completion Reports and schematic diagrams shall clearly define the parameters of all different clearance assets used on the task site and identify those areas that have been sampled. Any un-cleared area shall be marked as required.

B.4 Marking on the Suspension of a Mine Clearance or BAC Task

Area Clearance and BAC tasks may be suspended for a variety of reasons; e.g., on completion of specific demining operations and pending the start of further operations, climate changes, hostilities, or the termination of an IA's contract or accreditation. Intermediate Points (IP's) may be recorded on the Suspension Report and schematic diagram as Turning Points (TP's).

Marking should be in accordance with marking for a Completion with the following differences: after the LMAC QA Suspension evaluation, the Start Point, Turning Points and Intermediate Points should be driven into the ground with 10 cm (painted red) protruding. This is to ease identification when the task is restarted. In certain circumstances, such as when there is evidence to suggest that the marking may be removed before the resumption of clearance, the LMAC may authorize the pickets to be driven in flush with the ground.

NMAS 08.40, Edition 2.1: Amendment Record

The NMAS are subject to a comprehensive or partial review by the Review Board periodically. Changes in the context as well as safety requirements and efficiency considerations may necessitate amendments to individual NMAS standards more frequently. If this occurs, such amendments shall be given a number, dated, and detailed in the table below. The amendment should also be indicated on the header under the NMAS edition number.

Whenever the formal review of the NMAS is completed, a new edition shall be issued. Amendments that have taken place before the review date shall be incorporated in the new edition and the amendment record table cleared. Consequently, the recording of amendments shall start again until the next review.

The most recent revisions of the NMAS shall be posted on the Lebanon Mine Action Center (LMAC) website on www.lebmac.org.

Number	Date	Amendment Details
1	March 2020	Minor revisions throughout.