Cambodian Mine Action Standards
(CMAS)

Chapter 16

Cluster Munitions Remnant Survey
(CMRS)

Secretary-General
Cambodian Mine Action and Victim Assistance Authority
New Building St. 273/516
Toul Sangke
Toul Kork
Phnom Penh
Fax : +885-23-881-308
Email : deth@cmaa.gov.kh
Web : www.cmaa.gov.kh

Contents

Cluster Munitions Remnants Survey (CMRS)

Introduction

Cluster Munitions Remnants Survey (CMRS) is a combination of Non-Technical (NTS) and Technical Survey (TS) that has been tailored for the cluster munitions contamination context in Cambodia. The method has been developed, tested and implemented in Cambodia, Lao PDR and Vietnam with minor local adaptations.

The aim of the CMRS is to locate, map, and define cluster munitions contaminated hazard areas. The full implementation of CMRS is essential for Cambodia to collect data and clear the cluster munitions contaminated areas in an acceptable timeframe with limited resources.

There are still no international standards available covering CMRS, but the Geneva International Centre for Humanitarian Demining (GICHD) has released several documents covering the topic, and the third edition of “A Guide to Cluster munitions” released in May 2016 should also be read in conjunction with this standard. Additionally, CMAS 15 (Land Release) can be used as a general reference.
CMRS in Cambodia differs from Non-Technical and Technical Survey conducted in a landmine and or cluster contaminated areas in other countries outside South East Asia.

The cluster munitions found in Cambodia do not represent the same level of threat as landmines that typically will detonate if subjected to pressure by persons, animals or vehicles. However, cluster munitions do pose a threat if subjected to heat (for example burning), being hit by objects like a hoe or similar, or if the cluster munitions is tampered with by unqualified personnel. As far as children are concerned, cluster cluster munitions may be a greater threat than landmines. Cluster munitions are small, often visible on the ground, and attractive for children to pick up and play with.

The reduced threat level represented by cluster munitions in Cambodia enables operators to deploy assets directly into cluster contaminated areas with limited precautions compared to deployment in landmine contaminated areas. There are normally no restrictions on movement of personnel during a Technical Survey operation except when an indication is excavated or during demolitions. This allows a much faster deployment and the survey itself will be considerably faster compared to Technical Survey in a landmine context.

1. Scope

This standard establishes principals and provide guidance to enable the development of standard operating procedures, outline the responsibilities and obligations of all demining organizations and agencies in Cambodia to conduct CMRS to identify and define CHA within the cluster munitions suspected hazardous area (SHA) polygon.

When anti-personnel (AP) or anti-tank (AT) landmine is found during survey, the survey shall be ceased and an investigation shall be conducted. If the area is determined as not a minefield, the CMRS operation continues.

2. Terms and definitions

A complete glossary of all the terms and definitions used in the CMAS series of standards is given in CMAS 30.

- Suspected hazardous area (SHA): Land suspected of containing cluster munitions (Reference to Land Classification in CMAS 14)
- Confirmed hazardous area (CHA): Land containing cluster munitions.

3. Principles

Principle of Cluster Munitions Remnant Survey (CMRS)

CMRS in Cambodia is an evidence-based survey approach that starts with a Non-Technical Survey, which is a combination of desktop study followed by village meetings and is followed on by Technical Survey on the cluster munitions suspected hazardous area.

4. Non-Technical Survey

The purpose of Non-Technical Survey is to confirm whether there is evidence of a hazard or not, to identify the type and extent of hazards and to define, as far as possible, within the perimeter of the suspected hazardous areas.
The Non-Technical Survey process begins with a desktop study where all available data is analysed, such as, but not limited to:

a) US Bombing Data
b) Previous survey data
c) CMVIS data
d) Previous EOD spot tasks
e) Community report
f) Any other strong indicators that an area is CM contaminated

If the desktop study finds convincing evidence of a cluster munitions within SHA, the survey team shall arrange a village meeting with the aim of talking with reliable sources, and to physically visit the particular area for further analysis. Typical evidence can be, but not limited to:

a) Visible cluster-munitions
b) Visible cluster-munition fragments
c) Visible cluster-munition dispenser(s)
d) Reliable witnesses that have seen cluster munitions (at least two key informants)

The evidence points recorded shall be the starting points for the Technical Survey intervention.

The below information should be included in the site plan:

- Marking as per Annex E of CMAS 15
- Reference point (landmark), benchmarks, start point, turning points and intermediate points as applicable;
- Grid reference, distances and bearings from the benchmark, starting point and turning points;
- Location of visible cluster munitions/ERW and the footprint;

Following the desktop study, the second phase of the Non-Technical Survey is to conduct village meetings to identify credible evidence of cluster munitions remnant or other ERW contamination/evidence points to be recorded in the Suspected Hazard Area report.

All cluster munitions evidence points identified in a SHA will become starting points for investigation by survey team.

Cluster munitions or other UXO found during survey process will be removed or destroyed within the same day if possible.

When survey team discovers a new cluster munitions evidence outside a SHA, the survey team is to follow CMAS 14 to identify the new SHA before CMRS is conducted.

5. Technical Survey

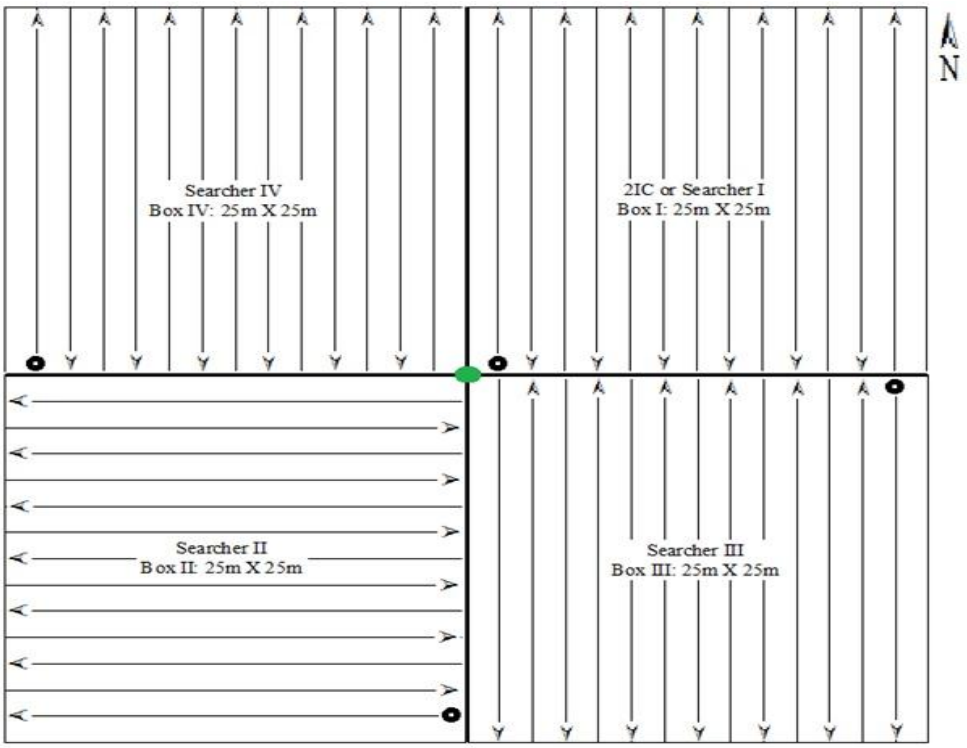
The term “Technical Survey” refers to the collection and analysis of data, using appropriate technical interventions, in order to define better where Cluster munitions contamination is present, and where it is not, and to support planning and prioritisation process.

Effective Technical Survey help ensure that subsequent clearance intervention is efficient and allowing the confident release of land without the need for further technical interventions, whereby the resource is used effectively.

In the cluster munitions context, each strike has left a footprint of various shapes as sizes depending on type of munition, altitude and speed when the container or dispenser was dropped. The Technical Survey intervention shall aim to define the outer perimeter of the strike and if possible avoid spending time and resources in the centre of the strike. US bombing data, known targets in the area, flight pattern if known, and established evidence points should all be used to guide the Technical Survey Team(s) in the most likely direction.

The key objective of CMRS is to define CHA through finding the evidence of a cluster munitions. This could be a cluster munitions, fuse, or fragmentation from a cluster munitions. It involves rapidly surveying 50 m x 50 m (2500 m^2) boxed areas around the initial evidence start point. CMRS determines which boxes contain evidence of contamination. Searchers overseen by team leader are assigned to boxes. When one of the searchers finds a cluster munitions or strong evidence such as a fuse, survey in that boxed area will be terminated and the box is colour coded red and finding is recorded.
The survey team shall use the already established evidence points as starting points for the survey. In areas with little to medium vegetation the grid and boxing system may be used. Prior to deployment a 1x1 kilometre grid map is produced consisting of 400 boxes, 50 x 50 metres. This grid map will typically be placed over the evidence points with the existing evidence point located near in the middle. The Technical Survey will typically start in one of the boxes adjoining the evidence point and move in the most likely direction of the strike with the aim to identify the outer perimeter of the strike.

The centre of each 50 x 50 metre box is uploaded in the team leader's GPS. The team leader then locates the centre of the chosen box, the centre is checked with a metal detector before a pole is driven into the ground. Searchers should subdivide the 50 x 50 metre box in sections of 25 x 25 metres with appropriate marking system. Each searcher is then responsible for searching his/her section as directed by the team leader in the pattern illustrated below.



Example of search deployment in a 50 x 50 metres box:

Search deployment in a 50 x 50 metres box that has been subdivided in four 25 x 25 meters boxes. This system requires four searchers as, in the example above, one of the searchers is also 2IC. The team leader will direct the searchers and also make sure that the search is conducted in a pattern that does not make unnecessary interference between the detectors. The four black dots indicate the starting point for each searcher, for optimal control for the team leader. The search will normally be conducted in a north-south and east-west direction.

Technical Survey may be carried out as an independent activity or it may be integrated with clearance operations. **However, it is advisable not to use TS assets for clearance before the CHA has been defined.** When the majority of the Technical Survey in the respective areas has been completed the TS teams should gradually be transformed to conduct clearance in the defined CHAs according the set priorities through sub-national planning and prioritisation processes.

Colour coding system
CMRS colour coding system:

Depending on the results, each box will be coloured with a colour code as below:GIS Grid (50x50M BOXES) COLOUR UPDATE FOR EVIDENCE FOUND DURING CMRS

COLOR CODE	IDENTIFICATION COLOUR	MEANING IN ENGLISH	MEANING IN KHMER	RGB CODE
6	Red ក្រហម	CM FOUND	រកឃើញគ្រាប់បែកចង្កោម	**255, 0, 0**
5	Yellow លឿង	CM FRAGMENT FOUND	រកឃើញអំបែងគ្រាប់បែកចង្កោម	**255, 255, 0**
4	Orange ទឹកក្រូច	ERW FOUND	រកឃើញគ្រាប់យុទ្ធភ័ណ្ឌមិនទាន់ផ្ទុះ	**255, 155, 55**
3	Blue ខៀវ	MK FOUND	រកឃើញគ្រាប់ទម្លាក់ពីយន្តហោះ (MK)	**0, 155, 255**
2	Grey ប្រផេះ	INACCESSIBLE	មិនអាចចូលស្រាវជ្រាវបាន	**155, 155, 155**
1	Green បៃតង	NOTHING FOUND	រកមិនឃើញគ្រាប់	**0, 255, 0**
0	White ស	NOT SURVEYD/SKIPPED	មិនទាន់បានចូលស្រាវជ្រាវ ឬរំលង	**255, 255, 255**

a) The location where cluster munitions is found is to be marked and grid reference taken. The box is to be coloured red (Color Code: 6) on the map and the team moves to the next box and continue surveying. The cluster munitions shall be destroyed.

b) Fragmentation findings that are clearly identified as part of a cluster munitions, the box are coloured yellow (Color code: 5) and the team moves to the another box to continue surveying. Fragments are also removed from the site to avoid unnecessary readings for future clearance teams.

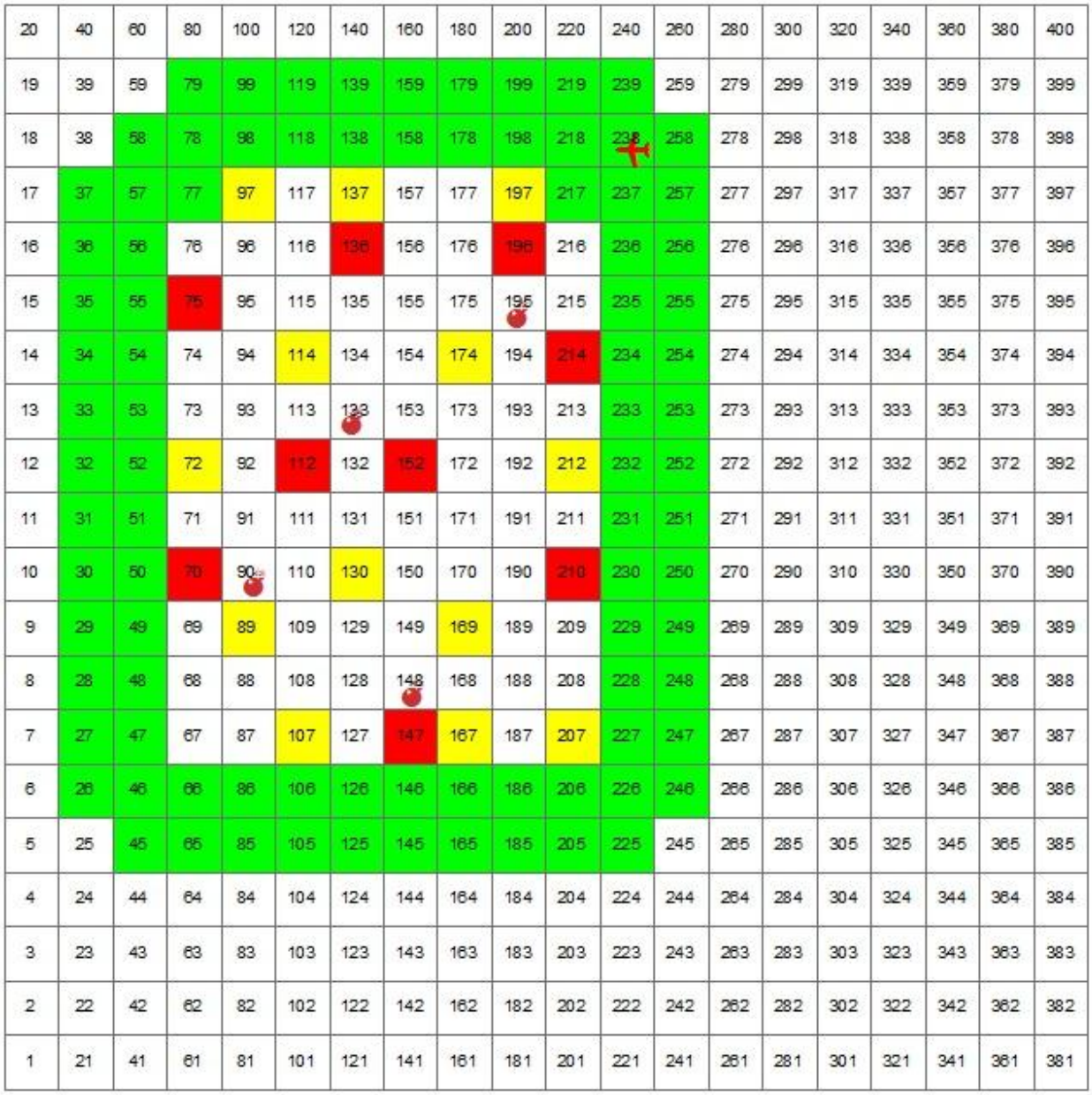
c) The location where ERW (not cluster munitions) is found is to be marked and grid reference taken. The box may not be coloured orange (Colour Code: 4) as the search for cluster munitions will continue and the team may find cluster munition(s) or fragment(s), thus the box will be coloured red or yellow. If nothing else is found, the box is to be coloured orange. The ERW shall be destroyed.

d) If MK bomb is found in a box, the item is marked and grid reference taken. The box may not be coloured blue (Colour Code: 3) as the search for cluster munitions will continue, and the team may find cluster munition(s) or fragment(s) thus the box will be coloured red or yellow, if nothing else is found, the box may be coloured Blue. The MK bomb shall be removed or appropriately destroyed.

e) If a box for any reason is not accessible, or if the team leader judges the box too difficult to search in a given time frame, the box is coloured grey (Color Code: 2) and the team move to another box and continue surveying.

f) If nothing found in a box, the box is coloured green (Colour Code: 1) and the team move to another box and continue surveying.

g) The box has not been surveyed, then it remains coloured white (Colour Code: 0). If the box is coloured white while the survey is ongoing it may mean that the box is pending to be surveyed, if the box remains coloured white on the final map, it means that the box was skipped.



The above example is showing the final results after the Technical Survey has been completed. The footprint of the strike has clearly been identified, cluster munitions were found in nine boxes (red colour) in addition to the four boxes with existing evidence points, which gives a total of thirteen confirmed boxes. Additionally, cluster munitions fragments were found in thirteen other boxes. The white boxes were not searched but skipped; the green boxes (nothing found) show the fadeout areas and will guide the drawing of the final CHA.

The CHA polygon should be drawn at least on the outer edges of the boxes to be cleared but should be adopted in a way to avoid having too many turning points.

In areas with high vegetation it may not be possible to deploy the survey team in a systematic grid/boxing survey system. Vegetation cutting tools and or machines may be used, but this is in most situations not recommended as the Technical Survey approach in the CMRS context is based on fast deployment and search with minimum use of assets.

Instead the survey team should focus on the areas surrounding the high vegetation areas or areas with other obstacles hindering a direct deployment. The team will then need to GPS track the areas actually surveyed. The GPS data shall then be overlaid on the grid map, and grid references of all findings shall be recorded and inserted on the grid map. The area actually surveyed will then cover parts of more than one box, but the colour codes can still be used. This system will still give a very good indication of the area and enable the survey team to define the CHA.

Time limitation and percentage of area actually surveyed should be determined and stated in the individual operators' SOP. This will to some degree also depend on the ground situation, however if nothing is found there should be a time limit set for when the team is to stop searching, colour the box green and continue to another box.

Skipping of boxes should be practiced: If the team identifies positive findings cluster munitions, the team leader shall colour the box red, and will not necessarily deploy the team to continue in the adjoining box. Instead the team should skip one or two boxes before resuming the search. This will in most cases increase efficiency of the search by more quickly reaching the boundary of the CHA and spending less time searching in the centre of the CHA.

6. Assets and methods

The most common assets and methods used for Technical Survey in the CMRS context are:

a) *Deployment of manual searchers with metal detectors*: manual assets may employ a range of detectors including large loops. The operators will have to test and make sure that each detecting tool is capable of finding the items down to the national standard of required depth. Samples of the hazard types expected to be found should be onsite and used as testing objects. Frequent detector testing shall be conducted; and extra testing should be conducted when there is a significant change in the type of soil.

b) *Explosive Detection Animals:* Explosive detection dogs (EDDs) are very suitable for CMRS; in most cases the EDDs will be significantly more efficient than a manual searcher with metal detector. An EDD will only detect explosives and discriminate metal, thus in areas with high metal fragmentation contamination or metallic soil the EDD will be the preferred detection tool, but in combination with manual searchers. The general rules and regulations for EDDs in CMRS will still apply but the search pattern will be slightly different.

c) ***Machines:*** (Mechanical clearance assets) will in general not be deployed in the CMRS context, as the Technical Survey approach in the CMRS is based on a fast deployment and search with a minimum use of assets. Lighter vegetation cutting tools may be used in some situations but the recommendation in general will be to not deploy TS assets in areas where ground preparation is required before deployment.

d) *Combination of tools:* A combination of manual searcher and EDDs for Technical Survey in cluster contaminated areas will in most cases be the most efficient approach. Other tools can be added such as Unnamed Aerial Vehicle (UAVs) for mapping and also as a team deployment decision making tool.

Note:

When anti-personnel (AP) or anti-tank (AT) landmine is found during survey, the survey shall be ceased and an investigation shall be conducted. If the area is determined as not a minefield, the CMRS operation continues.

7. Size of CHA and Reporting

The size of one CHA is to be no greater than 20 hectares. If the size of a CHA is greater than this, it should be broken down into smaller polygons for subsequent actions. On large tasks the area should be broken down into smaller blocks if there is sufficient information to do so, using evidence points and natural features available in the area. Following the completion of a Technical Survey task and the CHA defined, a standardised CMRS report form shall be filled in and sent to Database Unit of CMAA.

8. Responsibilities and obligations

8.1 CMAA's responsibilities

- Advise on the standards and guidelines for quality assurance and quality control to be applied to clearance contracts and agreements.
- Accredit and license demining organizations
- Monitor and record the CMRS activities of demining organizations.
- Maintain a registry of cleared land and of uncleared land showing the clearance status for each hazardous, cluster munitions or suspect area.
- Monitor the demining organization and its sub-units in accordance with CMAS 03 and to the requirements of the relevant clearance agreement or contract.
- Maintain and make available to legitimate interested parties documentation relating to site visits and inspections.

8.2 Operator's responsibilities

- Obtain (from the CMAA) accreditation and the appropriate licenses
- Apply clearance procedures in compliance with organizations SOPs and ensure that the organization SOPs in line with Cambodian Mine Action Standards
- The operators shall develop their SOPs on drawing CHA polygon.

- Maintain and make available documentation of clearance in a timely manner as specified by the CMAA.
- Apply management practices and operational procedures, which aim to clear land to the requirements specified in the clearance contract(s) or agreement(s).
- Apply internal quality assurance and quality control in accordance to SOP.

8.3 Donor responsibilities

- Donor agencies have a responsibility to ensure that the projects they are funding are managed effectively and safely in accordance with CMAS.
- Donors are also responsible for ensuring, through the CMAA and PMAC/MAPU, that the tasks and projects to be funded are consistent with national and provincial priorities. This involves strict attention to the identification of clearance projects, creation of agreement documents and ensuring that demining organizations chosen to carry out such agreements meet the accreditation, licensing criteria and standards of the CMAA.

Phnom Penh date November 2018

Secretary General

H.E. Prum Sophakmonkol