The CROMAC QA/QC System

Nikola Gambiroza

* Croatian Mine Action Centre (CROMAC) 

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The CROMAC QA/QC System

Quality mine and UXO clearance ensures that the beneficiaries of cleared lands can enjoy a safe livelihood in the demined area. This level of confidence requires a high degree of organization and management, maximum engagement of demining organizations and national mine-action bodies, and a quality-control system with detailed operating procedures. Such a system guarantees the best supervision and control of the suspected mined area.

CROMAC’s QA/QC System

The Croatian Mine Action Centre is developing a quality-assurance/quality-control system that incorporates all of the organization’s experiences, the requirements of humanitarian demining, and all of CROMAC’s functions and staff into the process of QA/QC and cancellation of areas from the suspected mined area. Based on such presumptions, CROMAC’s QA/QC system entails the following three development phases:

1. Quality Control
2. Quality Assurance
3. Total Quality Management

CROMAC bases its success on the continuous improvement principle exemplified in Total Quality Management. This progress is characterized by constantly improving conditions to reach an acceptable level of quality in a demined area. Attaining TQM is a goal of all CROMAC employees.

CROMAC’s QA/QC system follows the guidelines set in the following documents: ISO 9000, ISO 2859, IMAS 09.10 and IMAS 09.20.1,2 The International Mine Action Standards are an integral part of the management process aimed at verifying demining quality and reaching sufficient confidence (with acceptable quality levels) that the demining company has removed and/or destroyed all mines and unexploded ordnance from the mined area according to specifications.

Sampling Plans (Acceptance Plans)

The basic question asked during the control by sampling is: How many samples should be taken to assure a reliable estimate of the quality level of the entire demined area? This problem can be successfully resolved in humanitarian demining by using sampling plans or acceptance plans. Depending on the sampling plan applied, decisions about acceptance or rejection of the demined area can be made by:

- Controlling one randomly selected sample of the size \( n \) (single sampling)
- Controlling two randomly selected samples of the sizes \( n_1 \) and \( n_2 \) (double sampling)
- Controlling more than two randomly selected samples of the size \( n \) (multiple sampling)

Sampling plans are classified into two basic groups:

1. Acceptance plans for attributes (control result is an attribute: proportion of “good” [acceptable] to “bad” [defective] parts of an entirety, number of defects, etc.)

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2. Acceptance plans for variable (control result is measured data)

CROMAC has made the procedures for inspection and sampling during the execution of demining operations and supervision over completed demining operations based on sampling plans for attributive characteristics as per standard HRN ISO 2859-1.

Acceptance Criteria

Acceptable Quality Level for the projected area indicates the acceptable number of nonconformities that can be present in an area without causing rejection of the entirety (an area demined under the same conditions and procedures within the span of a day or week). Several levels of nonconformity exist. The larger the mine, item of UXO, or explosive fragment and the more shallow the soil treatment depth, the lower the allowable number of defects acceptable at each nonconformity level. Once the number of defects exceeds the acceptable standard at a certain level, the area reaches "critical nonconformity," which causes the entirety to be rejected.

The Law on Humanitarian Demining of the Republic of Croatia defines complete clearance as follows: "Complete worksite clearance is the status of an area and/or facility defined by geodetic measurement that is completely clear from all mines, UXO and their fragments to the depth specified by the project." Using the term complete clearance often causes misunderstandings and is subject to various interpretations. For example, should the worksite be completely clear from all parts of mines and UXO regardless of the type and size of such fragments (metal and plastic parts, parts of explosive, pyrotechnic chain, etc.) and regardless of whether they contain explosive substances?

Prior to introduction of the AQL concept to the quality-control system, significant demining efficiency and cost-effectiveness were lost due to the fact that every time metal was detected in the control sample during the final acceptance resulted in rejection of the demined area. This rejection of demined areas occurred frequently during the use of demining machines, especially rakes. Since the introduction of AQL, a demined area can contain certain indicators of defects such as remaining metal fragments discovered by metal detectors or remaining traces of explosives with or without metal that are found using the prescribed standard method for the detection of metal and explosives. Such cases can indicate the existence of nonconformities in demining and again create critical nonconformity. Terms for acceptability or non-acceptance of all nonconforming categories are defined by standard operating procedures for sampling. The demining contract defines the AQLs that should be used.

Nonconformity represents the deviation in quality that results in the demined area not meeting the specified requirements. Nonconformities are generally categorized into classes according to their level of gravity. The scheme of sampling plans (one-time sampling) and nonconformities are presented in Figures 1 (page 61) and 2 (page 62).

Demining methods and techniques, demining machines, and working tool types and makes, as well as the soil conditions on the demining project, are taken into consideration during the definition of critical nonconformity. Based on those factors, tables of confidence levels were made for light, medium and heavy machines as well as tables for definition of sample sizes for inspection.

Use of demining machines proved to be very efficient and cost-effective in combination with manual mine detection and mine-detection dogs. If demining machines that reach the depth specified by the project are used during the conduct of demining operations as a first method, following mechanical treatment, the entire area should be searched using manual methods or mine-detection dogs. In that case, the acceptability criteria for the use of MDDs should be defined as well.

Procedures of Corrections and Repetitions

Locations of control samples are selected in a partially guided way so that over 70 percent of control samples have to cover locations of minefields from the minefield records, mine- and UXO-detection sites and other risk areas (borders of minefields, road crossings, etc.) and 30 percent of control samples are selected using a random-selection method.

Acceptance plans and sampling tables are adjusted to the practical needs of demining. Sample sizes are selected in a way to inspect at least 2.5 percent of the worksite area in the case of big entireties (areas bigger than 150,000 square meters [37 acres]), or up to 35 percent in the case of smaller entireties (areas smaller than 3,201 square meters [3,828 square yards]) and bigger than 200 square meters [239 square yards].
Conclusion

Mine action and demining processes in the Republic of Croatia are organized in such a way as to reduce the mines and UXO danger to an acceptable risk level. The Law on Humanitarian Demining defines the complete clearance of worksites from all mines and UXO to the depth determined by the project, meaning the acceptable risk should be zero. However, it is very difficult to reach 100-percent worksite clearance in an efficient and cost-effective way.

In order to fulfill mine-action goals and completely eliminate the mine problem from the Republic of Croatia, as specified by the National Mine Action Strategy until 2019, CROMAC will focus its future efforts primarily on landmine and UXO removal to its stated Acceptable Quality Level.

The introduction of AQL enables a demined area to contain certain indicators of nonconformity, such as individually measured depths of mechanically treated soil, remaining fragments detected by metal detectors, or the remaining traces of explosive substance with or without metal that are found by approved methods for detection of metal and explosives. Such cases can indicate the existence of nonconformities in demining and again create critical nonconformity, which requires rejection of the area. Terms for acceptance or non-acceptance of all defect categories are defined by SOPs for sampling.

With CROMAC’s improved standards for humanitarian demining in place, the mine-action community in the Republic of Croatia hopes that the cost of demining operations will decrease as the effectiveness of demining increases. Lands will not be needlessly rejected, while areas at risk of harming its beneficiaries can be effectively targeted for demining procedures. If this model for an effective QA/QC system proves successful over time, the benefits will not only touch Croatia, but the international mine-action community as a whole.

See Endnotes, Page 83

Nikola Gambiroza, Ph.D.
Assistant Director
Croatian Mine Action Centre
A. Kruse a 15
44000 Sisak / Croatia
Tel: +385 44 554 103
Fax: +385 44 554 111
E-mail: nikola.gambiroza@hcr.hr
Web site: http://www.hcr.hr

Falkland-Malvinas Islands Update

Since conflict between the United Kingdom and Argentina ceased in 1982, the Falkland-Malvinas Islands have remained riddled with landmines. Under its obligation to the Ottawa Convention, the U.K. is removing the landmines from this territory. Despite concerns about clearance there, a successful pilot program has been conducted.

Following conflict between the United Kingdom and Argentina in 1982, close to 20,000 landmines contaminated the Falkland-Malvinas Islands. Despite numerous concerns, including those relating to the environmental effects of clearance activities, the United Kingdom is fulfilling its obligation to Article 5 of the Ottawa Convention to remove all anti-personnel landmines from the Islands.

A pilot program for landmine removal began in late 2009, conducted by Battle Area Clearance and Training Equipment Consultants International Ltd., with program direction and quality control oversight by the newly created Falkland Island Demining Programme Office. It is expected that the results of the pilot program will help inform future clearance activities.

Background

Argentina laid at least 20,000 landmines, forming approximately 120 minefields, in 1982. Following Argentina’s surrender to the United Kingdom, clearance began immediately but quickly ended after several British service-men were injured. The locations of the minefields were thoroughly recorded and fenced off, and no civilians have been killed or injured since the conflict ended.

Clearance operations did not again become a reality until 1998, when the United Kingdom, clearance began immediately but quickly ended after several British service-men were injured. The locations of the minefields were thoroughly recorded and fenced off, and no civilians have been killed or injured since the conflict ended.

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Current Activities

Clearance operations are focused on four suspect areas, each with different terrain types and with various mine and unexploded-ordnance threat levels: Fox Bay East, Goose Green and two areas near Stanley, the capital of the Falkland-Malvinas Islands. An additional area at Surf Bay was selected for demining because a main road bisected it and there were concerns about accidents in that area. It was also because it contained over 1,000 mines representing 5 percent of the overall mines remaining on the island. Current demining activities are scheduled for completion by the end of May 2010.

Following the pilot phase, the United Kingdom will better understand the logistical, environmental and technical challenges and will be able to inform future remediation phases.