Humanitarian mine action
Test and evaluation
Demining machines

CEN Workshop business plan
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1 The background to humanitarian mine action standards

1.1 Context

The presence of landmines represents a serious safety hazard and a major obstacle to reconstruction and development in former conflict zones across the world. With the incentive of entry into force of the Ottawa Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and their Destruction, the challenge for the international community is to overcome the landmine problem in the next 10-15 years. Nevertheless, there are 91 countries in the world contaminated with around 135 million mines and UXO (unexploded ordnance) items, and despite all the efforts and investments, it will be very difficult to free them of a landmine threat in the above stated time period. Invention of new methods and technologies detection of UXO may not be expected in the next 3-5 years. In the meantime, it is necessary to make optimum use of existing knowledge and methods, and use of demining machines is definitely one important method, because these machines speed up demining, reduce its cost and make it safer. This statement may be illustrated by an example from The Republic of Croatia, where out of the total of 13,640,014 m² of demined area, 9,494,693 m² were demined using demining machines (first method).

Based on its contribution to date, the European Union is expected to be one of the largest contributors in this activity. Success will only be achieved if the international political commitment and the resources are sustained, if international co-ordination is improved, if effective national capabilities are established in all of the most seriously mine-afflicted countries and safer and faster demining techniques are introduced.

The European Commission (EC) Communication for the proposed European Parliament and Council Regulation concerning action against anti-personnel landmines call for the establishment of international Specifications and Methodology for test and evaluation of equipment and their implementation, in close co-operation with CEN, ISO, and the UN. The EC has granted a mandate to the European Standardisation Bodies to proceed with this standardisation. Such standardisation would include minefield survey, close-in detection and identification of anti-personnel land mines (APL), information fusion and information management, quality assurance in the whole process of mine clearance and especially for test and evaluation of any tool in support to humanitarian demining.

The CEN BT/WG 126 “Humanitarian Mine Action” delivered in March 2002, as an action plan, the CEN response to the EC "Mandate to the European Standardisation Bodies on Technologies for Humanitarian Demining" (M/306), interpreted to cover humanitarian mine action. In this response, a particular action was identified on “Mechanical Equipment – Test and Evaluation Methods”.

1
1.2 The role of standards

Standardisation will support the development of new demining tools and methods and will facilitate the comparison of different tools and products and will significantly improve the efficiency of the demining programs. The benefit of agreed Specifications is acknowledged world-wide and urgently required.

A systematic and stepwise approach has been recommended. The first task is to provide the terms of reference for comparing present techniques and instrumentation and also for improving and optimising existing technologies (Development or improvement of new mechanical methods, standardisation of test mines etc.). However, Standards/Specifications are seen as a crucial aspect also for the development of new technologies and it is recognised that they would contribute to increasing the credibility when a new prototype is introduced on the market.

The EC and donors will use Standards/Specifications to ensure that they get value for money, supporting only validated methods and experienced teams. This will permit them to verify and certify that services provided are performed well and according to requirements. The standards/specifications will also support better EC decision making/quality control capacity and allow better quantification of the benefits of EC aid programs.

Finally, Standards/Specifications will help users to find the key technique or the key combination of techniques best adapted to given mine-clearance operations.

The importance of Standards/Specifications has therefore been stressed in terms of a collaborative effort to be conducted between developers and end users. It is for this reason that both machine manufacturers and in-field operators must be invited to participate actively in the discussions. Concerning the actions anticipated, participating experts in the process will have to be asked to consider the following important aspects in order to obtain a workable basis for an Agreement:

— provide a suggested selection of standard test mines for the machines to be tested upon;
— provide a preliminary set of definitions, parameters to be controlled and standard test conditions for characterisation and assessment tasks;
— specify a measurement and reporting system to ensure standard test conditions;
— provide a confidence level for validating the testing process.

1.3 International test and evaluation programme

On the 17th of July 2000, a Memorandum of Understanding was signed by Belgium, Canada, the Netherlands, Sweden, United Kingdom, the United States and the European Commission, and later this year also Germany, in order to establish a global network for test and evaluation of equipment and technologies for humanitarian demining - International Test and Evaluation Programme for Humanitarian Demining (ITEP). The aim is to establish standards for test and evaluation and carry out test and evaluation of all kinds of equipment and methodologies and to make the results available for the demining community. The co-ordination of work and the sharing of resources together with the combined knowledge and experience of the ITEP participants will increase their effectiveness to produce valuable test and evaluation data to the demining community.

1.4 The United Nations Mine Action Service

The United Nations Mine Action Service (UNMAS) initiated a review and revision of the International Mine Action Standards for humanitarian mine clearance operations (IMAS) in October 1999. The Geneva International Centre for Humanitarian Demining (GICHD) is implementing the project on behalf of UNMAS, with financial assistance from the Government of the United Kingdom.

The review and revision acknowledges the important changes that have taken place in the management of mine action. International interest and funding has increased and there is an expectation of improved cooperation, co-ordination and unity of effort. The UN has recommended that a framework be established to provide structure and coherence to the growing number of Specifications and Methodology and guidelines.
The IMAS provide a suitable medium for informing the mine action community of existing international regulations, conventions, treaties and Standards which impact on mine action, particularly those referring to basic human rights, clearance requirements, hazard marking and general safety issues.

1.5 CEN Workshop approach in mine action standardisation

While no decision has been taken yet on the final status of the documents, the participants in CEN BT/WG 126 have expressed their strong interest for the CEN Workshop approach, and its deliverable, the CEN Workshop Agreement (CWA).

Different participants will progressively identify the needs. CEN will deal with them in CEN Workshops (CEN WS) to be set up as and when needs are identified, in a transparent way, based on a CEN Workshop Business Plan (BP), which will be approved during a kick-off meeting, announced in advance.

The general concept and rules for a CEN WS can be found at CEN’s web-site:


Each such CEN WS will identify its own purpose, have its own objectives, fix its own programme and planning, provide its own resources (in terms of expertise, technical secretariat and CEN National Standardisation Bodies as professional standardisation support, participation fees or financial contribution).

Given that the involved experts have already relevant meetings (sometimes in the context of existing projects in development), it may sometimes be more efficient to declare the status of CEN Workshop over a part of those meetings. During that part, the rules of the CEN WS and the CEN WS BP will be followed. These meetings need to be announced well in time, especially regarding the agenda, on which must appear the documents to be approved as CWA.

During the CEN WS part, the identified and announced documents will be considered, consensus will be verified, checking whether the documents can be given the status of CWA, or whether changes need to be made.

As said above, in the area of "Humanitarian Mine Action" there could be various specific focussed CEN Workshops, organised according to the needs and priorities.

This could cover such specifications as follows:

— Test and Evaluation of all equipment;
— Technical training assessment/certification;
— Existing standards terminology/definitions;
— Risk and quality management and performance indicators.

This 'focussed' CEN Workshop (CEN WS) will deal with Specifications and Methodology for Testing and Evaluation (T&E) of Demining Machines.

2 Origin of this CEN Workshop

Test and Evaluation Specifications and Methodology for Demining Machines need to be developed for the following reasons:

— There is a lot of test and evaluation work performed in the demining world today, but in many instances, it is not what most of the demining community or developers need. In order to improve the situation it is necessary to provide Standards whereby each piece of equipment would be tested to the same standard, under the same conditions, and using criteria that can withstand technical scrutiny.
— The test and evaluation shall provide users and donors with useful and reliable data. This will permit users, donors and others to assess the effectiveness and efficiency of particular equipment and thus improve operational effectiveness and safety in demining operations.

— Important spin-offs are expected from well-executed, standardised test and evaluation. Manufacturers will be aware that standards must be met and will design and develop the equipment in such a way as to meet those criteria. At a very early stage, poor candidates could be eliminated. Persons tasked with test and evaluation would be able to plan and execute the work much more efficiently if the protocols/Standards are clearly defined. Their results will gain greater acceptance and credibility when that protocols/ Standards are carefully followed.

— Much of the test and evaluation being performed today is done on the basis of local experience and conditions. Some characteristics are being tested which have little bearing on the requirements of demining. In other cases, whole aspects are left out due to a number of constraints such as being too expensive, taking too much time, lack of a proper procedure, etc.

Many trials of the capabilities of mechanical means have been performed in recent years, stimulated by the growing international effort to combat the threat posed by mines and unexploded ordnance to civilian populations. However, as a result of the lack of an agreed standard for comparing the performance of these mechanical means this work has been of limited value to the end-users. As almost no standard exists, it is difficult to make cross-comparison between demining machines to determine which is best suited to particular needs.

In view of its expertise and interest, SWEDEC in co-operation with CROMAC and GICHD will organise a CEN Workshop on Specifications and Methodology for test and evaluation of Demining Machines.

The promoters of this CEN Workshop are currently as follows:

<table>
<thead>
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</table>

SWEDEC is committed to take the responsibility for the technical secretariat of this CEN WS. The National Standards Bodies of Sweden (SIS) provide the professional standardisation expertise and a formal link to the CEN System.

3 Market overview – Mechanical mine clearing means

The market players that will benefit from the outcome of this CEN Workshop are:

— Donors
— Demining Machines manufacturers
— Commercial and non commercial humanitarian demining organisations
— Mine Action Centres
— Test and evaluation agencies
The market for Demining Machines for Humanitarian Demining is based on donations. It is expected that the need for more efficient Demining Machines and the need for enhanced safety in the demining process will increase the market in the future.

It is also in the interest of manufacturers to have specifications that will guarantee the quality of their product. Having widely-applied specifications would help the market to grow. The aim is that tests made in accordance within these Specifications would be accepted internationally.

For the period 2000-2006 the EU is planning to spend around 200 million EUR for demining operations. Demining machines are going to be a basic tool in future mine-clearance operations, and to get the best return from invested money, standards can help choosing the right tool for the right task.

A list of most of the manufactures and machine-details can be found in the GICHD-catalogue “Mechanical Demining Equipment Catalogue 2003” (www.gichd.ch)

Considering the market described above, the following groups of people are invited to contribute to this CEN Workshop:

— Users of Demining Machines
— Manufacturers of Demining Machines
— Institutions/agencies who perform tests on Demining Machines
— Mine Action Centres
— Experts in standardisation of measurement equipment
— Donors

4 Objectives of this CEN Workshop

The purpose of this CEN Workshop is to define specifications for:

— test methodology;
— critical criteria to be tested.

This will be done in a 3-step process, establishing:

— specifications for performance-test and survivability-test in repeatable conditions;
— performance specifications for target mines;
— specifications for “field test” including field performance, logistics, safety for operators, classification of different machines.

The beneficiaries of this process will be field operators, manufacturers, researchers and developers within the global mine action community. The results of this work should ensure that, for the first time, there is a baseline standard against which to judge all performance aspects of mechanical equipment.

This will improve safety, reduce risk and ensure a continuous high level of clearance quality. Users of mechanical systems will be able to decide what action is to be taken after the mechanical systems has operated.
The main objective therefore is to develop widely accepted and applied specifications for the testing and evaluation of Demining Machines in humanitarian mine clearance, in order to have secure operations and equipment that are safe, reliable and fit for purpose.

The CEN Workshop process is open to participation from non-CEN member states. This is clearly an advantage in this case where the aim is to produce a document that can be accepted internationally. It has been decided therefore, to start with a CEN Workshop Agreement (CWA). This could then form the basis for TNMA, IMAS, EN Standards and possibly ISO Standards.

5 Programme for this CEN Workshop

5.1 Overall scope

The main aim is to develop internationally widely accepted and applied specifications for testing and evaluation of mechanical mine clearance devices and ground preparation systems, used in the context of humanitarian mine clearance, in order to have secure operations and equipment that are safe, reliable and fit for purpose.

The deliverable is a CEN Workshop Agreement (CWA) dealing with specifications for the testing and evaluation of Demining Machines used for humanitarian mine clearance. It is intended that the CWA, resulting from the CEN WS, conform to the IMAS on equipment test and evaluation.

The following important aspects should be defined:

— Specification of mine targets, suitable for the testing of all types of mechanical equipment
— Specifications for performance and survivability test
— Specifications for field test

Exclusions to the scope:

— Cost-effectiveness. This is seen as being outside the normal scope of CEN activities and is likely to be impractical due to the diverse nature of the data that need to be gathered to make accurate comparisons. This aspect will be covered in the GICHD Mechanical Study.
— Although test methods for measuring performance should be defined, it is recommended that the CWA avoid specifying acceptance levels for performance.
— Specifications and Methodology for combined “deminining systems” will not be covered in this CWA, e.g. how a machine and a dog work together.

5.2 Overall action plan

This CEN Workshop (CEN WS) intends to deal with Specifications and Methodology for Testing and Evaluation (T&E) of Demining Machines. The CEN Workshop will be divided into three separate ‘meetings’ to develop specifications for performance testing, field-testing and suitable targets. Finally the three different documents being the result of the three meetings shall be combined to a CEN Workshop Agreement (CWA).

Initial preparations for this CEN WS have already been initiated. Efforts have to be done to see to it that the CEN Workshop meetings are well attended by the research and donor community, as well as by field practitioners.

When enabled, the kick-off meeting of the CEN Workshop (resulting in a CWA) is achievable for the 3rd of June 2003 in Brussels. The meeting will decide on the CEN Workshop Business Plan and appoint a Chairman, a Secretariat and a Chairman’s Advisory Group.
The Chairman’s Advisory Group will formulate draft proposals for the CEN WS meetings, invite prospective participants and determine the structure of the CEN Workshop meetings. It is planned that most of the work of the Chairman’s Advisory Group will be achieved by e-mail correspondence.

The first CEN WS meeting is to be held at SWEDEC in Sweden the 15th to 16th of September 2003 and it shall develop the technical basis for specifications for the performance and survivability test.

The second CEN WS meeting will be organised by the GICHD and held at SWEDEC the 17th to 19th of September 2003 and it shall develop the technical basis for specifications for target mines.

The third CEN WS meeting will be held at CROMAC in Croatia the 14th to 16th of October 2003 and it will develop the technical basis for specifications for field tests.

The Chairman will seek consensus in each meeting (consensus meaning “no major opposition” as opposed to “unanimity”). Following each of the three CEN WS meetings, the minutes will be distributed for the comments to the participants. The minutes with comments, if any from the participants, will be the basis for the draft CWA to be prepared by the Chairman’s Advisory Group.

A fourth CEN WS meeting will be arranged, if needed, to discuss and adopt the final CWA. The objective is to have a draft CEN Workshop Agreement for adoption in September 2004. Once the CWA is adopted it will be circulated to CEN national members and others, to make it available at national level.

On completion of the work programme as described in the CEN WS BP and adoption of the CWA, the CEN Management Centre (CMC), in co-operation with Chairman and Secretariat, will consider the Business Plan to be fulfilled and the CEN Workshop will be disbanded.

On approval of the CWA it will be sent by CMC to GICHD review board for inclusion into IMAS.

### 5.3 Performance test

#### 5.3.1 Scope

The aim is to develop specifications for repeatable performance tests that will produce comparable results. The specifications for how to conduct these performance tests shall include the following topics:

- Specification of test facilities
- Execution of test
- Documentation of test
- Evaluation of test result

The following items will be considered:

- Design of test lane
- Soil properties
- Methods for measuring and changing the conditions of the soil
- Deployment of mines (i.e. pattern, depth and number)
- Statistical methods for the evaluation of the result
5.3.2 Action plan

— An example of a test plan, based on SWEDEC tests and the CCMAT-workshop, will be presented in September 2003.

— This example will be used as a basis for the discussion during the first CEN WS meeting (at SWEDEC). Target mines will not be discussed during that CEN WS meeting.

— The result of the second CEN WS-meeting (organised GICHD at SWEDEC) on target mines will be added to the performance/survivability test afterwards.

5.3.3 Survivability test - Scope

The scope for this part is to develop specifications for survivability test of both the operator and the tool. The test should be repeatable and produce comparable results. The standard will include specification for:

— type and size charge
— execution of test
— evaluation of impact on machine
— measuring the affect on the operator

Following items will be considered:

— maximum acceptable acceleration and pressure in the cabin

5.4 Target mines for testing and evaluation of mechanical systems

5.4.1 Scope

The aim is to:

— specify the aim of testing and therefore the requirements and needs of target mine types and design
— determine the key characteristics and or constraints for target mines for test purposes and if required create categories (Intrusive systems such as flails and mills; Non intrusive i.e. rollers),
— determine key characteristics needed for each test category,
— determine specifications for all surrogate mines that result in acceptable surrogate, that are fit for purpose, acceptable cost, minimal storage and holding issues, availability.

Following items will be concerned:

— Means for demining effect on targets
— Standard targets for testing for both performance and field testing
— Function, size, shape, construction etc. of AP- mines
— Function, size, shape, construction etc. of AT mines

5.4.2 Action plan

— Promote the CEN WS meeting among NGO’s, producers of Demining Machines and the research community to ensure that the expertise needed will participate.
— Based on the experience from the tests performed by SWEDEC and the result from the CCMAT-workshop a first draft of a standard for performance test will be produced and distributed well in advance to the first CEN WS meeting.

— Co-ordination with the other two CEN WS meetings

5.5 Field test

5.5.1 Scope

The aim is to develop specifications that will lead to determination of realistic results on survivability and quality of Demining Machines in realistic ground and mine/UXO conditions.

In order to achieve this, it is necessary to:

— establish a procedure for submitting testing requests

— establish general technical characteristics of a demining machine and its working tool (create forms to be filled in) and the list of documents to be submitted prior to the testing by the party ordering the testing,

— establish safety conditions of a machine operator

— establish the concept of the Testing Plan and Program

—

— establish realistic productivity of a machine per hour (order of a random list of spare parts (delivery time), fuel type, spare parts packages available, critical parts)

— establish the items to be stated in a manual (full documentation, instructors manual, spare parts catalogue, maintenance manual; production certificate, or others) Determine the documents required to secure that later delivered machines are at the same standard as the tested machine
6 Structure and resource requirements for this CEN Workshop

— The promoters will support this CEN WS on Testing and Evaluation of Demining Machines with a Chairman’s Advisory Group and a Secretariat with a local organisation team.

— The Chairman’s Advisory Group will establish a framework for standardisation, providing a starting point for the CEN WS, its membership is as follows:

<table>
<thead>
<tr>
<th>Name</th>
<th>Representing</th>
</tr>
</thead>
<tbody>
<tr>
<td>T. Bäckman</td>
<td>SWEDEC</td>
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<tr>
<td>Christer Karlsson</td>
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<td>Dinko Mikulic</td>
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<td>Göran Danielsson</td>
<td>SWEDEC</td>
</tr>
<tr>
<td>Kaj Hörberg</td>
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</tr>
<tr>
<td>Jan-Ole Robertz</td>
<td>Convenor of BT WG 126</td>
</tr>
</tbody>
</table>

Secretariat: SWEDEC has agreed to take responsibility for the technical secretariat and local organisation of the CEN WS, with the assistance of SIS.

Professional standardisation support to the CEN WS: CMC and SIS,

The CEN Workshop working language and documentation will be English.

7 External liaisons

A CEN Workshop Agreement has the advantage of being very flexible and is therefore the preferred initial option. Later it may be upgraded into an EN or ISO Standard. It is understood between CEN, CENELEC, ETSI and ISO that CEN will lead the development of the CWA, but the other Bodies will be informed of every step taken and can join the CEN WS when they so wish.

Close liaisons will be maintained with the promoters: GICHD, ITEP, UNMAS, the EC, and CEN/BT WG 126.

8 Contact points

8.1 Chair of the CEN Workshop

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9 Definitions

9.1 Demining machines

Machines that mechanically treat UXO and mine contaminated land to remove vegetation (by cutting and/or grinding) and/or destroy mines (by activation, breaking and grinding).

9.2 Performance test

Test of the machine’s performance in clearing mines and/or ground preparation tasks. The performance test shall be performed under different conditions and with different types of mines.

9.3 Survivability test

Test of the impact of an explosion from a defined target on the machine’s tool and on the driver in the cabin.

9.4 Field test

Test in the real mine field and terrain to evaluate and validate operative values of demining machines, with verification performed with conventional demining techniques.

9.5 Target mines

Mines for test purpose with key characteristics and or constraints to be specified and if required divided into the following categories of demining machines:

— Intrusive systems such as flails and mills.
— Non intrusive (i.e. rollers)

Key characteristics shall be determined for each test category.

Specifications shall be determined for all surrogate mines that result in acceptable surrogate, that are fit for purpose, acceptable in cost, with minimal storage and holding issues and with acceptable availability.
References


[10] ENIQ website, including published guidelines http://www.jrc.nl/eniq/